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FOREIGN AID, AID UNCERTAINTY AND PRIVATE INVESTMENT IN WEST AFRICA: AN UNOBSERVED COUNTRY EFFECTS MODEL

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This paper examines whether foreign aid has any impact on private investment in West Africa, taking other determinants of private investment 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 (aid volatility) 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 private investment.

Keywords: Foreign Aid, Private Investment, Fixed Effects
JEL classification: C33, F22, F35

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 primarily to domestic resource constraint. The constraint, as argued in the literature, is as a result of low savings and inadequate foreign exchange earnings from exports.[1] The effect, therefore, has been an increasing dependence of many SSA countries on external finance (foreign aid), received on concessional terms from

* All errors are those of the author.

[1] 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 Heiligendamn, 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 Heiligendamn. Whether this was achieved is an issue for another study.

multilateral and bilateral institutions. For example, between 1975 and 2005, the total amount of Official Development Assistance (ODA)[2] 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 institutions.[3] 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 A5 in the appendix) are 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.

This study focuses on West Africa for two 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. More so, it constitutes a very distinct bloc of bilateral aid recipients. Second, though private capital inflows, for example, FDI and remittances are generally low in Africa, the share to West Africa is very small when compared with that of other regions. On the empirical side, 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 insights, 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 the paper tests 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. In addition, we find that aid uncertainty measured as the standard deviation over the mean 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. Section 6 lays out the results of the impact of total, multilateral and bilateral aid on private investment. Section 7 discusses aid uncertainty, and finally section 8 concludes.

[2] 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).

[3] This figure does not include ODA to Liberia.

2. LITERATURE REVIEW

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

Earlier studies on aid allocation by Maizels and Nissanke (1984), Cassen *et al*. (1994), Boone (1996), and 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 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 the 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 examined the foreign aid-total investment relationship in SSA and Africa include Levy (1988), Gyimah-Brempong (1990), Lensink and Morrissey (2000), and 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 other studies on total aid and total investment conducted on developing and low income countries, including Levy (1987), Boone (1994), Hansen and Tarp (2001), Collier and Dollar (2004), and Hansen (2004).[4] 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 have been conducted by Hadjimichael *et al.* (1995), Dollar and Easterly (1999) among others: 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

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

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 term.[5] 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 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.

[5] The 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).

3. FOREIGN AID: THEORETICAL BACKGROUND

Though it is widely believed that aid affects private investment indirectly through public investment, there are two direct channels between foreign aid and private investment. 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 then implies 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 specification of the impact on private investment of multilateral and bilateral aid. As in Cashel-Cordo and Craig (1990), the sources of foreign aid and the conditions under which they are given, determine their effectiveness. 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. Hatemi-J and Irandoust (2005) examined the relationship between Swedish foreign aid and economic growth in developing countries.

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 remaining aggregation bias after splitting aid into multilateral and bilateral components will be recognised as one of the limitations of the present study. The main explanation 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 effectiveness.[6] 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 not totally promote domestic investment, economic growth and development.[7] 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.

4. THEORY AND DETERMINANTS OF PRIVATE INVESTMENT IN WEST AFRICA

There are three main investment theories that have been advanced in the literature, namely the Keynesian theory, the accelerator model and the neoclassical model.[8] Although these theories are quite revealing, independently, they have not been very successful for analysis of developing countries. This has led to the emergence of hybrid models, which attempt to take into account the structural composition of developing economies.

In *The General Theory*, Keynes (1936) recognised the existence of private investment decisions on 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

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

[7] 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.

[8] There are other recent theories of investment, for example that which focuses on investment uncertainty. Athukorala and Sen did not take logs in their estimations.

accelerator model is popular not only because of its simplicity, but also its 'realism'. 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, 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 a 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.

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 developing country context, building on the accelerator and the neoclassical theories. Now, consider the relation between the desired capital stock[9] (K^*), the level of output (Y) and the user cost of capital (C):

$$K_t^* = \varphi Y_t C_t^{-\sigma}, \tag{1}$$

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:

$$I_t^n = \Delta K_t^*. \tag{2}$$

Therefore (2) can be written as

$$I_t = \Delta K_t^*. \tag{3}$$

[9] This is also the steady-state capital stock.

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

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

Assuming a unitary elasticity of substitution between capital and labour, by adding the error term, we get our basic model:[10]

$$I_t = \varphi_1 \Delta Y_t - \varphi_2 \Delta C_t + \mu_t \quad (5)$$

Next, we can augment Equation (5) with other determinants of private investment, beginning with financial deepening.

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 credit by 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, 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

[10] See Athukorala and Sen (2002) for a different version of this model.

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. Thus, 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 discernible 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 2008 (summary statistics, correlation coefficients and definition of variables are presented in the appendix). However, for most of the series, there are missing values for individual countries. Thus, we have an unbalanced panel of 14 countries observed over 32 years.[11] We take 4 year

[11] The countries include Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Sierra Leone, Senegal and Togo. For Liberia, there are a lot of missing data for most series, and consequently we dropped it from our sample.

period averages for all the variables from 1975-78 to 2005-08, thus giving 8 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. To reduce errors in averaging, the period observations are calculated using at least three yearly observations. 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:

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it} + \beta_2 rint_{it} + \mu_{it}, \tag{6}$$

where *pigdp* is private investment as a percentage of GDP, *gdpg* 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:

$$\begin{aligned} pigdp_{it} = {} & \alpha + \beta_1 gdpg_{it} + \beta_2 rint_{it} + \beta_3 m2gdp_{it} + \beta_4 inf_{it} \\ & + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_t toda_{it} + \mu_{it}, \end{aligned} \tag{7}$$

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:

$$\begin{aligned} pigdp_{it} = {} & \alpha + \beta_1 gdpg_{it} + \beta_2 r\,\mathrm{int}_{it} + \beta_3 m2gdp_{it} + \beta_4 \mathrm{inf}_{it} \\ & + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_m \mathrm{mod}a_{it} + \delta_b boda_{it} + \mu_{it}, \end{aligned} \tag{8}$$

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:

$$y_{it} = x_{it}\beta + c_i + \mu_{it}, \quad t = 1,...,T. \tag{9}$$

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., $H_0 : c_1 = c_2 = ... = c_{N-1} = 0$. 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 $t = 1,...,T$ to get the cross-section equation:

$$\bar{y}_i = \bar{x}_i\beta + c_i + \bar{\mu}_i , \tag{10}$$

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:

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

Alternatively, Equation (11) can be rewritten as:

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

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 day would not have an instantaneous effect on economic variables such as investment and growth.

Two points stand out from Table 1. 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 can be linked to the nature of financial markets in many developing countries which are still very repressed.

Overall, 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 1. Impact of Aid on Private Investment: Fixed Effects

	1	2
gdpg(lagged)	0.57***	0.55***
	(0.10)	(0.10)
rint	0.08**	0.09**
	(0.03)	(0.04)
m2gdp	-0.03	-0.01
	(0.07)	(0.07)
inf	-0.05**	-0.04**
	(0.02)	(0.02)
dstx	-0.11***	-0.11***
	(0.03)	(0.03)
xg	0.08***	0.08***
	(0.02)	(0.02)
toda(lagged)	0.17**	
	(0.07)	
moda(lagged)		0.27**
		(0.12)
boda(lagged)		-0.07
		(0.10)
R-squared	0.74	0.73
F-test of FE	10.28	9.06
	[0.0000]	[0.0000]
Observations	51	51

Notes: 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.

Table 2. Impact of Aid on Private Investment: Fixed Effects
(Parsimonious Model - using only significant and rightly signed variables)

	1	2
gdpg(lagged)	0.44***	0.42***
	(0.10)	(0.11)
inf	-0.04**	-0.04*
	(0.02)	(0.02)
dstx	-0.07**	-0.09***
	(0.03)	(0.03)
xg	0.07***	0.06***
	(0.02)	(0.02)
toda(lagged)	0.11*	
	(0.06)	

moda(lagged)		0.25**
		(0.12)
boda(lagged)		-0.11
		(0.10)
R-squared	0.61	0.64
F-test of FE	6.86	6.47
	[0.0000]	[0.0000]
Observations	67	66

Notes: 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 2. The results are similar to those in Table 1 except that the goodness of fit reduced to around 64 percent.

7. AID UNCERTAINTY AND PRIVATE INVESTMENT

Another strand in the empirical literature on aid that we examine is the effect of aid uncertainty on investment.[12] 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 period. This is calculated as the standard deviation over the mean, using at least three yearly observations. To an extent, these issues restrict us from comparing the results directly with that of Lensink and Morrissey.

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

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

always follow their 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. The following model equations specify the impact of aid uncertainty on private investment:

$$\begin{aligned} pigdp_{it} &= \alpha + \beta_1 gdpg_{it} + \beta_2 r\,int_{it} + \beta_3 m2gdp_{it} + \beta_4\, inf_{it} \\ &\quad + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_t toda_{it} + \theta_t\, covtoda_{it} + \mu_{it}, \end{aligned} \tag{13}$$

where *covtoda* is volatility of total ODA.

Next, we distinguish between the effects of volatility of multilateral aid and volatility of bilateral aid by re-specifying Equation (13) in an unrestricted form:

$$\begin{aligned} pigdp_{it} &= \alpha + \beta_1 gdpg_{it} + \beta_2 r\,int_{it} + \beta_3 m2gdp_{it} + \beta_4\, inf_{it} \\ &\quad + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_m\, mod\, a_{it} + \delta_b boda_{it} \\ &\quad + \theta_m\, covmod\, a + \theta_b boda + \mu_{it}, \end{aligned} \tag{14}$$

where *covmoda* is volatility of multilateral aid and *covboda* is volatility of bilateral aid as a percentage of GDP. Other variables are as earlier defined. For the estimations, we use the levels of the uncertainty variables as we do not have any theoretical justification for taking the lags. We think that any effect of endogeneity will be minimised by the standard deviations. Furthermore, using the lags will lead to unnecessary loss of degrees of freedom (and fewer observations), which can bias our results. This consideration is important given the problem of missing data in our sample.

Turning to the empirical effects of aid uncertainty, specification 1 in Table 3 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 3 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 3 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 3. Impact of Aid Uncertainty on Private Investment: Fixed Effects

	1	2
gdpg(lagged)	0.46***	0.43***
	(0.10)	(0.10)
inf	-0.06***	-0.04**
	(0.02)	(0.02)
dstx	-0.07**	-0.09***
	(0.03)	(0.03)
xg	0.06***	0.06***
	(0.02)	(0.02)
toda(lagged)	0.12**	
	(0.06)	
moda(lagged)		0.21*
		(0.12)
boda(lagged)		-0.09
		(0.11)
covtoda	-3.97**	
	(1.83)	
covmoda		0.40
		(1.55)
covboda		-4.32**
		(2.02)
R-squared	0.64	0.68
F-test of FE	7.24	6.61
	[0.0000]	[0.0000]
Observations	67	67

Notes: 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 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.

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 this investigation, 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 mean 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 facing the challenge of aid coordination.

The evidence that bilateral aid is highly volatile suggests that policymakers can mitigate the uncertainty which results from political exigencies by channelling aid through coordinated efforts - multilateral agencies.

APPENDIX

Table A1. Summary Statistics for the Main Variables (1975-2008)

Variable	Observation	Mean	Std. Dev.	Minimum	Maximum
pigdp	89	9.08	3.87	1.30	18.58
gdpg	94	2.82	2.64	-5.10	9.85
m2gdp	90	22.53	10.57	0.87	61.20
inf	92	14.67	17.90	-2.50	90.50
dstx	89	17.55	12.26	1.160	64.25
rint	72	3.49	12.48	-44.57	21.80
toda	94	14.81	12.25	0.06	58.72
moda	94	5.75	4.88	0.04	26.10
boda	94	8.92	7.72	0.03	36.55
covtoda	94	2.99	3.28	0	16.54
covmoda	94	1.82	2.16	0	9.17
covboda	93	1.96	2.33	0	13.93
xg	92	4.01	9.59	-40.78	32.80

Table A2. Country Summary Statistics II, 1975-2008

	Foreign Aid % GDP			
	Average	Starting Year 1975	Ending Year 2008	Missing Period
WAEMU				
Benin	10.1	8.0	9.6	-
Burkina Faso	13.1	9.5	12.6	-
Cote d'Ivoire	4.4	2.7	2.8	-

Guinea Bissau	40.7	16.7	15.8	-
Mali	16.4	17.0	11.0	-
Niger	13.9	13.2	11.4	-
Senegal	10.5	6.5	8.1	-
Togo	9.7	6.8	11.4	-
Non-WAEMU				
Cape Verde	23.8	-	14.9	75-85
Gambia	21.1	7.0	12.1	-
Ghana	8.0	4.5	4.6	-
Guinea	9.9	-	9.9	75-85
Nigeria	0.9	0.3	0.7	-
Sierra Leone	17.6	2.5	19.1	-

Table A3. Country Summary Statistics III, 1975-2008

	Private Investment % GDP			
	Average	Starting Year 1975	Ending Year 2008	Missing Period
WAEMU				
Benin	8.3	11.1	14.9	-
Burkina Faso	13.0	-	-	75-85; 04-08
Cote d'Ivoire	8.7	12.8	7.1	-
Guinea Bissau	7.2	-	-	75-86; 03-08
Mali	12.0	12.5	-	08
Niger	5.6	9.3	-	06-08
Senegal	11.2	8.4	20.2	-
Togo	13.2	13.4	-	06-08
Non-WAEMU				
Cape Verde	12.0	-	32.9	75-79
Gambia	10.3	2.1	-	04-08
Ghana	7.9	8.0	12.1	-
Guinea	11.8	-	12.1	75-85
Nigeria	10.9	14.3	-	06-08
Sierra Leone	5.6	-	8.6	75-79

Table A4. Correlation Coefficients

	pigdp	*moda*	*toda*	*boda*	*covboda*	*covmoda*	*covtoda*
pigdp	1.0000						
moda	-0.1362	1.0000					
toda	-0.1204	0.9522	1.0000				
boda	-0.0897	0.8690	0.9772	1.0000			
covboda	-0.1875	0.5706	0.6170	0.6082	1.0000		

covmoda	-0.1759	0.6202	0.6028	0.5435	0.4330	1.0000	
covtoda	-0.2234	0.6588	0.6265	0.5553	0.8771	0.5952	1.000

Table A5. Foreign Aid and Foreign Direct Investment in West Africa (1975-2008)

	Foreign Aid % GDP			Foreign Direct Investment % GDP		
	1975-1984	1985-1994	1995-2008	1975-1984	1985-1994	1995-2008
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 Bissau	37.7	55.1	42.7	0.4	0.8	1.4
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

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

Table A6. Definition and Description of Data

Variable	Definition
pigdp	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.
rint	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.
gdpg	Annual percentage growth rate of GDP at market prices based on constant local currency.
m2gdp	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.

inf	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.
dstx	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.
xg	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.
toda	Official development assistance expressed as a percent of GDP.
moda	Total official development assistance from multilateral institutions expressed as a percent of GDP.
boda	Total official development assistance from bilateral institutions expressed as a percent of GDP.

Source: All variables are from World Development Indicators with the exception of aid data from the Organisation for Economic Cooperation and Development (OECD) website.

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