The Impact of Foreign Direct Investment (FDI) on the performance of the Agricultural Sector in Ghana

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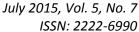Email: haliduosman@gmail.com

Abstract
The impact of foreign direct investment (FDI) on the economic growth of host economies has attracted significant debate in the literature with empirical evidence being inconclusive. Sectoral analysis was therefore introduced in the literature to understand the heterogenous response of the performance of the various economic sectors to changes in the inflows of FDI as opposed to the impact of the latter on the whole economy. On the sectoral paradigm, very little attention has been given to the agricultural sector which holds the key to food security in the world and poverty reduction in developing economies such as Ghana where the sector employs majority of the active working population. In this respect, our study looked at the impact of FDI on the performance of the agricultural sector in Ghana with data over the period 1980 - 2013 using Johansen cointegration test. We found that FDI negatively impacts the agricultural sector productivity in the long run but with positive relationship in the short run. We also found that the depreciation of the cedi negatively impacts the growth of the agricultural sector in the long run. Trade openness on the other hand had positive and significant long run impact on the agricultural sector. We recommend that the government harnesses trade relations, stabilizes the local currency and ensures that FDI inflows to agriculture and the entire economy are not harmful to the economy by way of capital and excessive profit repatriations.
Key words: FDI, Agricultural sector, Johansen cointegration test, trade openness, exchange rate.

Introduction

Foreign Direct Investment (FDI) represents an important source of capital and potential lifeline for many developing countries especially Africa where there are high poverty levels, low savings culture and relatively weak or non-existing capital markets. According to the United Nations in their Millennium Development Goals (MDG) Report, about fifty per cent of the population in Sub-Sahara Africa still lives on less than USD 1.25 a day. The only region across the globe to have witnessed a steady rise in the number of people living in extreme poverty is Sub-Sahara Africa. The number moved from 290 million in 1990 to 414 million in 2010 representing over one third of the world's desperately poor people (United Nations, 2013). The recent MDG report in 2014 indicates that Sub-Sahara Africa is not likely to reach the goal of halving the number of people living in extreme poverty by the 2015 target (United Nations, 2014). With such high poverty levels, savings needed for capital accumulation and investment are insufficient and thereby making FDI a necessity for these African countries.

Moreover, a number of researchers have stressed the importance of FDI towards the growth of the economies of the host countries by supplementing local capital to promote growth or impacting growth through technology and knowledge transfer (Singh and Zammit, 2009). These benefits of FDI have driven many countries, especially developing countries, to put in place policies and incentives to attract inward FDI. Between 2010 and 2011 for instance, the developing countries increased their FDI inflows by USD 88 billion from USD 637 billion in 2010 to USD 725 billion in 2011 (UNCTAD, 2013& 2014). In 2012, the developing economies for the first time surpassed the developed economies in terms FDI inflows by as much as USD 212 billion by recording USD 729 billion against USD 517 billion for developed economies (UNCTAD, 2014). The dominance of the developing countries continued in 2013 with the same margin by recording FDI inflows of USD 778 billion against USD 566 billion for developed economies. The stock of Ghana's FDI stood at USD 319 million in 1990 but grew to USD 1,554 million in 2000 representing 387% growth over a decade and then increased further to USD 19,848 million in 2013 representing a whopping 1,177% growth between 2000 and 2013. Meanwhile, FDI inflows to Ghana increased by 164.4% between 2008 and 2013, moving from USD 1,220 million in 2008 to USD 3,226 million in 2013 (UNCTAD, 2014).

To understand whether these inflows do benefit the host economies, many empirical studies have been undertaken on FDI and growth relationship. While some have explored the relevance of FDI in supplementing local capital accumulation, others have looked at the spillover effect of FDI. There are those who have concentrated their works on the channels through which FDI impacts growth in the host country. The empirical evidence on this relationship is inconclusive. Whereas some authors (Bashir, 1998; Gao, 2001; Eller, 2005; Li and Liu, 2005; Lai et al, 2006; Chong et al, 2010; Samimi et al, 2010; and Elkanj et al, 2013) found a positive impact of FDI on economic growth, other authors such as Carkovic and Levine (2002) and Hassan (2004) did not find any positive significant relationship between FDI and economic growth. Frey (1992) even found a negative relationship between FDI and economic growth.

Baltabaev (2013) argues that the conflicting results on the impact of FDI on economic growth could result from 'endogeneity problem' in the sense that there could be bi-directional impact
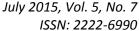
from FDI to growth and from growth to FDI. This argument flows from the work of Choe (2003) who employed granger causality test to demonstrate that growth impacts more on FDI than FDI impacts growth. Baltabaev (2013) argues further that the problem of conflicting results could also emanate from the measure of FDI as a flow and proposes that a measure of FDI as a stock could be superior. Another source of conflicting results, according to Baltabaev (2013), is the use of growth in income as the dependent variable instead of total factor productivity. The argument is that the technology transfer from FDI works through the labour.

Apart from the reasons given by Baltabaev (2013) for the inconclusiveness of the empirical results, some authors reckon that the growth-related benefits of FDI could vary from sector to sector. Alfaro (2003) argues that it is possible for differences to occur in the way FDI affects different sectors of the economy. In this respect, a number of studies have been done on the different economic sectors of the economy. However, many of these studies have been focused on manufacturing and service sectors with very little studies on the impact of FDI on agriculture.

Meanwhile, the increase in the productivity and the growth of the agric sector is critical for reducing poverty and enhancing sustainability prospects of countries in the developing world (Msuya, 2007). In Sub Sahara African countries where the agricultural sector employs a large number of the labour force and a major contributor to the gross domestic products of these countries, a growth in the sector would go a long way to propel their developmental agenda. Msuya (2007) argues that growth in productivity in the agric sector which is enhanced by adoption of modern and sophisticated technologies has become imperative in view of the falling per capita arable land, rising costs of production, increasing population and increasing migration to urban centres. Although the adoption of the modern and sophisticated technologies are necessary to improve productivity in the agric sector, the said adoption by farmers is largely limited by meager incomes of the farmers and the unavailability of credit, a gap FDI is believed to fill by bringing new technologies and the required financial investments (Msuya, 2007).

The ability of agriculture in developing economies to meet food requirements by the year 2050, according to FAO estimates, demands an annual investment of USD 83 billion (Hallam, 2009). The author argues further that these developing countries do not have the capacity to make such investments in agriculture as spending by governments of these developing nations on agriculture has declined to 7% and much less for Africa. Lending by commercial banks to agriculture has fallen across developing nations with sub Sahara African countries recording commercial lending to agriculture of less than 10%. Additionally, the nature of capital required to boost the agricultural sector makes microfinance loans unsuitable either. Worse still, the development assistance that is directed to agriculture in developing countries has dipped to 5% (Hallam, 2009) thereby making FDI a substantial lifeline to the development of agricultural sector in the developing countries like Ghana. In Ghana, agriculture plays a key role in its economy. The sector contributed 22.4% of Ghana's GDP in 2013 and 22% of GDP in 2014 based on basic prices (GSS, 2015). On the basis of 2006 constant prices, the agricultural sector contributed 23% of the country's real GDP (GSS, 2015). More importantly, agricultural sector
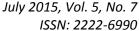
employs 41.2% of the active working population in Ghana according to the summary report of the final results on the 2010 population and housing census (GSS, 2012).

In the context of Ghana, a number of studies have been done on FDI and growth relationship with conflicting results (see Karikari, 1992; Frimpong and Oteng-Abayie, 2006 & 2008; Sakyi,2011; Insah, 2013; and Antwi et al, 2013). However, all these studies were focused on FDI and growth of the economy as a whole in Ghana. The only studies that looked at the impact of FDI on agricultural sector, to the best of our knowledge, are the works of Djokoto (2011 and 2013). Djokoto (2011) looked at the granger causality between growth in agriculture in Ghana and the growth of FDI into agriculture using data covering the period 1966 and 2008. The second study (Djokoto, 2013) looked at how openness impact agricultural performance in Ghana by using FDI as a proxy for openness and data covering the period 1995 and 2009. Apart from contributing to the limited literature on the impact of FDI on agricultural sector, this study differs in many ways from the works of Djokoto (2011 & 2013). Whereas Djokoto (2011) looked at the causal link or direction of movements between growth of FDI to agriculture and the growth of agricultural productivity by performing granger causality test, our study takes a more robust approach by looking at the impact of FDI on the growth of the agricultural sector in Ghana using a co-integration approach. Mere causal link does not tell the nature and extent of impact of FDI on growth of the agricultural sector. Moreover, Djokoto (2013) looked at openness and performance of the agricultural sector, with FDI only as a proxy for openness. In addition, Djokoto (2013) employs data between 1995 and 2009 but our study looks at the impact of FDI on the growth of the agricultural sector and employs an expansive data between 1980 and 2013. The rest of the work is arranged in a way that literature review is covered in section with data and specification of model covered in section three. We present our findings and analysis in section four and then provide the conclusion and policy implications in section five.

Brief Literature

Many empirical works have been done on the relationship between FDI and growth. While some have explored the relevance of FDI in supplementing local capital accumulation, others have looked at the spillover effect of FDI. There are those who have concentrated their works on the channels through which FDI impacts growth in the host country.

El-Wassal (2002) pointed out that the theoretical underpinnings of the extensive works on FDI-growth relationship can be grouped into three. These are the 'positive' view, the 'negative' view and the 'dependent impact' view. The underlying theory of the 'positive' view is that of the neoclassical economic growth theory. This view looks at the impact of FDI on economic growth from two main channels of benefit, namely direct and indirect. The direct benefit channel, which considers the impact of FDI on growth from the perspective of augmentation of domestic capital, is based on the neoclassical proposition that it is capital that drives growth. The indirect benefit channel flows from endogenous growth models, especially the work of Romer (1994), where technology and knowledge are included in the factors of production. Thus FDI indirectly impacts on growth through the transfer of knowledge and technology from the

multinationals to the domestic firms. Supportive of the indirect channel are the works of Kumar and Pradham (2002) and Moran et al.,(2005).

The arguments put forward in respect of the 'negative' view is to the effect that FDI could widen income inequality and negatively impact on growth of the host economies. The works of Bomschieret al.,(1978) and Nolan (1983) support this assertion. Chase-Dunn (1975) argues that FDI could be a recipe for the creation of monopolies in certain industries which ultimately affects efficient usage of productive resources. Additionally, the sheer size and financial muscle of these multinationals could potentially sideline and crowd out local firms and investments. Reis (2001) adds that the repatriation of profits by these multinationals does not only stagnate the economies of the host countries but also moves demand away from the domestic markets to international ones.

For the 'dependent impact' view, the argument is that FDI does not independently impact growth and as such, a host country's benefit from FDI largely depends on its ability to absorb these benefits. Blomstromet al.(1994) have asserted that it is only when the host country is adequately wealthy beyond a certain threshold that it can have a positive impact on its growth from FDI. Domestic investment has been argued by Lautier and Moreaub (2012) to constitute a major attracting factor of FDI. Alfaro et al.(2004) add that host economies with well developed financial markets tend to have positive impact on growth from FDI. The host nation's export orientation and trade openness have been argued by Balasubramanyam et al.(1996) to aid the transfer of knowledge and technology from the multinationals to the local firms and greatly enhance domestic investments. The stock of human capital in the host country, according to Borensztein et al.(1998), greatly helps the host economy to adequately absorb the benefits of knowledge, technology and other spillovers of FDI. Mody and Murshid (2005) argue that host economies with strong macroeconomic policies are able to enhance the absorption of the FDI spillovers. Countries with weak institutions are likely to limit the spillover benefits of FDI according to Antras (2003) and Rajan and Zingales (1998). Meanwhile, Alfaro and Charlton (2007) put forward the argument that a host country's sectoral composition is key in absorbing the spillover benefits since the said benefits across sectors such as services, manufacturing and primary differ greatly.

Just as the views above differ, the empirical evidences are also inconclusive. Elkanj et al (2013) found a positive impact of FDI on economic growth in the Arabian countries. They also established that openness has even stronger positive impact on economic growth. Focusing on oil importing countries, Samimi et al (2010) also found positive impact of FDI on economic growth. Other studies that have found positive impact include Bashir (1998), Gao (2001), Eller (2005), Li and Liu (2005), Lai et al (2006) and Chong et al (2010). Meanwhile, some other studies such as Carkovic and Levine (2002) and Hassan (2004) did not find any positive significant relationship between FDI and economic growth. Frey (1992) even found a negative relationship between FDI and economic growth.

Mohamed et al (2013) looked at the long-run causal relationship between Foreign Direct Investment (FDI), Domestic Investment (DI) and Economic Growth in Malaysia and found no evidence of causality between FDI and economic growth although a bilateral causality between DI was established. El-Wassal (2012) looked at 16 Arab countries and found a negligible impact of FDI on the economies of the Arab countries. He therefore argues that the composition of the sectors in the receiving country's economy is important in reaping the benefit of FDI. Earlier, De Mello (1999) had argued that the impact of FDI on a host country's economy is largely through capital accumulation and technology transfer.

Authors such as Findlay (1978) and Wang and Blomström (1992) argue that the gap between the levels of technology between the host countries and the foreign investors greatly influence the realization of the growth benefit of FDI. They indicate that where the gap in technology is huge, the benefits are enormous. However, some other authors have argued that the ability of the host economy to derive growth benefits from FDI lies largely on its absorptive ability and not the technology gap. Such absorptive capabilities include the level of human capital (Borensztein et al., 1998), financial development (Alfaro et al., 2004; Ang, 2009; and Azman-Saini et al., 2010) and economic freedom (Azman-Saini et al., 2010).

On FDI and the agricultural sector, Oloyede (2014) studied the impact of FDI on the development of the Agricultural sector in Nigeria using time series data covering the period 1981 and 2012 and employing the Ordinary Least Square (OLS) estimation technique. The author finds FDI to positively impact agriculture. The author also finds instability of the political environment to inversely affect the agricultural sector.

Msuya (2007) studied the impact of FDI on productivity in the agricultural sector and poverty reduction in Tanzania and observed that productivity growth in the agricultural sector is impacted positively by FDI. The observation of the study was however based on the review of existing literature as opposed to empirical and statistical modelling.

Turning to Ghana, a number of studies have been done in respect of the FDI-growth relationship. Karikari (1992) did not find FDI to granger cause economic growth in Ghana but the latter rather granger caused the former, having considered data covering the period 1961 to 1988. Frimpong and Oteng-Abayie (2008) did not also find FDI to granger cause output growth nor does the latter granger cause the former. Having looked at pre and post Structural Adjustment Programme (SAP), Frimpong and Oteng-Abayie (2006) did not find any relationship between FDI and economic growth for the period before the SAP as well as the entire sample period. They however found FDI to granger cause economic growth during the period after the SAP.

Sakyi (2011) found a long term relationship between economic growth, openness of trade and foreign aid by using autoregressive distributed lag (ARDL) bounds test approach and data covering the period 1984 and 2007. With time series data covering the period 1980 – 2010, Insah (2013) found a positive relationship between FDI and economic growth in Ghana. The author found an inverse relationship between economic growth and FDI when the FDI values are lagged. Using the same data coverage of between 1980 and 2010, Antwi et al (2013) found a similar result on Ghana by establishing that FDI has a positive relationship with economic growth in Ghana.

In terms of the impact of FDI on growth of the agricultural sector,Djokoto (2011) studied the causal link or direction of movements between growth of FDI to agriculture and the growth of agricultural productivity by performing granger causality test using data covering the period 1966 and 2008. The author found no causal link between the variables. Djokoto (2013) looked at openness and performance of the agricultural sector, with FDI and trade openness as proxies for openness and data spanning the period 1995 and 2009. The author did not find FDI and trade openness to have any long term relationship with performance of agriculture in Ghana by using data covering the period 1995 and 2009. The author rather found openness and FDI to have negative and significant impact on agricultural performance over the short run.

Methodology

Data Sources

Our study employed time series data over the period 1980 and 2013 on variables in our model including the agricultural sector, foreign direct investment, gross fixed capital formation, imports and exports, exchange rate and inflation. We obtained the data from the World Development Indicators, the International Financial Statistics and the African Development Indicators.

Description of Variables
Agriculture (Value Additions Constant 2005 USD)

Output in the agricultural sector is made up of crops production, animal farm production, forestry, fishing and hunting. We employed real aggregate output of these sub-sectors of agric to proxy for the agricultural sector. We expect FDI to have positive relationship with the agricultural sector.

Gross Fixed Capital Formation Expressed as a % of GDP (GFCF)

This variable (GFCF) is made up of machinery, plant, purchases of equipment, industrial buildings, construction of railways and roads. It is expected that GFCF would positively impact growth in the agricultural sector.

Foreign Direct Investment (FDI)

Foreign Direct Investment is measured as FDI net inflows expressed as a percentage of GDP. FDI is expected to have positive impact on productivity in the agricultural sector.

Trade Openness (TRADE)

Export and import as a percentage of GDP is used to represent trade openness. We expect trade openness to have positive impact on the agricultural sector.

Exchange Rate (EXR)

We used the exchange rate between the Ghanaian cedi and the United States dollars for this variable. The choice of the cedi-dollar exchange rate is because the United States dollar is the most actively traded foreign currency in Ghana.

Inflation (INFL)

We used the percentage change in the Consumer Price Index (CPI) for this variable. The inflation variable also represents the stability of the macroeconomic environment.

Specification of our model

The dependent variable in our model is the agricultural sector performance and the independent variables include gross fixed capital formation, foreign direct investment, trade openness, exchange rate and inflation. With these variables, our model can be formulated as follows:

$$AGRIC_t = f(FDI_t, INFL_t, GFCF_t, EXR_t, TRADE_t) + \varepsilon_t \tag{1}$$

Where the error term ε_t takes care of all the other variables excluded in the model but could affect agricultural productivity. We adopted the Cobb-Douglas log-linear form to make equation (1) linear. This is represented in equation (2) and it is multiplicative in nature.

$$AGRIC_t = \alpha_0 (FDI_t)^{\alpha_1} (INFL_t)^{\alpha_2} (GFCF_t)^{\alpha_3} (EXR_t)^{\alpha_4} (TRADE_t)^{\alpha_5} u_t^{\varepsilon_t} \tag{2}$$

The natural log of equation (2) then gives;

$$lnAGRIC_t = \alpha_0 + \alpha_1 lnFDI_t + \alpha_2 lnINFL_t + \alpha_3 lnGFCF_t + \alpha_4 lnEXR_t + \alpha_5 lnTRADE_t + \varepsilon_t \tag{3}$$

The independent variables in equation (3) have their coefficients representing their individual long run elasticities with regard to the dependent variable.

Test for Unit Root

Using time series data in econometric analysis of this nature requires, first of all, that we test for the stationarity properties of the variables. We employed both the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests for unit root. The ADF approach to unit root takes the equation below:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \tag{4}$$

Null hypothesis, H_0: $\delta = 0$ (implying that the series are not stationary)
Alternative hypothesis H_1: $\delta < 0$ (implying that the series are stationary).

Test for Cointegration

Having tested for the stationarity properties of our variables, we employed the cointegration test developed by Johansen (1988, 1991) as detailed below:

From VAR(k), let Y_t be a vector that is integrated of order one or *I*(1) variables as in equation (5) below;

$$Y_t = A_t Y_{t-1} + A_t Y_{t-2} + \ldots\ldots\ldots\ldots + A_k Y_{t-k} + \varepsilon_t \qquad (5)$$

Such that Y_t and ε_t are n × 1 vectors.

If we remodel equation (5), we get;

$$\Delta Y_t = \sum_{i=1}^{k-1} \Gamma_i Y_{t-i} + \prod Y_{t-1} + \mu_0 + \varepsilon_t \qquad (6)$$

$$\text{where } \prod = \sum_{i=1}^{k} A_i - I \quad \text{and} \quad \Gamma_i = -\sum_{j=i+1}^{k} A_j$$

We have n × r matrices and α and β each with a rank *r* in a way that matrix $\prod = \alpha\beta'$ and $\beta'Y_t$ is said to be stationary. That depend on the fact that the reduced rank *r<n*, α and every column of β represent the adjustment parameters in the vector error correction model (VECM) and the cointegrating vectors respectively where *r* represents the number of cointegrating relationships.

Having tested for cointegration, we used vector error correction model (VECM) that looks at the long run relationship between our variables as well as the dynamics and error correction in the short run. We estimated the long run impact of FDI on agricultural sector as follows:

$$\text{InAGRIC}_t = \alpha_0 + \sum_{i=1}^{n} \Phi \text{InAGRIC}_{t-i} + \sum_{i=1}^{n} \Phi \text{InFDI}_{t-i}$$

$$+ \sum_{1=0}^{n} \partial \text{InINFL}_{t-i} + \sum_{i=0}^{n} \Omega \text{InGFCF}_{t-i} + \sum_{i=0}^{n} \varphi \text{In EXR}_{t-i}$$

$$+ \sum_{i=0}^{n} \psi \text{InTRADE}_{t-i} + \varepsilon_t \qquad (7)$$

$$\Delta \text{InAGRIC}_t = \alpha_0 + \sum_{i=1}^{n} \Phi \Delta \text{InAGRIC}_{t-i} + \sum_{i=1}^{n} \Phi \Delta \text{InFDI}_{t-i}$$

$$+ \sum_{1=0}^{n} \partial \Delta \text{InINFL}_{t-i} + \sum_{i=0}^{n} \Omega \Delta \text{InGFCF}_{t-i} + \sum_{i=0}^{n} \varphi \text{In} \Delta \text{EXR}_{t-i}$$

$$+ \sum_{i=0}^{n} \psi \Delta \text{InTRADE}_{t-i} + \xi \text{ECT}_{t-1} + \varepsilon_t \qquad (8)$$

Where the error correction term's (ECT_{t-1}) coefficient is represented by ξ.

We then looked at FDI's impact on agriculture in the short-run as follows

$$\text{InAGRIC}_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \text{InAGRIC}_{t-i} + \sum_{i=1}^{n} \beta_2 \text{InFDI}_{t-i}$$
$$+ \sum_{1=0}^{n} \beta_3 \text{InINFL}_{t-i} + \sum_{i=0}^{n} \beta_4 \text{InGFCF}_{t-i} + \sum_{i=0}^{n} \beta_5 \text{InEXR}_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_6 \text{InTRADE}_{t-i} + \varepsilon_t \tag{9}$$

$$\Delta\text{InAGRIC}_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta\text{InAGRIC}_{t-i} + \sum_{i=1}^{n} \beta_2 \Delta\text{InFDI}_{t-i}$$
$$+ \sum_{1=0}^{n} \beta_3 \Delta\text{InINFL}_{t-i} + \sum_{i=0}^{n} \beta_4 \Delta\text{InGFCF}_{t-i} + \sum_{i=0}^{n} \beta_5 \Delta\text{InEXR}_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_6 \Delta\text{InTRADE}_{t-i} + \chi \text{ECT}_{t-1}$$
$$+ \varepsilon_t \tag{10}$$

Where the agricultural sector is represented by $AGRIC_t$ and error correction term's coefficient is represented by χ.

Presentation of Results

Results of the unit root test

Table 1: Results based on the ADF approach to unit root test

Variables	At the levels		After first difference	
	Constant	Constant and Trend	Constant	Constant and Trend
LFDI	-0.803339	-2.619411	-5.179736*	-5.182304*
LINFL	-3.715295	-5.070960	-8.328569*	-8.220125*
LEXR	-3.022927	-1.117210	-3.182755**	-4.194359**
LGFCF	-1.487107	-1.645019	-5.408002*	-7.343377*
LAGRIC	-0.971861	-3.088719	-5.601782*	-5.480417*
LTRADE	-1.354677	-1.265349	-4.396838*	-7.861267*

Note: *denotes significance at 1% level while** denotes significance at 5% level.

As per the results in table 1 above, all our variables are not stationary at the levels, with or without trend. All the variables are stationary only after the first difference, implying that all the variables are integrated of the order one or I(1).

In view of the homoskedastic error term assumption inherent in the ADF approach, we also used the Phillip-Perron test to address the weaknesses associated with the restrictive assumptions of the ADF approach. We present the results of the Phillips-Perron test in table 2 as follows

Table 2: Results of the Phillips-Perron (PP) Unit Root Test

Variable	At Log Levels		After First Difference	
	Constant	Constant and Trend	Constant	Constant and Trend
LFDI	-0.690335	-2.606519	-5.213267*	-5.204811*
LINFL	-3.634901	-5.311465	-16.45639*	-20.70536*
LEXR	-5.782935	-0.734770	-3.182327**	-4.152161**
LGFCF	-1.594694	-1.501867	-5.550701*	-10.53975*
LAGRIC	-0.429217	-2.614953	-7.856082*	-7.927539*
LTRADE	-1.374386	-1.534810	-4.402033*	-4.996895*

Note: *denotes significance at 1% level while** denotes significance at 5% level.

The Phillips-Perron test confirmed the results we obtained under the ADF approach both at the levels and after the first difference. That is, all our variables are not stationary at the levels but are stationary only after the first difference. The fact that all the variables are integrated of the order one or I(1) makes the Johansen test for cointegration a more appropriate model for our study since the Johansen test assumes that all the variables are integrated of the order one.

FDI's impact on the agricultural sector

We present here FDI's impact on the agricultural sector.

Table 3. The selection criteria of the VAR lag length
Endogenous variables: LAGRIC LFDI LINFL LEXR LTRADE LGFCF
Sample: 1980 2010

Lag	LogL	LR	FPE	AIC	SC	HQ
0	92.19654	NA	8.54e-11	-6.156895	-5.871423	-6.069624
1	218.7756	189.8686	1.41e-13	-12.62683	-10.62852	-12.01593
2	266.5095	51.14340*	9.08e-14	-13.46496	-9.753821*	-12.33043
3	327.1939	39.01142	5.79e-14*	-15.22814*	-9.804160	-13.56997*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Each of the information criteria, as per the table above, suggests the various lag length. We used the Schwarz Information Criterion to select a lag length of two (2) to minimize information criteria. We then test for cointegration between our independent variables and agricultural sector using the Johansen cointegration approach as that approach is not sensitive to what is chosen as the endogenous variable.

Results on the impact of FDI on agriculture based on the Johansen Cointegration

Table 4: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.866280	173.4213	95.75366	0.0000
At most 1 *	0.825946	117.0851	69.81889	0.0000
At most 2 *	0.738394	68.13010	47.85613	0.0002
At most 3 *	0.467614	30.58448	29.79707	0.0405
At most 4	0.359142	12.93364	15.49471	0.1173
At most 5	0.016825	0.475112	3.841466	0.4906

Trace test indicates 4 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.866280	56.33622	40.07757	0.0003
At most 1 *	0.825946	48.95497	33.87687	0.0004
At most 2 *	0.738394	37.54562	27.58434	0.0019
At most 3	0.467614	17.65084	21.13162	0.1435
At most 4	0.359142	12.45853	14.26460	0.0946
At most 5	0.016825	0.475112	3.841466	0.4906

Max-eigenvalue test indicates 3 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Our Johansen cointegration test results based on the trace statistic is presented in table 4 while the results based on the maximum-eigenvalue test statistic is presented in table 5. Based on the results in table 4, we reject the null hypothesis of no cointegration at the 5% significance level given the trace statistic of 95.75366 and the highly significance p-value (0.0000). Turning to the

maximum-eigenvalue test statistic in table 5, we again reject the null hypothesis of no cointegration. We therefore have cointegration between the independent variables and the agricultural sector.

Result of the Long-Run Estimates

Result on the impact of FDI on the agricultural sector, having controlled for the other variables, is presented below:

Table 6: Impact of FDI on Agric Sector
Dependent Variable: LAGRIC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.519252	0.097944	15.51143	0.0000
LFDI	-0.030282	0.012805	-2.364773	0.0261**
LINFL	0.029673	0.020934	1.417430	0.1687
LEXR	-0.093038	0.014551	-6.393939	0.0000*
LTRADE	0.163377	0.068057	2.400609	0.0241**
LGFCF	0.009109	0.067935	0.134082	0.8944

Diagnostic Tests		
R-squared	0.898177	
Adjusted R-squared	0.877812	
F-statistic	44.10484	
Prob(F-statistic)	0.000000	
Durbin Watson stat	1.278030	
Serial Correlation LM Test (p-value)	6.221705	(0.0446)
Normality: Jarque-Bera test (p-value)	0.624296	(0.731873)
Heteroskedasticity: Chi-square (p-value)	8.007302	(0.1558)

Notes: * represents significance at 1% and ** represents significance at 5%. Standard errors are White Heteroskedasticity-Consistent.

Looking at the results from the diagnostic checks, the independent variables explain about 88% of changes in the productivity of the agricultural sector. The independent variables, overall, are significant given the *F*-statistic of 44.105 and the highly significant *p*-value (0.000). The results

of the diagnostic tests on normality, residual serial correlation and heteroskedasticity show that our model is very robust. Turning to the parameters we establish that FDI, at the 5% significance level, is significant and impacts the agricultural sector negatively. More specifically, the value added to the agricultural sector falls by 0.03% when FDI grows by 1%. This finding is consistent with the findings of Djokoto (2011) who did not find a causal link between FDI into agriculture and growth of the agricultural sector. Djokoto (2013) did not also find trade openness and FDI to have any long term relationship with the performance of the agricultural sector.

We also find that exchange rate negatively impacts the agricultural sector. That is, an increase in exchange rate (depreciation of the cedi) by 1% causes productivity in the agricultural sector to fall by 0.09%. Our finding is not surprising considering the fact that many agricultural inputs in Ghana as well as machines needed to mechanize and boost agricultural productivity are all imported to Ghana. An increase in the exchange rate (depreciation of the cedi) makes imports expensive thereby affecting theimports of these inputs and machinery with inverse impact on productivity.

We find trade openness to have positive impact on the agricultural sector. When trade openness increases by 1%, productivity or value additions in the agricultural sector improve by 0.16%. As Ghana opens up its economy to the rest of the world for foreign trade, it is able to import inputs, machinery and new technology from abroad to boost agricultural productivity. Additionally, foreign trade offers Ghanaian farmers the opportunity to export their products and widen their clientele base. The increase in the clientele base helps to increase demand and productivity in the sector.

Having established cointegration, we proceed to analyse the short run dynamics by using the vector error correction model (VECM). The results are presented in the table below:

Short-Run Dynamics for the impact of agriculture sector

Table 7: Impact of FDI on agricultural sector, results based on VECM.

Variable	Coefficient	Stand. Error	t-statistic
C	-0.018068	0.01901	-0.95029
D(LAGRIC(-1))	-0.111013	0.34229	-0.32433
D(LAGRIC(-2))	-0.443621	0.28394	-1.56239
D(LFDI(-1))	0.019426	0.03309	0.58701
D(LFDI(-2))	0.083248	0.03726	2.23412**
D(LINFL(-1))	-0.045494	0.05278	-0.86194
D(LINFL(-2))	0.001141	0.03404	0.03351
D(LEXR(-1))	-0.080964	0.17174	-0.47144
D(LEXR(-2))	0.053311	0.11073	0.48145
D(LTRADE(-1))	0.041659	0.16714	0.24924
D(LTRADE(-2))	0.193761	0.13071	1.48234
D(LGFCF(-1))	-0.008613	0.14929	-0.05770
D(LGFCF(-2))	-0.233335	0.13052	-1.78767
ECT	0.107429	0.14174	0.75793
DIAGNOSTIC TESTS			
R-squared	0.598005		
Adjusted R-squared	0.165088		
F-Statistic	1.381337		

Notes: ** represents 5% significance level.

The results from the table above indicate that the coefficients of lagged FDI, particularly the second lag of FDI, are positive implying that value additions in the agricultural sector are positively impacted by FDI. The agricultural sector improves by 0.08% when FDI changes by 1% in the short run. We do not find exchange rate, inflation, gross fixed capital formation and trade openness to be significant in the short run.

Conclusion and Policy Recommendation

The growth-related benefits of FDI have gained substantial attention in terms of both theoretical and empirical research. However, the inconclusiveness of the results in respect of the impact of FDI on economic growth of the host economies has led some authors to take account of sectoral differences in respect of the growth impact of FDI. The studies on this heterogeneity paradigm in the way FDI affect various sectors tend to focus much on the manufacturing and service sectors, with very few on agriculture. The few studies on agriculture in Ghana have looked at the causal link between FDI and agricultural sector in Ghana. Our study adopted a more robust approach by looking at the long run impact of FDI on the agricultural sector as well as the short run dynamics using the Johansen (1988) cointegration and the VECM. Our time series data spans the period 1980 and 2013. We found that FDI negatively impacts the agricultural sector productivity in the long run but with positive relationship in the short run.

We also find that the depreciation of the cedi negatively impacts the growth of the agricultural sector in the long run. This finding is not surprising considering the fact that most, if not all, of the inputs and machinery needed to boost agricultural productivity in Ghana are imported. As a result, a depreciation of the cedi makes these imported inputs relatively expensive and thereby affecting the sector. Trade openness on the other hand has positive and significant long run impact on the agricultural sector. Government should harness trade policies that would offer Ghanaian farmers the opportunity to export their products abroad as a way to expand their markets, demand and productivity. Harnessing the trade policies would also provide the farmers the needed access to international markets for growth-enhancing inputs as well as cutting-edge technology to boost their level of productivity. The government should also work at stabilizing the local currency (cedi), the depreciation of which has made farming inputs very expensive (as they are imported). Policy makers should ensure that FDI inflows to agriculture and the entire economy for that matter should not be harmful to the economy by way of capital and excessive profit repatriations.

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