An examination of Public Expenditure, Private investment and Agricultural Sector Growth in Nigeria: Bounds Testing Approach

Elijah Udoh
Department of Economics
University of Calabar, Calabar.
Nigeria
Email: udoea@yahoo.com
Phone: +2348037136637

Abstract

This article estimated the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970-2008. The bounds test and Autoregressive distributed lag (ARDL) modelling approach was used to analyze both short- and long-run impacts of public expenditure, private investment (both domestic investment and foreign direct investment) on agricultural output growth in Nigeria. Results of the error correction model show that increase in public expenditure has a positive influence on the growth of the agricultural output. However, foreign investment has insignificant impact in the short run. Hence, it is recommended that policymakers should combined both private and public investment in a complementary manner to ensure that both short run and long run productivity of the agricultural sector is not undermined.

Keywords: Public Investment, Foreign Direct Investment, Gross domestic investment, Agriculture Growth, Nigeria, ARDL bounds test.

1. Introduction

A country's agricultural sector is expected to play a particularly important role in development performance. At the start of development, the agricultural sector typically constitutes the largest segment of economic activity in developing country. Its contribution to employment is even larger than its share of output. Its performance determines the well-being of a large fraction of the population. It serves as a source of various resources that can be transferred to other faster growing sectors in the economy. It affects both economic well-being and equity, largely due to its sheer size. Its importance also lies in its relation to food production, since meeting national nutritional levels is one of the basic tasks of development.Until the 1970s, the Nigerian economy was predominantly agricultural. However, with the discovery of crude petroleum in commercial quantities in the early 1970s, Mining and Quarrying (in the Industry sub-sector) has since become a major contributor to the country's foreign exchange earnings and the main source of revenue for the economy. Nonetheless, agriculture still remains the mainstay of the Nigerian economy; directly, in terms of volume of employment opportunities it offers, as the sector provides for a significant proportion of the country's labor force; and indirectly, through the important linkages it provides with the rest of the economy.

The role of the government in economic management is performed through the formulation and implementation of economic policy generally and fiscal policy in particular. As recognized by the new growth theory, public spending is an important factor for self – sustaining productivity gains and long term growth. For instance, government expenditure can contribute to agricultural growth (and hence poverty alleviation), it has indirectly created rural non – farm jobs and increased wages. The real significance of government development lies in the fact that it imparts a greater amount of "trickle-down" benefits for the poor in the growth process than growth alone. While economic growth alone often reduces poverty only by increasing mean consumption, government expenditure on agricultural reduces poverty both by increasing mean consumption and improving distribution of income (see Fan, Zhang and Zhang, 2000; Van de Walle, 1996; Galal, 2003).

Total expenditure on agriculture, as percentages of overall expenditure, fluctuated from 4.57 percent in the 1986-1993 periods through an average of 4.51 percent per annum in 1994-1998 to 3.53 percent in 1999-2005, reflecting government's intensified efforts to reduce its size. Intense efforts at down-sizing also showed up in declines in the ratio to GDP of this component of public expenditure. As a percentage of GDP, it was 4.38 percent between 1986 and 1993, but thereafter, declined to remain at less than 1.0 percent from 1993 to 2005 (CBN, 2006). Capital expenditure on agriculture exhibited a similar trend. As a percentage of overall expenditure, it was 4.33 percent per annum in 1986-1993, but declined to an annual average of 2.37 percent between 1999 and 2005.

As a ratio of GDP, capital expenditure in agriculture rose impressively from 1.45 in 1970-1979 to 4.32 percent in the years 1980 to 1985. It, however, stayed at less than 1.0 percent between 1994 and 2005. Similarly, per capita expenditure on agriculture was N127.27 and N289.11, respectively, in 1994-1998 and in 1999-2005. On the other hand, the agricultural sector of the Nigeria economy did not attract significant foreign private investment. The distribution of cumulative foreign private capital flow by types of activity between 1970 and 2007 reveals that agricultural sector lagged behind other major sectors (such as mining, manufacturing and services) in terms of share of total foreign private capital. The highest share of total foreign private capital recorded by the agricultural sector was 4.1 percent of total foreign capital flow in 1978 (CBN, 2008).

As a result of the low level of investment in the agricultural sector, output has fluctuated widely and productivity has also declined. On average, the sector grew at the rate of 11.4 per annum between 1960 and 2008. Further analysis of the performance of this sector indicates that the highest annual growth rates were recorded in the 1970s and 1980s, at 13.2 percent and 29.2 percent respectively. During the 1990s, the growth rate dropped to 3.4 percent. It rose at annual growth rate of 6.9 percent during the period 2000-2005, and at 4.2 percent during the period 2005-2008. At the population growth of 2.8 percent, per capita output grew by only 1.4 percent between 2005 and 2008. The deplorable state of the sector is also glaringly reflected in two important statistics: daily per capita calories intake and the unemployment rate. Calories intake deficiency has been a pervasive problem in the country. It stood at 13.80 kcals per day in 1985-1993 but only rose marginally by the 1994-1998 periods to 18.47 kcals per day. However, this improvement was lost in the 1999 to 2005 period when it fell to 14.23 kcals per day. This was probably due mainly to a combination of low levels of the state of households' real final consumption expenditure, low public spending on agriculture and low foods imports to augment low domestic food production. In the same vein, the unemployment rate remained high at an annual average of 25.73 percent, from 1980 to 1985. This upward trend persisted throughout the period under review. The rate increased from 30.53 percent per annum in the 1986 – 1993 period to 34.38 percent in 1994 to 1998 period, but fell, albeit only marginally, to an annual average of 34.17 between 1999 and 2005 (NBS, 2006).This paper attempts to evaluate the roles of both public expenditure and private investment, particularly foreign direct investment (FDI), in the growth of the agricultural sector over the period under evaluation, 1970 to 2008. The rest of the paper is organized into six sections. In the next section is a review of the related studies. Sections three and four contain theoretical model, and empirical methodology, respectively. Estimation and analysis of results is in the fifth section, while the last section concludes.

2. Review of related Studies

The extant literature on market failure clearly dismisses the classical economists' argument that government intervention is necessarily distortionary. This literature recognizes the existence of monopolies and other forms of market imperfection, the lack of incentives for the provision of public goods, the failure of markets to adequately reflect social costs and equitably distribute income (Agarwala, 1983). Another group of scholars have argued that government efforts to redress these failures often lead to greater distortions than created by market failures (Stiglitz, 1988; Krueger, 1990). Their propositions hang on the rent-seeking and crowding-out which inevitably arises from government intervention in the economy. Trade and public choice theorists such as Krueger (1974, 1990), Buchanan (1980), Tullock (1980), Bhagwati (1982) and Srinivasan (1985) claim that apart from the deadweight loss of output arising from government policies, public activity (such as government monopolies and trade policies) gives rise to additional inefficiencies by encouraging rent-seeking by various interest groups. In addition, government involvement may lead to unhealthy competition with private sector over resources and investment opportunities.

Contrary to this view, Easterly (1989) and Barro (1990; 1991a; 1991b) employing theoretical models inspired by new growth theory, found that initial increments to public capital accelerated growth. Nevertheless, at some point additional increments to public capital reduced growth by creating distortions in the private sector. On this note Kelly (1997) argues in favour of complementarity of public and private actions. This will be particularly important in the case of developing countries where such factors as severe income disparity, asset concentration, the disparate nature of production in the agricultural and industrial sectors, land tenure system and fragmented financial markets are key features of the economy. In such economies, public investment program is likely to be the central determinant of successful private sector activity and economic growth. On the role of foreign direct investment (FDI), the burgeoning literature on FDI flows indicates the significance of FDI to economic development. Studies have shown that FDI can have both positive and negative economic effects on host countries. The positive effects stem from transfer of technology and other intangible assets, leading to productivity gains and improvements in the efficiency of resource allocation (Lipsey, 2001, Bhagwati, 1985).

Negative effects, on the other hand, can arise from the market power of large foreign firms and the attendant ability to generate very high profits or from interference in domestic politics by foreign multinational corporations (MNCs). Other negative effects of FDI muted in the literature include: (i) worsening of environmental pollution (ii) exacerbation of inter-regional economic disparities as a result of uneven distribution of FDI (and the emerging enclave economies) and (iii) transfer pricing (Sun, 1998). Empirical research, however, suggests that while the evidence of negative effects from FDI is inconclusive, the evidence of its positive effects is overwhelming (Graham, 1995).

Scholars have also shown that whether FDI causes growth depends on the recipient economy's trade policy and the general domestic environment. Specifically, domestic policy variables are shown to affect both FDI and economic growth in the long-run. Thus, identification of specific economic, social and political variables that determine FDI flows have been an important area of research that has generated many findings with varying conclusions. In general, Akinkugbe (2003) has identified some factors which can serve as baseline factors. These include; market size, rate of return on investment, availability of infrastructure, international competitiveness, and liberalization. On the basis of this theoretical rationale, this article estimated the relationship between public expenditure, foreign direct investment and agricultural output growth in Nigeria over the period 1970-2008.

3. Theoretical Models

The focus of our study is on the impact of public expenditure and private investment on the growth of the agricultural output. Our analysis utilizes the aggregate production framework proposed by Fosu and Magnus (2006) and Constant and Yaoxing (2010). The aggregate production framework is an extension of the conventional production function, which emphasizes labour and capital as the main factors of production, to examine the impacts of other variables such as public expenditure, terms of trade, exchange rate, foreign direct investment and so on. The general form of the function linking aggregate output in period t with inputs or factors of production is specified thus:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \quad (1)$$

Where Y_t denotes the aggregate production of the agricultural sector at time t, and A_t, K_t, and L_t also denote the total factor productivity (TFP), the capital stock and the stock of labour at time t, respectively. According to Lipsey (2001) and Barro (1990, 1991), the impact of government expenditure on output growth possibly operates through the total factor productivity (A). Hence, we assume that TFP is a function of foreign direct investment (FDI), public spending, and other exogenous factors (C). In respect of the agricultural sector productivity, we add environmental and natural factors such as weather condition. Thus, we modelled the total factor productivity as:

$$A_t = f(FDI_t, PUB_t, WEA_t, C) \quad (2)$$

Equation (2) can be expressed explicitly as:

$$A_t = FDI_t^{\phi} PUB_t^{\lambda} WEA_t^{\eta} C_t \quad (3)$$

Combining equations (3) and (1), we obtain:

$$Y_t = C_t K_t^{\alpha} L_t^{\beta} FDI_t^{\phi} PUB_t^{\lambda} WEA_t^{\eta} \quad (4)$$

Linearizing equation (4) and adding the error term, we obtain an explicit estimable econometric model as follows:

$$\ln Y_t = c + \alpha \ln K_t + \beta \ln L_t + \phi \ln FDI_t + \lambda \ln PUB_t + \eta \ln WEA_t + \varepsilon_t \quad (5)$$

Where all coefficients and variables are as defined earlier, c is a constant parameter and **ε** is the white noise error term.

4. *Methodology and Data*

This study applies the Autoregressive Distributed lag (ARDL) modelling otherwise known as the bounds tests approach popularised by Pesaran et al (1999, 2001). The ARDL modeling approach is advantageous since it can be used irrespective of whether the variables are I(0) or I(1) (Pesaran, Shin and Smith, 2001).Unlike the Johansen approach, the ARDL approach to cointegration does not require pre-testing of the variables for unit roots. However, the variables must be tested for unit root to ensure that they are not integrated of higher order than 1, such as I(2). According to Fosu and Magnus (2006), the ARDL approach starts with conducting the bounds test for the null hypothesis of no cointegration. We construct a vector autoregression of order p, VAR(p), for the following function:

$$z_t = \sigma + \sum_{i=1}^{p} \mu_i z_{t-1} + \varepsilon_t \quad (6)$$

Where y is a vector of both the dependent variable agricultural output and the exogenous variables, β_i is a matrix of VAR parameters to be estimated and ε is the white noise error term. According to Pesaran et al (2001), the dependent variable must be I(1), while the exogenous variables can be either I(1) or I(0). Based on equation (6), we can develop a vector error correction model (VECM) as:

$$\Delta z_t = \sigma + ct + \psi z_{t-1} + \sum_{i=1}^{p} \Gamma_i \Delta z_{t-i} + \varepsilon_t \qquad (7)$$

Where matrices $\psi = I_{k+1} + \sum_{i=1}^{p} \Omega_i$ and $\Gamma_i = -\sum_{j=i+1}^{p} \Psi_j$, i=1,2----,p-1, contain the long run multipliers and short run dynamic coefficients of the VECM. Equation (7) is important in testing for the number of cointegration between dependent variable and the exogenous variables according to Johansen (1988). Assuming the dependent is denoted as y and exogenous variables as x, equation (7) becomes:

$$\Delta y_t = \sigma + ct + \partial_{yy} y_{t-1} + \partial_{yx} x_{t-1} + \sum_{i=1}^{p-1} \nu_i \Delta y_{t-i} + \sum_{i=0}^{p-1} \vartheta_i \Delta x_{t-i} + \varepsilon_{yt} \qquad (8)$$

On the basis of equation (8), the VECM of interest in this study can be specified as:

$$\Delta agric_t = \theta_0 + \theta_1 agric_{t-1} + \theta_2 aff_{t-1} + \theta_3 pub_{t-1} + \theta_4 lab_{t-1} + \theta_5 gdi_{t-1} + \theta_6 wea + \sum_{i=1}^{p} \kappa_i \Delta agric_{t-i} +$$
$$\sum_{j=1}^{q} \chi_j \Delta aff_{t-j} + \sum_{l=1}^{q} \gamma_l \Delta pub_{t-l} + \sum_{m=1}^{q} \varpi_m \Delta lab_{t-m} + \sum_{n=1}^{q} \rho_n \Delta gdi_{t-n} + \sum_{s=1}^{q} \tau_s \Delta wea_{t-s} + \zeta DUM + \varepsilon_t \qquad (9)$$

Where θ_i are the long run multipliers and ε is the error term. All the variables are in logarithm. On the other hand, the short-run adjustments are captured by the coefficients on the differenced (Δ) variables. The null and alternative hypotheses tested are:

H_0: $\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0$ (no long-run relationship)
H_1: $\theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq 0$ (long-run relationship exist)

Bounds testing was done by estimating equation (9) and then testing the null hypothesis (H_0) of no long run relationship against the alternative hypothesis (H_1) that there is a long-run relationship. The calculated F-statistics are then compared against the critical values given in Pesaran et al (2001). The lower bound critical values assume that the explanatory variables are integrated of order zero (i.e I(0)), while the upper critical values assume that the explanatory variables are integrated of order one (i.e. I(1)). If the calculated F-statistic is lower than the lower bound, the null is accepted. If it is greater than the lower bound but less than the upper bound a decision cannot be made as to the long run relationship in which case we say it is inconclusive. Lastly, if it is greater than the upper bound, the null hypothesis of no cointegration is rejected in favour of existence of a long-run relationship between the variables.

Once the existence of a long run cointegration relationship has been established, the conditional ARDL (p_1,q_1, q_2, q_3 q_4 q_5) long run model for *agric* can be estimated as:

$$agric_t = c_0 + \sum_{i=1}^{p} \delta_1 agric_{t-i} + \sum_{i=1}^{q1} \delta_2 aff_{t-i} + \sum_{i=1}^{q2} \delta_3 pub_{t-i} + \sum_{i=1}^{q3} \delta_4 lab_{t-i} + \sum_{i=1}^{q4} \delta_5 gdi_{t-i} +$$
$$\sum_{i=1}^{q5} \delta_6 wea_{t-i} + \zeta DUM + \varepsilon_t \qquad (10)$$

Finally, we obtain the short run dynamic parameters by estimating an error correction model associated with the long run estimates. This is specified as follows:

$$\Delta agric_t = \mu + \sum_{i=1}^{p} \kappa_i \Delta agric_{t-i} + \sum_{j=1}^{q} \chi_j \Delta aff_{t-j} + \sum_{l=1}^{q} \gamma_l \Delta pub_{t-l} + \sum_{m=1}^{q} \varpi_m \Delta lab_{t-m}$$
$$+ \sum_{n=1}^{q} \rho_n \Delta gdi_{t-n} + \sum_{s=1}^{q} \tau_s \Delta wea_{t-s} + \pi ecm_{t-1} + \zeta DUM + \varepsilon_t \qquad (11)$$

where π is the speed of adjustment.

The data used in this study were obtained from the Central Bank of Nigeria Statistical Bulletin and Annual Report and Statements of Account for different years. All the variables are expressed in logarithm. *agric* is the log of agricultural output, *pub* is total public expenditure, *lab* is the labour force participation rate for the country obtained from the World Development Indicator (WDI), *gdi* is gross fixed capital formation used as proxied for capital, *aff* is the total foreign direct investment in agriculture, forestry and fishery, while *wea* is the annual average rainfall used as a proxy for weather condition. A dummy variable was included to capture the structural break owing to economic reforms and liberalization introduced in 1986.

5. Analysis of Results

Before proceeding to the ARDL bounds test, unit root tests for stationarity conducted for the variables indicated that all the variables were integrated of order one [I(1)], except weather condition (wea). From the results presented in Table 1, only *wea* was stationary at level. The stationarity was pertinent to avoid spurious results which might occur if the bounds test is conducted for I(2) variables. Thus the bounds test conducted are valid. Table 2 shows the results of the bounds test when the regressions are normalized on each of the variables of the model. When the regression is normalized on *agric*, the calculated F-statistics, 5.32, is higher than the upper bound critical value 4.79 at the 5% level. Also, the F-statistic calculated when the regression is normalized on *gdi* is equally higher than the upper bound critical value 6.13 at the 1% level. Thus, the null hypotheses of no cointegration are rejected in favour of the existence of long-run cointegration relationships amongst the variables when the regressions are normalized on both *agric* and *gdi* variables. Though, there may be no sufficient reason not to expect a bi-directional causality between investment and agricultural output.[1]

On the basis of the theoretical framework of this study, we adopted *agric* as the dependent variable.
Having established that there exists a long-run cointegration relationship between the dependent variable, *agric*, and the explanatory variables, namely, *gdi, aff, lab, pub*, and *wea*, we proceeded to estimate the parameters of equation 10, which describe the long-run relationship between *agric* and *gdi, aff, lab, pub*, and *wea* (Table 3). The estimated coefficients show the long-run response of agricultural output (*agric*) to the various regressors. From the results, capital investment proxied by gross fixed capital formation has a very high significant impact on agricultural production. A 1% increase in capital investment leads to approximately 0.69% increase in agricultural output all things being equal. Foreign direct investment also has a positive long-run impact on agricultural productivity. A percentage increase inflow of foreign direct investment in the agricultural sector leads to approximately 0.26% increase in the agricultural productivity in the long-run. The labour force has a positive impact on agricultural productivity. Contrary to the general speculation that labour productivity is low and even negative, the results show that a percentage increase in labour force would result in about 3.8% increase in agricultural production. This implies that the agricultural production is still in the region of increasing marginal productivity, maximum output has not yet been reached. Other variables were not statistical significant at 5% level. Hence, government spending, weather condition and economic reforms may not have long run impact on agricultural output, howbeit; they may have significant short run impact.

The results of the short-run dynamic coefficients associated with the long-run relationships are given in Table 4. The signs of the short-run dynamic impacts differ remarkably from the long-run counterparts. Public spending has positive and significant impact on agricultural production in the short run. A percentage increase in government spending leads to 0.26% increase in agricultural production all things being equal. Similarly, economic reforms and liberalization policy dummy has a positive impact on agricultural production in the short-run. Contrary to expectation, increase rainfall adversely impact agricultural production. A quick conclusion from this exercise is that policies that have positive short run impact may not have significant impact in the long run, and vice-versa. Hence, a good policy mix is required for both short run efficacy and relevance in the long run.

The equilibrium correction coefficient (ecm) estimated -0.42 is highly significant and has the correct sign. It implies a fairly high speed of adjustment to equilibrium after a shock. Approximately 42% of disequilibria from the previous year's shock converge back to the long run equilibrium in the current year. The diagnostic tests for the short-run dynamic relationship were within satisfactory range despite the relatively low value of the coefficient of determination, R-squared adjusted = 39%, which measures the goodness of fit. The model passes the tests against serial correlation, functional misspecification, heteroscedasticity, and non-normal errors at 5%.The cumulative sum and cumulative sum of squares plots from recursive estimation of the model also indicate stability in the coefficients over the sample period (Figure 1).

[1] Using the Wald test, the causality tests can be conducted by restricting the coefficient with its lags (agric or gdi) to zero.

6. Policy Implications and Conclusion

The purpose of this study was to test the relationship between government expenditure, private investment (foreign direct investment and gross domestic investment) and agricultural sector growth in Nigeria during 1970 to 2008. Hence, it includes some years of substantial government agricultural and foreign trade policies. From the estimated relationship, it is obvious that government policy has a key role to play in agricultural sector growth and development. The main constraints to agricultural growth can only be confronted by the government. By eliminating the short run constraints via public investment, government would enhance the marginal productivity of private capital in the sector. Thus a complementary role is advocated for private and public investment.

Some of the identified challenges of the agricultural sector include: low productivity, lack of hybrid varieties and other modern inputs; subsistence level farming, no irrigation and mechanized system, poor infrastructure and access roads. To eliminate these constraints and achieve high rate of agricultural sector growth in Nigeria, the following recommendations would be useful:

- Provision of accessible credit facilities to the farmers. Obstacles and other bottlenecks to Nigerian Agricultural Cooperative and Rural Development Bank facilities should be removed. The farmers can be enlightened to form cooperatives for the purpose of loans as this will be easier for the banks to handle. Apart from this, the government should encourage the insurance sub-sector to develop insurance products to insure the farmers against lost due to climatic changes, this will reduce their systemic risk and encourage other commercial banks to grant credit to the farmers. Foreign investment in this respect will also be a welcome development.
- Government should create market access for the farmers through provision of the necessary infrastructure like farm road, storage facilities, processing equipment like milling machine, etc. Foreign investment in this area could be in the form of processing equipment and storage facilities.
- Farm equipments and improved varieties should be made available to the farmers through the various government agencies like Agricultural Development Projects (ADPs).
- Farmers should also be provided with sufficient training on the use of the modern farming inputs such as herbicides, pesticides, and insecticides.
- Amendment of the land use law to make more land available for large scale agriculture.
- There should be proper dissemination of reliable climate information and weather statistics to farmers.
- Sustainable land management through soil survey and mapping should be encouraged. This will help farmers to know the right crop for specific farm sites.

References

Agarwala, R. (1983), 'Price Distortions and Growth in Developing Countries', *World Bank Staff Working Papers,* No. 575, Management and Development Series, No.2, Washington, D.C.

Altar, M. and Samuel, J. (2004), 'Fiscal Policy, Public Capital and Economic Growth', 58th International Atlantic Economic Conference, Chicago, USA. October 7-10.

Barro, R. J. (1991a), 'A Cross-Country Study of Growth, Saving and Government', in B. D. Bernheim and J. B. Shoven eds., *National Saving and Economic Performance,* Chicago, IL: University of Chicago Press.

Barro, R. J. (1990), 'Government Spending In A Simple Model of Endogenous Growth', *Journal of Political Economy,* Vol.XCVIII, pp.S103-25.

Barro, R. J. (1991b), 'Economic Growth in a Cross-Section of Countries', *The Quarterly Journal of Economics,* May, pp.407-43.

Bhagwati, J. N. (1982), 'Directly Unproductive Profit-Seeking DUP Activities', *Journal of Political Economy,* Vol. 90, N0.5, pp.988-1002.

Bhagwati, J. N. (1985), Investing; Esmee Fairbain Lecture, Lancester University. Reprinted in V. N. Balasubramanyam (Ed.) J. N. Bhagwati, Writings on International Economics (1997, Delhi, Oxford Unversity Press).

Buchanan, J. (1980), 'Rent Seeking and Profit Seeking', in J. Buchanan, R. Tollison and G. Tullock, *Toward a Theory of Rent Seeking Society,* College Station, TX: Texas A & M University Press.

Constant, N. B. Z. S. and Yaoxing, Y. (2010), 'An Econometric Estimation of Import Demand Function for Cote D'Ivoire', International Journal Of Business and Management, Vol. 5, No. 2, pp.77-84.

Easterly, W. (1989), 'Policy Distortions, Size of Government and Growth', Cambridge: *National Bureau of Economic Research*, Working Paper No.3214.

Fan, S. Zhang, L. and Zhang, X. 2000. *Growth and poverty in rural China: the role of public investment.* Environment and Technology Division Discussion paper 66. Washington DC. IFPRI.

Fosu, O. E. and Magnus, F. J. (2006), Bounds Testing approach to cointegration: An Examination of Foreign Direct investment, trade and Growth relationships. *American Journal of Applied Sciences*, vol.3, N0. 11, pp. 2079-2085.

Galal, A. 2003. *Social expenditure and the poor in Egypt*. The Egyptian Center for Economic Studies Working Paper no. 89 (November).

Kelly, T. (1997), 'Public Expenditures and Growth", *The Journal of Development Studies*, vol.34, No.1, pp.60-84.

Krueger, A. O. (1974), 'The Political Economy of the Rent-Seeking Society', *American Economic Review*, Vol. 64, No.3, pp291-303.

Krueger, A. O. (1990), 'Government Failures in Development', Journal of Economic Perspectives, Vol.4, No.3, pp.9-23.

Lipsey, R. E. (2001). 'Foreign Direct Investment and the Operations of Multinational Firms: Concepts, History and Data'. *NBER working Paper* No. 8665, Cambridge, MA.

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001), Bound Testing Approaches to the Analysis of Level Relationship. *Journal of Applied Economics*, Vol. 16, pp.289-326.

Srinivasan, T. N. (1985), 'Neoclassical Political Economy, the State, and Economic Development', *Asian Development Review*, Vol.3, No.2, pp.38-58.

Stiglitz, J. (1988), 'Economic Organization, Information and Development', in H. Chenery and T. N. Srinivasan (eds.), *Handbook of Development Economics*, Vol.1, New York: Elsevier Science Publishers, pp.93-160.

Tullock, G. (1980), 'The Welfare Costs of Tariffs, Monopoly and Theft', in J. Buchanan and G. Tullock, *Toward A Theory of the Rent Seeking Society*, College Station, TX: Texas A&M University Press.

Van de Walle, D. 1996. *Infrastructure and poverty in Vietnam*. LSMS Study Working Paper no. 121. Washington, D.C.: The World Bank,

Table 1: ADF unit root tests on variables

Log Levels			**First Differences**			**Decision**
Variable	AIC lag	ADF stat	Variable	AIC lag	ADF stat	
Aff	3	-1.5610	⌂aff	1	-5.3315***	I(1)
Pub	2	-2.2882	⌂pub	1	-4.1038***	I(1)
Gdi	2	-1.4899	⌂gdi	1	-4.0196***	I(1)
Agric	3	-1.8668	⌂agric	1	-6.2075***	I(1)
Wea	3	-3.5542**	⌂wea	1	-6.2075***	I(1)
Lab	2	0.0400	⌂lab	1	-6.7791***	I(1)

Notes: All variables are in logs. Critical values at 5% and 1% significance levels are -3.5386 and -4.2324, respectively. ***(**) denotes 1% (5%) significance level.

Table 2: Results from ARDL Bounds Test

Dependent Variable	AIC lag	F- statistic	Probability	**Decision**
Agric	3	5.32	0.06	Cointegration
Aff	3	1.24	0.43	No Cointegration
Gdi	3	7.15	0.03	Cointegration
Lab	3	3.32	0.13	No Cointegration
Pub	3	2.97	0.15	No cointegration
Wea	3	2.00	0.26	No cointegration

Notes: Asymptotic critical value bounds are obtained from Pesaran et al (2001), table CI(iii). Lower bound = 4.25 (3.16) and upper bound = 6.13 (4.79) at 1% (5%) significance level.

Table 3: Estimates of the long run coefficients of the ARDL model

Dependent Variable: ⌂agric

Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	-15.10	-3.51***	0.00
Aff	0.26	2.61***	0.01
Pub	-0.15	-0.68	0.50
Gdi	0.69	4.40***	0.00
Wea	-0.11	-0.15	0.88
Lab	3.79	2.86***	0.01
DUM	0.16	0.88	0.39

***(**) denotes 1% (5%) significance level

Table 4: Short run Dynamic Error Correction Model

Dependent Variable: ⌂agric			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	-0.04	-0.61	0.54
⌂aff	-0.06	-0.79	0.43
⌂pub	0.27	2.77	0.01
⌂gdi	0.02	0.23	0.81
⌂ecm(-1)	-0.42	-3.98	0.00
⌂agric(-1)	0.24	1.98	0.06
⌂wea(-2)	-0.79	-3.54	0.00
⌂lab	1.21	1.49	0.14
DUM	0.15	2.65	0.01
R-squared	0.52		
Adjusted R-squared	0.39		
Durbin-Watson stat	1.93		
F-statistic	3.74		
Prob(F-statistic)	0.01		

Diagnostic Tests: Breusch-Godfrey LM Serial Correlation F = 0.06 (0.93), Normality (Jarque Bera) = 1.72 (0.38), Heteroscedasticity F = 0.51 (0.91) Functional Form (RESET) = 2.04 (0.13), ARCH (2) =0.68 (0.51).

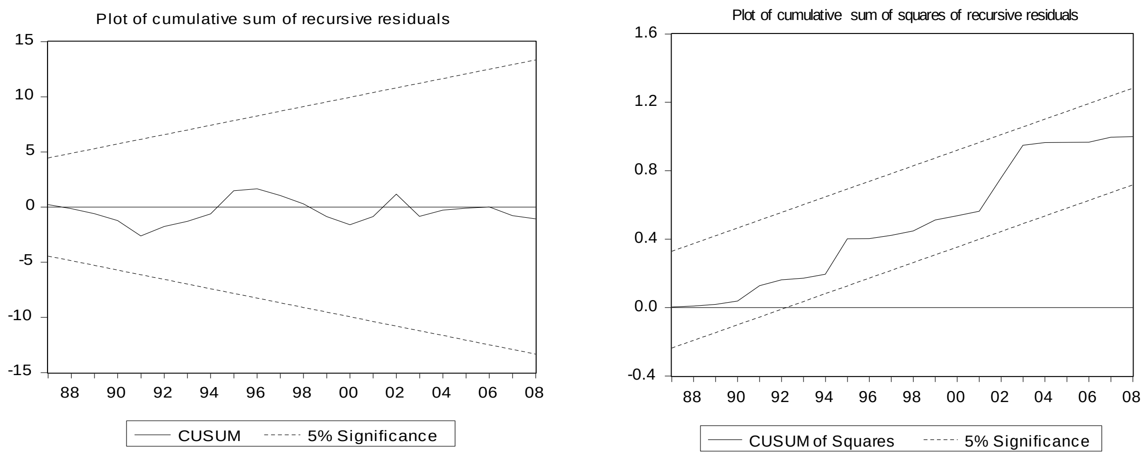

Figure 1: Plot of CUSUM and CUSUMQ for coefficients stability for ECM model