TESTING THE IMPACT OF FOREIGN AID ON DOMESTIC 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, controlling for other determinants of private investment. 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 aid uncertainty, defined by the coefficient of variation has a negative impact on private investment and therefore reduces the impact of aid on domestic private investment.

Keywords: "Foreign Aid"; "Investment"; "West Africa"

JEL Classification: E22; F35; C33

1. INTRODUCTION

Since George Marshall, in 1947 spoke of what is known today as the Marshall Plan, a long and inconclusive literature has emerged, examining the impact on investment and growth of foreign aid. Some recent studies, 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. But this paper however, singles out private investment, since it is more directly related to economic growth in developing countries than public sector investment, see for example (Lensink and Morrissey, 2006; Devarajan *et al.*, 2003; Greene and Villanueva; Khan and Reinhart, 1990).

There are two direct channels between foreign aid and private investment. First, foreign aid can have a positive impact on private investment if funds

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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. While these activities are aimed at increasing the level of private investment, it does not necessarily imply that foreign aid will automatically lead to higher private investment. In practice, these objectives can be achieved only if the projects are well coordinated and implemented. 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. When the private investment climate improves, the level of private investment would very likely 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. It is possible that both types of foreign aid may have discernable impacts on private investment. As Cashel-Cordo and Craig (1990) argue, the sources of foreign aid and the conditions under which it is given make a difference in determining the effectiveness of aid in developing countries. In this instance, classifying foreign aid along multilateral and bilateral lines will help 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. Multilateral aid is likely to have a positive effect because it has investment and wider development objectives as its central objective. Again, multilateral aid is often handled with greater expertise and this enhances its effectiveness Stiglitz (2002). Even as the literature on aid allocation remains contentious, recent conclu-

sions 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 with strong political and commercial ties with donors, and may not totally promote domestic investment, economic growth and development[1]. 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 hard.

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, controlling for other determinants of private investment. 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.

The results show that multilateral aid affects private investment positively, but not bilateral aid. In addition, we find that aid uncertainty, defined by the coefficient of variation and measured as the standard deviation from a percentage of the mean over the period has a negative impact on private investment and therefore weakens the impact of foreign aid on domestic private investment.

The rest of the paper is organized as follows: Section 2 discusses the empirical literature. Section 3 sets out the theory and determinants of private investment. Section 4 presents the empirical specifications and estimation techniques. Section 5 presents the data. Section 6 presents results of the 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

Past studies on aid allocation, for example, Maizels and Nissanke (1984); Cassen *et al*. (1994); Boone (1996); Burnside and Dollar (2000) argue that multilateral aid is intended to promote development and tends to be allocated based on recipients' need, while the allocation of 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) found that French aid tends to be driven by self-interest variables while

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[1] 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.

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 others 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 are likely to 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 (shown in Table 1) 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, and 2005). Apart from the studies mentioned above, there are other studies on total aid and total investment for developing and low income countries, including, Levy (1987); Boone (1994); Hansen and Tarp (2001); Collier and Dollar (2004); and Hansen (2004)[2]. 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 (see Table 2): Hadjimichael *et al*. (1995) examined the aid-investment relationship for a group of 41 sub-Saharan African countries over the period 1986-1993. Dividing the region into various country groups, they investigated the impact of foreign aid on investment. Additionally, they assessed whether foreign aid affected private investment differently from public investment using the Ordinary Least Squares technique. With aid variables as the only included independent variables, they found that public investment was strongly related to foreign aid. Results for private investment were mixed, only positive and significant for a group of sustained adjusters[3], and significantly negative for countries with negative per capita GDP growth. Furthermore, they applied the Generalised Least Squares on a modified private investment equation that included some macroeconomic variables and initial conditioning variables. For the entire sample, they find that aid has a strong positive effect on private investment, such as, a one percentage point increase in foreign aid increased private investment by 0.4 percentage points.

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

[3] These are SSA countries identified as having stable macroeconomic environment and making efforts to sustaining it during 1986-92. These countries include; Benin, Burundi, Gambia, Ghana, Kenya, Lesotho, Malawi, Mali, Mozambique, Niger, Senegal, Tanzania, Togo and Uganda.

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

Gross Domestic Investment and Foreign Aid			
Study and Country Coverage	*Estimation Technique*	*Period Covered*	*Findings*
Levy (1987), Developing Countries	*OLS and Two Stage Least Squares (2SLS)*	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)	*OLS*	1968 to 1982	Overall results suggest that aid stimulates investment in sub-Saharan Africa.
Gyimah-Brempong (1992), SSA	*2SLS*	1968 to 1987	Various aid types (grants, loans and food) have a positive impact on investment in SSA. The impact of loans and grants are however greater.
Lensink and Morrissey (2000), Developing countries including Africa.	*Cross Section (average) OLS*	1970 to 1995	Aid has a 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, varying from 10 to 5 per cent.
Hansen and Tarp (2001), Cross-Country	*Fixed Effects (FE) and GMM*	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 *et al.* (2002a and 2005), SSA	*Pooled OLS*	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.	*OLS and 2SLS*	1974 to 1993	Aid has a positive and significant impact on total investment.
Collier and Dollar (2004), Developing Countries	*Pooled OLS*	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			
Study and Country Coverage	*Estimation Technique*	*Period Covered*	*Findings*
Mosley (1987), Less Developed Countries	*OLS*	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	*OLS*	1981 to 1985	Weak positive relationship between aid and private investment.
Hadjimichael *et al*. (1995), SSA	*GLS - Random Effects*	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	*OLS and 2SLS*	1970 to 1993	A one percentage increase in aid causes a 1.9 percentage points increase in 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 encourages 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[4]. The conclusion of the study is that aid encourages 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.* (1995) is close in spirit to the

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[4] The policy index was constructed by regressing private investment on all explanatory variables, excluding aid and then evaluating the 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).

present study, the latter differs in the following important ways: distinction between multilateral and bilateral aid; use of different estimation techniques; use of 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) examined 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 sub-sample containing only African countries, Lensink and Morrissey find that controlling for aid uncertainty increases the significance of the coefficient on aid in the investment regression, but, the coefficient on uncertainty was not significant.

There are two reasons the study by Lensink and Morrissey is contentious. 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 panel data 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.

3. THEORY AND DETERMINANTS OF INVESTMENT

There are three main investment theories that have been advanced in the literature, namely the Keynesian theory, the accelerator model and the neoclassical model[5]. 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 proj-

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[5] There are other recent theories of investment, for example that which focuses on investment uncertainty.

ects 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'. 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 above discussions, it is apparent that no particular theory addresses all the important issues on the behaviour of private investment in developing countries. In this case, we follow Athukorala and Sen (2002) to derive a basic investment equation[6] that reflects the behaviour of investment in most developing countries. This equation builds on the accelerator and the neoclassical theories. To proceed, consider the relation between the desired capital stock[7] (K^*), the level of output (Y) and the user cost of capital (C):

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

[6] Athukorala and Sen did not take logs in their estimations.
[7] Also the steady-state capital stock.

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:

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

Therefore (2) can be written as,

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

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

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

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

$$I_t = \delta_1 \Delta Y_t - \delta_2 \Delta C_t + \mu_t$$ (5)

Next, we augment equation (5) with other determinants of private investment, starting with financial deepening.

3.1 Financial Deepening

Developed financial markets are expected to help mobilise and pool savings, and allocate capital to the most efficient users (Levine, 2005). Therefore, financial deepening, by increasing the supply of credit to private investors can stimulate private investment in the economy. Two main proxies of financial deepening have been used in the literature, and include nominal money supply (M2) as a percentage of GDP and the share of bank credit to the private sector in GDP. Private credit supply is believed to be a more reliable proxy for financial deepening because it measures the quantity and quality of investment (Demetriades and Hussein, 1996; Ghirmay, 2004). Though it does not capture the financial developments that occur outside the banking system, it is preferred to M2. M2 measures the rate of money supply (monetisation) or currency circulation in the economy, the increase of which does not necessarily imply an increase in Bank deposits. Following other studies

in the development literature, we use private sector credit as a proxy for financial deepening.

3.2 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, firms find it difficult to predict their costs and revenues accurately and, therefore, are discouraged from making investment decisions 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.

3.3 Debt Service

The amount of financial resources committed to debt service obligations can affect the rate and level of private investment in the economy. Debt service will be a disincentive to invest if investors' returns are subjected to increased taxation by the 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)*. A major justification for choosing this variable is because most of the countries in the sample were severely indebted over the period under study. This variable has also been used by previous authors, for example, Hadjimichael *et al*. (1995).

3.4 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 slipovers to domestic firms from more technologically advanced countries. In order to compete with advanced firms, domestic firms borrow technology from more advanced countries, which usually comes with skills transfer. Also, Thirlwall (2003) argues that growth of exports generates foreign exchange to import intermediate goods needed for investment. These derivable benefits, lead us to the inclusion of export growth in the private investment equation.

4 EMPIRICAL SPECIFICATIONS 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. The aim is not to examine the impacts of different types of aid as studied by Gyimah-Brempong (1992), but to follow Cashel-Cordo and Craig (1990) who argue that sources of aid matter for its effectiveness and Ram (2003 & 2004) who classified aid into bilateral and multilateral sources to examine the effect of foreign aid on economic growth in developing countries. Third, we want to know the impact of aid uncertainty on domestic private investment.

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

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

where *pigdp* is private investment as a percentage of GDP, *gdpg* is growth in real GDP (accelerator variable), *rint* is real interest rate (cost of capital), 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:

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it-1} + \beta_2 rint_{it} + \beta_3 bc_{it} + \beta_4 \text{inf}_{it} +$$
$$\beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_t toda_{it-1} + \mu_{it} \tag{7}$$

where *bc* is bank credit to the private sector 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. The difficulty with the above specification is that the inclusion of both real interest rate and inflation may lead to multicollinearity. However, multicollinearity can only cause problems if the value of the correlation coefficient is large (Asteriou *et al.*). Table A.2 in the Appendix shows that the correlation between real interest rate and inflation is around 0.8, which is lower than the 0.9 threshold beyond which problems may emerge.

We next distinguish between multilateral and bilateral aid by rewriting equation (7) in an unrestricted form:

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it-1} + \beta_2 rint_{it} + \beta_3 bc_{it} + \beta_4 \inf_{it} +$$
$$\beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_m moda_{it-1} + \delta_b boda_{it-1} + \mu_{it} \qquad (8)$$

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 account for unobserved country effects as well as shield our estimates from sample heterogeneity problem, we apply the unobserved effects model suggested by Wooldridge (2002). These effects arise from unobserved variables that impact the dependent variable. The effects may be fixed or random, and can be estimated using a fixed effects (FE) estimator or random effects (RE) estimator. Consider the model for T time periods:

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

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. 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 appropriate estimator 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.

A major limitation of FE estimator is that it cannot be implemented if the x_{it} vector contains important observed time invariant variables. The time-invariant variables are spanned by individual dummies and any attempt to estimate the model using FE will fail due to the presence of perfect multi-collinearity. Another reason for this is that the time invariant variables are wiped out through transformation.

In this paper, FE estimator is preferred for two reasons. First, x_{it} does not contain any observed time-invariant variable. Second, the choice of countries in the sample is not a product of a random process. To formally check for presence of country specific effects, we follow Baltagi (2008) to conduct the F test of fixed effects. This involves performing a joint significance test based on the following hypothesis. $H_0 : c_1 = c_2 = ... = c_{N-1} = 0$. The rejection of the null hypothesis will reinforce the arguments in favour of 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:

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

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

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

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

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 $\ddot{y}_{it} \equiv y_{it} - \overline{y}_i$, $\ddot{x}_{it} \equiv x_{it} - \overline{x}_i$, $\ddot{\mu}_{it} \equiv \mu_{it} - \overline{\mu}_i$. 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 may affect our inferences, we perform the regressions using robust standard errors.

5. DATA

We use OECD and World Bank data for 14 West African countries[8] over 1975-2004. We selected the countries and time period based on data availability. In this paper, we measure foreign aid with Official Development Assistance (ODA) as a percentage of GDP. We construct our measure of uncertainty (volatility) using the coefficient of variation (CoV). The summary statistics and definition of variables are presented in the Appendix. We take 4 year period averages for all the variables from 1975-78 to 1999-04, thus giving 7 periods. Where there is missing data in-between the average period we divide by the number of years for which data are available, instead of by 4. There is no theoretical basis for this interval, but primarily to dilute business cycle developments. This conforms to the usual practice in empirical studies involving panel data, where four and five year averages have been used (see, for example, Blomstrom *et al.* 1996, Dollar and Easterly, 1999 and Burnside and Dollar, 2000). Throughout the estimation, we use robust (heteroskedasticity-consistent) standard errors in order to take account of potential heteroskedasticity that are associated with period averages. The use of such robust standard errors means that the resulting test statistics are appropriate, whether or not the errors have a constant variance (Verbeek, 2008). We take lags of only potential endogenous variables as we do not have any justification to lag the other variables. Other studies have followed a similar approach. For example, Ghura and Goodwin (2000); Lensink and Morrissey (2006) included only the lag of potential endogenous variables in their estimation.

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), using the FE estimator. As discussed in section 5, we address the endogeneity problem by using only the lagged values of the aid variables 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 fairly reasonable to argue that aid received today would not have an instantaneous effect on economic variables such as investment and growth. Our preliminary attempt to lag the other independent variables decreased our observations

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[8] The countries are Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

significantly (to around 28), primarily due to large cases of missing data. We therefore, limit the use of lags to potential endogenous variables.

Two points stand out from Table 3. First, the *F-test* of fixed effects suggests the 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 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 64 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, real interest rate and bank credit to the private sector have no independent effect on private investment. These could explain the nature of financial markets in many developing countries which are still very depressed and underdeveloped.

In summary, 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 supports 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 (*pigdp*)		
	1	2
gdpg(lagged)	0.39***	0.45***
	(0.10)	(0.15)
rint	-0.20	-0.27
	(0.12)	(0.19)
bc	0.06	0.19
	(0.09)	(0.13)
inf	-0.14**	-0.21**
	(0.06)	(0.10)
dstx	-0.08**	-0.09**
	(0.04)	(0.03)
xg	0.07**	0.09**
	(0.03)	(0.04)

	1	2
toda(lagged)	0.13**	
	(0.05)	
moda(lagged)		0.21**
		(0.09)
boda(lagged)		-0.02
		(0.12)
R-squared	0.64	0.63
F-test of FE	5.39	4.88
	[0.0001]	[0.0000]
Observations	56	56

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 1 percent significance level.

To examine the robustness of our results, we re-estimate the equations by dropping real interest rate and bank credit to the private sector as a percentage of GDP. This is the so-called general-to-specific approach which gives a parsimonious specification. The results of this exercise are located in Table 4, and are consistent with those in Table 3.

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 (*pigdp*)		
	1	2
gdpg(lagged)	0.55***	0.54***
	(0.10)	(0.10)
inf	-0.05**	-0.07***
	(0.02)	(0.02)
dstx	-0.09**	-0.09**
	(0.03)	(0.03)
xg	0.07**	0.11***
	(0.03)	(0.02)
toda(lagged)	0.14*	
	(0.08)	
moda(lagged)		0.27**
		(0.13)
boda(lagged)		-0.15
		(0.15)

R-squared	0.49	0.64
F-test of FE	5.57 [0.0000]	4.98 [0.0000]
Observations	67	66

Note: Robust standard errors are in parentheses (). Numbers in brackets [ ] indicate p –values. * indicates that a coefficient is significant at the 10 percent level; ** indicates 5 percent significance level; *** indicates 1 percent significance at 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 investment[9]. In particular, uncertainty regarding the stability of aid inflows can discourage private investment (Hadjimichael *et al.*, 1995). As discussed in section 2, the leading empirical study of this issue is Lensink and Morrissey (2000). However, our work differs in three important ways. First, we use a different estimation procedure (FE estimator) to estimate the extent to which aid uncertainty affects domestic private investment. Unlike the OLS technique used by Lensink and Morrissey, the FE estimator technique takes account of country specific effects in the estimation process. Secondly, we test for the impact of aid uncertainty using aggregate aid as well as multilateral and bilateral aid. Third of all, our measure of uncertainty (volatility) in this study is defined by the coefficient of variation which is the standard deviation as a percentage of the mean over each sub-period. Osei *et al.* (2002) and Lensink and Morrissey (2006) used a similar measure of volatility in their study. We do not claim that this measure best defines uncertainty, but we believe it captures the unexpected changes in aid well. Lensink and Morrissey (2000) used aid instability, constructed from the residual of an autoregressive regression on foreign aid as a measure of uncertainty. Essentially, this requires consistent series for each country in the sample. We are not able to implement this due to gaps in our data. We cannot directly compare our results as a result of these differences.

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 uncertain-

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[9] In this study, volatility and uncertainty imply the same thing and are interchangable.

ty in multilateral aid, it 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 (*pigdp*)		
	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

Note: Robust Standard errors are in parentheses ( ). Numbers in brackets [ ] indicate p –values.
* indicates that a coefficient is significant at the 10 percent level; ** indicates 5 percent significance level; *** indicates 1 percent significance 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). We relied on the fixed effects estimation technique for this analysis. Our findings suggest that there is evidence of country specific effects and that the disaggregated model performs 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, from these results, we have established that high volatility in bilateral aid is a source of uncertainty in total aid.

The evidence gathered from this analysis 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, the findings show that aid can yield effective results for this group of countries, especially when organised and coordinated within a multilateral framework. This is particularly relevant to the donor communities that are struggling with aid coordination.

Evidence that the impact of bilateral aid on domestic private investment is negative partly due to its high volatility suggests that bilateral donors can increase aid effectiveness by improving the predictability of aid inflows in recipient countries. This means that aid stability improves the effectiveness of bilateral aid.

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APPENDIX

Table A.1: Summary Statistics for the Main Variables (1975-2004)

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
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
xg	92	4.01	9.59	-40.78	32.80

Table A.2: Correlation Matrix

	pigdp	gdgp	rint	bc	infl	dstx	toda	xg
pigdp	1.0000							
gdgp	0.3237	1.0000						
rint	0.2173	0.1153	1.0000					
bc	0.1164	0.2079	0.3275	1.0000				
infl	-0.2808	-0.1999	**-0.8443**	-0.4492	1.0000			
dstx	-0.3796	-0.3239	-0.1117	-0.0398	0.2667	1.0000		
toda	-0.0337	0.0651	0.0581	-0.0896	0.1985	0.2264	1.0000	
xg	0.3316	0.4188	-0.0211	0.1969	0.0183	-0.1768	0.2573	1.0000

Table A3: 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 in 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.
bc	Domestic credit provided by the banking sector to various sectors on a gross basis, with the exception of credit to the central government expressed as in percent of GDP.
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	Total official development assistance expressed as a percentage of GDP.
moda	Total official development assistance from multilateral institutions expressed as a percentage of GDP.
boda	Total official development assistance from bilateral institutions expressed as a percentage of GDP.

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

Résumé

S'appuyant sur la vaste littérature sur l'allocation d'aide, cet article examine si l'aide étrangère a une incidence sur l'investissement privé en Afrique occidentale, si les autres déterminants de l'investissement privé sont contrôles. L'étude examine aussi si l'aide multilatérale et l'aide bilatérale affectent différemment l'investissement privé. Dans une analyse connexe, l'article examine l'impact de l'incertitude d'aide sur l'investissement privé. Les résultats montrent que l'aide multilatérale affecte positivement l'investissement privé, mais cela ne se produit pas avec l'aide bilatérale, et l'incertitude de l'aide, définie par le coefficient de variation, a un impact négatif sur l'investissement privé et réduit donc l'impact de l'aide sur l'investissement privé intérieur.

Mots clés: aide étrangère, investissement, Afrique de l'Ouest

Classification JEL: E22; F35; C33