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**Testing the Impact of Foreign Aid and Aid Uncertainty on Private Investment
in West Africa**

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Abstract

Drawing on the vast literature on aid allocation this paper examines whether foreign aid has any impact on private investment in West Africa when other determinants of private investment are taken into account. Following from this, the paper investigates whether multilateral aid and bilateral aid affect private investment differently. In a related analysis the paper examines the impact of aid uncertainty on private investment. The results show that multilateral aid affects private investment positively, but not bilateral aid, and uncertainty, measured as the coefficient of variation has a negative impact on private investment and therefore reduces the impact of aid on domestic private investment.

JEL Classification: E22; F35; C33

Key words: Foreign Aid; Investment; Fixed Effects

1. Introduction

Investment is a very critical factor in the growth and development process, but remains low in many developing countries. In sub-Saharan Africa (SSA) the low level of investment is due to domestic resource constraint. The constraint, as argued in the literature, is as a result of low savings and inadequate foreign exchange from exports². The effect therefore, has been an increasing dependence of many SSA countries on external finance (foreign aid), received on concessional terms, from multilateral and bilateral institutions. For example, between 1975 and 2005, the total amount of Official Development Assistance (ODA)³ received by West Africa had reached USD111,860 million in nominal terms – out of this, USD70,685 million was from bilateral donors while the remaining USD41,175 million came from multilateral institutions⁴. Another reason concessional financing is very popular is because the level of private sources of finance such as foreign direct investment (FDI) and remittances (see Table A2 in the appendix) are also low. More so, a standard argument in the literature about FDI is that private investors frequently wait for growth to take off before moving into emerging market economies.

The SSA countries may be homogenous in many respects, but there are still some divergences in the level of economic and political development. This study, therefore, singles out West Africa for three important reasons; first, it is the most populous and integrated of the regional economic groupings in Africa – however, it lags behind the southern region in terms of prosperity, measured in per capita GDP. Second, though private capital inflows, for example, FDI and remittances are generally low in Africa, the share to West Africa remains very small when compared with the other regions. Third, West African countries constitute a very distinct bloc of recipients of bilateral aid. To a great extent, working with an integrated sample can help to ease the problem of aggregation bias, and also mitigate any effects of pooling (heterogeneity) on the results.

Given the above discussions, the primary aim of this paper is to examine whether foreign aid has any impact on private investment in West Africa when other determinants of private investment are taken into account. Following from this, the paper investigates whether multilateral aid and bilateral aid affect private investment differently. In a related analysis we test whether aid uncertainty has any effect on private investment. This paper considers private investment because it is more directly related to economic growth in developing countries than public investment; see for example, (Lensink and Morrissey, 2006; Khan and Reinhart, 1990).

The findings show that multilateral aid affects private investment positively, but not bilateral aid. We find also that aid uncertainty, measured as the coefficient of variation has a negative impact on private investment and therefore weakens the value of foreign aid on domestic private investment.

The remaining part of the paper is organized as follows: Section 2 discusses the empirical literature. Section 3 presents the theoretical background. Section 4 sets out the determinants of private investment in West Africa and the private investment model. Section 5 presents the empirical specifications, data, and estimation techniques. In section 6 we present results of the

² The NEPAD estimates that Africa will need to fill an annual resource gap of \$64 billion (equivalent of 12 percent of GDP) if it is to experience sustainable growth. In 2005, the group of eight industrialised countries (G8) met in Gleneagles and called for aid to Africa to be raised to \$25 billion a year by 2010. This declaration was reiterated in the 2007 G8 summit in Heiligendamm, Germany. To further underscore the need and urgency of filling the resource gap in Africa, the G8 Summit in Japan in 2008 committed to fulfil the Gleneagles Declaration, as reaffirmed in Heiligendamm². Whether this was achieved is an issue for another study.

³ ODA consists of concessional flows to developing countries from bilateral and multilateral institutions, which contain a grant element of at least 25 percent (frequently calculated at a rate of discount of 10 percent).

⁴ This figure does not include ODA to Liberia.

impact of total, multilateral and bilateral aid on private investment. Section 7 discusses aid uncertainty, and finally section 8 concludes.

2. A Brief Review of the Relevant Literature

Since George Marshall, then US Secretary of State, spoke in 1947 of what is known today as the Marshall Plan a long and inconclusive literature has emerged to explain the link between aid and investment on one hand, aid and growth on the other. There is also another strand that tends to concentrate of the factors that influence aid allocation. The present review will attempt to discuss the literature on both aid allocation and aid-investment nexus.

Earlier studies on aid allocation, represented by Maizels and Nissanke (1984); Cassen *et al.* (1994); Boone (1996); Burnside and Dollar (2000) argue that multilateral is intended to promote development, and tends to be allocated based on recipients' need, while bilateral aid is largely influenced by political considerations. In contrast, recent studies (for example, Berthelemy, 2006; Fleck and Killby, 2006a, 2006b) argue that some bilateral donors frequently allocate aid on the basis of need. Furthermore, Berthelemy (2006), find that French aid tends to be driven by self-interest variables while British aid is allocated based on both self-interest and need. Fleck and Killby (2006a, 2006b) also show that US bilateral aid allocation is often based on the need factor and on the composition of the US government. They find that development motives supersede other motives when the president and Congress are more liberal, while more weight is given to commercial and political interests when the Congress are more conservative. Similarly, they find that US interests tends to influence that allocation of World Bank aid. Thus, aggregating donors may likely produce some estimation bias – since it amounts to assuming that all donors are the same. Given the above, one can minimise this bias by classifying foreign aid along multilateral and bilateral lines.

More generally, the studies that have empirically investigated the foreign aid-total investment relationship in SSA and Africa include Levy (1988); Gyimah-Brempong (1990); Lensink and Morrissey (2000); Gomanee *et al.* (2002a, 2002b and 2005). For example, Hansen and Tarp (2001) and Gomanee *et al.*, (2005), find that investment is the most significant channel through which aid positively affects growth. This is based on the notion that aid is intended to finance investment as a basis for economic growth.

Apart from the studies mentioned above, there are also other studies on total aid and total investment for developing and low income countries, and include Levy (1987); Boone (1994); Hansen and Tarp (2001); Collier and Dollar (2004); and Hansen (2004)⁵. Surprisingly, none of these studies examine the impact of multilateral and bilateral aid on either total investment or private investment. Studies on the impact of total aid on private investment are those conducted by Hadjimichael *et al.* (1995); Dollar and Easterly (1999) among others. For example, Hadjimichael *et al.* (1995) applying the generalized least squares (GLS) technique on a panel of 41 Sub-Saharan African countries find that a one percentage point increase in foreign aid leads to a 0.4 percentage point increase in private investment.

⁵ Hansen (2004) studied a group of Highly Indebted Poor Countries (HIPCs) and non-HIPCs.

Table 1 Selected Cross-Country studies on the Impact of Foreign Aid on Investment.

Gross Domestic Investment and Foreign Aid			
<i>Study and Country Coverage</i>	<i>Estimation Technique</i>	<i>Period Covered</i>	<i>Findings</i>
Levy (1987), Developing Countries	<i>OLS and Two Stage Least Squares (2SLS)</i>	1968 to 1980	Aid has a strong positive impact on gross domestic investment. A one percentage point increase in aid increases investment by more than one percentage point.
Levy (1988), Sub-Saharan Africa (SSA)	<i>OLS</i>	1968 to 1982	Overall results suggest that aid stimulates investment in sub-Saharan Africa.
Gyimah-Brempong (1990), SSA	<i>2SLS</i>	1968 to 1987	Various aid types (grants, loans and food) have positive impact on investment in SSA. The impact of loans and grants are however greater.
Lensink and Morrissey (2000), Developing countries including Africa.	<i>Cross Section (average) OLS</i>	1970 to 1995	Aid has positive impact on investment at 10 per cent level of significance when uncertainty is not controlled for. The uncertainty coefficient is not significant but its inclusion increases the significance of the coefficient on aid the variable from 10 to 5 per cent.
Hansen and Tarp (2001), Cross-Country	<i>Fixed Effects (FE) and GMM</i>	1974 to 1993	Aid has significant positive impact on investment. For the fixed effects, the response of investment to aid is between 2/3 and 3/4 at the median, while for GMM its response to aid at the median exceeds unity.
Gomanee <i>et al.</i> (2002a, 2002b, 2005), SSA	<i>Pooled OLS</i>	1970 to 1997	On average, a one percentage point increase in total aid leads to 0.53 percentage point increase in total investment.
Hansen (2004), Heavily Indebted Poor Countries (HIPCs) and non-HIPCs.	<i>OLS and 2SLS</i>	1974 to 1993	Aid has a positive and significant impact on total investment.
Collier and Dollar (2004), Developing Countries	<i>Pooled OLS</i>	1974 to 1997	Strong evidence of positive impact of aid on investment.

Table 2 Selected Cross-Country studies on the Impact of Foreign Aid on Private Investment.

Private Investment and Foreign Aid			
<i>Study and Country Coverage</i>	<i>Estimation Technique</i>	<i>Period Covered</i>	<i>Findings</i>
Mosley (1987), Less Developed Countries	<i>OLS.</i>	1960 to 1980	Aid crowded out private investment by 0.37 percent between 1960 and 1970, while between 1970 and 1980 the crowding out disappeared, showing evidence of weak positive impact.
Mahdavi (1990), Developing Countries	<i>OLS</i>	1981 to 1985	Weak positive relationship between aid and private investment.
Hadjimichael <i>et al.</i> (1995), SSA	<i>GLS – Random Effects</i>	1986 to 1993	Aid has positive and significant effect for a group of ‘sustained adjusters’ and significantly negative for countries with negative per capita GDP growth.
Dollar and Easterly (1999), Africa	<i>OLS and 2SLS</i>	1970 to 1993	A one percentage increase in aid crowds in 1.9 percentage points increase of private investment in a good policy environment, while in a poor policy environment aid crowds out 1.2 percentage points of private investment.

On another front, Dollar and Easterly (1999) test whether foreign aid crowds in private investment in a good policy environment for a panel of 49 countries including African and non-African countries. The estimations were carried out using both the ordinary least squares (OLS) and two-stage least squares (2SLS) methods. In addition, Dollar and Easterly interacted aid with a policy index term⁶. The conclusion of the study is that aid crowds in private investment in good policy environments, while in poor policy environments it crowds out private investment. Clearly, these studies do not distinguish between multilateral and bilateral aid.

Though the study by Hadjimichael *et al.* is close in spirit to the present study, the latter differs in the following important ways: distinction between multilateral and bilateral aid; use of different estimation technique; an organized sample of countries in SSA (West Africa); and addition of a measure of aid uncertainty in the private investment equation.

On the impact of aid uncertainty on investment, Lensink and Morrissey (2000) examine the impact of aggregate aid uncertainty on total investment for a sample of 75 developing countries, including a sub-sample of 36 African countries over the period 1970 to 1995. For the African countries sub-sample, Lensink and Morrissey, find that controlling for aid uncertainty increases the significance of the coefficient on aid in the investment regression. However, the coefficient on uncertainty is not significant.

However, there are some contentious issues with the study by Lensink and Morrissey. First, the cross-sectional data on which the results are based do not take the time-series dimension of the data into account. It is well known that a good cross-country study is one that utilizes both the time and cross-sectional dimensions of the data (Temple, 1999). Second, the study also assumes equality in coefficients of multilateral and bilateral aid, which may not be the case (see, for example, Ram, 2003). In fact, estimating the impact of aid on investment using this approach does not reveal the inherent differences related to the nature, motives, purpose and objectives of

⁶The policy index was constructed by regressing private investment on all explanatory variables, excluding aid and then evaluating then policy variables using the estimated coefficients. The included policy variables are: openness as measured by Sachs and Warner (1995), inflation, the budget surplus, and a measure of institutional quality (rule of law, absence of corruption) from Knack and Keefer (1995).

aid giving, which to a great extent determine the effectiveness of aid. We therefore enrich the literature by systematically addressing these estimation issues. The next section provides a brief theoretical overview of aid and investment.

3. Theoretical Background

Though it is widely believed that aid affects private investment indirectly through public investment, there is also a direct channel between foreign aid and private investment. Two direct channels between foreign aid and private investment can be identified. First, foreign aid can have positive impact on private investment if funds provided by donors are used to increase private sector credit – this can be channelled through local institutions and Development Finance Corporations (DFCs). For example, in the 1970s a large amount of aid which was disbursed in the form of programme grants or import support was mainly targeted at the private sector via agricultural credit agencies and development banks (Mosley *et al.*, 1987). This way, the foreign exchange can lead to increased capacity utilization as well as support the provision of additional spare parts required for industrial production, which are activities aimed at increasing the level of private investment.

Second, donors can promote private investment by supplying funds aimed at improving private sector environment. In particular, Official Development Assistance (ODA) can improve the environment for private sector activity when donors support projects that contribute towards lower costs of investment; reduce risks; improve competition; and develop capacity. Certainly, when the private investment climate improves, the level of private investment would also increase; therefore aid will have a positive impact on private investment. However, earlier economists, for example (Friedman, 1958; Bauer, 1966, 1970; Griffin and Enos, 1970) have challenged the view that foreign aid and private investment are positively related. These authors are of the view that aid can hurt private sector activity. Here, the contention is that aid encourages public sector consumption in a way that hinders the emergence of an indigenous entrepreneurial class. This may then imply a negative impact on private investment.

While the aid-private investment nexus has been examined in the empirical literature by Mosley (1987); Mahdavi (1990); Hadjimichael *et al.* (1995); and Dollar and Easterly (1999), there is nothing in the literature about the impact on private investment of multilateral and bilateral aid. In this instance, classifying foreign aid along multilateral and bilateral lines will certainly shed additional light on the aid-investment relationship. At least, drawing on the vast literature on aid allocation one can test whether these aid components have different effects on private investment.

More so, given that West African countries receive large amount of French and British bilateral aid, there is a case for a distinction between multilateral and bilateral aid. In what follows, any additional aggregation bias that remains after splitting aid into multilateral and bilateral components will be recognised as one of the limitations of the present study.

Now, our explanation for why multilateral aid is likely to have a positive effect is that it has investment and wider development objectives as its central objective. Again, multilateral aid is often handled with greater expertise which enhances its effectiveness⁷. Additionally, multilateral aid is devoid of distortionary political pressures and interferences. Even as the literature on aid allocation remains contentious, recent conclusions point to multilateral sources as the viable mechanism for improving aid effectiveness (see for example, CfA, 2005). As for bilateral aid, it is often given to countries that have strong political and commercial ties with donors, and may

⁷ The UNCTAD (2006) also argues that multilateral aid has the advantage of being effective since it is handled with greater expertise.

not totally promote domestic investment, economic growth and development⁸. A further argument for why bilateral aid is not likely to promote growth as Stiglitz (2002) recognises, arises from severe agency problem, such as free-riding, adverse selection and moral hazard.

3.1 Investment Theory.

There are three main investment theories that have been advanced in the literature, namely the Keynesian theory, the accelerator model and the neoclassical model⁹. Although these theories are quite revealing, independently however, they have not been very successful for developing countries' analyses. This has led to the emergence of hybrid models, which attempt to take the structural composition of developing economies into account.

In *The General Theory*, Keynes (1936) recognised the existence of private investment decisions in the economy, which as he argued depends on the marginal efficiency of capital that reflects the opportunity cost of capital. The insight emerging from this is that a fall in interest rate will decrease the cost of investment relative to the return so that planned capital investment projects may become profitable on the margin. Keynes theory emphasises the role of interest rates in investment decisions, but ignores other major factors that determine investment behaviour.

In the *accelerator theory*, the level of investment depends on the level of output (Harrod, 1936, 1948; Hansen, 1949; Hicks, 1949). This is the same as saying that the rate of investment depends on growth rate. According to Hicks (p.199), 'when the rate of increase in output has begun to decline, as it must as full employment is approached, the induced investment in inventories and in fixed plant and equipment will fall'. The accelerator model is popular not only because of its simplicity, but also its 'realism', given that capital is always required to produce output. The model assumes that the demand for machinery and factories is derived from the demand for goods. Thus, if the demand for the goods that capital equipment produces is to increase and the existing capacity cannot meet this expected increase in demand, then, a new investment in plant and machinery will be required to increase production.

Jorgenson (1967) and Hall and Jorgenson (1971) formulated the *neoclassical model* to address the restrictive assumptions of the accelerator theory. Here, the desired capital stock depends on the user cost of capital and the level of output. The user cost of capital is in turn said to depend on the price of capital goods, the real interest rate, and the depreciation rate. The difference between the current and desired capital stock is thought to be a result of lags in decision making and delivery, which then gives rise to an investment equation. Therefore, increases in user cost of capital will lead to lower rate of investment. The assumptions of this model are: perfect competition and exogenously determined output; static expectations about future prices, output and interest rates. However, some of these assumptions may be too restrictive, especially, the assumption of static expectations regarding economic agents.

4. Determinants of Private Investment in West Africa

From the discussions above, it is apparent that no particular theory takes all the important factors that influence the behaviour of private investment in developing countries into account. In this case, we will derive a basic investment model that reflects the behaviour of investment in a

⁸ Some studies on aid allocation e.g. Wheeler (1984), Cassen *et al.* (1994), and Collier and Dollar (2002) argue that bilateral aid is driven by political, ideological and strategic interests of the donors. However, we note that some bilateral donors e.g. the Scandinavian countries sometimes give small amounts of aid for other objectives, other than political.

⁹ There are other recent theories of investment, for example the one that focuses on investment uncertainty.

developing country context, building on the accelerator and the neoclassical theories. Now, consider the relation between the desired capital stock¹⁰ (K^*), the level of output (Y) and the user cost of capital (C):

$$K_t^* = \phi Y_t C_t^{-\sigma} \quad (1)$$

where ϕ and σ represent the distribution parameter and the constant elasticity of substitution between capital and labour, respectively. An investment function can be derived by splitting gross investment into net and replacement components. In the present analysis, we are interested in the net component and hence we ignore the replacement component. The net component (I_t^n) is equal to the change (Δ) in the desired capital stock, which will increase the capital stock by the amount of investment:

$$I_t^n = \Delta K_t^* \quad (2)$$

Therefore (2) can be written as,

$$I_t = \Delta K_t^* \quad (3)$$

Substituting equation (1) into (3) we get our investment model:

$$I_t = \Delta \phi (Y_t C_t^{-\sigma}) \quad (4)$$

Assuming a unitary elasticity of substitution between capital and labour, by adding the error term, we get our basic model¹¹:

$$I_t = \phi_1 \Delta Y_t - \phi_2 \Delta C_t + \mu_t \quad (5)$$

Now, we can augment equation (5) with other determinants of private investment discussed below:

4.1 Financial Deepening

McKinnon (1973) and Shaw (1973) argue that financial markets in developing countries are repressed and over-regulated. As such, the supply of to private investors can influence investment behaviour independent of the user cost of capital. Therefore, financial deepening, by increasing the supply of credit can stimulate investment. To capture this effect, we include *money supply as a percentage of GDP (M2)*. Another proxy which has been used in the empirical literature is the *share of bank credit to the private sector in GDP*.

4.2 Macroeconomic Stability

There are different measures of macroeconomic instability that have been used in the empirical literature. In the present study, macroeconomic instability is proxied by the *inflation rate*. Inflation tends to cause uncertainty in the business environment, especially when the rate of fluctuation is frequent. In this environment, it is difficult for firms to predict costs and revenues,

¹⁰ This is also the steady-state capital stock.

¹¹ See Athukorala and Sen (2002) for a different version of this model.

and therefore would be discouraged from making investments decision that will lead to increased investment. Again, the presence of high inflation may signal the inability of government authorities to efficiently manage the economy, thereby reducing the level, and rate of private sector investment. Therefore, high rates of inflation would be expected to lower private investment.

4.3 Debt Service

The amount of foreign exchange and domestic resources committed to debt service obligations can be a disincentive to invest. This is especially true if investors fear that the returns from their investment will be subjected to high marginal tax by government. Similarly, investors will be worried that high debt accumulation will increase debt service obligation, which can lead to a deflation of the economy. The overall effect, therefore, will be a reduction or delay in investment. To capture these effects, we include *debt service as a percentage of GDP (debt service ratio)*. This variable has also been included by previous authors, for example, Hadjimichael *et al.* (1995). This variable is important because most of the countries in the sample were severely indebted over the sample period.

4.4 Trade Openness

Openness to trade can also affect private investment, but how best to measure this variable is a problematic issue. Investment may respond to openness through a size of the market effect. According to Adam Smith, market size imposes a constraint on the division of labour, so that more open countries are better able to exploit increasing returns to scale (Wacziarg, 2001). Two variables have emerged as top proxies for openness to trade. First is the ratio of exports plus imports to GDP.

The second measure is *the growth rate of exports*, which is a proxy for the degree of the anti-export bias of the policy regime affecting the manufacturing sector. More specifically, greater growth of exports can lead to a higher quality and rate of private investment, which comes via learning by doing and knowledge spillovers. Along this line, Thirlwall (2003) argues that growth of exports generates foreign exchange needed to import intermediate goods. These derivable benefits, lead us to the inclusion of export growth in the private investment equation.

5. Empirical Specifications, Data and Estimation Techniques.

In this analysis, three issues appear to be important. First, we want to know if foreign aid has any discernable impact on private investment. Second, and following from the first, we want to know if bilateral aid has the same impact as multilateral aid on private investment, controlling for other determinants. Third, we want to know the impact of aid uncertainty on domestic private investment.

To address these issues, we use data from 1975 to 2004 (summary statistics and definition of variables are presented in the appendix). However, for most of the series, there are missing values for individual countries. For instance, for Liberia, there are a lot of missing data for most series, and consequently we dropped it from our sample. Thus, we have an unbalanced panel of 14 countries observed over 28 years. We take 4 year period averages for all the variables from 1975-78 to 1999-04, thus giving 7 periods. Where there are missing data in-between the average period we divide by the number of years for which the data are available, instead of by 4. The gain from taking averages is that it helps to smooth out erratic shocks in the data. It also conforms to the usual practice in empirical studies involving panel data, where four and five year

averages have been used (see, for example, Dollar and Easterly, 1999 and Burnside and Dollar, 2000).

To proceed with the empirical estimations, we first re-write the basic model (5), giving equation:

$$pigdp_{it} = \alpha + \beta_1 gdp_{it} + \beta_2 rint_{it} + \mu_{it} \quad (6)$$

where $igdp$ is private investment as a percentage of GDP, gdp is growth in real GDP (accelerator variable), $rint$ is real interest rate, μ is error term, and subscripts i and t represent country and time, respectively. Second, we write a complete private investment equation in accordance with the discussions above, giving the estimating equation:

$$pigdp_{it} = \alpha + \beta_1 gdp_{it} + \beta_2 rint_{it} + \beta_3 m2gdp_{it} + \beta_4 inf_{it} + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_t toda_{it} + \mu_{it} \quad (7)$$

where $m2gdp$ is broad money supply as a percentage of GDP, inf is rate of inflation, $dstx$ is debt service as a percentage of total exports, xg is export growth, $toda$ is total aid as a percentage of GDP and other variables are as previously defined. The expected signs of these variables have been discussed in the theoretical section.

Next, we distinguish between multilateral and bilateral aid by rewriting equation (7) in an unrestricted form:

$$pigdp_{it} = \alpha + \beta_1 gdp_{it} + \beta_2 rint_{it} + \beta_3 m2gdp_{it} + \beta_4 inf_{it} + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_m moda_{it} + \delta_b boda_{it} + \mu_{it} \quad (8)$$

where $moda$ is multilateral aid as a percentage of GDP and $boda$ is bilateral aid as a percentage of GDP. Other variables are as earlier defined.

To take account of unobserved country effects, and to also insulate our estimates from any sample heterogeneity issue, we apply the traditional panel data estimation technique. In this case, the Wooldridge (2002) unobserved effects model becomes the natural estimation technique. Now consider the model for T time periods:

$$y_{it} = x_{it}\beta + c_i + \mu_{it}, \quad t = 1, \dots, T \quad (9)$$

where y_{it} is the dependent variable, x_{it} is a vector of observed independent variables for country i at time t , c_i is unobserved country specific effects and μ is the error term. This model can be estimated using the random effects (RE) estimator or the fixed effects (FE) estimator. The choice of the estimation method depends, in part, on the assumption made about the unobserved country specific effects and on what the researcher seeks to achieve. If we assume that the unobserved effect, c_i , is not correlated with x_{it} , RE would be the appropriate estimator. On the other hand, if the unobserved effect is correlated with the observed time-varying variables, FE would be the appropriate estimator.

Apart from the assumption on the unobserved heterogeneity, FE will be the proper specification if the focus is on specific cross-sectional units (countries), which is the case in this study. What this implies is that all inferences will be restricted to the observed individual countries (Baltagi, 2008; Wooldridge, 2002). In contrast, inferences drawn from using RE will apply to the population from which the countries are drawn.

Another issue is that, if the x_{it} vector contains any important observed time invariant variables, proceeding with the FE estimator becomes problematic. The reason for this is that the time invariant variables are wiped out through transformation – *within means transformation*. Put differently, since the time-invariant variables are spanned by individual dummies, any attempt to estimate the model will fail because of the presence of perfect multicollinearity.

Since the countries in our sample are not randomly selected, we will advance with the fixed effects method. Following Baltagi (2008), we conduct the F test of fixed effects to determine if there is presence of country specific effects or not. This implies performing a joint significance test on the individual effects, i.e. $H_0 : c_1 = c_2 = \dots = c_{N-1} = 0$. The rejection of the null hypothesis will strengthen the case for using the FE estimator.

In practice, the idea of estimating β is to transform (9) so that the unobserved effect, c_i is eliminated. This approach is the fixed effects transformation, often referred to as the within transformation, and is obtained by first averaging equation (9) over $t = 1, \dots, T$ to get the cross-section equation:

$$\bar{y}_i = \bar{x}_i \beta + c_i + \bar{\mu}_i \quad (10)$$

where $\bar{y}_i = T^{-1} \sum_{t=1}^T y_{it}$, $\bar{x}_i = T^{-1} \sum_{t=1}^T x_{it}$, $\bar{\mu}_i = T^{-1} \sum_{t=1}^T \mu_{it}$

Then, subtracting equation (10) from equation (9) for each t gives the within transformed equation:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i) \beta + \mu_{it} - \bar{\mu}_i \quad (11)$$

Alternatively, equation (11) can be rewritten as:

$$\ddot{y}_{it} = \ddot{x}_{it} \beta + \ddot{\mu}_{it}, \quad t = 1, 2, \dots, T ; \quad i = 1, 2, \dots, N \quad (12)$$

where $\ddot{y}_{it} \equiv y_{it} - \bar{y}_i$, $\ddot{x}_{it} \equiv x_{it} - \bar{x}_i$, $\ddot{\mu}_{it} \equiv \mu_{it} - \bar{\mu}_i$. This transformation removes the country specific effect c_i . In this form, the FE estimator is the pooled OLS estimator of (12).

Finally, to avoid any possible influence of serial correlation features in the private investment series, which could affect our inferences, the regressions are performed using robust standard errors.

6. Impact of Total, Multilateral and Bilateral Aid on Private Investment

The objective of this section is to estimate the parameters in equations (7) and (8) by eliminating the heterogeneity term, using the within effects transformation. To avoid endogeneity problem, we use the lagged values of aid and real GDP growth. This specification is also plausible in the sense that aid can affect private investment with a lag (over four to five years). It is sensible to argue that aid received to today would not have an instantaneous effect on economic variables such as investment and growth.

Two points stand out from Table 3. First, the F -test of fixed effects suggests a strong presence of fixed effects in all the specifications. Second, the coefficient on total aid is significant, but once

we split aid into multilateral and bilateral components we find a result that tends to support our intuitive reasoning. Multilateral aid is significant, while that of bilateral aid remains negative and insignificant (our preferred model).

Other variables, such as the accelerator, inflation, debt service, and export growth are significant, and have the right signs. Jointly, the explanatory variables explain around 74 per cent of the changes in domestic private investment. Other studies report similar results [e.g. Hansen, (2004) for total investment and Hadjimichael *et al.* (1995) for private investment]. Once account is taken of the effects of other variables, money supply has no independent effect on private investment. However, except for the wrong sign the coefficient on the real interest rate is significant. This could explain the nature of financial markets in many developing countries which are still very repressed.

In sum, our findings suggest that multilateral aid may have an impact on private investment different from that of bilateral aid. Therefore an investment equation such as (7) can give misleading results as far as the impact of aid on private investment is concerned. This result lends support to the recent campaign on channelling more aid through multilateral sources (CfA, 2005).

Table 3: Impact of Aid on Private Investment: Fixed Effects

Dependent variable: Share of private investment in GDP (<i>pidp</i>)		
	1	2
<i>gdpg(lagged)</i>	0.57*** (0.10)	0.55*** (0.10)
<i>rint</i>	0.08** (0.03)	0.09** (0.04)
<i>m2gdp</i>	-0.03 (0.07)	-0.01 (0.07)
<i>inf</i>	-0.05** (0.02)	-0.04** (0.02)
<i>dstx</i>	-0.11*** (0.03)	-0.11*** (0.03)
<i>xg</i>	0.08*** (0.02)	0.08*** (0.02)
<i>toda(lagged)</i>	0.17** (0.07)	
<i>moda(lagged)</i>		0.27** (0.12)
<i>boda(lagged)</i>		-0.07 (0.10)
<i>R-squared</i>	0.74	0.73
<i>F-test of FE</i>	10.28 [0.0000]	9.06 [0.0000]
<i>Observations</i>	51	51

Note: Robust Standard errors are in parentheses (). Numbers in brackets [] indicate p – values. * indicates that a coefficient is significant at 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

Robustness Analysis

To examine the robustness of our results, we re-estimate the equations by dropping real interest rate and money supply variables. This is the so-called general-to-specific approach which gives a parsimonious specification. The result of this exercise is located in Table 4. The results are similar to those in Table 3 only that the goodness of fit reduced to around 64 percent.

Table 4: Impact of Aid on Private Investment: Fixed Effects
(Parsimonious Model - using only significant and rightly signed variables)

Dependent variable: Share of private investment in GDP (<i>pigdp</i>)		
	1	2
<i>gdpg(lagged)</i>	0.44*** (0.10)	0.42*** (0.11)
<i>inf</i>	-0.04** (0.02)	-0.04* (0.02)
<i>dstx</i>	-0.07** (0.03)	-0.09*** (0.03)
<i>xg</i>	0.07*** (0.02)	0.06*** (0.02)
<i>toda(lagged)</i>	0.11* (0.06)	
<i>moda(lagged)</i>		0.25** (0.12)
<i>boda(lagged)</i>		-0.11 (0.10)
<i>R-squared</i>	0.61	0.64
<i>F-test of FE</i>	6.86 [0.0000]	6.47 [0.0000]
<i>Observations</i>	67	66

Note: Robust Standard errors are in parentheses (). Numbers in brackets [] indicate p – values. * indicates that a coefficient is significant at 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

7. Aid Uncertainty and Private Investment

Another strand in the empirical literature on aid that we examine is the effect of aid uncertainty on investment¹². In particular, uncertainty regarding the stability of aid inflows can discourage private investment (Hadjimichael *et al.*, 1995). As discussed earlier, the leading empirical study of this issue is Lensink and Morrissey (2000), which uses an OLS technique. However, we differ on three important fronts: First, we use a different estimation procedure - the fixed effects method, to estimate the extent to which aid uncertainty affects domestic private investment. This technique accounts for country specific effects. Second, we test for the impact of aid uncertainty using both aggregate aid and aid disaggregated into multilateral and bilateral components. Third, our measure of uncertainty is the coefficient of variation, computed for each sub-period. To an extent, these issues restrict us from comparing the results directly.

Multilateral donors tend to disburse their aid commitments as long as recipients follow any conditions attached to such aid. On the other hand bilateral donors do not always follow their

¹² In this study, volatility and uncertainty imply the same thing and are used interchangeably.

commitments if their political and commercial interests are not fully protected. As long as bilateral donors' geo-political concerns change, their financial support cannot be reliable (Cassen and associates, 1994; CfA, 2005). Theoretically, these points can provide arguments for why multilateral aid may be predictable and why bilateral aid may not.

Turning to the empirical effects of aid uncertainty, specification (1) in Table 5 shows that volatility of total ODA affects private investment. The uncertainty term (*covtoda*) is significant. Based on this evidence, we now assess the individual effects of multilateral and bilateral aid uncertainty on private investment. On one hand, specification 2 in Table 5 suggests that multilateral aid (*covmoda*) may not be uncertain. However, even if there is any uncertainty in multilateral aid, its size may not be sufficiently large enough to affect the impact of aid on domestic private investment.

On the other hand, specification 2 in Table 5 shows that bilateral aid uncertainty has a negative impact on private investment. This means that high volatility in bilateral flows is partly the reason why its impact on domestic private investment is negative and/or weak. These results are broadly in line with the explanations we have provided.

Table 5: Impact of Aid Uncertainty on Private Investment: Fixed Effects

Dependent variable: Share of private investment in GDP (<i>pigdp</i>)		
	1	2
<i>gdpg(lagged)</i>	0.46*** (0.10)	0.43*** (0.10)
<i>inf</i>	-0.06*** (0.02)	-0.04** (0.02)
<i>dstx</i>	-0.07** (0.03)	-0.09*** (0.03)
<i>xg</i>	0.06*** (0.02)	0.06*** (0.02)
<i>toda(lagged)</i>	0.12** (0.06)	
<i>moda(lagged)</i>		0.21* (0.12)
<i>boda(lagged)</i>		-0.09 (0.11)
<i>covtoda</i>	-3.97** (1.83)	
<i>covmoda</i>		0.40 (1.55)
<i>covboda</i>		-4.32** (2.02)
<i>R-squared</i>	0.64	0.68
<i>F-test of FE</i>	7.24 [0.0000]	6.61 [0.0000]
<i>Observations</i>	67	67

Note: Robust Standard errors are in parentheses (). Numbers in brackets [] indicate p – values. * indicates that a coefficient is significant at 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

8. Conclusion and Policy Implications

This paper has examined the impact of aid on domestic private investment in West Africa using both aggregate aid (total ODA) and disaggregated aid (multilateral and bilateral). The paper relied on the fixed effects estimation technique. Our findings suggest that there is evidence of country specific effects and that the disaggregated model may perform better than the aggregated one. There is evidence that multilateral aid affects private investment positively, but not bilateral aid. Aid uncertainty has a negative impact on domestic private investment and therefore reduces the value-effect of bilateral aid on domestic private investment. Furthermore, we establish from these results that high volatility in bilateral aid is the source of the uncertainty in total aid.

Again, we find some evidence that export growth variable is indeed very important in explaining the level of private investment in West Africa. Additionally, our findings show that total debt service explains the behaviour of private investment. The results indicate that high of external debt burden discourages private investment.

The evidence gathered from the empirical analyses carried out in this study has a number of implications, both for West African policymakers and aid donors in particular and, more generally, for development policy practitioners and experts.

Perhaps, the single most important finding, emerging from our investigation on private investment issues, is the significant impact of multilateral aid on private investment in West Africa. Furthermore, our findings that there exists a strong presence of fixed effects means that any regional aid policy at the West African level can yield effective results, especially when organised and pursued within a multilateral framework. This is particularly relevant to the donor community that is grappling with aid coordination.

Still at the donor level, the evidence that bilateral aid is highly volatile suggests that policymakers can reduce this uncertainty and volatility which results from political exigencies by channelling aid through coordinated efforts – multilateral agencies.

APPENDIX

Table A1: Summary Statistics for the Main Variables (1975-2004)

<i>Variable</i>	<i>Observation</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>
<i>pigdp</i>	89	9.08	3.87	1.30	18.58
<i>gdp</i>	94	2.82	2.64	-5.10	9.85
<i>m2gdp</i>	90	22.53	10.57	0.87	61.20
<i>inf</i>	92	14.67	17.90	-2.50	90.50
<i>dstx</i>	89	17.55	12.26	1.160	64.25
<i>rint</i>	72	3.49	12.48	-44.57	21.80
<i>toda</i>	94	14.81	12.25	0.06	58.72
<i>moda</i>	94	5.75	4.88	0.04	26.10
<i>boda</i>	94	8.92	7.72	0.03	36.55
<i>xg</i>	92	4.01	9.59	-40.78	32.80

Table A2: Foreign Aid and Foreign Direct Investment in West Africa (1975-2005)

	Foreign Aid % GDP			Foreign Direct Investment % GDP		
	1975-1984	1985-1994	1995-2005	1975-1984	1985-1994	1995-2005
WAEMU						
Benin	7.0	13.4	10.2	0.2	2.0	1.4
Burkina Faso	10.9	14.4	14.3	0.1	0.2	0.4
Cote d'Ivoire	2.0	6.7	5.1	0.8	0.3	2.3
Guinea	37.7	55.1	42.7	0.4	0.8	1.4
Bissau						
Mali	14.9	20.5	15.4	0.2	0.1	3.0
Niger	10.0	17.7	14.4	1.2	0.3	0.5
Senegal	9.1	12.9	9.9	0.6	0.3	1.3
Togo	10.3	13.6	6.3	2.6	1.1	2.6
Non-WAEMU						
Cape Verde	..	32.2	19.6	..	0.4	4.4
Gambia	19.3	34.0	12.6	0.7	2.0	7.9
Ghana	3.6	9.8	10.9	0.4	0.8	1.9
Guinea	..	12.3	8.1	-0.01	0.5	0.9
Nigeria	0.1	0.8	1.1	0.6	3.7	3.1
Sierra Leone	5.0	16.8	26.8	0.8	-2.3	2.1
SSA	2.9	5.7	4.9	0.5	0.6	2.4
LIC	1.9	1.4	1.0	0.6	1.0	2.6
East Asia	0.8	1.0	0.5	0.5	1.9	3.3

Source: World Development Indicators (2008) and own calculation. LIC stands for low income countries.

Table A3: Definition and Description of Data

<i>Variable</i>	<i>Definition</i>
<i>pigdp</i>	Private investment consists of outlays on additions to the fixed assets of the private sector net changes in the level of inventories, expressed as a percent of GDP.
<i>rint</i>	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.
<i>gdp</i>	Annual percentage growth rate of GDP at market prices based on constant local currency.
<i>m2gdp</i>	Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.
<i>inf</i>	Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed.
<i>dstx</i>	Debt service is the sum of principal repayments and interest actually paid in foreign currency, goods, or services on long-term debt, interest paid on short-term debt and repayments to the IMF.
<i>xg</i>	Annual growth rate of exports of goods and services based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. Exports of goods and services represent the value of all goods and other market services provided to the rest of the world.
<i>toda</i>	Official development assistance expressed as a percent of GDP.
<i>moda</i>	Total official development assistance from multilateral institutions expressed as a percent of GDP.
<i>boda</i>	Total official development assistance from multilateral institutions expressed as a percent of GDP.

Non-aid variables are from World Development Indicators, while aid data are from Organisation for Economic Cooperation and Development (OECD).

Table A4: West African Countries

West African Economic and Monetary Union (WAEMU)
Benin
Burkina Faso
Cote d'Ivoire
Guinea Bissau
Mali
Niger
Senegal
Togo

Non-West African Economic and Monetary Union (Non-WAEMU)
Cape Verde
Gambia
Ghana
Guinea
Liberia*
Nigeria
Sierra Leone

* The analysis excludes Liberia.

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