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The Effect of Aid Flows on Nigeria's Agricultural Growth

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Abstract: The study investigates the effect of foreign aid on agricultural growth during 1970-2007. Employing a simultaneous equation system with agricultural growth, savings, aid and agricultural imports as endogenous variables, it finds that foreign aid has a significant positive effect on agricultural growth in Nigeria. However, the results do not support the view that foreign aid flows more to countries with low savings. Moreover, the view that aid flows generate increased imports by recipient countries is not supported by the findings of this study.

Key words: Aids, agricultural, growth, effect, Nigeria

INTRODUCTION

A dominant feature of the relationship between industrial and developing countries since the 1960s is foreign aid. Foreign aid has been a major source of external finance for the majority of countries in Africa and Asia since they gained independence.

From a developmental viewpoint, aid was originally conceived in the post-World War II environment in the context of a particular "development paradigm", where poor countries were perceived to be caught in a low-income equilibrium trap, unable to generate adequate savings to promote capital formation and rapid growth. At the low level of development, which is characteristic of most developing countries, low domestic savings rates had to be supplemented by foreign savings-in form of aid. The general belief was that capital from developed countries was needed to provide the spurt of growth that would make economic take-off possible. This was the core of the two-gap model of Chenery and Strout (1966). Although the predominant nature of aid has changed considerably, from project finance in the 1960s to adjustment support in the 1980s, its economic importance to recipients has remained considerable.

The critical role of aid to Sub-Saharan Africa (SSA) was put succinctly by UNCTAD, thus: "an increase in official flows of $20 billion could trigger a virtuous circle of rising national savings and investment and faster growth in SSA". "Doubling the current amount of aid to give a big push to African economies today could end their dependence within a decade". This resulted in the commitment by donors and aid users at the World Summit for Social Development (WSSD) in Copenhagen to reduce the world population living in extreme absolute poverty by 2015. The World Bank showed that Africa's economy must grow at an annual rate of 7% if the preceding is to be achieved. A productive investment of an amount equivalent to 30% of Africa's GDP each year is required. Given the region's low saving rates and limited immediate prospects of attracting private capital, this would imply about 20% increase in Africa's aid budget, assuming the additional resources were fully invested. Developed countries were to make efforts to raise their level of aid flows to 0.7% of GNP as soon as possible.

Recent discussions on the effectiveness of foreign aid have focused on Africa because it has received the greatest amount of aid on a per capita basis of any world region (Holmgren and Torgney, 1998). Nigeria has received less foreign aid on a per capita basis than other developing countries in Sub-Saharan Africa (SSA). While average net real Official Development Assistance (ODA) for African countries in 1990-96 was $52 per person, Nigeria received just $2.20 per person. As a percentage of Gross National Product (GNP), net ODA for SSA averaged 14%, while for Nigeria, it was less than 1% (Herbst *et al*., 2001). Nevertheless, aid is still significant to Nigeria, in particular the agricultural sector, a major recipient of aid. Out of a total net ODA of $350 million in 1990, about 25% of this went to the agricultural sector.

Despite the Copenhagen commitment, aid flows to Nigeria and indeed other developing countries have been on the decline. In the view of Lensink *et al*. (2001), this is simply a manifestation of the frequently proclaimed aid

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fatigue. Significant also is the mounting opposition among farm organisations in industrialised countries to the use of foreign aid funds to promote agricultural development in developing countries. These groups argue that development assistance leads to productivity increases and greater agricultural output in developing countries, thereby reducing industrialised countries' farm exports (Houck, 1986; Pardey *et al*., 1991). It was partly in response to the various farm lobbies' pressures that the US congress adopted an amendment that prohibits the use of development assistance funds for support of research or of measures to increase production of commodities currently exported by the United States (Thompson, 1992).

These issues raise a number of challenging questions for Nigeria's agriculture. First, is there any correspondence between aid flows to Nigeria and agricultural growth? What is the magnitude of this relationship? What is the likely impact of the declining trend in aid flows on Nigeria's agriculture? It has been argued that agricultural assistance to developing countries is beneficial not only to developing countries' producers and consumers but also to industrialised countries' farmers. The argument is that foreign aid to agriculture leads to increases in agricultural productivity, resulting in increases in income in developing countries. These rising incomes then lead to increased demand for imports, including agricultural products from industrialised countries. Does increased agricultural output result in increased imports in Nigeria? If the answer is in the affirmative, what then are the likely implications of the declining trend in aid flows on the country's imports?

The study investigates the effect of foreign aids on the aggregate agricultural growth and imports of Nigeria. In addition, it tests whether or not aid flows to Nigeria engenders an increase in the agricultural imports of the country. It is motivated by the absence of unanimity on the impact of aid flows on growth as findings from empirical studies in this area have been conflicting. Evidence on the relationship between aid and agricultural growth in particular contributes to the understanding of how aid impacts on a predominantly agricultural economy such as Nigeria's. Such studies are presently scanty. Most studies examining the impact of aid flows on economic growth do not give consideration to the endogeneity of aids and growth, thereby providing biased and misleading results. For the most part, studies on the impact of aid flows employ panel data. This does not provide a basis for the application of the findings of such studies to specific country.

REVIEW OF RELATED LITERATURE

The literature on aid flow dates back to over three generations and has during this period undergone some metamorphosis. Accordingly, it is relevant that this development in the literature is traced. There exists three generations of empirical cross-country work on aid effectiveness (Hansen *et al*., 2000). These generations are distinguished by their analytical underpinnings. A review of these generations of empirical work on aid effectiveness proceeds as follow.

First generation studies: The first generation of studies on the effectiveness of aid flows was characterized by the perception of foreign aid only as an exogenous net investment to the capital stock of the recipient country. The theoretical workhorse underlying this empirical work was the Harrod-Domar growth model. This model embodies a bottleneck approach: capital shortage is the only constraint on growth. The rate of growth could be raised by increasing the rate of investment (Lewis, 1955; Rostow, 1960; Rosenstein-Rodan, 1961). However, the exogenety of the aid variable has been challended. Robustness was another issue (Papanek, 1973).

Second generation studies: These focus on estimating the link between aid and growth. Some estimated the link via investment and some directly in reduced form equations. The view is that investment is the major direct determinant of growth. The implicit assumption is that if a positive relationship can be established between aid and investment, it is justified to conclude that aid makes a positive contribution to growth. Moreover, the specifications of the aid-investment relationship in the regressions include a behavioural equation linking investment to aid.

However, the conclusions from these studies are conflicting. On the one hand, some studies show a positive impact of aid on growth (Papanek, 1973; Dowling and Hiemenz, 1982; Singh, 1985; Voivodas, 1973 and Mosley *et al*., 1987), while others such as Mosley *et al*. 1987 and Stoneman (1975) conclude that aid does not seem to spur growth.

Third generation studies: These break novel ground by working with panel data and by endogenizing of aid and other variables (Boone, 1996; Burnside *et al*., 1997).

The conclusion from the literature review is that the focus has been predominantly aggregative rather than specific. It is uncommon in the literature, for instance, to

focus on the link between aid flows and agricultural growth. It can be argued, for instance, that while aid may be ineffective on the aggregate, this may not be the case for some specific sectors. Moreover, attention has been on the use of single equation techniques without giving due consideration to the endogeneity of the aid variable.

THEORETICAL FRAMEWORK AND MODEL SPECIFICATION

Theoretical framework: Most growth models specified for developing countries trace their roots back to the neoclassical framework of Solow (1956). This framework takes as its starting point an aggregate production function relating output to factor inputs and a variable usually referred to as total factor productivity:

$$y = Af(K, L, Z) \tag{1}$$

where, y is the level of output, K is capital, L is the labour force and Z is a vector including other factors affecting growth. The variable, A measures factor productivity, which is generally assumed to grow at a (constant) exogenous rate. The signs of all partial derivatives of y with respect to the arguments in f(.) as well as A are assumed to be positive.

Expressing Eq. (1) in growth terms, the following is obtained:

$$\frac{dy}{y} = [A.\frac{\partial y}{\partial K}.\frac{k}{y}]\frac{\partial K}{K} + [A.\frac{\partial y}{\partial L}.\frac{L}{y}]\frac{dL}{L} + [A.\frac{\partial y}{\partial Z}.\frac{Z}{y}]\frac{dZ}{Z} + \frac{dA}{A} \tag{2}$$

For estimation purposes, this can be written as:

$$\frac{\Delta y}{y_{-1}} = \alpha_0 + \alpha_1\frac{\Delta k}{k_{-1}} + \alpha_2\frac{\Delta L}{L_{-1}} + \alpha_3\frac{\Delta Z}{Z_{-1}} \tag{3}$$

K consists of savings, aid and private capital flows.

Equation (3) is, of course, very familiar and has been used in one form or the other in most studies of the growth process in developing countries. In the empirical analysis of growth in developing countries, an even simpler form of Eq. (3) is sometimes used, in which $\alpha_0 = \alpha_2 = \alpha_3 = 0$. The result is the familiar "incremental capital output" relationship (ICOR) associated with, among others (Chenery and Strout, 1966). The more general specification of Eq. (3) is now the most popular, with various other determinants of growth introduced in addition to capital, labour and productivity growth. For example, proponents of "export-led growth", such as Balassa (1978), Tyler (1981) and Ram (1985) argue that growth of exports belongs in the specification on grounds that in a number of developing countries, the growth of exports has led to the development of infrastructure, transport and communications, etc., which in turn facilitated the production of other goods and services. Furthermore, investment opportunities are opened up in areas far removed from the actual export activity as the need to supply inputs rises and productive facilities are created utilising inputs and outputs that were non-existent prior to the expansion of exports.

Since, many developing countries are also heavily dependent on imports of capital and intermediate goods such as inputs into production, the variable Z could be imported inputs, as suggested by Bardhan and Lewis (1979). Recent work on development theory emphasises the role of education and research and development (R and D) and thus human capital has also been included in the specification (Otani and Villanueva, 1989). In summary, while there have been a number of variants of Eq. (3) proposed in the literature, the essential nature of the model remains the same.

Model specification: A simultaneous equation technique is employed in examining the subject matter. Two main arguments are in favour of this choice of technique. First, savings both influence growth and are influenced by growth. Second, single equation models tend to exaggerate the positive effect of aid on growth and aid's negative effect on the savings rate. Accordingly, a simultaneous equation model is estimated in which both savings and growth are specified as endogenous variables. Furthermore, it has been argued that countries with declining savings and growth rates are the ones that attract larger amounts of foreign assistance. The amount of foreign aid a country receives is at least partially determined by and endogenous to its economic performance (Michalopoulos and Sukhatme, 1989). Therefore, aid is treated as simultaneously determined with growth and savings. In addition, aid creates trade ties between donors and recipients (Ruttan, 1989), increasing import capacity and creating foreign markets. This suggests that agricultural imports and aid are jointly dependent.

To test the effect of aid on growth, a simultaneous equation model in which growth in agricultural output, savings, imports and aid are treated as endogenous variables is estimated. This is a modification and adaptation of the model employed by Kherallah *et al.* (1994) in the sense that it incorporates only relevant variables because of the shortness of the period of

observation and the need to have sufficient degrees of freedom. For instance, variables such as terms of trade were removed from the agricultural growth equation. In addition, international reserve was not included as an explanatory variable in the import equation. The model is presented as follows:

$$GA = \alpha_0 + \alpha_1 ODA + \alpha_2 S + \alpha_3 AEXP + \alpha_4 INFL + \upsilon \quad (4)$$
$$(\alpha_1, \alpha_2, \alpha_3 > 0;\ \alpha_4 < 0)$$

$$S = \beta_0 + \beta_1 ODA + \beta_2 GA + \beta_3 AEXP + \beta_4 PCY + \varpi \quad (5)$$
$$(\beta_1 <> 0;\ \beta_2, \beta_3\ \beta_4 > 0)$$

$$ODA = \lambda_0 + \lambda_1 GA + \lambda_2 S + \lambda_3 AM + \lambda_4 PCY + \rho \quad (6)$$
$$(\lambda_1 < 0;\ \lambda_2 < 0;\ \lambda_3 > 0;\ \lambda_4 < 0)$$

$$AM = \sigma_0 + \sigma_1 ODA + \sigma_2 GA + \sigma_3 PCY + \theta \quad (7)$$
$$(\sigma_1,\ \sigma_2,\ \sigma_3 > 0)$$

Where, ν, ϖ, ρ and θ = Error terms

Endogenous variables:

GA = Growth rate of agricultural output with agricultural output defined as agriculture gross domestic product.
ODA = Official development assistance as % of GDP.
S = Gross domestic savings as % of GDP.
AM = Agricultural imports as % of GDP.

Exogenous variables:

AEXP = Net agricultural exports (agricultural (exports-imports)) as % of GDP.
INFL = Inflation rate.
PCY = Per capita income.

A brief comment on the above model is in order.

The agricultural growth equation presented in Eq. (4) is specified as a function of net agricultural exports. The inclusion of the export variable in the growth equation is sequel to the findings from a number of empirical studies showing a positive association between exports and growth (Massel *et al*., 1972). It is argued that exports bring additional incomes that can be used for investment. The production of exportables also make use of unemployed resources, increases specialisation to capture the benefits of comparative advantage, expand production possibilities through access to knowledge and technology, offers greater economies of scale due to an enlargement of the market size and enables the country to import goods which are more productive than domestic resources (Rana and Dowling, 1988). In addition, the growth equation is specified to include ODA and gross domestic savings as important determinants as both variables are considered as important forms of investment (Papanek, 1973). The inclusion of the inflation rate is to account for differences in economic policy and performance.

The inclusion of the savings equation in Eq. (5) derives from the theoretical proposition of the joint determination of growth by savings and savings by growth. The specification is consistent with Mikesell and Zinser (1973). The level of savings is positively related to per capita income (Laudau, 1971). Growth of agricultural and non-agricultural output implies positive income growth for Nigeria. Therefore, increases in output growth rate raises transitory income with positive influence on the savings rate (Gupta and Islam, 1983). The effect of ODA on savings is still highly controversial. The dominant argument for the inclusion of exports in the savings equation is that the changing structure of the economy as reflected by the ratio of exports to GDP itself induces changes in savings and in the savings rate because of the higher propensity to save in the export sector (Maizels, 1968; Johnson and Chiu, 1968; Leff, 1968; Lee, 1971). The change in income distribution implied by the change in economic structure has an impact on the savings rate independent of economic growth. This is the famous Maizels (1968) hypothesis. A subsidiary argument put forward by Maizels (1968) has been that government savings rely heavily on trade taxes. Another argument that growth in exports can induce increases in marginal savings propensities in other sectors (Mikesell and Zinser, 1973). In developing countries such as Nigeria, exports are an important source of income and serve to generate tax revenues and relieve foreign exchange bottlenecks (Papanek, 1973; Rana and Dowling, 1988).

The aid equation is presented in Eq. (6). Foreign aid is determined by agricultural and non-agricultural growth in order to measure their influence on the amount of aids received. The level of per capita income in the aid equation is significant because it has an important bearing on the size of aid disbursements, as poorer countries appear to receive larger amounts of aid. Agricultural and other imports are other determinants of aids introduced to test whether foreign aid is used to fill a trade gap created by larger import volumes especially for agricultural products.

The agricultural imports equation in Eq. (7) is modelled as a function of foreign assistance in order to the hypothesis that aid creates commercial ties between donors and recipient countries. If this is true, then, increases in aid flows to Nigeria should generate

increased demand for agricultural and non-agricultural imports from the donor countries. If otherwise, then increased aid flows does not induce increased imports from the donor countries. The implication of such a finding may be that Nigeria may not have a strong justification to demand for increased aid flows from the donor countries. The inflation rate is another important variable. High inflation rates decrease the value of the domestic currency relative to foreign currencies, thereby lowering the purchasing power of the inflating country.

Estimation technique and sources of data

Estimation technique: The two stage least square technique developed independently by Theil (1953) and Basmann (1957) was adopted in estimating the model due to the over-identified nature of the equations in the model. Applying the ordinary least square technique to over-identified equations will yield estimates that will be inconsistent in view of the likely correlation between the explanatory variables and the error terms.

Sources of data: The data covering 1970-2005 were culled from both national and international sources. Specifically, data on official development assistance, savings, inflation and per capita income were sourced from the World Bank World Development Indicators on CD, 2006 while agricultural gross domestic product, agricultural imports and exports were sourced from the Annual Report and Statement of Accounts of the Central Bank of Nigeria.

RESULTS AND DISCUSSION

The results obtained from the estimation of the model are reported in Table 1. The appropriateness of the estimates is depicted by the adjusted R-squared of over 0.5 for each of the equations in the model. Moreover, the absence of autocorrelation is demonstrated by the Durbin Watson statistic that lies between 1.8 and 2.17.

Commenting specifically on the coefficients, the results of the growth equation confirm that agricultural growth in Nigeria is stimulated by foreign aid. The positive effect of net exports on agricultural growth is also shown by the results, though the effect is not statistically significant. The policy performance variable (INFL) has an adverse effect on agricultural growth, confirming that inflation has a dampening effect on agricultural growth. Agricultural growth is aided by savings. However, the impact is not statistically significant.

The savings equation results conjecture that domestic savings are not crowded out by foreign assistance. This does not appear to support the argument of many critics that foreign aid crowds out or discourages domestic savings. However, the growth of agricultural output and per capita income were found to adversely impact savings. This may no be entirely surprising and may be explaining the point that incomes in Nigeria are so low that additional increases in incomes do not necessarily generate any increase in savings. This could be suggestive of a high level of poverty in the country.

A positive association is found between agricultural output growth and foreign aid. The negative relationship found between aid and per capita income supports the view that poorer countries with limited savings receive more foreign aid. It is also important to note the strong negative association between agricultural imports and development assistance. This result does not provide any evidence that aid helps to fill foreign exchange needs associated with large food and agricultural import volumes in Nigeria.

On the factors influencing agricultural imports, aid is revealed to be negative and significantly related to imports. This shows that in the Nigerian context, foreign aid is not tied, so that higher levels of foreign aid do not automatically generate larger import flows. It indicates that foreign assistance flows to Nigeria is independent of the country's imports from the donor countries. However, this supports the argument by farm interest groups, that foreign aid to developing countries decreases potential industrialized countries' export markets. This suggests that foreign aid may not be contributing to expanding agricultural markets for industrialized countries' exporters. Increases in per capita income significantly lead to increases in agricultural imports.

Table 1: Results of two-stage least squares estimation of agricultural growth, foreign aid and agricultural imports

	Agricultural growth		Agricultural imports		Savings		Foreign aid	
Explanatory variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
C	-0.220	-0.320	0.378	2.177	1.314	2.093	0.320	2.176
ODA	0.030	3.890	-0.621	-3.871	0.321	2.216		
S	0.433	1.322					0.132	0.583
GA			0.439	2.210	-0.214	-1.054	0.211	2.180
AEXP	0.127	1.997			0.653	1.320		
INFL	-0.645	-5.320						
PCY			0.422	3.430	-0.221	-1.721	0.322	2.213
AIMP							-0.316	-4.213
Adj. R-sq	0.721		0.669		0.585		0.739	
DW	2.10		1.812		2.178		1.943	

CONCLUSION

The study was preoccupied with investigating the effect of foreign aid on agricultural growth during 1970-2005. A simultaneous equation system was specified with agricultural growth, savings, aid and agricultural imports as endogenous variables. The results show that official development assistance significantly impacts agricultural growth in a positive manner, lending credence to the hypothesis that agricultural growth is promoted by development assistance. However, the view that aid flows more to countries with low savings is not supported by the findings of this study. Moreover, the view that aid flows generate increased imports by recipient countries is not in consonance with the results of this study.

The negative association between aid and per capita income may be evidence that countries that are the poorest receive more foreign aid. Finally, agricultural imports and aid were negatively signed, implying that aid does not necessarily fill a trade gap and may not promote trade ties between donor and Nigeria.

IMPLICATIONS

The negative association found between official development assistance and agricultural imports could further strengthen the demand by farm interest groups in the advanced countries for further cut in foreign assistance to developing countries, Nigeria inclusive. Such pressure could indeed lead to a further physical cut in aid flows to developing countries. This could have negative repercussions for the agricultural growth of Nigeria.

The negative association found between per capita income and agricultural growth on the one hand and between per capita income and savings on the other is a major challenge for Nigeria. This can have serious adverse implications for the growth of the agricultural sector in particular and the Nigerian economy at large. Nigeria needs to shore up its domestic savings or resort to foreign private capital inflows. However, the ability of the economy to engineer agricultural growth through domestic savings appears very slim given the pervasiveness of abject poverty in the country.

POLICY RECOMMENDATIONS

Precautionary measures should be taken to cushion the agricultural sector and the economy at large against the likely reduction in foreign assistance to Nigeria's agriculture.

Nigeria should take more drastic measures to boost non-traditional agricultural exports with a view to increasing its foreign exchange earnings that could be used to fund agricultural growth. The need to raise the incomes of Nigeria through increased output and productivity cannot be overemphasized. In the final analysis, this is the best option.

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