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Domestic and foreign direct investment in Ghanaian agriculture

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Abstract

Purpose – The purpose of this paper is to investigate the effects of foreign direct investment (FDI) into agriculture on domestic investment in agriculture.
Design/methodology/approach – Time series data from 1976 to 2007 was fitted to a derived model.
Findings – Foreign direct investment into agriculture crowd-in domestic investment into agriculture.
Research limitations/implications – A targeted approach that will attract foreign direct investment into agriculture is required as to complement existing efforts at boosting domestic agricultural investment.
Originality/value – Numerous papers investigated the relationship between foreign direct investment and domestic investment at the aggregate national and regional levels. However, the evidence for this relationship has been conflicting. That for agriculture is rare. For Ghana, a developing agrarian economy that has promoted foreign direct investment for some decades now, it is imperative to establish the relationship between foreign direct investments and domestic investment. Also, the estimation was based on a theoretically derived model.

Keywords Agriculture, Foreign direct investment, Ghana, Crowd-in effect, Domestic investment
Paper type Research paper

Introduction

Domestic and foreign investments are crucial to development of the agricultural sector. Foreign direct investment connotes an investment involving a long-term relationship and reflecting a lasting interest in and control by a resident entity in one economy (foreign direct investor or parent enterprise) of an enterprise resident in a different economy (foreign direct investment enterprise or affiliate enterprise or foreign affiliate). Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates. The transactions comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to a foreign direct investment enterprise, and include the three following components: equity capital, reinvested earnings and intra-company loans (UNCTAD, 2013). These capital transfers occur in sectors of Ghana's economy including agriculture. Benefits of foreign direct investment into agriculture arises from capital inflows, technology transfer leading to higher domestic productivity and production, quality improvement, employment creation, backward and forward linkages (Hallam, 2011). Additionally, there could also be multiplier effects through local sourcing of labour and other inputs, processing of outputs and possibly an increase in food supplies for the domestic market and for export.

Domestic investment in agriculture on the other hand refers to the value of physical assets used in the production process covering land development, irrigation works, structures, machinery and livestock within an economy (FAOSTAT, 2013). This is often captured as annual stocks. However, the flow values are obtainable by taking

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the difference between the stocks of consecutive annual stocks. The investment (capital) flows then refers to value of physical assets created for employment in agricultural production. This comprises what is generated (created) by the indigenes as well as that which is generated by foreigners in their investment process within the economy. Domestic investment into agriculture, all of which is not consumed in any one year, forms an important part of agricultural production processes.

Ghana has been the home of multinationals such as Unilever (formerly United Africa Company and Lever Brothers), CFAO and Patterson Zocchonis (PZ) since pre-colonial days. Immediately after independence in 1957, others such as Volta Aluminium Company (VALCO) and Nestle were specifically attracted into the country. The quest for multinational (foreign direct investor) attraction took a concerted form with the promulgation of Ghana Investment Promotion Centre Act, 1994 (Act 478) to encourage, promote and facilitate investments in all sectors of the economy except mining and petroleum. Ghana Investment Promotion Centre (GIPC), the body established under the Act, co-ordinates and monitors all investment activities falling under Act 478. Although the activities of GIPC are directed at both domestic and foreign investors, GIPC (2013) noted that domestic (Ghanaian) projects registered were miniscule. Miao (2012) reported non-complimentary relationship between agricultural foreign direct investment (AGFDI) and domestic investment into agriculture in China. In Ghana where the largest proportion of the population depends heavily, directly or indirectly on agriculture (ISSER, 2007; World Bank, 2009), does foreign direct investment into agriculture discourage or compliment domestic investment into agriculture?

The main objective of this paper is to examine the effect of foreign direct investment into agriculture on domestic investment in agriculture. Specifically, to establish whether foreign direct investment into agriculture crowd-in or crowd-out domestic investment in agriculture in Ghana.

Numerous papers have investigated the relationship between foreign direct investment and domestic investment at the aggregate national (Ghazali, 2010) and regional levels (Al-Sadig, 2013) with conflicting results. Xu and Wang (2007) reported crowd-in effect. Adams (2009) provided evidence for crowd-out effect. Indeed, Wang showed that long-run results disagree with short-run results. Whilst the relationship at sectoral level is hard to find, that of agriculture is virtually, non-existent[1]. This paper contributes to the literature by providing evidence on the relationship between foreign direct investment into agriculture and domestic investment in agriculture in a developing country, Ghana.

The rest of the paper is sectioned into four. Review of literature is taken up in the second section. Third section elaborates the model that is employed in the estimation, outlines the data generation as well as indicating the sources of data. Fourth section reports and discusses the results. Conclusions and accompanying recommendations are presented in final section.

Literature

2.1 Effect of foreign direct investment on domestic investment

Foreign direct investment and domestic investment may have a complimentary relationship, non-complimentary relationship or no relationship at all statistically. Where there is complimentary relationship, increase in foreign direct investment usually leads to increase in domestic investment. This is called a crowd-in effect. On the contrary, crowd-out effect is reflected by increase in foreign direct investment leading

to decrease in domestic investment. No statistically significant relationship connotes a neutral effect of foreign direct investment on domestic investment.

Al-Sadig (2013) found that foreign direct investment stimulated private domestic investment in support of the "crowd-in-hypothesis" based on a panel data for 91 developing countries over the period 1970-2000. After grouping countries based on their level of income, he found that the positive effects of foreign direct investment on private investment in low-income countries depended on the availability of human capital. McMillan (1999) and Ndikumana and Verick (2008) reported crowd-in effects for sub-Saharan Africa (SSA). The former noted that the stronger impact of foreign direct investment on domestic investment than lagged private domestic investment variable itself was due to the association of technological and managerial capabilities with foreign direct investment. This made private domestic investment more profitable. She concluded that foreign direct investment was a strong catalyst for domestic investment in developing countries. The latter found in a causal analysis that the impact of private investment on foreign direct investment was stronger and more robust than the reverse relation. This meant that African countries would benefit from measures aimed at promoting domestic private investment conditioned on the fact that a strong investment performance would serve as a sign of high returns to capital. This in turn would attract more foreign capital.

Mileva (2008), Elboiashi *et al.* (2009) and Wang (2010) also found positive long-run crowd-in effects for transition economies, north African non-oil producing countries and LDCs, respectively. Adams (2009) and Wang (2010) reported crowd-out effect for SSA (1990-2003) and 50 countries, respectively. In the case of SSA, it was found that both the initial and later effects of the foreign direct investment on domestic investment were negative. In the case of the 50 countries, only the short-run effect was negative whilst the cumulative effect was positive.

Individual country studies by Mišun and Tomšík (2002), Xu and Wang (2007), Tang *et al.* (2008), Ghazali (2010) and Amadou (2011) also point to complimentary effect between foreign direct investment and domestic investment. Mišun and Tomšík (2002) reported particularly strong effect for Hungary and Czech Republic. Xu and Wang (2007), using data for 1980-1999 indicated a positive relation for China. With a wider data set (1978-2003), Tang *et al.* (2008), employing Granger causality tests for China found a positive relation as well. Ghazali (2010) and Amadou (2011) reported similar complimentary effects in the case of Pakistan and Togo, respectively.

Recently, Djokoto (2013) provided empirical evidence on the effect of inward foreign direct investment on domestic investment in Ghana. The other explanatory variables included output, total consumption and net exports. Based on data covering 1971-2011, total consumption and net exports exerted a negative effect on domestic investment. GDP growth rate statistically significantly impacted domestic investment positively. There was neither crowd-out nor crowd-in effect of inward foreign direct investment on domestic investment. This was attributable to the inability of the foreign direct investments to yield the expected dividends to the local economy. The study recommended a concerted effort by government principally to reduce final consumption by dual approach of reducing her expenditure and pursuing policies that will encourage savings to induce domestic investment.

The only agriculture specific study found during the literature search was authored by Miao (2012). The data covered 1997-2009 for China and a simultaneous equation model was employed. The effect of AGFDI as explanatory variable on domestic investment and employment as dependent variables were modelled using two-stage

least square and ordinary least square estimation procedures. The results showed that a 1 per cent increase of AGFDI crowd-out 0.2 per cent domestic investment and 0.01 per cent of employment. Despite the frequent crowd-in effects of foreign direct investment on domestic investment and the few crowd-out effects reported for LDCs, there was a neutral contemporaneous effect of foreign direct investment on domestic investment.

2.2 Effect of growth, consumption and export on domestic investment

Total final consumption (including government expenditure), investment and net exports are linked in the computation of national income. The levels of these macroeconomic indicators are bound to influence each other. At the national level a number of studies have reported the relationship between some macroeconomic indicators (used later as control variables) and domestic investment. Tang *et al.* (2008) reported that economic growth causes domestic investment in China. However, Tan and Tang (2012) did not find evidence for this in Malaysia. In the short run, Alfa and Garba (2010) noted that economic growth "Granger-caused" domestic investment in Nigeria, respectively. In the long run, whilst Lean and Tan (2011) report growth discouraging domestic investment in the Indian economy, Ghazali (2010) noted that growth promotes domestic investment in Pakistan. Adams (2009) reported that trade is an incentive to domestic investment in their study on SSA countries. In the case of Cameroon, Khan (2008) reports similar positive effect of trade on domestic investment. In the short run, Alfa and Garba (2010) found that exports from Nigeria did not positively influence domestic investment. In respect of the effect of total consumption on domestic investment, Li and Li (2005) and Gatawa and Bello (2012) made some findings for Shandong Province in China and Nigeria, respectively. The latter noted that the coefficient for the relationship between consumption and domestic investment was negative. This indicated that consumption expenditure crowded-out domestic investment. In the case of the former, increased household expenditure had positive effect on domestic investment in Shandong Province of China.

Methodology

3.1 Model

Foreign direct investment adds to stock of domestic investment by indigenes hence increasing total domestic investment. Aside of this, Hallam (2011) noted the following benefits; foreign direct investment into agriculture arises from capital inflows, technology transfer leading to higher domestic productivity and production, quality improvement, employment creation, backward and forward linkages. Also, there could be multiplier effects through local sourcing of labour and other inputs, processing of outputs and possibly an increase in food supplies for the domestic market and for export. These would result in increased domestic investment. Thus foreign direct investment has some influence on domestic investment. The direction of this effect, which is the subject of this paper, is unknown in the case of Ghana. Foreign direct investment and domestic investment may have a complimentary relationship, non-complimentary relationship or no relationship at all statistically as evidenced in the literature review.

Accelerator theory may be used to explain the relationship between output and investment. Increased demand levels are an opportunity for firms to increase output (preferably) rather than increase prices. Since this demand arises from increased income (GDP), national output will thus influence investments. Indeed, it is common knowledge that countries with higher income levels generally dedicate more of their

wealth to domestic savings which would then be used to finance investment. In the same vein, neoclassical investment theory postulates that private investment is positively related to the growth of real GDP. Hence output growth Y is related to domestic investment, I^T. This relationship is postulated to be positive.

Households in an economy have two choices to make regarding their disposable income; spend on final goods and services and savings. Increased consumption expenditure would lead to decreased domestic savings and vice versa. This will influence the level of private investment. Likewise, governments would also distribute their income (revenue) between investment and expenditure on final goods and services. So, increased spending on final goods and services would decrease public investment and vice versa. Thus total consumption (TC) by households and government would influence domestic investment (I^T). And this influence is expected to be positive.

In a small open economy like Ghana, export market is an incentive to increase output beyond domestic demand. Firms will respond to this stimulus by increasing investments. In this way, exports and domestic investment will be related. Indeed, there would be a positive relationship. In respect of imports, increased demand for domestic goods would stimulate imports of resources which may not be available locally and would be paid for by funds procured for investment. In cases where imports compete with locally produced resources and final goods and services, firms would decrease output and hence investment. Therefore, imports may have positive or negative effects on domestic investment. Defining net exports as exports minus imports (NX) the direction of effect of NX remains unclear. Thus the a priori sign would be positive or negative depending especially on the composition of imports.

From the foregoing, Equation (1) can be specified as:

$$I^T = f(I^F, TC, NX, Y) \tag{1}$$

Using the superscript, A to represent agriculture, the equivalent of the agricultural economy can be represented as:

$$I^{TA} = f(I^{FA}, TC^A, NX^A, Y^A) \tag{2}$$

The estimable equation then becomes:

$$I^{TA} = a_0 + a_1 I_t^{FA} + a_2 TC_t^A + a_3 NX_t^A + a_4 Y_t^A + \varepsilon_t \tag{3}$$

where a_i are parameters to be estimated. I_t^{TA} is agricultural domestic capital flow (consecutive annual differences between agricultural capital stock) to agricultural GDP ratio. I_t^{FA} is ratio of agricultural inward foreign direct investment flow to agricultural GDP. AGFDI was available from GIPC for 1995-2010. The short span of the data would not be appropriate for meaningful time series estimation hence, the need to increase the series. To generate data for previous years, it was assumed that there would be some causality between AGFDI and national foreign direct investment flow (GHFDI) into Ghana. This was tested by performing a Granger causality test (Table I). For the purposes of data generation "Granger causality" was considered adequate.

Following causality from GHFDI inflow to AGFDI, three equations (linear, quadratic and cubic) were modelled to select the appropriate one for backcasting. All three possessed significant F-statistics suggesting they were all candidates for backcasting.

However, further inspection showed that the quadratic model had the highest adjusted R^2 of 94.97 per cent, all terms including the intercept were statistically significant at least at 5 per cent probability level (Table II).

The appended series for 1976-1994 was then generated using the quadratic equation. TC_t^A is agricultural total consumption (sum of private final consumption and government expenditure on final agricultural goods and services) weighted by agricultural GDP in total GDP (following UNCTAD, 2009) to agricultural GDP ratio. NX_t^A is net agricultural exports (agricultural exports minus agricultural imports) to agricultural GDP ratio. Since all the variables were divided by agricultural GDP, maintaining Y_t^A would turn the variable expressed as ratio of agricultural GDP to unity. So, the growth rate of agricultural GDP was used in place of agricultural GDP.

Foreign direct investment inflow into Ghana's agricultural economy may promote agricultural domestic investment, discourage agricultural domestic investment or have no discernible effect as outlined in the literature. As stated earlier, the main objective of the paper is to assess the crowd-in or crowd-out effects of AGFDI on agricultural domestic investment. This is principally dependent on estimates of coefficient of I_t^{FA}, a_1.

It is important to appreciate the relationship among I^{TA}, I^{DA}, I^{FA} and the estimate of a_1:

$$I^{TA} = I^{DA} + I^{FA} \tag{4}$$

where I^{DA} is investment by indigenes in Ghana. If estimate of a_1 equals 1, I^{FA} within I^{TA} has already increased by 1 unit, thus any change in I^{TA} is resulting from (I^{DA}). In

Pairwise Granger causality tests
Sample: 1995Q1 2010Q4
Lags: 2

Null hypothesis	Obs.	*F*-statistic	Prob.
GHFDI does not "Granger-cause" AGFDI	62	3.99981	0.0237
AGFDI does not "Granger-cause" GHFDI		0.40598	0.6682

Table I.
Granger causality test

Terms	Cubic function	Quadratic function	Linear
Intercept	17724740.19*	23962958.43***	−4376666.12
X^3	1.58139E−20	–	–
$3X^2$	2.13743E−12	–	–
X^2	–	6.56E−11***	–
$3X$	−0.002282694	–	–
$2X$	–	−0.02966**	–
X	–	–	0.08888358***
R^2	0.960476409	0.95983445	0.757767044
Adjusted R^2	0.946104194	0.949793063	0.73913374
F-statistic	66.82869806	95.58783148	40.66734661
Probability for *F*-statistic	0.0000***	0.0000***	0.0000***

Table II.
Results of model fitting to generate agricultural foreign direct investment here

Notes: Dependent variable: FDI inflow to agriculture in Ghana; independent variable FDI inflow into Ghana. *Xs* are FDI inflow to Ghana. *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

general, any change in (I^{FA}) on the right-hand side of Equation (4) is the same for I^{FA} within I^{TA} on the left-hand side of (4). As a result changes in I^{FA} on the right-hand side of (4) impact on I^{DA} component of the left-hand side of Equation (4) only. Armed with this understanding the following four criteria are outlined:

(1) If it is not possible to reject the null hypothesis $\hat{a}_1 = 0$ with a t-test, it means an increase or decrease in I^{FA} of one unit will not cause a change in agricultural domestic investments (I_t^{TA}). There is therefore neither crowd-in nor crowd-out effect of foreign direct investment on domestic investment.

(2) If it is not possible to reject the null hypothesis $\hat{a}_1 = 1$ with a t-test, it means an increase in I^{FA} of one unit will cause additional total agricultural investments (I_t^{TA}), of one unit. Since foreign direct investment is part of total domestic investment, it implies that AGFDI is noticeable within total investment.

(3) If the null hypothesis $\hat{a}_1 = 0$ is rejected in favour of the alternative and that $\hat{a}_1 < 0$, this is evidence of crowd-out effects. One additional unit of I^{FA} will lead to less than one unit of additional I_t^{TA}, meaning that inward foreign direct investment crowd-out I_t^{TA}.

(4) If the null hypothesis $\hat{a}_1 = 1$ is rejected in favour of the alternative and that $\hat{a}_1 > 1$, this is evidence of crowd-in effects. One additional unit of I^{FA} will lead to more than one unit of additional I_t^{TA}. That is to say, inward foreign direct investment into agriculture stimulates and exerts *crowd-in* effect on I_t^{TA}.

3.2 Data sources

Data covered 1976-2007. The bounds of the data were determined by the limitation of agricultural capital stock within the above range. This series and data for agricultural export and imports were obtained from FAOSTAT (2013). Data on foreign direct investment into Ghana was extracted from UNCTADSTAT (UNCTAD, 2013). The weight of agriculture in national GDP and agricultural GDP growth rate data were extracted from UNSTAT (2013). All original data were in current USD and the ratio forms were subsequently generated. Agricultural GDP growth was, however, based on GDP in constant 2005 USD prices.

3.3 Estimation procedure

Estimation methods for investigating the relationships between foreign direct investment and domestic investment have varied. McMillan (1999) used the method of moments, whilst Lalwani (2002) employed pairwise correlations. Xu and Wang (2007), Ndikumana and Verick (2008), Wang (2010) and Ghazali (2010) used Granger causality tests. Mišun and Tomšík (2002) derived a theoretical model and fitted data using OLS. Mileva (2008) used partial adjustment models and Amadou (2011) employed error correction approach to the estimation. Recognising the role of additional variables in studying economic phenomenon, Granger causality was avoided. The relatively elementary pairwise correlation was not considered at all. The possibility of unit roots and subsequent test for level relationships permitted the appropriate use of autoregressive distributed lag (ARDL) model.

Results and discussion

4.1 Unit root and cointegration tests

The variables were tested for unit roots and level relationships. Three reasons accounted for the test; to avoid infinite persistent shocks of data series, eliminate

spurious regression and conform to the standard assumptions for asymptotic analysis that ensure that the *t*-ratios follow a *t*-distribution. Both augmented Dickey-Fuller and Phillips-Perron tests produced the same decisions on each of the variables (Table III). The mix of stationarity at levels and at first difference precluded the use of Johansen method of testing for cointegration.

Subsequently, the ARDL method was employed to test for the existence of level relationships among the variables (Table AI). The results show that both the computed *F*-statistic and the *W*-statistic exceeded the upper bound of the critical values for both the 90 and 95 per cent confidence limits based on the ARDL model (Table IV). Following the existence of level relationships among the variables, both the long-run (Table V) and short-run (Table VI) models were estimated.

4.2 Long-run estimates

The coefficient of I^{FA} recorded 3.5332, positive and significant at 1 per cent probability level. Therefore, Statement 4 on the hypothesis statements that if the null hypothesis $\hat{a} = 1$ is rejected in favour of the alternative and that $\hat{a} > 1$, the evidence of crowd-in effect holds. One additional unit of I^{FA} will lead to more than one unit (3.5332) of additional I_t^{TA}. That is to say, inward foreign direct investment into agriculture stimulates and exerts crowd-in effect on I_t^{TA}. This can be elucidated by appreciating the relationship among I^{TA}, I^{DA} and I^{FA}. If estimate of a_1 equals 1, I^{FA} within I^{TA} has already increased by 1 unit, thus any change in I^{TA} is resulting from (I^{DA}). In general, any change in I^{FA} on the right-hand side of Equation (4) is the same within I^{TA} on the left-hand side of (4). As a result changes in I^{TA} on the right-hand side of (4) impacts on I^{DA} component of the left-hand side of Equation (4) only. Therefore, 1 unit increase in I^{FA} will lead to a 3.5332-unit increase in domestic investment in agriculture. This means that foreign direct investment into agriculture crowds-in domestic investment into agriculture in Ghana. This is contrary to the findings of Miao (2012) for the agricultural sector in China. The result also diverges with whole economy studies for Poland (Mišun and Tomšík, 2002) and Korea (Kim and Seo, 2003). The finding of crowd-in effect is in conformity with a preponderant crowd-in effect findings for whole

Variables	Augmented Dickey-Fuller	Phillips-Perron
I^{FA}	−2.715406 *I*(0)*	−2.634463 *I*(0)*
I^{TA}	−4.743058 *I*(0)***	−4.77333 *I*(0)***
NX^{A}	−3.617695 *I*(1)**	−6.989483 *I*(1)***
TC^{A}	−4.344624 *I*(0)***	−3.150671 *I*(0)**
Y^{A}	−5.581077 *I*(0)***	−5.621156 *I*(0)***

Notes: *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

Table III.
Test for unit roots

F-statistic 95%	Lower bound 95%	Upper bound 90%	Lower bound 90%	Upper bound
9.7795	2.6051	3.9403	2.1077	3.2851
W-statistic 95%	Lower bound 95%	Upper bound 90%	Lower bound 90%	Upper bound
48.8977	13.0254	19.7015	10.5384	16.4257

Notes: *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

Table IV.
Test statistics and critical bounds for testing existence of level relationship among the variables

economies as evidenced for Hungary and Czech (Mišun and Tomšík, 2002), China (Xu and Wang, 2007; Tang *et al.*, 2008), Pakistan (Ghazali, 2010) and Togo (Amadou, 2011). For groups of countries, the finding concurs with those of Ndikumana and Verick (2008) for SSA, Mileva (2008) for transition economies, Wang (2010) for LDCs and Al-Sadig (2013) for developing countries.

Since foreign direct investment into agriculture complements domestic investment in agriculture, Ghana ought to target agriculture in promoting domestic investment inflows using foreign direct investment policies and regulations. Agriculture is generally primary and employs more than 60 per cent of the labour force (ISSER, 2007; World Bank, 2009) therefore increased I^{FA} will not only provide employment in foreign business but also boost investment in local business that will also create employment opportunities. Technology diffusion and spillover of management know-how by multinational enterprises and vertical inter-firm linkages with domestic firms may explain the crowd-in effect.

ARDL(1,1,1,0,0) selected based on Akaike information criterion
Dependent variable is I_t^{TA}
31 observations used for estimation from 1977 to 2007

Regressors	Coefficient	SE	*T*-ratio
I^{FA}	3.533200	0.945840	3.7355***
TC^{A}	0.019818	0.004350	4.5555***
NX^{A}	−0.040150	0.016464	−2.4386**
Y^{A}	0.000011	0.000670	0.0159

Notes: *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

Table V.
Estimated long-run coefficients using the ARDL approach

ARDL(1,1,1,0,0) selected based on Akaike information criterion
Dependent variable is dI^{TA}
31 observations used for estimation from 1977 to 2007

Regressor	Coefficient	SE	*T*-ratio
dI^{FA}	0.49119	1.2285	0.39981
dTC^{A}	−0.10790	0.08708	−1.2391
dNX^{A}	−0.05120	0.02326	−2.2008**
dY^{A}	0.00001	0.00085	0.015862
ecm(−1)	−1.2751	0.16858	−7.5638***

$$\text{ecm} = I^{TA} - 3.5332 \times I^{FA} - 0.019818 \times TC^{A} + 0.040150 \times NX^{A} - 0.000011 \times Y^{A}$$

R^2	0.726470	$\bar{R}^2$	0.65809
SE of regression	0.021684	*F*-statistic, *F*(4,26)	15.9355***
Mean of dependent variable	0.002230	SD of dependent variable	0.037083
Residual sum of squares	0.011285	Equation log-likelihood	78.7467
Akaike information criterion	71.7467	Schwarz Bayesian criterion	66.7277
D-W statistic	2.1313		

Notes: *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

Table VI.
Error correction representation for the selected ARDL model

The coefficient of total consumption is 0.0198 and significant at 1 per cent probability level (Table V). This implies increased consumption of final goods and services rather increased domestic investment in the long run. Through the savings and investment equation in national income accounting this should not be plausible. However, substantial portions of household incomes in Ghana are spent on food. Increased spending will imply more resources to agriculture (assuming the transmission of prices passes on adequate margins to farmers). This will lead to increased surpluses that can be channelled into accumulating capital resources in the long run. This finding of complimentary role of consumption and domestic investment in agriculture agrees with the conclusion of Li and Li (2005) for Shandog Province of China but disagrees with the findings of Gatawa and Bello (2012) for Nigeria.

Net exports coefficient of −0.040 was statistically significant at 5 per cent probability level. The implication is that net exports of agricultural goods and services crowd-out domestic investment into the sector. The increased imports over exports would mean that expenditure on imported agricultural products would create competition for locally produced agricultural products. Inability of local producers to sell more of their produce will decrease resources available for investment. The competition from imported agricultural products would be a negative signal to potential local investors into agriculture. The resultant effect of the crown-in effect of total consumption and crowd-out effect of net exports will depend on the strength of influence from the two variables. The crowd-out effect of trade does not concur with the conclusion of Khan (2008) for the Cameroonian economy.

Although positively signed, the coefficient for agricultural growth is miniscule and statistically indistinguishable from zero. This implies that agricultural growth does not induce domestic investment in Ghana based on the data used. This finding concurs with that of Tan and Tang (2012) but disagrees with that of Tang *et al.* (2008). Lean and Tan (2011) reports crowd-out effect of growth for India whilst Ghazali (2010) reports crowd-in effect of growth for Pakistan. Both of these do not support the finding for Ghana.

4.3 Short-run estimates

The short-run estimates are presented in Table VI. The *F*-statistic of 15.9255 is statistically significant at 1 per cent. This implies that the explanatory variables in the short-run model jointly explain the dependent variable. The R^2 value is relatively high showing that the variability in the dependent variable is appreciably explained. The *D-W* statistics shows there is no first-order autocorrelation of the errors terms. Since the R^2 value is less than the *D-W* statistics, this is additional proof that the regression model is not spurious. The sign of the ecm (−1) is negative in conformity with expectations. Its magnitude registering 1.2741 suggests that more 100 per cent of the previous year's disequilibrium is corrected for before the current year ends. The negative and statistically significant ecm (−1) confirms the existence long-run relationship of the model in Table V.

In the short run (Table VI), however, *H1* (outlined earlier) holds, that, if it is not possible to reject the null hypothesis $\hat{a}_1 = 0$ with a *t*-test, it means an increase or decrease in I^{FA} of one unit will cause no change in agricultural domestic investments. Thus in the short run, I^{FA} does not exert any discernible effect on domestic investment in agriculture. Some reasons account for this result. First, agricultural companies, like all others, require time to set up. In the case of agriculture, design and implementation of irrigation facilities, for example require a couple of

years. Second, agricultural commodities have gestation periods during which biological processes take place in order to realise agricultural outputs, the length of these periods vary though. Nevertheless, generally, these are longer compared to non-agricultural products. Thus in the short run, the full effects of the benefits of foreign direct investment outlined in the introduction would not be appreciable hence the statistical insignificance of I^{FA} on domestic investment. Miao (2012) agrees with the no contemporaneous effect of I^{FA} on agricultural domestic investment with evidence from China. Djokoto (2013) also agrees with the neutral effect of foreign direct investment on domestic investment at the multi-sectoral level.

Total consumption coefficient is negatively signed but statistically insignificant. This implies that in the short run, total consumption does not have any discernible effect on domestic investment in agriculture. This findings agree with Djokoto (2013) for the whole economy of Ghana but diverges with those of Li and Li (2005) and Gatawa and Bello (2012). As in the case of the long run, the short-run results also show that growth does not significantly influence domestic investment. The net exports variable showed similar sign and magnitude as in the long-run model. Interestingly, the level of significance is also 5 per cent. This implies that given the current trade imbalance (more imports than exports for agricultural goods and services) domestic investment in agriculture has suffered and will continue to suffer if this situation is not reversed.

Conclusions and recommendations

The paper set out to assess the effect of foreign direct investment into agriculture on domestic investment into the sector. More specifically, to determine whether AGFDI crowd-in or crowd-out agricultural domestic investment.

In the long run, the positive sign and statistically significant coefficient of 3.5332 for I^{FA} makes the study conclude that AGFDI crowd-in agricultural domestic investment. Essentially, there is a complimentary relationship between the two. Since investment promotion practitioners believe that targeting is better than the mass approach Harding and Javorcik (2011) and Djokoto (2013) showed that foreign direct investment does not crowd-in domestic investment for the whole of Ghana's economy, the Government of Ghana through the GIPC should consider a targeting strategy that will specifically attract foreign direct investment into the agricultural sector. This will induce domestic investment in agriculture as well. Indeed, promoting foreign direct investment will complement government efforts at promoting domestic investment into agriculture.

Total consumption and agricultural GDP growth rate influenced domestic investment in agriculture in the long run. The ability of current level of consumption to induce domestic investment calls for greater efforts at increasing domestic investment through local domestic as well as foreign investment into the agricultural sector. Net exports into agriculture decreased domestic investment into the sector. This calls for greater efforts at increasing agricultural exports whilst discouraging imports of finished agricultural products. This will be possible through cost-effective agricultural production. Exports can be increased through effective marketing of fiscal incentives to agricultural producers and exporters. Local agricultural products must be popularised at formal and informal gatherings where food is served. The quality of these products (raw and processed) must be improved. Non-native agricultural products that can be produced locally must be encouraged to meet the need of foreign residents as well as serve as opportunity to develop capacity and export market for these.

In the short run, foreign direct investment into agriculture does not impact domestic investment into agriculture significantly. Governments efforts at reducing time to registering businesses and others costs at business start-up must be intensified. Improved technologies must be deployed by foreign investors to decrease the time to maturity of plants and animals they grow. Net exports diminished domestic investment in agriculture. This calls for efforts by the government and response by investors to increase production and consumption of agricultural products locally. A product that can be targeted is rice. This will reduce net export which has a negative mean value. This would decrease the quantum of imported final agricultural products and in favour of agricultural output and boost domestic investment.

Note

1. Except, for Miao (2012).

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(The Appendix follows overleaf.)

Appendix

Table AI.
ARDL model for test for existence of level relationship among the variables

ARDL(1,1,1,1,0,0) selected based on Akaike information criterion

Regressors	*Coefficient*	*SE*	*T-ratio*
$I^{TA}(-1)$	−0.275090	0.168580	−1.63180
I^{FA}	0.491190	1.228500	0.39981
$I^{FA}(-1)$	4.014000	1.269300	3.1624***
TC^{A}	−0.107900	0.087080	−1.23910
$TC^{A}(-1)$	0.133170	0.087629	1.51970
NX^{A}	−0.051195	0.023262	−2.2008**
Y^{A}	0.000013	0.000856	0.015862
R^2	0.535090	$\bar{R}^2$	0.41886
SE of regression	0.021684	*F*-statistic, *F*(6,24)	4.6037***
Mean of dependent variable	0.032800	SD of dependent variable	0.028444
Residual sum of squares	0.011285	Equation log-likelihood	78.7467
Akaike information criterion	71.7467	Schwarz Bayesian criterion	66.7277
D-W statistic	2.1313	Durbin's *h*-statistic	−1.0595

Test statistics	*LM version*	*F version*
A: Serial correlation	CHSQ(1) = 0.46459	*F*(1,23) = 0.34994
B: Functional form	CHSQ(1) = 0.7915E−6	*F*(1,23) = 0.5872E−6
C: Normality	CHSQ(2) = 5.3992*	Not applicable
D: Heteroscedasticity	CHSQ(1) = 0.28908	*F*(1,29) = 0.27297

A: Lagrange multiplier test of residual serial correlation
B: Ramsey's RESET test using the square of the fitted values
C: Based on a test of skewness and kurtosis of residuals
D: Based on the regression of squared residuals on squared fitted values

Notes: *,**,***Statistical significance at 10, 5 and 1 per cent, respectively

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