How corruption mitigates the effect of FDI on economic growth?

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22 December 2021

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Abstract

Unlike previous studies in the Foreign Direct Investment-economic growth literature, this study uses the panel vector autoregressive (PVAR) model to examine the role of corruption in inhibiting the effect of Foreign Direct Investment on the African economic growth. Furthermore, we use the impulse response function tool to better understand the reaction of economic growth, after shock on Foreign Direct Investment and the interaction between Foreign Direct Investment and Corruption. Using data over the period 1996–2016, this research results show that the Foreign Direct Investment promotes the African economic growth. While corruption mitigates this effect. Therefore, the implications of this paper are that public policies should aim to minimize the level of corruption in order to ameliorate the attractiveness of FDI and ensure its efficient utilization in order to give strength to the level of economic growth.

1. Introduction

It is generally recognized that foreign direct investment is seen as a potential source of economic growth, particularly for the developing countries whose governments have taken various measures to actively attract FDI. As a direct effect, FDI-based capital flows promotes capital accumulation in the host country and as indirect effect, FDI stimulates economic growth in host country through promoting productivity growth and technology transfer. There is a rich body of literature on how FDI negatively, and sometimes positively (Almfraji et Almsafir (2014), Alfaro (2003), (Busse & Groizard, 2008)), affects economic growth.

Nevertheless, other studies show that this effect can be influenced by many factors. In fact, some studies have shown that FDI have a positive effect on growth through technology transfer (Borensztein et al. (1998)), capital infusion (Busse and Groizard, 2008). Alfaro et al. (2010) have shown that FDI positively affects economic growth, especially in countries with better local conditions such as more developed financial institutions and more human capital. Furthermore, Alfaro et al. (2009) concluded that countries with developed financial institutions benefit from FDI through increases in total factor productivity. Also, Jalilian and Weiss (2002) found that the positive effect of FDI on economic growth is greater in countries with better education.

The relationship between FDI and economic growth can be influenced, also, by the level of corruption. It is commonly acknowledged by economists and international organizations that corruption remains one of the prevalent challenges to our modern society. Corruption can affect negatively the economic growth, domestic investment, FDI, …

To investigate the relationship between corruption, economic growth and FDI, Freckleton et al (2012) showed that lower levels of corruption ameliorate the impact of FDI on economic growth. In another study, Papaconstantinou et al (2013) indicated that bureaucracy and corruption affect positively economic growth. Also, Belgibayeva and Plekhanov (2015) showed that Corruption can minimize the positive impact of FDI on economic growth because

it increases the costs of investment and increases uncertainty about returns on investment, thus discouraging FDI ; So the economic growth deteriorates.

Recently Bouchoucha and Yahyaoui (2019) have shown that FDI positively affects economic growth, especially in countries with a healthy institutional quality. However, less attention has been paid to whether corruption affects the relationship between FDI and economic growth.

In this paper, we aim to study how corruption can mitigate the impact of FDI on economic growth in the Africa region. it appears that the level of corruption in African countries significantly worsened in recent years, and corruption was an epidemic in both economic and political sectors. Therefore, the contribution of the current research study to Foreign Direct Investment and economic growth in the empirical literature is two folds. On the one hand, the study attempts to fill the gap in the empirical literature regarding the role of corruption in enhancing the relationship between FDI and economic growth in the African region. On the other hand, unlike previous studies that have employed traditional econometric models, such as the vector error correction model (VECM) and/or the vector autoregressive (VAR) framework, this study makes use of a recent multivariate econometric tool known as the panel data vector autoregressive (PVAR) technique that was recently developed by Love and Zicchino (2006).

The rest of the paper is organized as follows: section 2 is a brief literature on empirical studies on the relationship between FDI, corruption and economic growth. Section 3 provides the econometric methodology and discusses the main findings while the last section concludes the study.

2. Literature Review

Several empirical studies have examined the relationship between FDI and economic growth. For example, Asiedu (2002) found that the factors affecting FDI are trade openness, return on investment, and infrastructure development. In fact, Bengoa and Sanchez-Robles (2003) showed that economic freedom is considered a key factor in FDI inflows. For Baharumshah and Thanoon (2006), they found that there is a long and short term relationship between economic growth and FDI.

On the other hand, some empirical research has supported the hypothesis of the positive impact of FDI on economic growth (Obwona (2002), Durham (2004), Bengoa and Sanchez-

Robles (2003), Alfaro et al. (2004), Dupasquier and Osakwe (2005), Mengistu and Adams (2007), and Malikane and Chitambara (2017). However, Yabi (2010) concluded that FDI inflows do not always have an impact on economic growth and also found that, because of the heterogeneity of countries, a positive impact of FDI was observed in countries with a high economic growth but not in countries with a low economic growth. However, the impact of FDI on economic growth depends on a number of factors such as the minimum level of existing human capital (Borensztein et al., 1998), the degree of complementarity and substitution between FDI and the domestic investment (de Mello, 1999) and the degree of financial system development (Alfaro et al., 2004). However, some other studies showed that the impact of FDI on economic growth is ambiguous (Carkovic and Levine, 2002, Alfaro, 2003). Moreover, Salman, Feng (2009) and Misztal (2011) mentioned the growing role of foreign capital in improving economic growth through their contribution to human resource development, capital formation and increased competitiveness on the local market. In this context, Inekwe (2013) showed that FDI positively affects economic growth in the servicing sector while FDI has a negative impact on economic growth in the manufacturing sector.

Regarding the relationship between corruption and economic growth, Institutional quality and good governance play an important role in promoting economic growth (Roy, 2005; Verspagen, 2012) while weak institutions in terms of corruption increase the costs of the firms doing business. Indeed, Corruption can influence the costs of investment operations in the sense of Bardhan (1997). Therefore, foreign investors should support an additional cost in the form of bribes to obtain a license or a government permission to conduct their commercial activities. In fact, these additional costs would reduce the expected return on investment. Furthermore, corruption in all its forms can be responsible for the degradation of the business environment as a result, it reduces investment (Mauro, 1995, keefer and Knack, 1996) and in particular foreign direct investment. As a result, foreign investors would tend to avoid investing in countries with high levels of corruption.

However, in the presence of strict regulation and in the absence of bureaucratic delays, corruption cannot thrive, which helps attract FDI inflows. This means that corruption can increase the efficiency of bureaucracy by accelerating the process of decision-making (Bardhan, 1997)).

However, the effects of institutional quality and governance on FDI have produced mixed results. For example, several studies, such as those of (Mathur and Singh 2013, Busse and

Hefeker 2007, Wei 2000, Habib and Zurawicki 2002), found a positive relationship between institutional quality and FDI inflows. To our knowledge, few empirical studies have examined the link between corruption and foreign direct investment while some studies stated that corruption can increase FDI. However, in the long run, the effect of corruption on FDI is expected to be negative. Therefore, it can be thought that the effect of corruption on FDI is not always clear but is the subject of theoretical and empirical controversy. For example, Al-Sadig (2009) investigated the link between corruption and the attractiveness of FDI. He concluded that the negative effect of corruption disappears with the presence of the quality of institutions in the host country. However, other studies suggestd that corruption and bribery can facilitate FDI inflows (Olson 1993). Similarly, Egger and Winner (2005) found a positive relationship between corruption and FDI inflows. Moreover, Castro and Nunes (2013) examined the effect of corruption on FDI inflows in 73 countries during the period of 1998-2008. Their results showed that the control of corruption is considered as a determinant of the increase of the level of FDI inflows. On the other hand, Quazi et al (2014) analyzed the impact of corruption on FDI inflows in 53 African countries between 1995 and 2012. They showed that corruption facilitates FDI inflows into Africa. As for Navickas et al., (2016), they studied the effect of high corruption on the attractiveness of FDI in the European Union and found that corruption has an adverse effect on FDI, however, particular actions may have a positive effect on FDI. In a similar but more extensive study, Bouchoucha and Ben ammou (2018) examined the impact of various measures of the institutional quality on FDI in African countries. They found that the control of corruption positively affects the attractiveness of FDI.

Despite the positive effect of corruption on FDI, there are other studies, such as those of (Shleifer and Vishny 1993, Wei 2000, Al-Sadi 2009, Egger and Winner 2006), which found a negative relationship between corruption and the investment environment, and therefore a negative impact on economic growth. For their part, Bayar and Alakbarov (2016) examined the relationship between corruption and foreign direct investment. Their results showed that control of corruption has no statistically significant impact on the attraction of foreign direct investment.

Nevertheless, less attention has been paid to the examination of the relationship between corruption, FDI and economic growth. As for Okada and Samerth (2014), they studied the effect of foreign direct investment (FDI) on economic growth in 130 countries over the period 1995-2008, while taking into account the role of corruption in each country as an absorption

factor. Their estimation results indicated that FDI alone does not promote economic growth however, they stated that it can have a significant effect on economic growth if they take into account the interaction term between FDI and corruption. On the other hand, Freckleton et al (2012) showed that FDI has a significant effect on economic growth in both the short- and the long-run in both developing and developed countries. In fact, in the case of the developing economies, lower levels of corruption enhance the impact of FDI on economic growth. In the same vein, Hakimi and Hamdi (2017) have recently analyzed the effects of corruption on investment and economic growth in 15 countries in the Middle East and North Africa (MENA) over the period 1985-2013. Their results indicated that corruption is a major impediment to economic growth in these countries as it affects investment activities and foreign direct investment inflows. More recently, Bouchoucha and Yahyaoui (2019) have examined the effect of different dimensions of governance of the World Bank on the effect of FDI on economic growth. They found that all the indicators ameliorate this effect and specifically corruption has a positive influence on the attractiveness of FDI.

3. Methodology and Discussion

3.1. The econometric equation

Annual data over the period of 1996-2016 was collected from the World Bank Development Indicators (WDI) online databases. The selection of the starting period (1996-2016) was constrained by the availability of data, especially the control of corruption, which was available only from 1996. In order to study the impact of Foreign Direct Investment on economic growth, we will estimate equation (1):

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 open_{it} + \beta_3 \inf_{it} + \beta_4 inv_{it} + \beta_5 Scol_{it} + \beta_6 BM_{it} + \varepsilon_{it} \quad (1)$$

With: GDP is the log of real GDP in countries i at time t ; FDI_{it} refers to foreign direct investment as a percentage of GDP; open is trade openness, which is measured by the sum of export and import relative to GDP; inf is the inflation rate, which is approximate by consumer price index,inv is the domestic investment, which is approximated by gross fixed capital formation as a percentage of GDP; Scolhuman capital is approximated by the tertiary enrollment rateand BM refers to the financial development. It is approximated by broad money supply (M2) to GDP ratio; β is the parameters to be estimated; μ_i represents the individual effects (i=1…. 48) and t denotes the time (t=1996 …2016); ε_{it}designates the model error term.

Therefore, to examine the role of corruption in promoting the effect of FDI on economic growth, we add in our equation (1) the variable "CC" (Control of Corruption), which is a measure of corruption in line with that of Daude& Stein, (2004), Belgibayeva & Plekhanov (2015) and Canare (2017). In fact, the control of corruption is one of the six indicators of governance performance or quality of institutions. In this context, Kaufmann et al. (2016) defined the control of corruption as the perception of the extent to which the public power is exercised for private gain, including petty and great forms of corruption (- 2.5:2.5 scale) (Worldwide Governance Indicators, 2016). Moreover, we have introduced the interaction term between corruption and foreign direct investment in order to check if the effect of foreign direct investment on economic growth is limited by the presence of corruption.

As a consequence, we will re-estimate equation (2)

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 open_{it} + \beta_3 \inf_{it} + \beta_4 inv_{it} + \beta_5 Scol_{it} + \beta_6 BM_{it} + \beta_7 CC_{it} + \beta_8 FDI_{it} * CC_{it} + \varepsilon_{it} \quad (2)$$

3.2. Data and data source

In fact, the indicator of corruption utilized was the Control of Corruption score of Kaufmann et al. (2016) , which was obtained from the World Bank's WGI while all the others data were acquired from the World Development Indicators database (WDI, 2016).Then, t description of all the variables is presented in table (1).

------Insert Table 1 here------

3.3. Panel VAR Estimation Results

We begin our work by checking the stationarity of all the variables in models (1) and (2), using the test of Levin et al. (2002), Im et al. (1997, 2003). We find from table (2) of the Panel Unit Root Test, we noticed that all the variables are stationary in first difference therefore; we can estimate the Panel VAR in both model (1) and (2). However, we found that some variables are not stationary in level but become stationary in first difference otherwise they will not be co-integrated or have a long term relationship. Therefore, we can't use the vector error correction model but instead, we can use the Panel-VAR model to study the interaction between the variables of our model.

Moreover, we have tried to estimate the panel VAR method, which makes it possible to analyze the relationship between all the variables included in our model. This method seems to be the most efficient as it enables us to estimate , on the one hand, a large number of lags and, on the other hand, the volatility of the variables as well as to predict the effect of the

shocks. In fact, the VAR model is the vector of the autoregressive time series, which is considered in the macroeconomic literature as a model of simultaneous multiple equations (Sims, 1980). In fact, in the VAR model, all the variables are generally considered endogenous although the identification of restrictions based on theoretical models or statistical procedures is necessary to unravel the impact of exogenous shocks on the system. In this context, Holtz-Eakin et al. (1988) confirmed that the panel-VAR models can be used in multiple applications.

Therefore, since all the series under study are integrated in first difference, it is natural to examine whether there is evidence for a long-term relationship between all the variables. On the other hand, to test for a possible existence of a long-term relationship, we carried out the Kao test of co-integration the results of which are reported in table (3). In fact, the findings presented in table (3) show that the null hypothesis of no co-integration could not be rejected. Hence, in order to investigate the possible existence of a significant relationship between all these variables, we will estimate the PVAR for all the variables in first differences.

------Insert Table 2 here------

------Insert Table 3here------

Before proceeding with the PVAR framework, the first step consists in determining the optimum lag selected by minimizing the Akaike Information Criterion (AIC) and Shwartz Criteria (SIC) of all regressions (1) and (2) in the case of all African countries. The findings reported in table (4) show that lag 1 is found to be the optimal lag length for both equations (1) and (2).

------Insert Table 4 here------

At this stage, we will estimate the PVAR (1) for both regressions (1) and (2) in the case of all African countries. The results of the estimation of the PVAR model are reported in tables (5) and (6) for regressions (1) and (2), respectively. Moreover, table (5) resumes the determinants of each variable presented in equation (1) in the case of African countries. Then, columns (2), (3), (4), (5), (6) and (7) present the determinants of economic growth, foreign direct investment, trade openness, inflation, investment, the tertiary enrollment rate and broad money, respectively while table (6) resumes the determinants of each variable presented in equation (2). Then, columns (2), (3), (4), (5), (6), (7), (8) and (9) present the determinants of economic growth, foreign direct investment, trade openness, inflation, investment, the tertiary enrollment rate, broad money, corruption, and the interaction between corruption and foreign direct investment (FDI*CC), respectively.

Regarding the findings reported in column (2) of table (5), we show that the estimated coefficient associated with the first lag of foreign direct investment is equal to 0.000613 and significant at 1% level. As a consequence, we can conclude that the current economic growth is positively affected by the previous foreign direct investment. Moreover, the positive relationship between FDI and economic growth can be explained by the fact that several factors, such as human capital, capital accumulation, international trade, government policy, and technology transfer, which, according to the theory of endogenous growth, can explain long-term growth, can be conveyed by FDI. The latter is supposed to stimulate growth by creating dynamic comparative advantages leading to technology transfer, the accumulation of human capital and the intensification of international trade (OECD, 2002)

In fact, FDI facilitates the developing countries' access to modern technologies and simplifies the transfer process. Thus, the innovation, the production and the dissemination of new knowledge are proving to be key determinants of economic growth, Furthermore, FDI positively affects employment. On the other hand, opening up to foreign capital has a positive effect on job creation in the host country. Similarly, FDI stimulates capital accumulation by adding to domestic savings and increases the efficiency of the recipient country's economy by improving the allocation of resources, instilling a degree of competition, improving human capital, strengthening the national capital markets and reducing the local cost of capital (Mishra et a1.2001).

However, the coefficient associated with the first lag inflation variable is negative and significant, which implies that the current economic growth is negatively correlated with inflation. In fact, the negative relationship between these two variables is explained by the fact that when inflation increases, anticipations of futures returns become more difficult therefore, the results will be erroneous.

Additionally, trade openness, which is represented by the ratio of total trade (imports and exports) to GDP, has a significant and positive impact at 1% level of significance on the current economic growth. This result indicates that improving trade openness is one of the essential levers of economic growth (GbambieLadifatou and Guy Paulin (2018) since imports and exports will be accompanied by newly developed technologies.

------Insert Table 5 here------

------Insert Table 6 here------

The findings reported in table (5) confirm that education, which is measured by the tertiary enrollment rate, positively affects the current economic growth. This result indicates that

education catalyzes the accumulation of human capital, which stimulates labor productivity and accelerates economic growth (Robert Lucas (1988)).

Regarding the investment, this variable has a significant and positive effect on the current economic growth. This positive relationship can be explained by the fact that when investment increases, consumption increases, so economic growth will be stimulated.

Finally, the negative impact of the previous financial development measured by the Broad Money on the current economic growth is explained by the fact that the African countries are experiencing a period of financial instability and several financial problems. In addition, a rise in asymmetric information and the financial instability affect the performance of companies and create financial hardship, which may adversely impact economic growth (Richard, 2010; Ghosh, 2016).

As for the foreign direct investment equation presented in column (3) of table (5), the results show that all the variables, except the GDP one, have a significant impact on the level of FDI. Therefore, we can conclude that the current FDI is not influenced by the previous GDP. On the other hand, the current FDI is positively correlated with the previous trade openness and investment. This positive relationship can be explained by the fact that when trade openness and investment increase, consumption increases, which attracts FDI.

Additionally, inflation has a significant and negative effect on the current FDI. The result indicates that countries with high levels of inflation are the least attractive for FDI (Asiedu (2006)). Indeed, inflation reduces the real returns of an investment, which deters foreign investors from entering the economy, and therefore reduces the level of FDI (Narayanamurthy et al. (2010)).

Regarding the relationship between the tertiary enrollment rate and FDI, the results showed that education does not positively contribute to FDI, which indicates that education in the African countries is not well developed but it is still at its first stage of development.

Finally, the first lagged broad money has a significant and positive impact on the current foreign direct investment. Then, this positive relationship can be explained by the fact that financial development has several advantages, namely the efficient channeling of resources and the pooling of risks. Furthermore, financial development helps to reduce the problems related to the asymmetric information, mobilize the savings, facilitate trade and the exchange of services and goods (Dutta& Roy, 2011, Shah, 2011b). Thus, financial development is crucial for the growth and expansion of the private sector and the growth of FDI.

As for the Trade openness equation, which it is presented in column (4) of table (5), the results show that all the variables, except the GDP and FDI ones, have a significant impact on

the level of FDI. In fact, the coefficient of the first lag of the tertiary enrollment rate is positively correlated with trade openness, where the first lag coefficient is significant at 10%. Additionally, the findings reported in column (4) of table (5) conclude that previous inflation and investment are negatively and significantly correlated with the current trade openness at 5% and 10% levels of significance, respectively. Finally, concerning the broad money, its coefficient is positive and significant at 5% level.

For the inflation equation, the results show that previous GDP does not explain the current inflation in the African region. In fact, its coefficient is negative and not significant. Regarding the first lagged values of foreign direct investment and trade openness, our results show that these variables positively determine the current level of inflation. This positive relationship can be explained by the fact that when FDI and trade openness increase production is triggered, which increases consumption and the inflation. For the rest of the variables (INV, SCOL and BM), they are negatively and significantly correlated with the current inflation at 5% level of significance.

However, for the equation related to the investment variable, the findings reported in column (6) of table (5) show that only the first lag of GDP hasn't a significant impact on the level of investment while the first lag of foreign direct investment, Inflation and the tertiary enrollment rate have a significant negative impact on the current investment. However, the first lag of trade openness and broad money positively and significantly affect the current Investment.

Regarding the equation related to the tertiary enrollment rate variable presented in column (7) of table (5), we show that GDP and trade openness have a significant negative effect on the tertiary enrollment rate while FDI, inflation, investment and broad money positively and significantly affect the tertiary enrollment rate. Finally, for the broad money equation, the results reported in column (8) of table (5) conclude that GDP hasn't any impact on the broad money in contrast, the previous FDI, and the previous tertiary enrollment rate are negatively and significantly correlated with the current inflation at 5% level of significance. However, the previous trade openness and the inflation positively and significantly affect the current broad money.

Therefore, after estimating the impact of previous foreign direct investment on promoting economic growth, we examine, at this stage, the role of corruption in limiting this impact. In this case, we estimate our second model (equation (2)) by introducing the variable of corruption (CC) and the interaction between foreign direct investment and corruption (FDI*CC). In fact, our findings are reported in table (6). After that, we will focus in our analysis on column (2) of table (6) by presenting the determinants of economic growth

measured by the annual GDP (%). The results reported in column (2) of table (6) show that the coefficient of the interaction between Corruption and Foreign Direct investment (-0.001733) is negative and significant at 1% level. Additionally, this coefficient is less important that the FDI one in eq (1) (0.000613), which means that when we introduce corruption, the previous FDI deteriorates the current economic growth in the African economies. This implies that an increase of corruption reduces the effect of FDI on economic growth. This negative relationship can be explained by the fact that corruption discourages the investors to invest especially in countries where the level of corruption is high. As a consequence, corruption is considered a major impediment to economic growth in the African countries as it influences foreign direct investment inflows (Hakimi and Hamdi (2017)).

------Insert Figure 1 here------

On the other hand, based on the PVAR estimation, foreign direct investment determines economic growth. Therefore, the interpretation of the impulse response function to one standard deviation shock on FDI should be considered carefully. Figure (1) resumes the reaction of GDP to FDI one standard deviation shock. The interpretation of the results here is to help understand the expected impact if FDI significantly determines the GDP with the same obtained sign. The results show that the effect of one standard deviation shock and the growth of foreign direct investment on the GDP growth is positive in the short and long run. The results also show that the impact of foreign direct investment on economic growth in the African countries quickly increases. This result can be explained by the fact that FDI has quickly increased in the African countries in the last decade, increased consumption. Furthermore, FDI stimulates economic growth by creating dynamic comparative advantages, which leads to technology transfer, the accumulation of human capital and the intensification of international trade (OECD, 2002). On the other hand, FDI facilitates the developing countries' access to modern technologies and simplifies the transfer process, which enhances economic growth.

------Insert Figure 2 here------

By looking at figure (2), which resumes the reaction of GDP to the interaction between FDI and corruption (CC) one standard deviation shock, we show that the impact on the interaction between foreign direct investment and corruption, as a result of one standard deviation shock to economic growth, is negative in both the short and long run. In fact, this impact decreases quickly in the first three years then almost stabilizes for the rest of the period (up to ten. Hence, the negative impact of the shock of the interaction between FDI and corruption on economic growth is explained by the fact that corruption discourages the investors to invest.

While the impulse responses can give details about the impact of variations of one variable on the other variables, they do not specify the magnitude and degree of this effect. In fact, the variance decomposition technique determines this. This technique provides information about the variation in percentages in the dependent series that are attributable not only to their own shocks but also to shocks generated by the other variables.

Tables (7) and (8) show the results of the variance decomposition obtained from the orthogonalized impulse response coefficient matrices. The variance decomposition presented in table (7) shows that foreign direct investment explains approximately 1.82% and 16.18% of the variations in economic growth, in both the short and long-run, respectively. On the other hand, trade openness explains approximately 0.024% and 0.56% of the variations in economic growth, in both the short and long run, respectively. As for inflation, it explains approximately 0.11% of the variations in economic growth, in the short run and 1.99% in the long run while for investment, it explains approximately 0.58% of the variations in economic growth, in the short run 4.98% in the long run. Finally, the tertiary enrollment rate and broad money explain approximately 0.005% and 0.032%, respectively, of the variations in economic growth in the short run, while in the long run, they explain approximately 0.03% and 0.36%, respectively.

Conclusion

this study examines, on the one_hand, the impact of foreign direct investment on economic growth in the African countries by employing the PVAR technique, which has been recently developed by Love and Zicchino (2006). and, on the other hand, how the control of corruption improves the efficiency of FDI in terms of economic growth. Moreover, the most important results of this research can be summarized in two important points. First, we found that foreign direct investment has a positive impact on economic growth, indicating the possibility of improving economic growth in the African region by promoting the foreign direct investment. This positive relationship between FDI and economic growth can be explained by the fact that flowing FDI is one of the most dynamic resources that play an important role in economic growth by increasing domestic savings, creating innovation and income growth, transferring modern technology and employment generation. Second, this paper shows that corruption can be considered as a serious hurdle to economic growth in the African countries since it negatively affects FDI attractiveness. Moreover, we found a significant weak negative impact at 1% level of the interaction between foreign direct investment and corruption on economic growth. In other words, corruption reduces the impact of FDI on economic growth

because investors are reluctant to invest in countries when where the level of corruption is high. This imlies that corruption is a major impediment to economic growth in the African countries as it influences foreign direct investment inflows (Hakimi and Hamdi (2017)).

Regarding the impulse response results, our empirical findings showed that the response of economic growth to one standard shock on foreign direct investment displays a positive sign besides, its effect increases overtime. However, regarding the interaction between corruption and foreign direct investment, the results provide evidence that the response of economic growth to one standard deviation shock on this interaction is negative overtime. Furthermore, the variance decomposition analysis confirmed that foreign direct investment has a slight influence and can slightly explain economic growth. Additionally, the role of corruption in the African countries is still too weak to contribute to economic growth. Thus, the study suggests that Africa should take policy directions that must attract FDI to the region more seriously in order to promote economic growth. For this reason, the African policy makers should minimize the level of corruption in order to ameliorate the attractiveness of FDI and ensure its efficient utilization, which strengthens the level of economic growth.

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Tables

Table 1: Data description and Source

variable	Measure	Data source
GDP	The real GDP in countries i at time t	World Bank
FDI	Foreign Direct Investment, net inflows(%GDP) in countries t at time t.	World Bank
open	the trade openness that is measured by the sum of export and import relative to GDP	World Bank
inf	Inflation approximated by consumer price index (annual%)	World Bank
B M	It is proxy for Financial development. The measure of financial development is broad money supply (M2) to GDP ratio (MGDP). This indicator has become a standard measure of the financial depth and size of the financial intermediary sector. So an increase of broad money stock (M2) may give an indication of a financial deepening improvement in the economy (Gregorio &Guidotti, 1995; Odhiambo, 2008; Mahran, 2012).	World Bank
inv	Domestic investment measured by the gross fixed capital formation as a percent of GDP	World Bank
Scol	Human capital measured by the tertiary enrollment ratio	World Bank
CC	Corruption measured by the control of corruption that is one of the six indicators of governance performance or quality of institutions. Kaufmann et al. (2016) were defined the control of corruption as the perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption (- 2.5:2.5 scale) (Worldwide Governance Indicators, 2016).	World Bank
CC*FDI	Interaction term between FDI and corruption	World Bank

Table 2: Panel Unit root test results

	In level		In first difference	
	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat
BM	0.4449	0.9979	0.0000	0.0000
CC	0.0000	0.3941	0.0000	0.0000
FDI	1.0000	0.0000	0.0000	0.0000
GDP	0.4685	1.0000	0.0000	0.0000
Inf	1.0000	1.0000	0.0000	0.0000
inv	0.8873	0.0004	0.0000	0.0000
open	0.0110	0.4825	0.0000	0.0000
Scol	0.0025	0.9836	0.0000	0.0000

Table 3: Kao test results

		t-Statistic	Prob.
ADF	Equation (1)	1.509168	0.0656
	Equation (2)	1.185520	0.1179

Table 4: Results of Akaike and Schwartz tests in the case of African countries

	Equation (1)		Equation (2)	
Lag	AIC	SC	AIC	SC
0	50.31482	50.44241	55.14460	55.33923
1	26.41655	27.43727*	26.68035	28.62666*
2	25.90367*	27.81752	26.18443	29.88242
3	26.03078	28.83776	26.27317	31.72284
4	26.13274	29.83284	26.17074*	33.37209

Table 5: Results of PVARfor regression (1) in the case of African countries

	GDP	FDI	open	inf	inv	Scol	BM
GDP(-1)	1.002159	-0.346963	-1.460220	-0.535532	-0.085065	-0.064604	-0.087817
	(0.00105)	(0.28471)	(0.66690)	(0.30082)	(0.32445)	(0.09550)	(0.24244)
	[958.204]	[-1.21866]	[-2.18958]	[-1.78026]	[-0.26219]	[-0.67648]	[-0.36222]
FDI(-1)	0.000613	0.687323	0.171452	0.118084	-0.056750	0.007570	-0.006820
	(0.00018)	(0.04797)	(0.11236)	(0.05068)	(0.05466)	(0.01609)	(0.04085)
	[3.47913]	[14.3292]	[1.52597]	[2.32997]	[-1.03821]	[0.47049]	[-0.16696]
open(-1)	7.23E-07	0.011404	0.939485	0.005626	0.004489	-0.001603	0.002074
	(3.6E-05)	(0.00984)	(0.02305)	(0.01040)	(0.01122)	(0.00330)	(0.00838)
	[0.02000]	[1.15862]	[40.7505]	[0.54101]	[0.40027]	[-0.48553]	[0.24743]
inf(-1)	-8.85E-05	-0.003217	-0.031024	1.029514	-0.000981	0.001651	0.011359
	(3.1E-05)	(0.00840)	(0.01969)	(0.00888)	(0.00958)	(0.00282)	(0.00716)
	[-2.86608]	[-0.38281]	[-1.57590]	[115.936]	[-0.10246]	[0.58574]	[1.58711]
inv(-1)	0.000227	0.011319	-0.020303	-0.061791	0.854412	0.000670	-0.018090
	(0.00011)	(0.02931)	(0.06865)	(0.03097)	(0.03340)	(0.00983)	(0.02496)
	[2.11162]	[0.38619]	[-0.29573]	[-1.99537]	[25.5811]	[0.06814]	[-0.72482]
Scol(-1)	7.51E-05	-0.040213	0.008429	-0.030720	-0.020841	1.022116	-0.072234

	(0.00011)	(0.02953)	(0.06917)	(0.03120)	(0.03365)	(0.00991)	(0.02515)
	[0.69269]	[-1.36171]	[0.12185]	[-0.98455]	[-0.61930]	[103.185]	[-2.87248]
BM(-1)	-6.44E-05	0.001078	0.011875	-0.002582	0.017500	0.002459	1.030459
	(4.2E-05)	(0.01130)	(0.02648)	(0.01194)	(0.01288)	(0.00379)	(0.00963)
	[-1.55130]	[0.09539]	[0.44853]	[-0.21623]	[1.35865]	[0.64866]	[107.060]
C	-0.006200	4.966166	24.28725	9.411619	4.220255	0.928201	1.008632
	(0.01374)	(3.73946)	(8.75925)	(3.95103)	(4.26140)	(1.25434)	(3.18431)
	[-0.45132]	[1.32804]	[2.77276]	[2.38207]	[0.99034]	[0.73999]	[0.31675]
R-squared	0.999733	0.510998	0.892948	0.980422	0.762517	0.984846	0.985441
Adj. R-squared	0.999727	0.500433	0.890636	0.979999	0.757386	0.984518	0.985127
F-statistic	173307.6	48.36762	386.0824	2317.883	148.6156	3008.021	3132.950
Log likelihood	924.2235	-937.1722	-1219.760	-955.4433	-980.5501	-574.5180	-883.8180

Table 6: Results of PVAR for regression (2) in the case of African countries

	GDP	FDI	open	inf	inv	Scol	BM	CC	FDI*CC
GDP(-1)	1.000901	-0.133909	-0.899820	-0.805126	0.225841	-0.041134	0.616246	0.002983	-0.180789
	(0.00122)	(0.35063)	(0.75049)	(0.41270)	(0.41254)	(0.12172)	(0.32061)	(0.01061)	(0.31264)
	[818.028]	[-0.38191]	[-1.19898]	[-1.95087]	[0.54743]	[-0.33794]	[1.92213]	[0.28116]	[-0.57827]
FDI(-1)	-0.000543	0.892753	0.008014	0.224510	0.184500	0.036356	0.144252	-0.002628	-0.302422
	(0.00030)	(0.08677)	(0.18572)	(0.10213)	(0.10209)	(0.03012)	(0.07934)	(0.00263)	(0.07737)
	[-1.79407]	[10.2891]	[0.04315]	[2.19834]	[1.80726]	[1.20700]	[1.81820]	[-1.00089]	[-3.90900]
open(-1)	-1.64E-05	0.014091	0.927581	-0.003343	0.010653	-0.000518	0.001911	0.000383	-0.013793
	(3.8E-05)	(0.01096)	(0.02347)	(0.01291)	(0.01290)	(0.00381)	(0.01003)	(0.00033)	(0.00978)
	[-0.42913]	[1.28516]	[39.5252]	[-0.25900]	[0.82581]	[-0.13613]	[0.19060]	[1.15526]	[-1.41084]
inf(-1)	-0.000101	-0.001576	-0.029225	1.035331	-0.010233	-0.002486	0.020240	-1.26E-05	0.005591
	(3.4E-05)	(0.00968)	(0.02071)	(0.01139)	(0.01138)	(0.00336)	(0.00885)	(0.00029)	(0.00863)
	[-2.98957]	[-0.16292]	[-1.41115]	[90.9104]	[-0.89889]	[-0.74025]	[2.28779]	[-0.04290]	[0.64810]
inv(-1)	0.000153	-0.026749	-0.052876	-0.115136	0.839344	0.015654	-0.089506	0.000228	0.025823
	(0.00012)	(0.03319)	(0.07104)	(0.03906)	(0.03905)	(0.01152)	(0.03035)	(0.00100)	(0.02959)
	[1.32292]	[-0.80596]	[-0.74435]	[-2.94739]	[21.4947]	[1.35871]	[-2.94947]	[0.22727]	[0.87261]
Scol(-1)	0.000101	-0.047042	-0.004287	0.029688	-0.019076	1.016876	-0.043847	-0.000306	0.014705
	(0.00011)	(0.03222)	(0.06896)	(0.03792)	(0.03790)	(0.01118)	(0.02946)	(0.00097)	(0.02873)
	[0.89531]	[-1.46019]	[-0.06217]	[0.78293]	[-0.50326]	[90.9234]	[-1.48847]	[-0.31362]	[0.51192]
BM(-1)	-8.18E-05	0.007049	-0.002385	-0.011747	0.011725	0.001512	1.015918	0.000168	-0.007003

	(4.2E-05)	(0.01208)	(0.02585)	(0.01422)	(0.01421)	(0.00419)	(0.01104)	(0.00037)	(0.01077)
	[-1.94141]	[0.58367]	[-0.09225]	[-0.82635]	[0.82512]	[0.36072]	[91.9914]	[0.46018]	[-0.65030]
CC(-1)	0.005732	-0.945724	1.580129	-0.238323	-1.157064	-0.025779	0.854844	0.974971	2.709316
	(0.00249)	(0.71262)	(1.52530)	(0.83878)	(0.83846)	(0.24739)	(0.65160)	(0.02157)	(0.63541)
	[2.30487]	[-1.32711]	[1.03595]	[-0.28413]	[-1.37999]	[-0.10421]	[1.31191]	[45.2095]	[4.26391]
FDICC(-1)	-0.001733	0.269219	-0.181007	0.084016	0.395443	0.063662	0.125343	0.000543	0.283895
	(0.00036)	(0.10245)	(0.21929)	(0.12059)	(0.12054)	(0.03557)	(0.09368)	(0.00310)	(0.09135)
	[-4.84836]	[2.62776]	[-0.82543]	[0.69671]	[3.28052]	[1.78996]	[1.33801]	[0.17511]	[3.10774]
C	0.018737	2.103109	20.72152	14.01961	0.826528	0.579053	-6.039712	-0.075799	3.424327
	(0.01555)	(4.45695)	(9.53968)	(5.24595)	(5.24396)	(1.54723)	(4.07531)	(0.13488)	(3.97403)
	[1.20471]	[0.47187]	[2.17214]	[2.67246]	[0.15762]	[0.37425]	[-1.48203]	[-0.56198]	[0.86168]
R-squared	0.999790	0.594133	0.912869	0.978283	0.780229	0.986451	0.986797	0.967461	0.589114
Adj. R-squared	0.999782	0.579039	0.909628	0.977475	0.772055	0.985947	0.986306	0.966251	0.573833
F-statistic	128186.0	39.36160	281.7136	1211.266	95.46042	1957.714	2009.738	799.4690	38.55241
Log likelihood	738.7149	-687.0939	-878.8651	-728.1681	-728.0723	-420.4790	-664.5356	194.3640	-658.1936

Figure 1: Reaction of GDP to FDI one standard deviation shock

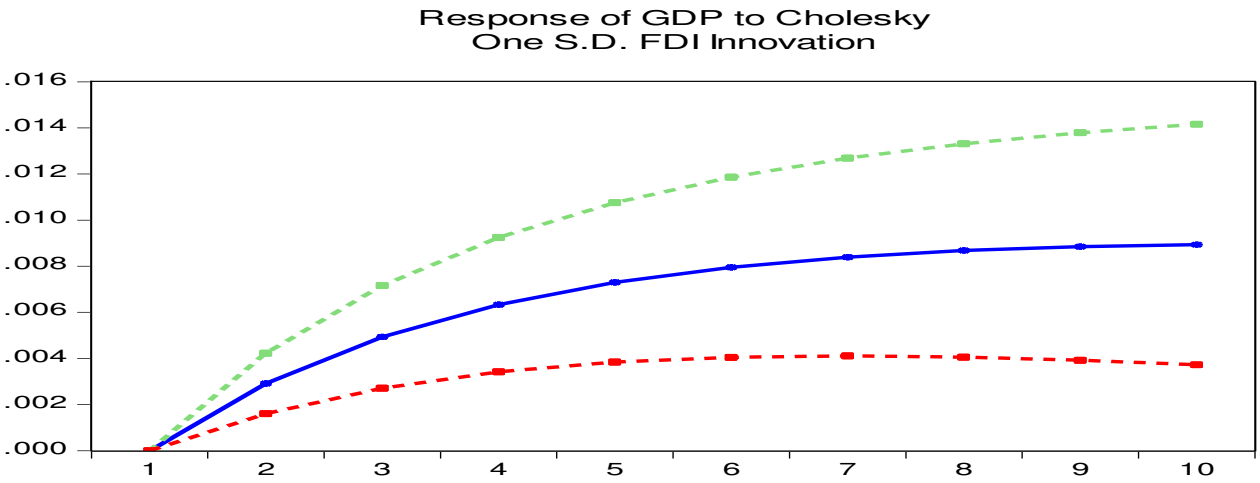

Figure 2: Reaction of GDP to FDICC one standard deviation shock

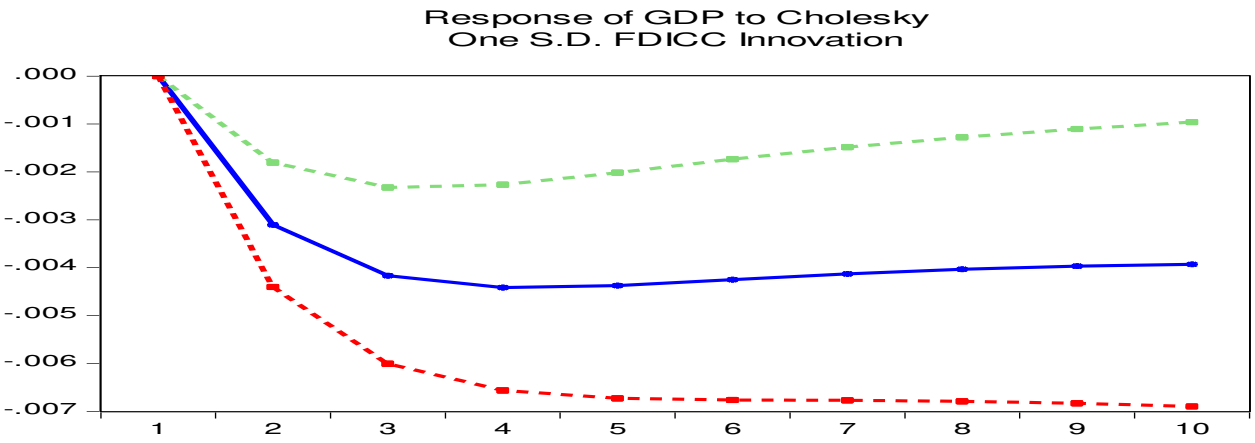

Table 7: Variance composition

Period	S.E.	GDP	FDI	open	inf	inv	Scol	BM
1	0.015138	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.021583	97.93212	1.822230	0.005790	0.034314	0.192990	0.002106	0.010455
3	0.026853	94.68751	4.552964	0.024746	0.115625	0.581222	0.005396	0.032541
4	0.031586	91.21548	7.310033	0.059993	0.243325	1.098461	0.009031	0.063681
5	0.035989	87.91992	9.741642	0.112039	0.416921	1.694816	0.012762	0.101897
6	0.040152	84.93378	11.75154	0.179799	0.636635	2.335851	0.016613	0.145787
7	0.044126	82.27148	13.35030	0.261357	0.903312	2.998467	0.020724	0.194358
8	0.047945	79.90205	14.58582	0.354446	1.218210	3.667307	0.025285	0.246879
9	0.051637	77.78136	15.51357	0.456723	1.582813	4.332238	0.030520	0.302782
10	0.055222	75.86528	16.18518	0.565919	1.998694	4.986653	0.036675	0.361599

Table 8: Variance composition in presence of control of corruption

Period	S.E.	GDP	FDI	open	inf	inv	Scol	BM	CC	FDI*CC
1	0.013166	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.018517	94.57583	2.381348	0.000124	0.017916	0.042987	0.009979	0.045904	0.002747	2.923163
3	0.022952	88.53443	5.762964	0.008239	0.100772	0.143087	0.027362	0.113431	0.002153	5.307558
4	0.026929	83.52095	9.023718	0.036691	0.277942	0.293861	0.047786	0.187508	0.002165	6.609382
5	0.030601	79.53111	11.79427	0.092248	0.564513	0.490701	0.069073	0.264555	0.005687	7.187844
6	0.034056	76.30891	13.99991	0.177264	0.969148	0.731664	0.090219	0.343927	0.013665	7.365296
7	0.037351	73.62549	15.67128	0.291650	1.498069	1.016682	0.110789	0.425407	0.026042	7.334589
8	0.040532	71.31042	16.87124	0.434052	2.156490	1.346733	0.130610	0.508581	0.042395	7.199477
9	0.043636	69.24062	17.66693	0.602442	2.948837	1.723163	0.149620	0.592733	0.062198	7.013454
10	0.046695	67.32696	18.12007	0.794376	3.878489	2.147178	0.167788	0.676877	0.084919	6.803341