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The Impact of Foreign Aid on Investment, Growth and the Exchange Rate in West Africa

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Supervisor: Professor A. P. Thirlwall

Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy (PhD) in Economics

Department of Economics, University of Kent, May 2009

In memory of my parents, Cyril & Mercy

ABSTRACT

Since the last two to three decades, the economic performance of the African countries has been the focus of global attention. While other developing countries that share similar characteristics are beginning to emerge, Africa is yet to 'take off'. At the regional level, the North and Southern regions have made some progress but West Africa in spite of its deep integration has barely managed to outperform the East and Central regions.

This thesis focuses on the investigation of the relationship between foreign aid and economic performance in West Africa. Using annual data from 1975 to 2005, it examines the impact of foreign aid on private investment, growth, the real effective exchange rate, as well as the nature of the relationship between external debt, private investment and growth in Nigeria.

The first of the main findings of the thesis is that the impact of foreign aid on private investment and growth in West Africa depends on the type of aid. Also, the effect of aid uncertainty on private investment cannot be attributed to aggregate aid, as multilateral aid does not appear to be volatile. Second, the thesis by splitting aid into multilateral and bilateral components, addresses a major issue in the aid-growth debate - the bi-directional causation between aid and growth. Third, based on two recent pooled estimation techniques – the pooled mean group estimator (PMG) and the dynamic fixed effects (DFE), the thesis examined the effect of foreign aid inflows on the real exchange rate – the so-called 'Dutch Disease' hypothesis, relying mainly on the floating aspect of the real effective exchange rate. Finally, using the ARDL approach, we find that official debt of around 40 percent of GDP is not inimical to growth for Nigeria.

DECLARATION

I hereby certify that the work embodied in this thesis is the result of my own investigation except where reference has been made to a published work or research paper.

I declare that this work has not already been accepted partially or wholly, nor is it currently under consideration for the fulfillment of the requirement of any other degree.

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Chapter 1

Introduction

The economic performance of Sub-Saharan African (SSA) countries is one of the mostly debated issues in the development economics literature in recent times. The debate has focused on investment and growth, which are the major levers of economic development. However, while there have been some growth sparks in a few countries, modest rates of investment and growth still elude many countries in the region. This is primarily a result of low savings and inadequate foreign exchange from exports. More generally, inadequate finance has also restricted the scope for development in the region. The NEPAD[1] framework document 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.

Over the past two to three decades, however, there has been an increasing effort at filling the domestic resource gap, through both multilateral and bilateral financing. Evidently, concessional financing has become popular

[1] New Partnership for Africa's Development

because the magnitude of private flows, such as foreign direct investment (FDI) and remittances are small, and even decreasing. For FDI, a standard argument is that private investors frequently wait for growth to take off before they move into emerging market economies. This then leaves SSA countries with foreign aid as the main source of external finance.

Recently, the group of eight industrialised countries (G8), in their Gleneagles Declaration in 2005, 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 commitments made at the Gleneagles, and reaffirmed at Heiligendamn[2].

Arguably, foreign aid has played some vital roles in the development process of many economies, augmenting domestic resource gap and offering an entirely new source of finance. For instance, the Marshall Plan of 1947 and the 'big push' advocated by Rosenstein-Rodan (1962) for the industrialization of Eastern and South-eastern Europe are examples of how foreign aid has supported development efforts.

In West African countries (see Table 1.1 for list of countries), as in many other SSA countries, economic growth; increased private sector investment; and

[2] 2008 G8 Summit Declaration, "Development and Africa", July 8, 2008.

industrialization remain very central to the overall economic objectives, and foreign aid is one of the major components of development finance that can be used to achieve these objectives. This growing dependence of West African countries, for example, Cape Verde, Cote d 'Ivoire, Gambia, and Mali, including other SSA countries, on foreign aid, and the renewed effort by rich nations to double and scale-up aid to Africa have therefore contributed to the revival of interest on the effectiveness of foreign aid in SSA[3]. Between 1975 and 2005, the total amount of Official Development Assistance (ODA)[4] received by West Africa had reached $111,860 million in nominal terms - out of this, $70,685 million was from bilateral donors while the remaining $41,175 million came from multilateral institutions[5].

The renewed debate on the aid effectiveness issue tends to focus mainly on particular conditions and country characteristics under which aid works. Broadly, these studies, for example, Burnside and Dollar (2000), Hansen and Tarp (2001), Dalgaard *et al.* (2004), Islam (2005) and Roodman (2007) argue that aid itself would not have any independent effect on growth or development unless interacted with policy, geography or institutional variables. Yet many of

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[3] At the G-8 summit in Gleneagles, Scotland, 2005, Heads of government pledged to double Aid to Africa.

[4] 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).

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

these studies are based on techniques that leave many important issues still begging.

In many respects, the evidence so far produced as regards the impact of foreign aid on growth remains inconclusive. For instance, the study by Burnside and Dollar which sparked this renewed interest in aid-growth literature argue that aid works only in good policy environments. There are of course several difficulties with this conclusion, as some other authors have also pointed out. One is that what comprises policy index as proposed by Burnside and Dollar (2000) remains an open ended issue, and hence cannot be determined by the inclusion of few policy variables. This is also the case with the political index variable presented by Islam (2005). These issues and more, therefore limit the ability of these studies to generalize.

The SSA countries may be homogenous in many respects, but there are still some divergences in the level of economic and political development. In this instance, this study singles out West Africa for three important reasons; first, it is the most populous and integrated of the regional economic groupings in Africa. However, it lags behind the Southern region in terms of prosperity, usually measured in per capita GDP. Working with a more integrated sample can help reduce the heterogeneity effect on the results. Second, though private capital inflows, for example, FDI and remittances are generally low in Africa, the share to West Africa remains very small when compared with the other

regions. Third, West African countries constitute a very distinct bloc of bilateral aid recipients, thus, easing the problem of aggregation bias.

Motivated by these issues, this thesis seeks to contribute to the debate on the relationship between foreign aid and macroeconomic performance, focussing mainly on related issues of private investment, growth and the real effective exchange rate. More specifically, the thesis is made up of four core chapters, written up in the form of independent essays, which address these three subjects from different perspectives. The thesis relies on theoretical, descriptive and econometric techniques. While chapter 2 is primarily descriptive, chapters 3, 4 and 5 rely on panel data empirical methods. Chapter 6 is a country-specific study and uses a time series procedure.

The selection of private investment, growth and the real effective exchange rate as the most important subjects of enquiry of the thesis is consistent with the insights revealed from the analysis conducted in chapter 2, and by the recognition of the fact that growth thrives in an environment where private sector participation is high. This is an introductory chapter in which we shed some light on the different questions the thesis seeks to address (an overview of the chapters).

To set the stage, chapter 2 lays out the theoretical link between aid and development, and gives a descriptive overview of the main subjects of

investigation of the thesis. From a descriptive view point, the chapter looks at how growth, investment and the real effective exchange rate have evolved between 1975 and 2005 in West Africa. In addition, the pattern of foreign aid is analysed along side with foreign direct investment. With these issues in mind, the questions linked to the other chapters are then formalised and thus discussed:

1. *What impact do foreign aid and the associated uncertainty have on private investment in West Africa?*

The relationship between foreign aid and investment has not been fully addressed as there is no study on the impact of multilateral and bilateral aid on private investment. To address the above question, therefore, we first estimate the impact of total aid on private investment. Then we unbundle the different effects of foreign aid on private investment by looking at the multilateral and bilateral aid components. We posit that using total aid does not really tell us much about the relationship between foreign aid and private investment. One reason is that foreign aid has the potential of benefiting recipients, but when channelled through multilateral institutions. Chapters 3 and 4 explain why.

More so, we model the impact of aid uncertainty (volatility) on private investment by tracing out the effects of uncertainty that are associated with each of these aid types. With the existence of different effects of foreign aid,

chapter 4 follows on to investigate whether that pattern is present for foreign aid and growth. With this in mind, we present the next question:

2. *What is the impact of foreign aid on economic growth in West Africa?*

The answer to this question forms the basis of chapter 4. In line with chapter 3, we continue to distinguish aid along multilateral and bilateral lines. A salient issue that arises when dealing with the relationship between foreign aid and growth is the simultaneity bias linked to aid endogeneity.

A further issue that remains after answering questions 1 and 2 above is whether aid inflows restrict real GDP growth via loss of competiveness. We deal with this question by analyzing the WAEMU zone. This is the subject of the chapter 5, and the relevant question at this point is:

3. *Has foreign aid led to an appreciation of the real exchange rate in the West African Economic and Monetary Union?*

In answering this question, we do not distinguish between the different types of aid, instead we rely on recent panel data estimation procedures to test the 'Dutch disease' prediction that foreign aid leads to an appreciation of the real exchange.

Given the rigid, and often violated assumptions which underlie the core 'Dutch disease' model, we contend that the effect of aid on the real effective exchange rate can be mitigated if it supports imports. More specifically, aid inflows may lead to a depreciation of the real effective exchange rate if imports increase faster than aid inflows.

Departing from previous studies, we use a dynamic technique that addresses both endogeneity and heterogeneity problems. We find that the real effective exchange rate is associated with a depreciation of the real exchange rate in West African Economic and monetary Union. In what follows, chapter 6 addresses the last question:

4. *What effects have capital imports (including foreign aid), external debt and the associated servicing obligations had on private investment and economic growth in Nigeria?*

This question is central to chapter 6. Primarily, the goal here is to examine the impact of multilateral and bilateral aid on private investment and growth for an individual country. This is because cross-country study can never explain an individual country's experience.

Then, focusing mainly on official debt, the chapter assesses the main theoretical predictions regarding the impact of debt and debt service obligation on private investment and growth. It is important to justify the effect of debt on private

investment and growth in this thesis, not least because relative to GDP, Nigeria has borrowed intensely on non-concessional terms over time.

Finally, Chapter 7 concludes by summing up the main findings of the thesis as it relates to private investment, economic growth and the real effective exchange rate in West Africa. The chapter also presents some limitations of the study and implications for future research.

Throughout this thesis, we have primarily relied on data from the World Bank Development Indicators, Global Development Finance, IMF International Financial Statistics, African Development Indicators, Debt Management Office (Nigeria) and the Organisation for Economic Co-operation and Development (OECD). In addition, we have employed data provided directly by staff at the World Bank.

Table 1.1: West African Countries

West African Economic and Monetary Union (WAEMU)

Benin
Burkina Faso
Cote d'Ivoire
Guinea Bissau
Mali
Niger
Senegal
Togo
Non-West African Economic and Monetary Union (Non-WAEMU)
Cape Verde
Gambia
Ghana
Guinea
Liberia*
Nigeria
Sierra Leone

* Throughout the analyses, the thesis excludes Liberia.

Chapter 2

Foreign Aid and Economic Performance in West Africa: A Theoretical and Descriptive Analysis

2.1 Introduction

West Africa comprises two distinct zones, namely CFA (WAEMU) and non-CFA (non-WAEMU) zones. While the CFA zone pegs its currency to the euro (pegged to the French franc before 1999), the non-CFA countries float their currencies against the rest of the world. Cape Verde is the richest country in the region in terms of per capita income which was about $1300 (in 2000 prices) in 2005, while Guinea Bissau remains the poorest - with a per capita income of about $130 (in 2000 prices) over the same period. In terms of real GDP (output), the WAEMU economy is dominated by Cote d'Ivoire, and the non-WAEMU by Nigeria and Ghana.

First, however, the goal of this chapter is to lay out the theoretical underpinnings of foreign aid and economic development, and thereafter provide a descriptive overview of the West African economic performance. Furthermore, it briefly examines the Official Development Assistance and compares it with foreign direct investment in West Africa.

The remaining part of the chapter is organized as follows: Section 2 lays out the theoretical underpinnings of foreign aid and economic development. Section 3 analyzes the performance of the main macro variables. Section 4 briefly discusses foreign aid to West Africa, and compares it with foreign direct investment. Finally section 5 concludes.

2.2 Theory of Foreign Aid and Development

In 1947, the US Secretary of State, George C. Marshall, spoke at a commencement ceremony at Harvard University of what is known today as the Marshall Plan. At that time, it was believed that Europe would face an economic deterioration of a very grave nature if substantial financial assistance was not extended to it. As it were, by 1953 Europe had received about $13 billion (in nominal terms) in economic aid from the United States[6]. With the inflows, Europe witnessed an unprecedented economic recovery and a quick 'return to prosperity'. Given the success of the Marshall Plan, the role of foreign aid in the development process began to emerge in the mainstream literature on economic growth and development.

Thus, by the early 1950s, aid evolved within the United Nations' (UN) Scheme through the emphasis on capital accumulation, industrialization and planning

[6] These issues are elaborated in Hogan, M. J (1987) and Milward, A. S (2006).

(Meir, 1984). It was argued that grants and other concessional flows would be needed to finance domestic investment in developing countries.

In many respects, the role of foreign aid is rooted in the seminal works of early development economists, for example, the 'Big Push' theory of Rosenstein-Rodan (1962); the 'vicious cycle of poverty' of Nurkse (1953), which is partly attributable to the problem of capital formation caused by small capacity to save; and the 'take-off' stage of self-sustaining growth by Rostow (1960). Rostow (1960), and Rosenstein-Rodan (I962) argue that foreign aid was a means through which greater investment and growth could be achieved in developing countries. Given these instances, foreign aid, as a source of development finance began to receive wider economic attention.

More formally, the traditional role of aid is to supplement domestic saving in order to close the investment-savings [*I-S* from henceforth] gap. This gap was thought to determine the growth rate at the pre-take off stage. If developing countries were to grow faster, foreign assistance was expected to bridge this gap (Thirlwall, 2006). In fact, previous *I-S* gap studies relied on the Harrod-Domar growth model, which held sway during the 1950s and up to early 1970s. After the 'traditional' *I-S* gap concept, came 'dual-gap' analysis, which emphasized both the investment and the import channels.

This additional gap is the import-export (*M-X*) gap or the foreign exchange gap developed by Chenery and Strout (1966), and shows that foreign exchange

constraint creates a resource gap when the rate of exports is not adequate to keep pace with the growing demand for imports. This way, aid can be a supplement to foreign exchange. In the dual-gap sense, the dominant of the two gaps was expected to be filled by foreign assistance (aid), and by doing so, the other gap becomes automatically filled. Therefore, foreign aid can quicken the pace of investment and growth by providing additional foreign exchange.

One main assumption of dual-gap theory is the lack of substitutability between domestic and foreign resources. It is believed that a developing country is unable to convert its surplus domestic resources into foreign currency. In this sense, therefore, a country can only finance any current account shortfall through external borrowing since domestic saving cannot be used to finance the external deficit. Another problem with the dual-gap model is that it is a planning model and, requires the knowledge of the historical savings and investment functions.

In practice, however, aid affects growth through a number of channels. Investment in physical capital, technology, human capital and imports, are the main channels through which aid can affect growth. In some empirical studies (for example, Hansen and Tarp, 2001 and Gomanee *et al.*, 2005) investment is found to be 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.

It is also plausible to hold the view that some portion of aid inflows finances consumption activities, which do not lead to capital accumulation. This is not surprising as one would expect any aid inflows to be divided between consumption and investment according to rates of time preference of the recipient country. In this sense, what is important and as well relevant is, whether aid directed at investment is actually effective, not whether any part goes to consumption.

Based on Nurke's (1953) vision of development, the level of a country's 'backwardness' and the available 'overhead facilities' in the early stage of development determine how much of aid that it absorbs for current consumption and for capital formation. In this case, therefore, the one-for-one relationship between aid and investment that is implicit in the dual-gap theory may be too rigid and restrictive. Evidently, the empirical application of this two-gap model has not been very successful in Africa (Dollar and Easterly, 1999 and Easterly, 1999).

Following this line of debate, Obstfeld (1999) showed that an increase in aid raises consumption and investment as well as the growth rate when the economy is below its steady state. Similarly, Easterly (2003) asserts that greater investment can only be financed by aid if investment is liquidity constrained and incentives to invest are favourable. What this implies is that aid would not

increase investment if the cause of low investment is poor incentives. Again, this will not mean that aid does not work since it could work where these incentives are right.

Some economists, however, (for example, Friedman, 1958; Bauer, 1966, 1970; Griffin and Enos, 1970) are of the view that aid can hurt private sector activity. The contention here is that aid encourages public sector consumption and hinders the emergence of an indigenous entrepreneurial class.

On the other hand, the neoclassical and new growth theories focus on the other channels, e.g. human capital and technology transfer, in addition to the investment channel. From the neoclassical perspective, foreign aid is simply viewed as income or lump sum transfer that can propagate or hurt growth, depending on whether it is invested or it is consumed. In this sense, if aid is invested in physical or human capital; used to import capital goods needed at the initial level of development; and for inward transfer of technology, we would expect it to be effective. Hansen and Tarp (2001) point out that if aid has an effect on growth, conditional on a fixed investment ratio and a constant level of human capital, then it works through channels that impact on total factor productivity.

On the other hand, aid can increase investment when it is used to provide private credit 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). The foreign exchange will allow for increased capacity utilization and provision of spare parts required for industrial production. These activities would then increase the level of private investment.

Similarly, donors can promote private investment by supplying funds aimed at improving private sector environment. In particular, Official Development Assistance 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. This way, when the private investment climate improves, the level of private investment would also increase; therefore aid will have a positive impact on private investment.

But, understanding the theoretical effects of aid is not limited to its relationship with physical capital formation, human capital or growth; it may also affect the competitiveness of countries via the real exchange rate. In fact, the traditional 'Dutch Disease' model posits that increases in the supply of foreign currency, induced by aid inflows, will lead to an appreciation of the real exchange rate or loss of competiveness. The Dutch disease, when present, can hurt export orientation, especially if the export sector can benefit from both static and dynamic gains from trade. For instance, Rajan and Subramanian (2009), find

that aid inflows have systematic adverse effects on a country's competiveness through lower relative growth rate of exportable industries, and this works via the real exchange rate appreciation.

However, the assumptions that underlie this model are too rigid and, are frequently violated, for example, it assumes that resources are fully employed, which is quite doubtful. In this regard, aid inflows may not necessarily cause an appreciation of the real exchange rate. Moreover, the effect of an aid increase on the real exchange rate can be neutralized when the aid money is used to import goods from abroad. What remains a puzzle, however, is how aid can lead to a depreciation of the real exchange rate - unless imports increase faster than aid inflows.

In the next section, we will take up some descriptive analyses of the main subjects of the thesis.

2.3 Macroeconomic Performance of West Africa

A common characteristic shared by most developing countries is the production and export of primary commodities, which by their nature, are subject to volatile international market conditions. The main primary commodities exported by West African countries include; cocoa, coffee, timber, cotton and oil. Price volatility affects the region's ability to depend on foreign

exchange from exports, limiting its ability to raise effective demand and growth. More so, the subsidies given to farmers in the Western countries are not helping to catalyze growth, instead they constitute stumbling blocks to the regions' competiveness and ability to raise foreign exchange required for development.

2.3.1: Real GDP Growth, Gross Domestic Investment and Gross Domestic Savings

There are of course many macroeconomic variables; however, we limit the chapter to real GDP growth, gross domestic investment, gross domestic savings, and the exchange rates since they are more related to the overall objective of this study. Thus, Table 2.1 presents their historical overview. Figures 2.1 and 2.2 show the respective country plots for investment and real GDP growth.

Without attempting to disentangle the factors responsible for growth in West Africa, we can observe that real GDP growth between 1975 and 1984 was fairly impressive for many countries, with Cape Verde and the Gambia growing at an average of 9 and 5 percent, respectively. Much evidently, there was a downturn in economic activities between 1985 and 1994 as growth fell in most countries, with few exceptions like, Burkina Faso, Guinea Bissau, Ghana, Guinea and Nigeria where growth improved. While growth deteriorated sharply in Sierra

Leone, Nigeria reversed the negative growth of 0.8 percent it recorded between 1975 and 1984, and then grew at about 5 percent. Similarly, Ghana wiped out its negative growth, and grew at 4.6 percent over the same period.

For most countries, this second period coincides with the period when most commodity prices were adversely affected by international shocks, and many countries resorting to structural adjustments programmes with Bretton Woods institutions (for example, Ghana in 1985 and Nigeria in 1986). Nonetheless, growth performance for most countries in the region was generally above the average growth for low income countries.

Turning to the period between 1995 and 2005, we observe that most countries recovered from the slow and negative growth of the preceding decade. Except Cote d'Ivoire and Guinea Bissau, growth was generally above 3 percent on the average, with faster growth taking place in the WAEMU zone. Guinea Bissau's growth performance deteriorated sharply, mainly as a result of serious unstable political environment that affected its cereal production. Surprisingly, Sierra Leone witnessed an unprecedented growth recovery after a decade of civil war which ended in January 2002. However, this has been associated with inflows of foreign aid which increased significantly during the period (Radelet, *et al.*, 2005).

Observe that Cote d'Ivoire's growth was not generally impressive for most of the decades. This is quite surprising, because the country was regarded as an economic miracle up to the end of the beverage boom of the late 1970s (Azam and Morrison, 1994 and Azam, 1997) and is the largest economy in the CFA (WAEMU) zone.

Figure 2.2 highlights a distinct feature of most SSA countries - large fluctuations in growth. Apart from these large fluctuations, many countries differed in their growth performance. Notably, Ghana maintained a robust and sustained growth of round 5 percent after 1984. In Cape Verde and Guinea, growth fluctuated around 6 percent and around 3 percent, respectively. In contrast, Sierra Leone experienced a negative growth performance, with steady positive growth taking place after 2000.

Though no growth theory has evolved to explain Africa's economic performance, it remains a complicated process and may not be easily and fully understood by distinguishing one particular factor as being responsible for its performance. However, there is an increasing evidence and consensus that poor economic policies, political instability, geographical factors, ethnic

fractionalisation, a lack of industrialization, inadequate domestic resources and low investment, among others are the main factors[7].

Regarding domestic investment, it was generally below the 25 to 30 percent threshold usually recommended for rapid economic growth. For most countries, investment as a percentage of GDP fell between 1985 and 1994 except for Burkina Faso, Mali and Ghana where there were some modest increases. For Guinea, Guinea Bissau, Ghana and Nigeria domestic investment as a percentage of GDP increased between 1995 and 2005 but remained fairly stagnant in other countries. While this was the trend for SSA and developing countries, in East Asia, domestic investment moved at a faster and unprecedented pace - over 32 percent. Similarly, savings have been generally low for many countries in sharp contrast to what obtains in East Asia. This then suggests an acute investment-savings gap in almost all the West African countries, leading to the increasing demand for external capital, especially foreign aid. Again, this is in sharp contrast with East Asia where there is no apparent investment-saving gap. Figure 2.1 tends to show similar pattern in investment behaviour.

Given these facts, we will examine the nature of foreign aid and foreign direct investment to West Africa in section 2.2.3. Our interest will be primarily on

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[7] These issues are explained in details in Fosu (1992); Easterly and Levine (1997); Sachs and Warner (1997); Guillaumont *et al.* (1999); Devarajan *et al.* (2001) and Thirlwall (2006).

foreign aid. First, however, let us examine the nominal and the real effective exchange rates.

2.3.2: Nominal Exchange Rates in WAEMU

This section highlights the movement of the nominal exchange rates for WAEMU. Throughout the thesis, exchange rates are expressed in index, where rates are measured against a base year in which exchange rates are assumed to be 100.

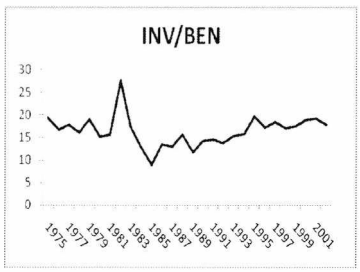
Figures 2.3 and 2.4 illustrate the foreign prices of WAEMU currency - the *CFAF*. The figures show that nominal exchange rates (except for *Lira/CFAF*) depreciated for most of the period, depicting a clear downward trend between the 1970s and early 1980s. Notice, however, that between mid 1980s and early 1990s there was a steady appreciation of the currency (*CFAF*) before it was devalued in 1994. In contrast, the *Lira/CFAF* and *Mark/CFAF* were relatively stable between 1986 and 1994. Overall, the rates converged immediately after the devaluation. Another important observation is that the exchange rates in figure 2.3 show larger variation, over time, than those of figure 2.4, implying that the former is likely to dominate the movements in the real effective exchange rate if relative prices of goods remain fairly stable.

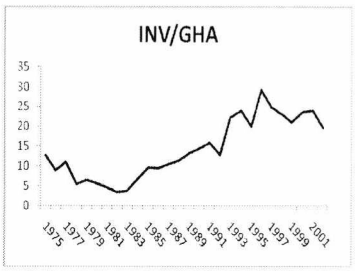
Table 2.1: Macroeconomic Indicators for West Africa (1975-2005)

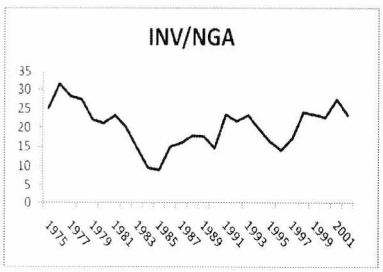
	GDP growth			Gross Domestic Investment			Gross Domestic Savings		
	1975-1984	*1985-1994*	*1995-2005*	*1975-1984*	*1985-1994*	*1995-2005*	*1975-1984*	*1985-1994*	*1995-2005*
WAEMU									
Benin	3.1	2.9	4.6	17.7	13.6	18.4	-1.7	-0.01	5.6
Burkina Faso	3.3	3.8	6.4	17.9	20.8	19.9	-3.4	5.9	5.4
Cote d'Ivoire	2.7	1.1	2.1	23.6	10.3	11.9	24.3	16.3	20.9
Guinea Bissau	3.3	3.5	0.7	23.8	3.4	15.8	-3.0	2.0	-4.2
Mali	3.6	1.7	5.8	14.8	21.7	22.8	0.2	3.1	10.4
Niger	0.5	2.2	3.5	18.2	10.8	12.7	8.4	5.3	4.5
Senegal	2.5	2.0	4.5	17.6	11.6	18.3	6.2	3.5	9.1
Togo	2.1	1.3	3.7	29.8	16.8	17.5	21.4	7.9	3.8
Non-WAEMU									
Cape Verde	8.9	4.4	5.4	..	30.5	25.6	..	-2.0	-9.5
Gambia	5.1	2.9	3.9	19.7	19.1	20.4	4.3	7.5	8.7
Ghana	-1.4	4.6	4.6	6.9	14.3	23.7	6.3	6.0	7.3
Guinea	1.5	4.1	3.8	..	19.6	17.0	14.1	18.2	13.3
Nigeria	-0.8	4.7	4.4	22.3	17.9	21.2	21.5	21.2	23.9
Sierra Leone	2.3	-1.7	4.0	15.1	9.0	8.6	9.2	11.5	-5.6
SSA	**2.1**	**1.6**	**3.9**	**24.0**	**17.6**	**18.0**	**21.9**	**17.4**	**15.9**
Low income C.	**4.0**	**3.3**	**4.7**	**25.9**	**26.0**	**25.0**	**24.9**	**25.7**	**25.6**
East Asia	**7.7**	**8.7**	**7.6**	**31.6**	**35.7**	**35.2**	**31.4**	**35.4**	**38.4**

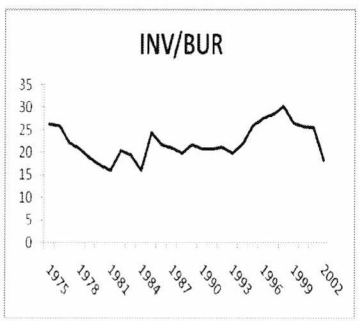
Source: World development indicators (2008) and own calculation.

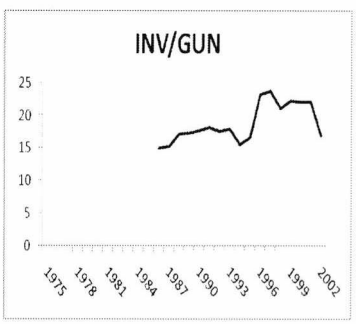
Figure 2.1: Investment as a percent of GDP

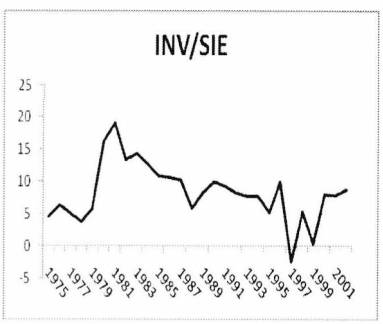


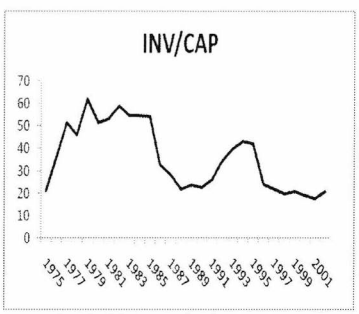


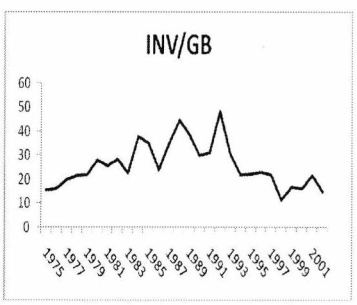


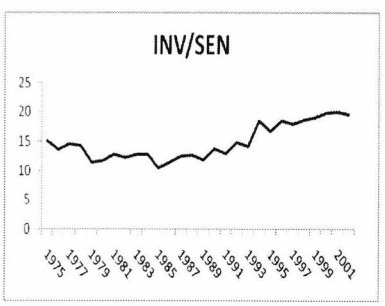


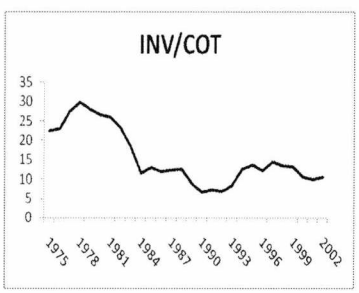


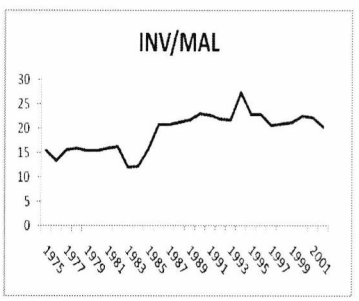


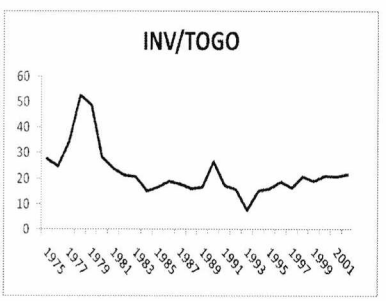


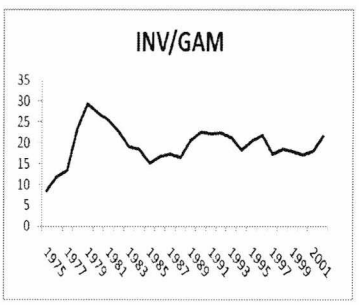












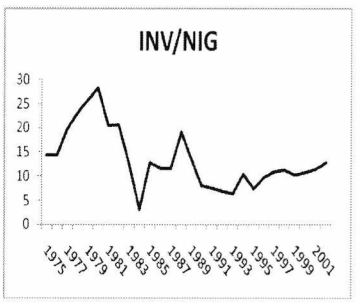
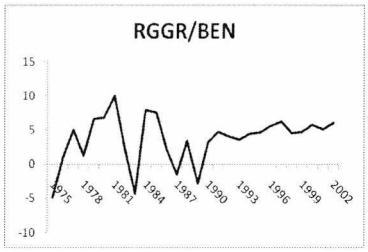
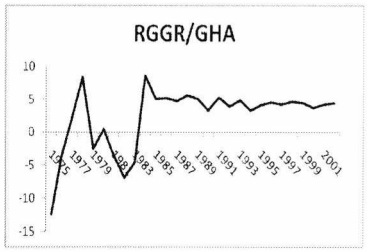
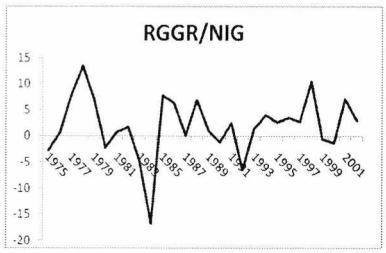
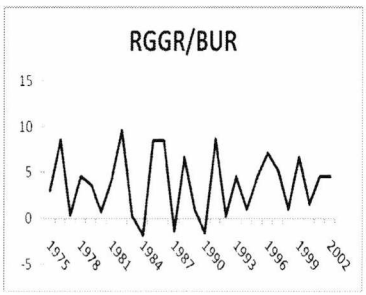


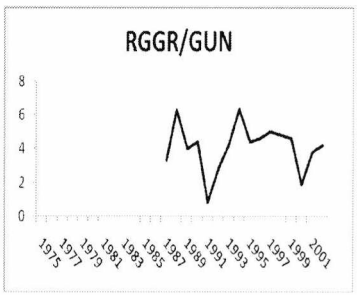
Figure 2.2: Growth of Real GDP

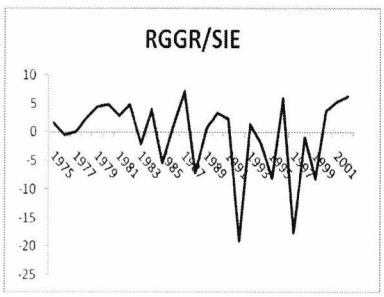


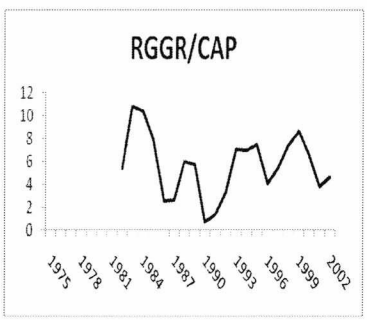


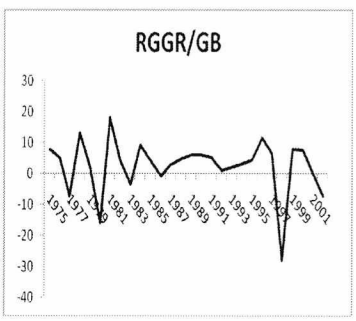


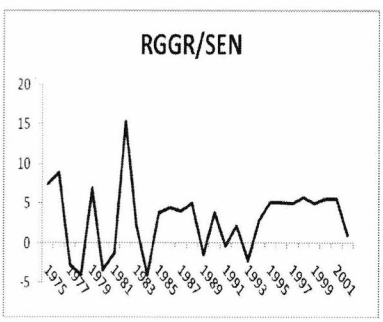


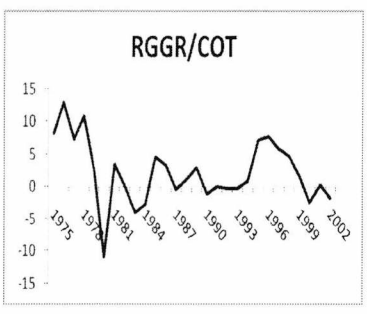


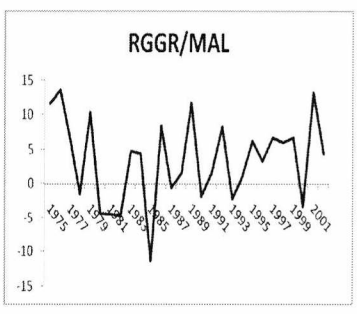


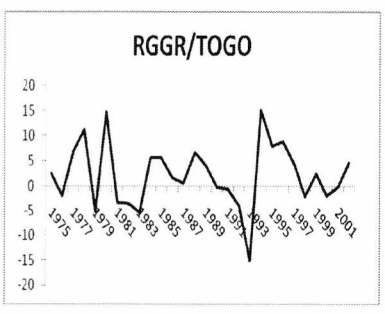


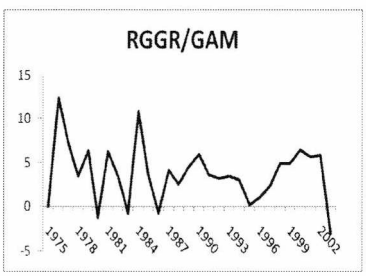












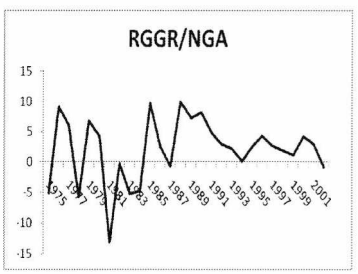


Figure 2.3: Nominal Exchanges Rates of WAEMU with US, China and Japan

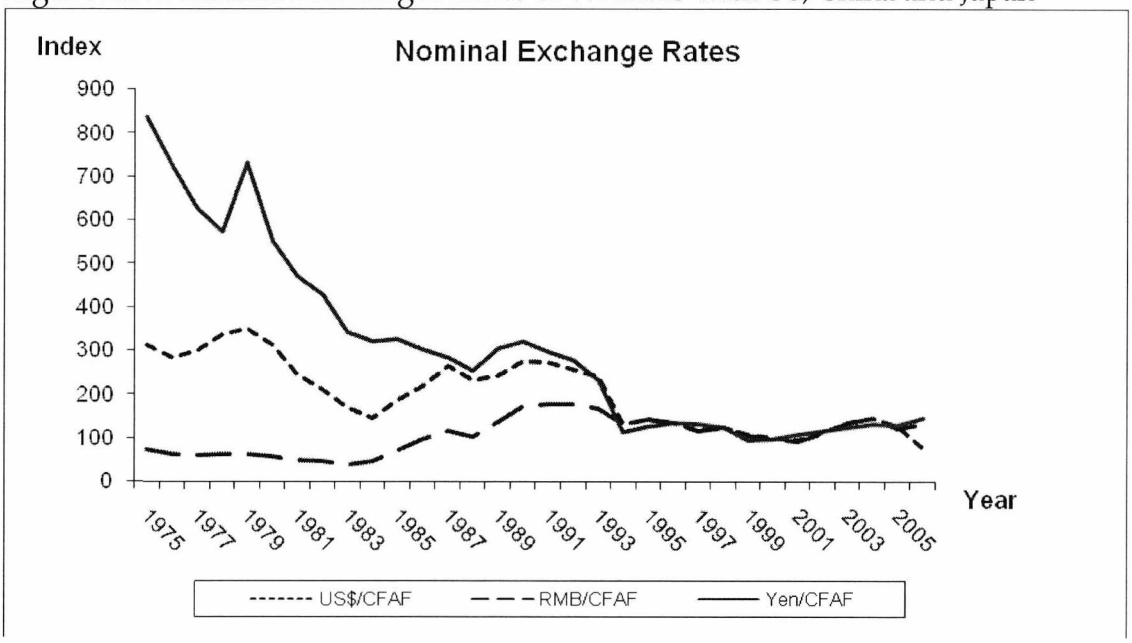
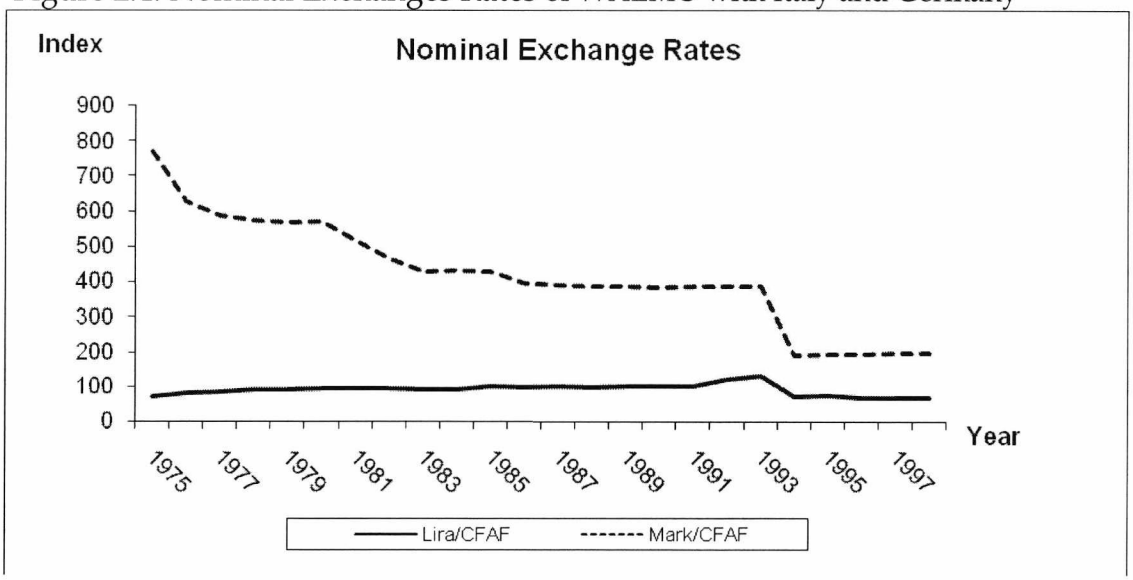


Figure 2.4: Nominal Exchanges Rates of WAEMU with Italy and Germany



2.4: Capital Inflows: Foreign Aid and Foreign Direct Investment (FDI)

Foreign aid has been a significant source of external finance to most West African countries. Table 2.3 gives a historical overview of foreign aid, and compares it with the inflows of foreign direct investment. The first three columns explain the trend in foreign aid. As can be observed, between 1975 and 1984 aid as a percentage of GDP was above 10 percent for many countries, even as high as 38 percent in Guinea Bissau and almost 20 percent in Gambia. In fact, in the following decade, average aid as a percentage of GDP did not only increase, but also intensified for many countries in West Africa. In particular, Guinea Bissau, Mali, Cape Verde and Gambia aid as a percentage of GDP was as high as 55 percent, 21 percent, 32 percent and 34 percent, respectively. The SSA average was well below these figures.

As observed earlier, between 1985 and 1994, growth generally fell for most countries in West Africa, including other SSA countries. Interestingly, most of these high aid countries experienced some modest growth. In fact, many authors, for example, Gomanee *et al.*, 2005; CfA[8], 2005, working in the field of development economics argue that growth in SSA would have been worse without aid. Again, during the same decade the REER also depreciated for most countries, suggesting a possibility of an inverse association between foreign aid and the movements in the REER.

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[8] CfA stands for Commission for Africa.

We observe a sharp fall in aid between 1995 and 2005 for many countries except for Sierra Leone that experienced a sharp rise from 17 percent to 27 percent. Much evidently, Sierra Leone experienced a remarkable rise in growth between this period - a jump from -1.7 percent to 4 percent.

The annual plots of total, multilateral and bilateral aid (see figures 2.5, 2.6 & 2.7) for the individual countries present a clearer pattern in aid receipts, and suggest some minor heterogeneity in the sample which will require an estimation technique that can fairly address this issue.

In sum, while the size of aid has been significant in many countries, the story is different for the two biggest economies in West Africa - Cote d'Ivoire and Nigeria.

As for FDI, values in columns 4 to 6 of Table 2.3 are not very remarkable. In the first instance, this may suggest that FDI is not a significant form of external finance in West Africa. Except for Nigeria that has a modest amount of FDI because of the large oil explorations; FDI in other countries has remained around 1 percent of GDP on the average. Most recently, however, few countries have benefitted from the surge in FDI from China.

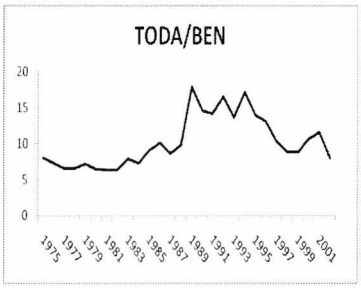
Table 2.2: Foreign Aid and Foreign Direct Investment in West Africa (1975-2005)

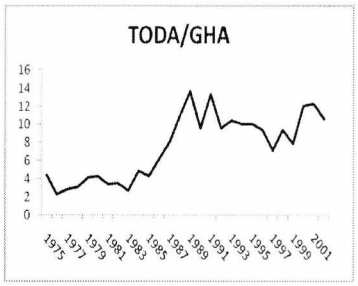
	Foreign Aid % GDP			**Foreign Direct Investment % GDP**		
	1975-1984	1985-1994	1995-2005	1975-1984	1985-1994	1995-2005
WAEMU						
Benin	7.0	13.4	10.2	0.2	2.0	1.4
Burkina Faso	10.9	14.4	14.3	0.1	0.2	0.4
Cote d'Ivoire	2.0	6.7	5.1	0.8	0.3	2.3
Guinea Bissau	37.7	55.1	42.7	0.4	0.8	1.4
Mali	14.9	20.5	15.4	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**

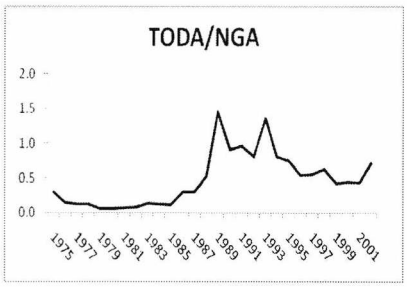
Source: World Development Indicators (2008) and own calculation. LIC stands for low income countries.

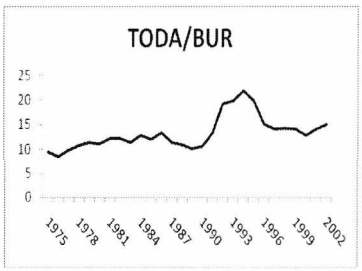
In sum, looking at these figures only helps us to gain some insights into the evolution of the variables and does not tell us the degree of association or the cause effect relationship. Given these constraints, we will examine the cause-effect relationships, so that we can draw some meaningful inferences from this enquiry. This forms the basis of the next chapters.

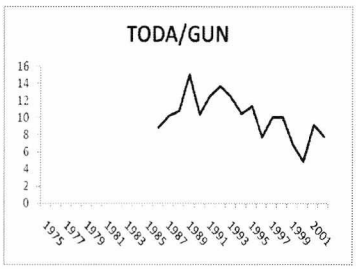
Figure 2.5: Total aid as a percent of GDP

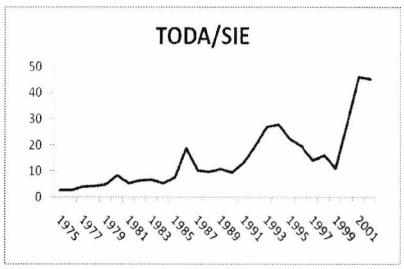


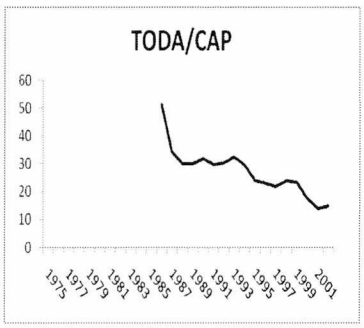


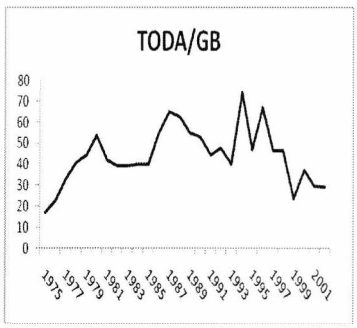


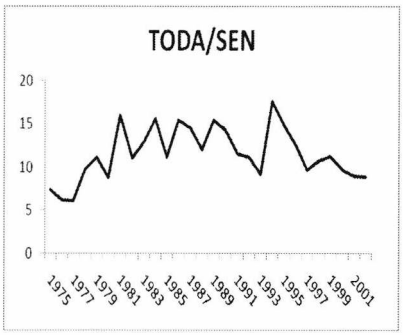


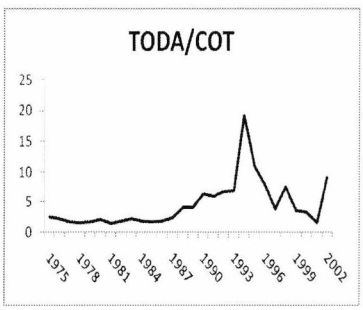


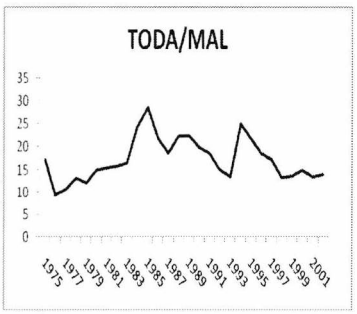


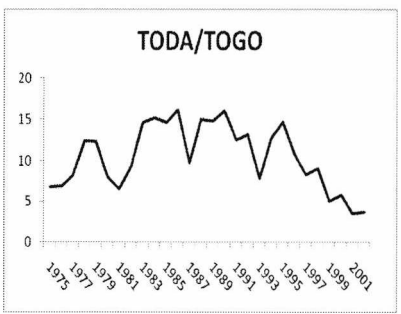


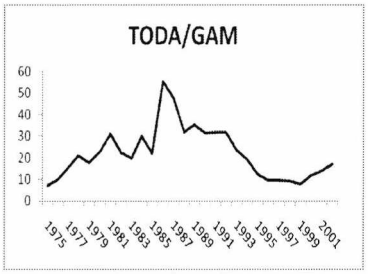












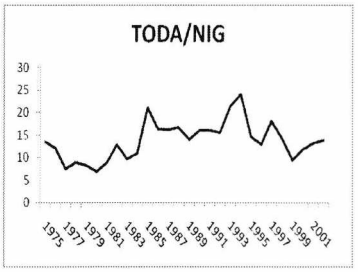
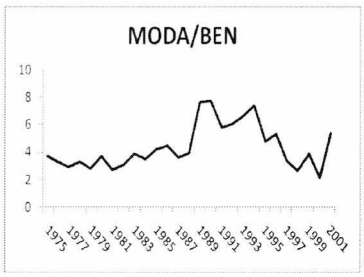
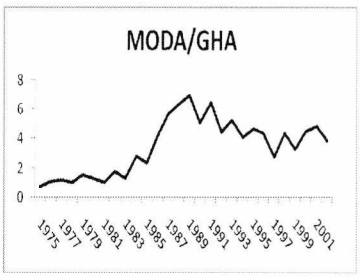
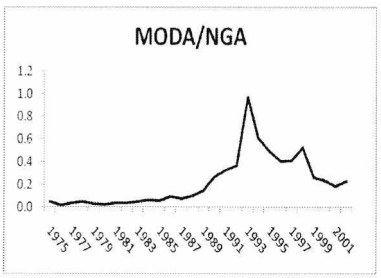
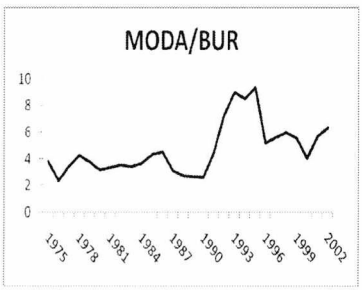


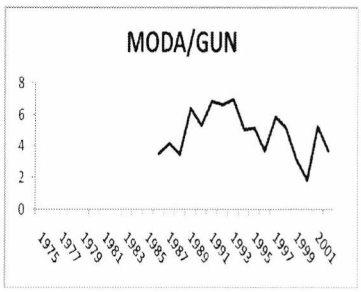
Figure 2.6: Mutilateral aid as a percent of GDP

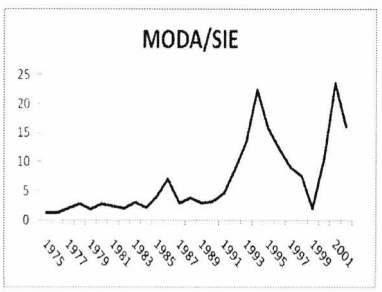


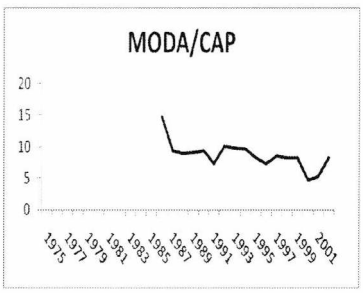


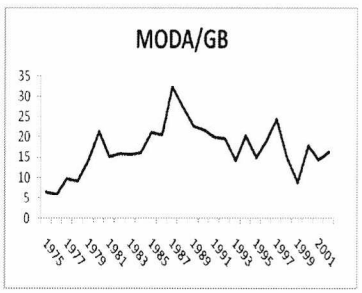


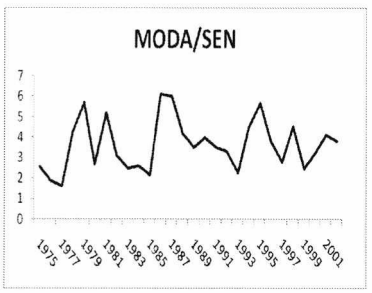


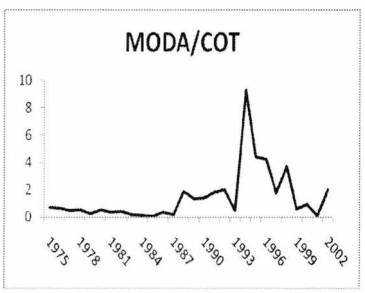


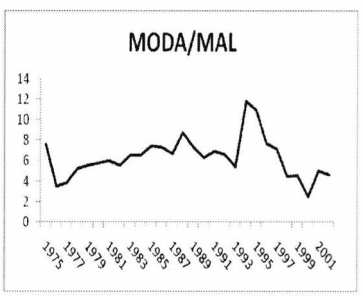


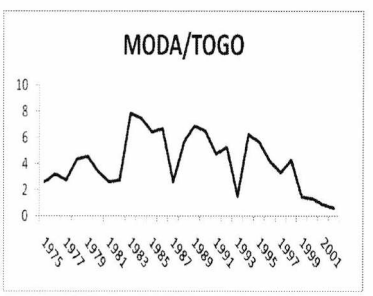


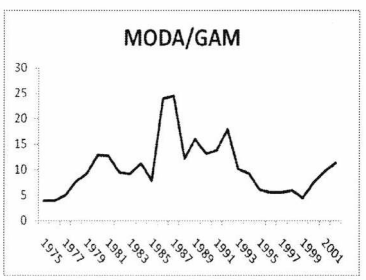












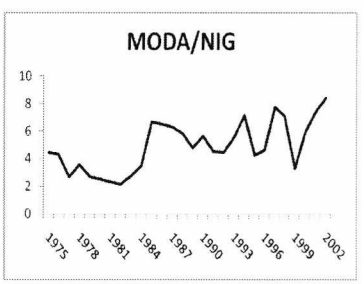
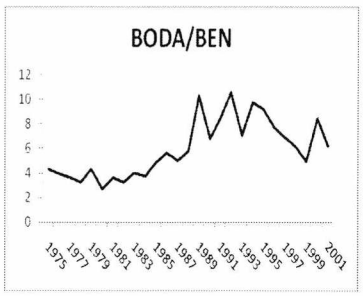
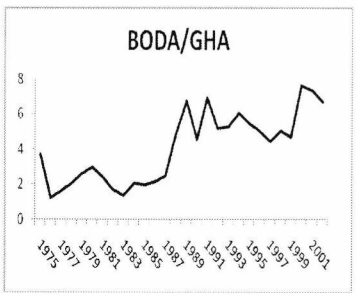
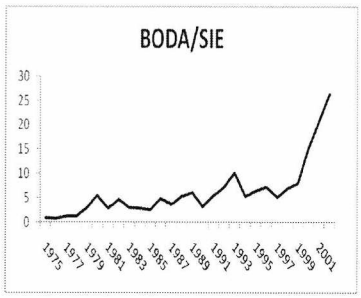
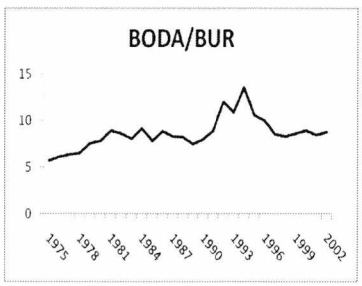


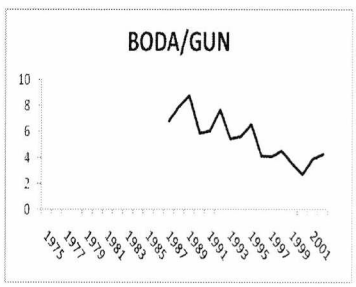
Figure 2.7: Bilateral aid as a percent of GDP

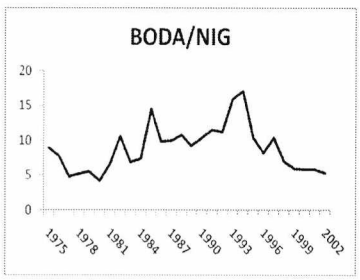


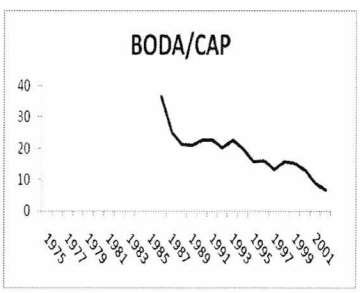


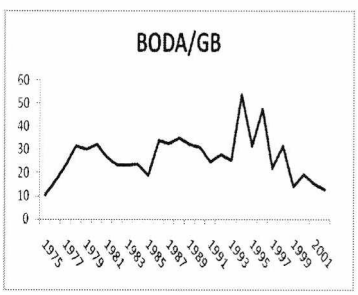


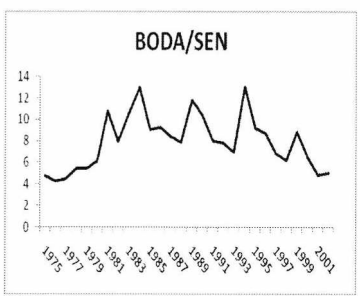


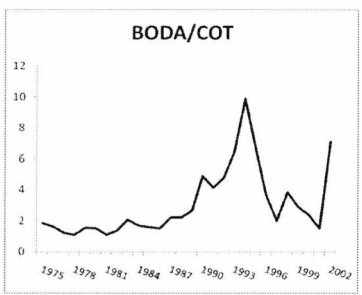


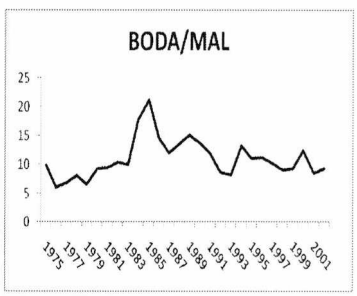


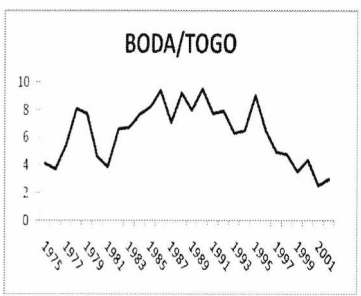


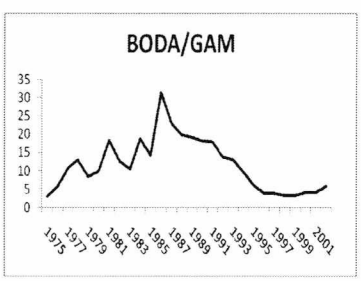


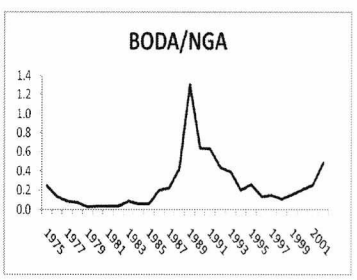












2.5 Conclusion

In this chapter we have previewed the theory of foreign aid and economic development alongside the descriptive overview of the performance of the main subjects of the thesis. These are mainly non-parametric procedures.

From this analysis, we conclude that growth has sometimes been high in some countries and negative in some others, implying some overall fluctuations in growth performance for West Africa. Again, in some countries were foreign aid intensified, we noticed some growth sparks, suggesting the possibility of an association between aid and growth. It is not very clear to identify if aid and the real exchange rate have followed a similar pattern, instead we noticed times when they moved in opposite direction.

All this suggests the need to use parametric procedures to investigate the impact of aid on these variables for West Africa.

Chapter 3

The Impact of Foreign Aid on Domestic Private Investment in West Africa

3.1 Introduction

Private sector investment is more directly related to economic growth in developing countries than public sector investment (see for example, Lensink and Morrissey, 2006; Khan and Reinhart, 1990). However, in many West African countries, investment is low[9] and, dominated, in most cases by public sector investment. In this chapter, the empirical link between aid and private investment will be investigated. As such, if aid supports private sector investment it will lead to higher growth and vice versa.

Though it is widely believed that aid affects private investment indirectly through public investment, there could also be a direct channel between aid and private investment as have been discussed in the previous chapter (see

[9] Most economists (for example, Barro and Lee, 1993; Collier and Gunning, 1999; Devarajan *et al.*, 2001; Thirlwall, 2006) are of the view that SSA countries have not performed well because of low investment and lack of industrialization.

theory of foreign aid and development). The empirical literature (see Table 3.2) has also attempted to test this direct channel, but without examining the impact of different aid types.

While there has been an extensive literature on the nature of the relationship between aid and investment, very little or nothing is known about the effects multilateral and bilateral on private investment. Though there is no *a priori* that multilateral and bilateral aids should have different effects on investment and growth, drawing from the vast literature on aid allocation one can test whether their effects differ. While the literature on aid allocation remains contentious, recent conclusions point to multilateral institution as the viable mechanism for improving aid effectiveness (CfA, 2005).

Previous literature, represented by Maizels and Nissanke (1984); Cassen *et al.* (1994); Boone (1996); Burnside and Dollar (2000) argue that multilateral has development motives as its definite objective, and tends to be allocated based on recipients' need, while bilateral aid is largely influenced by political considerations. In contrast, recent studies (for example, Berthelemy, 2006; Fleck and Killby, 2006a, 2006b) argue that some bilateral donors frequently allocate aid based on the need criteria. In this sense aggregating donors may likely produce some estimation bias - since it amounts to assuming that all donors behave the same. Berthelemy (2006), find that French aid tends to be driven by

self-interest variables while British is allocated based on both self-interest and needs. Fleck and Killby (2006a, 2006b) also show that US bilateral aid allocation is often based on the need criteria and on the composition of the US government. They find that development motives receive more weight when the president and Congress are more liberal, while more weight is given to commercial and political interests when the Congress are more conservative. Similarly, they find that US interests tends to influence that allocation of World Bank aid.

However, given that our sample is largely dominated by countries that mainly receive French and British bilateral aid, we can fairly make the distinction between multilateral and bilateral aids, recognising any further aggregation bias. In this sense, our explanation for why multilateral aid is likely to have a positive effect is that it has growth and wider development objectives as its central objective. Again, multilateral aid is often handled with greater expertise which then enhances its effectiveness[10]. Arguably, and in parallel to bilateral aid, multilateral aid is devoid of distortionary political pressures and interferences.

As for bilateral aid, it may be given to countries that have strong political and commercial ties with donors, hence may not totally promote economic growth

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

and development[11]. 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.

Therefore, the primary aim of this chapter is to examine if foreign aid has any impact on private investment in West Africa. Following from this, we investigate whether multilateral aid and bilateral aid affect private investment differently. In a related analysis we test if aid uncertainty has any effect on private investment.

From the evidence that emerge, multilateral aid affects private investment positively, but not bilateral aid. Aid uncertainty, measured as the coefficient of variation has a negative impact on private investment and therefore affects the effectiveness of foreign aid on domestic private investment.

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

[11] Some papers 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.

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

3.2 Empirical Background

Our goal in this section is to review the relevant empirical literature on aid and investment. With this in mind, Table 3.1 presents the summary of some cross-country studies on the impact of total aid on total investment, while Table 3.2 shows those of aid and private investment. Generally, the studies that have investigated the aid-total investment relationship in SSA and Africa include Levy (1988); Gyimah-Brempong (1990); Lensink and Morrissey (2000); Gomanee *et al.* (2002a, 2002b and 2005).

Apart from the studies mentioned above, there are also other studies on total aid and total investment for developing and low income countries, and include Levy (1987); Boone (1994); Hansen and Tarp (2001); Collier and Dollar (2004); and Hansen (2002; 2004)[12]. Surprisingly, none of these studies examine the impact of multilateral and bilateral aid on either total investment or private investment. Studies on the impact of total aid on private investment are those conducted by Hadjimichael *et al.* (1995); Dollar and Easterly (1999) among others. For example, Hadjimichael *et al.* (1995) used the generalized least

[12] Hansen (2002, 2004) studied a group of Highly Indebted Poor Countries (HIPCs) and non-HIPCs.

squares (GLS) techniques to study a panel of 41 Sub-Saharan African countries. The main finding of the study is that a one percentage point increase in foreign aid leads to a 0.4 percentage point increase in 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[13]. 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.

Totally, these studies do not distinguish between multilateral and bilateral aid. Though the study by Hadjimichael *et al.* is close 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.

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[13] 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).

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 a sub-sample of African countries, Lensink and Morrissey, find that controlling for uncertainty increases the significance of the coefficient on aid in the investment regression. However, the coefficient on uncertainty is not significant.

However, there may be some contentious issues with the study by Lensink and Morrissey. First, the cross-sectional data on which the result is based do not take into account the time-series dimension of the data. It is well know 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. More specifically, 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 issues.

Now, to model private investment, we require some knowledge of the main theories of investment. On this basis, we examine and discuss the 'fundamental' theories of investment.

3.3 Traditional Theories 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. Although these theories are quite revealing, independently, however, they have not been very successful for developing countries' analyses. This difficulty has rather led to the emergence of hybrid models, attempting to take into account, the structural composition of these economies.

3.3.1 The Keynesian Theory

In *The General Theory*, Keynes (1936) recognised the existence of private investment decisions in the economy, which depends on the marginal efficiency of capital that reflects the opportunity cost of capital. Based on this, firms rank investment projects depending on the marginal efficiency of capital or the internal rate of return and thereafter, choose those projects whose internal rates of return exceed the rate of interest. 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.

Table 3.1 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*	*Results*
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 (1990), SSA	*2SLS*	1968 to 1987	Various aid types (grants, loans and food) have positive impact on investment rate 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 positive impact on investment at 10 per cent level of significance when uncertainty is not controlled for. The uncertainty coefficient is not significant but its inclusion increases the significance of the coefficient on aid the variable from 10 to 5 per cent.
Hansen and Tarp (2001), Cross-Country	*Fixed Effects (FE) and GMM*	1974 to 1993	Aid has significant positive impact on investment. For the fixed effects, investment responds between 2/3 and 3/4 at the median, while for GMM its response at the median exceeds unity.
Gomanee *et al.* (2002a, 2002b,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 (2002, 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 3.2 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*	*Results*
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 crowds in 1.9 percentage points increase of private investment in a good policy environment, while in a poor policy environment aid crowds out 1.2 percentage points of private investment.

3.3.2 The Accelerator Model

In the accelerator theory, the level of investment depends on the level of output (Harrod, 1936, 1948; Hansen, 1949; Hicks, 1949). This is the same as saying that the rate of investment depends on growth rate. According to Hicks (p.199), 'when the rate of increase in output has begun to decline, as it must as full employment is approached, the induced investment in inventories and in fixed plant and equipment will fall'.

The accelerator model is popular not only because of its simplicity, but also its 'realism', given that capital is always required to produce output. The model assumes that the demand for machinery and factories is derived from the demand for goods. Thus, if the demand for the goods that capital equipment produces goes up and the existing capacity cannot meet this increased demand, then, a new investment in plant and machinery will be required to increase production. Because rises in demand lead to rises in investment, an investment boom would lead to an increase in GDP. But this is possible only to the extent that a constant increase in demand does not lead to the same level of investment. The problem here is that cost of capital is assumed away in investment decisions.

3.3.3 The Neoclassical Model

Jorgenson (1967) and Hall and Jorgenson (1971) formulated the neoclassical model to address the restrictive assumptions of the accelerator theory. Here, the desired capital stock depends on the user cost of capital and the level of output. The user cost of capital is in turn said to depend on the price of capital goods, the real interest rate, and the depreciation rate. The difference between the current and desired capital stock is thought to be a result of lags in decision making and delivery, which then gives rise to an investment equation. Therefore, increases in user cost of capital will lead to lower rate of investment. The assumptions of this model are: perfect competition and exogenously

determined output; static expectations about future prices, output and interest rates. However, some of these assumptions may be too restrictive, especially, the assumption of static expectations regarding economic agents.

Now that the traditional theories of investment have been discussed, we can proceed to set up a formal investment model, and thereafter, discuss other determinants of private investment that have featured in the empirical literature.

3.4 Determinants of Private Investment in West Africa

From the discussions above, it is apparent that no particular theory takes into account all the important factors that influence the behaviour of private investment, especially in developing countries. In this regard, it is instructive to derive a basic investment model that combines both Jorgenson's idea and the accelerator theory. Now consider the relation between the desired capital stock[14] (K^*), the level of output (Y) and the user cost of capital (C):

$$K_t^* = \phi Y_t C_t^{-\sigma} \qquad (3.1)$$

[14] This is 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. For simplicity, we will ignore the problem of machines or other forms of capital stock wearing out or becoming obsolete. 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:

$$I_t^n = \Delta K_t^* \tag{3.2}$$

Therefore (3.2) can be written as,

$$I_t = \Delta K_t^* \tag{3.3}$$

Substituting equation (3.1) into (3.3) we get our investment model:

$$I_t = \Delta\phi(Y_t C_t^{-\sigma}) \tag{3.4}$$

Assuming a unitary elasticity of substitution between capital and labour, by adding the error term, we get our basic model[15]:

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

$$I_t = \phi_1 \Delta Y_t - \phi_2 \Delta C_t + \mu_t \qquad (3.5)$$

Now, we can augment equation (3.5) with other determinants of private investment discussed below:

3.4.1 Financial Deepening

McKinnon (1973) and Shaw (1973) argue that financial markets in developing countries are repressed. Therefore, credit availability can influence investment behaviour independent of the cost of capital. In this instance, 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*.

3.4.2 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 fluctuates frequently. If it is difficult for

firms to fairly predict their costs and revenues, they may be discouraged from investing. The presence of high inflation may suggest inability of government authorities to efficiently manage the economy, thereby reducing private sector investment. Therefore, high rates of inflation would be expected to lower private investment.

3.4.3 Debt Service

The amount of foreign exchange and domestic resources committed to debt service obligations can be a disincentive to invest. Certainly, investors will fear that the returns from domestic investment will face a high marginal tax from government. In addition, investors may also fear that this will lead to the 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 instance, Hadjimichael *et al.* (1995). This variable is important because most of the countries in the sample have been severely indebted.

3.4.4 Trade Openness

Openness to trade can also affect private investment, but how best to measure this variable is a problematic issue. Investment may respond to openness

through a size of the market effect. According to Adam Smith, market size imposes a constraint on the division of labour, so that more open countries are better able to exploit increasing returns to scale (Wacziarg, 2001). Two variables have emerged as top proxies for openness to trade. First is the ratio of exports plus imports to GDP.

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

3.5 Empirical Specifications, Data and Estimation Techniques.

In this analysis, two 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.

We use data from 1975 to 2002 to investigate the foreign aid-private investment relationship. However, for most of the series, there are missing values for individual years. For instance, for Liberia, there is a lot of missing data for most series, and consequently we dropped it from our sample. Thus, we have an unbalanced panel of 14 countries observed over 28 years. We take 4 year period averages for all the variables from 1975-78 to 1999-02, thus giving 7 periods. Where there are missing data in-between the average period we divide by the number of years for which the data are available instead of by 4. The gain from taking averages is that it helps to smooth out erratic shocks in the data. It also conforms to the practice in the empirical work using panel data, where four and five year averages have been used.

To proceed, we re-write the basic model (3.5), giving equation:

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it} + \beta_2 r\,\mathrm{int}_{it} + \mu_{it} \qquad (3.6)$$

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

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it} + \beta_2 r\,\mathrm{int}_{it} + \beta_3 m2gdp_{it} + \beta_4 \inf_{it} + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_t toda_{it} + \mu_{it} \quad (3.7)$$

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.

At this stage, we distinguish between multilateral and bilateral aid. As a result, equation (3.7) can be written in unrestricted form, to get equation:

$$pigdp_{it} = \alpha + \beta_1 gdpg_{it} + \beta_2 r\,\mathrm{int}_{it} + \beta_3 m2gdp_{it} + \beta_4 \inf_{it} + \beta_5 dstx_{it} + \beta_6 xg_{it} + \delta_m \mathrm{mod}\, a_{it} + \delta_b boda_{it} + \mu_{it} \quad (3.8)$$

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 also insulate our estimates from sample heterogeneity, we apply the traditional panel data method. The Wooldridge (2002) unobserved effects model is a natural technique in this circumstance. Now consider the model for T time periods:

$$y_{it} = x_{it}\beta + c_i + \mu_{it}, \quad t = 1,..., T \tag{3.9}$$

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 is the error term. This model can be estimated using the random effects (RE) estimator or the fixed effects (FE) estimator. The choice of 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. Therefore, all inferences will be restricted to the observed individual countries (Baltagi, 2008; Wooldridge, 2002). In contrast, inference using RE pertains 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 the

deviations from means transformation (within transformation). Put differently, since these 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 use the fixed effects method to estimate our unobserved effects model. In this case, we avoid the inclusion of observed time invariant variables in our estimating equations. 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. $H_0 : c_1 = c_2 = ... = c_{N-1} = 0$. Empirically, 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 (3.9) 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 (3.9) over $t = 1,..., T$ to get the cross-section equation

$$\bar{y}_i = \bar{x}_i \beta + c_i + \bar{\mu}_i \qquad (3.10)$$

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

Subtracting equation (3.10) from equation (3.9) for each t gives the within transformed equation:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)\beta + \mu_{it} - \bar{\mu}_i \qquad (3.11)$$

Alternatively, equation (3.11) can be rewritten as:

$$\ddot{y}_{it} = \ddot{x}_{it}\beta + \ddot{\mu}_{it}, \quad t = 1,2 ..., T \; ; \; i = 1,2 ..., N \qquad (3.12)$$

where $\ddot{y}_{it} \equiv y_{it} - \bar{y}_i$, $\ddot{x}_{it} \equiv x_{it} - \bar{x}_i$, $\ddot{\mu}_{it} \equiv \mu_{it} - \bar{u}_i$. This transformation removes the country specific effect c_i. In this form, the FE estimator is the pooled OLS estimator of (3.12).

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

3.6 Impact of Total, Multilateral and Bilateral Aid on Private Investment

The objective of this section is to estimate the parameters in equations (3.7) and (3.8) 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 since aid can affect

private investment with a lag (over four to five years). Two points stand out from Table 3.3. First, the *F-test* of fixed effects suggests a strong presence of fixed effects in all the specifications. Second, the coefficient on total aid is significant, but once we split aid into multilateral and bilateral aids we find a result that tends to support our intuition. Multilateral aid is significant, while that of bilateral aid remains negative and insignificant (our preferred model).

Other variables, for example, 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. As for real interest rate, it is significant but has the wrong sign.

In sum, our findings suggest that multilateral aid may have an impact on private investment different from that of bilateral aid. Therefore an investment equation such as (3.8) can give misleading results as far as the impact of aid on private investment is concerned. This result fairly captures the recent campaign for more aid to be channelled through multilateral sources (CfA, 2005).

Table 3.3: Impact of Aid on Private Investment: Fixed Effects

Dependent variable: Share of private investment in GDP (*pigdp*)		
	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

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

Robustness Analysis

To examine the robustness of our results, we re-estimate the equations by dropping real interest rate and money supply variables. This is the so-called general-to-specific approach which gives a parsimonious specification. The result of this exercise is located in Table 3.4. The results are similar to those of Table 3.3 only that goodness of fit reduced to around 64 percent.

Table 3.4: Impact of Aid on Private Investment: Fixed Effects
(Parsimonious Model - using only significant variables)

Dependent variable: Share of private investment in GDP (*pigdp*)		
	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

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

3.7 Aid Uncertainty and Private Investment

Another strand in the empirical literature on aid that we examine is the effect of aid uncertainty on investment. In particular, uncertainty regarding the stability of aid inflows can discourage private investment (Hadjimichael *et al.*, 1995). As discussed earlier, the leading empirical study of this issue is Lensink and Morrissey (2000), which uses an OLS technique. However, we differ on three

important fronts: First, we use a different estimation procedure - the fixed effects method, to estimate the extent to which aid uncertainty affects domestic private investment. This technique accounts for country specific effects. Second, we test for the impact of aid uncertainty using both aggregate aid and aid disaggregated into multilateral and bilateral components. Third, our measure of uncertainty is the coefficient of variation, computed for each sub-period. To an extent, these issues restrict us from comparing the results directly.

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

Turning to the empirical effects of aid uncertainty, specification (1) in Table 3.5 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 3.5 suggests that multilateral aid (*covmoda*) may not be uncertain. However, even if there is any uncertainty in multilateral aid, its size is not large enough to affect the impact of aid on domestic private investment.

Table 3.5: 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 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

On the other hand, it 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 weak. These results are broadly in line with the explanations we have provided.

3.8 Conclusion

This chapter 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 may perform better than the aggregate 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 affects the effectiveness of bilateral aid on domestic private investment. What we establish from these results is that high volatility is bilateral aid is the source of the aid uncertainty.

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

Chapter 4

The Impact of Aid on Economic Growth in West Africa

4.1 Introduction

The relationship between aid and economic growth has been the subject of numerous empirical studies. Indeed, the past two decades has witnessed an outpouring of empirical research on the impact of aid on economic growth (Levy, 1988; Boone, 1994; Hadjimichael et al., 1995; Burnside and Dollar, 2000; Islam, 2005; Roodman, 2007) yet many central issues of interest remain unresolved. For instance, no consensus has been reached on the particular country characteristics under which aid affects growth positively across countries and over time (e.g. geography, economic institutions, political institutions etc). Nor is there an agreement on whether different aid types affect growth in the same way. There is also no consensus on the correct functional form of the aid-growth model; that is, whether the relationship is linear or quadratic in variables. In fact, results from many studies on these issues frequently reach conflicting conclusions.

Some countries that have received large amounts of aid have witnessed rapid growth, while others have witnessed slow or even negative growth. More remarkable is that, some countries that have received only a modest amount of aid have performed very well, while others have not. In West Africa, growth has been sluggish, but it seems a few countries have done relatively better in the presence of a high aid-GDP ratio, implying that aid may be a growth-inducing force (which is a testable hypothesis).

In fact, the debate on the impact of aid on growth is by no means over. For instance, Burnside and Dollar [BD from henceforth] (2000) argue that aid works only in a good policy environment; Guillaumont and Chauvet (2001) argue that aid is only effective in countries that are vulnerable to climatic and trade shocks; Hansen and Tarp (2001) note that aid works everywhere but with a tendency to diminishing returns; Dalgaard *et al.* (2004) argue that aid is more effective outside the tropics; and Islam (2005) argues that aid can promote growth only in countries where the political environment is stable. By contrast, Boone (1994, 1996) and Rajan and Subramanian (2005), using different specifications, find that the relationship is negative or weak. Our reading of the literature shows that choice of countries and coverage, time periods, country characteristics, and competing theoretical models have left the answer to the aid effectiveness question still begging.

The objective of this chapter is to investigate the impact of aid on growth in West Africa, with special emphasis on multilateral and bilateral components, using the unobserved effects approach of Wooldridge (2002). This methodology has already been set out in chapter 3. As we do not intend to resolve the many disputes in the aid-growth literature as identified above, this study complements other studies that have tried to reason along the same lines.

With this in mind, the chapter presents the following innovations: (1) First to test in a systematic manner, the impact of multilateral and bilateral aid on growth in West Africa using the FE-OLS and FE-2SLS techniques; (2) the use of different endogeneity assumption and strategy to estimate the growth equation. What is more, splitting aid into multilateral and bilateral components helps to clarify the aid-growth endogeneity issue. While we agree with some authors (e.g. Gyimah-Brempong, 1990 and Clemens *et al.,* 2004) that testing the general hypothesis, that all aid has the same positive effect on growth may be restrictive, we differ on the correct specification, aid classification and estimation assumptions; (3) use of a modified equation to generate an investment variable that is not attributed to aid.

We find evidence of a positive significant effect of multilateral aid on growth. This is similar to our finding on the relationship between aid and domestic private investment in the previous chapter. Our results tend to support the

emerging consensus on the need for aid donors to mobilise and channel more aid through multilateral agencies[16]. As to whether bilateral aid affects growth, we find some robust evidence that it has had a negative impact for West Africa.

The remaining part of the chapter is organised as follows: section 2 reviews some empirical studies on aid and growth; section 3 briefly discusses aid and growth theory; section 4 sets out the empirical specifications, and discusses the variables and the data, while estimation techniques and issues are discussed in section 5. Some results are given in section 6, while section 7 addresses the aid-investment double counting problem. Finally, section 8 concludes.

4.2 Foreign Aid and Growth: The Empirical Literature

Early studies which find a positive relationship between aid and growth are Papanek (1973)[17]; Levy (1988); Gyimah-Brempong (1990). This strand of research tested a linear specification of the aid-growth model, until the mid-1990s when researchers recognised the possibility of the effect of aid diminishing, as the volume of aid increased. First to apply the diminishing returns specification to the aid-growth relationship was Hadjimichael *et al.*

[16] See CfA (2005) and IDA 15 Working Group (2007) for more insights.
[17]This study was the first to depart from the old tradition of previous literature, which assumed capital inflows to be synonymous with aid.

(1995)[18]. Others that have also tested for diminishing returns to aid are Durbarry *et al.* (1998); Hansen and Tarp (2001); and Gomanee *et al.* (2002a, 2002b, 2005). However, most of these studies do not differentiate between the various aid types and were also hampered by inadequate data and lack of rigorous econometric work, e.g. Papanek.

Recently, a new dimension on the aid effectiveness literature has emerged. This literature tends to focus on country-specific circumstances that affect aid effectiveness. The seminal work by BD (2000) provides the lead in this literature. Using a sample of 56 middle and low income countries, which includes an SSA dummy in the regressions, BD find that aid is only effective in 'good' policy environments[19]. An important innovation of this work is the inclusion of interaction term (aid × policy index) in the growth equation[20]. This term measures the effectiveness of aid in a good economic policy environment. Good policy itself is defined in terms of sound macroeconomics - a small budget deficit, low inflation and openness to international trade. They find that in 'good' policy environments the marginal effect of aid is 0.43 for the full sample and 0.47 for the low income countries. This implies that when good

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[18] The diminishing returns effect is captured by the inclusion of the square of the aid variable in the growth equation.

[19]To construct a policy index, BD first run a growth regression that excludes the aid term but includes three economic policy indicators (inflation, budget deficits and trade openness measure) and other exogenous variables by the significance of the three included policy variables; inflation, openness and budget balance in the growth equation.

[20] The coefficient of the interaction term is significantly positive.

policy and aid coincide, the outcome has been good. On the other hand, Guillaumont and Chauvet (2001) argue that aid is only effective in countries that are vulnerable to climatic and trade shocks; Dalgaard *et al.* (2004) argue that aid is more effective outside the tropics; and Islam (2005) argues that aid can promote growth only in countries where the political environment is stable.

Evidently, most of these country-specific studies find results that are not robust to new data, estimation techniques, and are often driven by extreme observations. Not only that, they suffer from measurement errors and bias. For instance, the policy index which BD constructed does not include all the policy variables and as such could have wrongly been measured. This is also the case with the political index constructed by Islam. Easterly *et al.* [ELR from henceforth] (2003, 2004) show that BD's findings are sensitive to data and sample size. However, ELR do not show the effects of multilateral and bilateral aid on economic growth. We add to this literature by arguing that aid divided into multilateral and bilateral components can have different effects on growth not conditional on any country-specific characteristics.

More so, a detailed analysis conducted by Roodman (2004, 2007) shows that aid conditional on geography appears to be the only plausible finding. Contrary to this, Rajan and Subramanian (2005) find no evidence that 'aid works in better policy or institutional or geographical environments.' Clemens *et al.* (2004) find

that policies matter for growth, but distinguishing between 'good' and 'bad' policy is not necessary to find a positive relationship between 'short-impact' aid and growth. Therefore, it remains unsettled as to what environments, if any, are necessary for aid to be effective.

4.2.1 Aid Types Have Different Effects

So far, only a few studies have attempted to investigate the nature of the relationship between different types of aid and growth. Surprisingly, none of these studies investigate the impact of aid or its types on economic growth in West Africa where there are many aid dependent countries.

In Gyimah-Brempong (1990) it was shown that the effect of aid on growth in LDCs is, in part, dependent on the type of aid a country receives. This implies that aid aggregation has the tendency of producing biased estimates. To correct for this bias, he disaggregated aid into loans, grants and food components and applied both a simultaneous equation and a least-squares dummy variable [LSDV] technique. For the LSDV technique, which is our interest here, the coefficients on loans and grants were positive and significant, while the coefficient on the food aid was negative[21] and insignificant. However, a

[21]This can be expected since food aid is for consumption and not likely to affect economic growth at least in short and medium term, if at all. The sum of the coefficients on loan and grant variables give the total effect of aid on growth of

problem with this classification is that there are likely to be measurement errors since what constitutes loans as defined here remains very unclear. In addition, it fails to show the independent effects of multilateral and bilateral aid on growth, given other variables.

Other studies that have contributed to this literature are; Clemens *et al.* (2004), Ram (2004), Radelet *et al.* (2005) and Rajan and Subramanian (2005). Findings by Clemens *et al.* show that aid has a positive 'short-impact' on growth. However, it suffers some methodological problems: (1) arguing that four-year or five-year period averages are specifically for measuring 'short-impact' aid effect on growth may not be plausible, because the essence of taking averages is, partly, to remove shocks to the data[22]. Again, most of the studies they challenge do not state that their objective is to estimate a short-impact effect of aid on growth; (2) the process of selecting projects and programmes into 'short-impact' and 'long-impact' aid is rather ad hoc and may suffer from measurement problems; and (3) they claim to be estimating the short-impact aid effect on growth, over a four-year average period, but also include in their growth equation known

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GNP in SSA, of 0.0043 + 0.0063 = 0.0106. There is a large difference when this figure is compared with the coefficient of 0.083 on the aggregate aid term.

[22] For example, see Levy (1988, p. 156); Ram (2003, p. 105); Temple (1999, p. 132).

variables like, initial GDP, institutional quality, and log of initial life expectancy, which are determinants of long term growth[23].

We contend that this specification suffers some difficulties[24]. Drawing from the vast literature on aid allocation, we classify aid under to two major headings: multilateral and bilateral. Their definitions are also clear-cut and less ad hoc. For multilateral aid, it is typically given to countries for growth and development purposes. In contrast, bilateral aid is frequently given to foster political and diplomatic ties.

Another study with similar classification to Clemens *et al.* is Gomanee *et al.* (2002, 2005). They distinguish between 'medium-term impact' and 'long-term impact' aid. On the other hand, Rajan and Subramanian, in addition to other aid classifications, estimated a Clemens *et al.*-type specifications. They find that

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[23] See their core regression for more details. Also see Sachs and Warner (1997), 'Fundamental Sources of Long-Run Growth' for a list of some of the included variables in the growth equation.

[24] Quoting Rajan (2005), "the study shows that aid likely to have a short-term economic impact (for instance, aid used to build roads or support agriculture directly) is positively correlated with short-term growth. Here again, however, I am not fully persuaded. The authors of this study argue that the reason to focus on short-impact aid is because the literature focuses on country growth rates over four-year periods. So I presume it follows that if one were to depart from the literature and look at long-run growth (say growth over decades, which is really what we care about), economic aid (as contrasted with, say humanitarian aid) cumulated during the period should have a discernable effect on growth (and there would be no need to separate out short-impact aid from long-impact aid). My work with Subramanian suggests that economic aid does not have a robust positive correlation with long-run growth."

no significant relation (positive or negative) exists between any sub-categories of aid and growth. This finding relied on the 'traditional' cross-section instrumental variables approach. Because cross-section studies do not exploit the time dimension of the data unlike panel studies, the presence of fixed effects are entirely ignored. This may have caused the coefficient estimates to be insignificant. We differ with this study not only in aid classification but also on the empirical methods, as we employ the fixed effects ordinary least squares and two-stage least squares.

As to whether bilateral and multilateral aid components have independent effects on growth, no attempt has been made to investigate this link. More so, a fundamental issue of whether multilateral aid is endogenous to growth has been entirely ignored in the literature. However, Ram (2004) investigates the impact when bilateral aid and multilateral aid are interacted with policy and governance variables using the traditional OLS technique. We deviate from this approach by showing that these aid variables can have different and independent effects on growth in West Africa without adding interaction terms to the equations. Unlike Ram, our theoretical prediction is that multilateral aid has a positive effect while bilateral aid has a negative or weak impact (see empirical section for detailed explanation). In addition, we offer explanations as to why multilateral aid can be endogenous to growth, while controlling for country-specific effects.

Having explained how aid can affect growth and reviewed the empirical literature, we now set out a modern growth framework that encompasses the relevant issues. The Harrod-Domar growth model is not used here because it is too simple to explain the complex long term determinants of growth. Moreover, other factors besides capital accumulation affect growth. Frequently, the production function is used for the investigation of economic growth in the development economics literature. For example, in Jones (2002), the aggregate production function takes the Cobb-Douglas form:

$$Y = IK^{\alpha}(AL)^{1-\alpha} \qquad (4.1)$$

where I denotes the influence of an economy's social infrastructure on the productivity of its inputs, K is capital, A captures the invention of new capital goods and learning process of agents on the use of these new kinds of capital (technology), L is labour, α is a parameter between 0 and 1. In contrast to neoclassical growth models, in endogenous growth models, changes in the rate of investment matter for long run growth. However, for our case, a direct implementation of (4.1) will pose some problems because of data availability constraints. In particular, consistent data on labour is not available for most countries in our sample. Given this challenge, we resort to its intuition in choosing some important variables to include in our growth equation. Again, the essence of invoking the new growth theory is to underscore the role of

investment in the growth process. This, in part, provides a useful guide towards the understanding of economic growth in West Africa.

A good social infrastructure which relates to government policies and institutions will lead to growth even when two economies have the same *K*, *A*, and *L*. Jones further notes that the variation in the cost of setting up a business and in the ability of investors to reap returns from their investments arises in large part from differences in government policies and institutions - *social infrastructure*. Along these lines, Jones predicts that the size of the market (openness to trade and competition in the global market place), the extent to which the economy favours production, and the stability of the economic environment would affect investment rates, educational attainment, and total factor productivity.

Following the above discussions, the growth model we consider is formally expressed as:

$$g = g(IGDP, DI, XG, ODA) \qquad (4.2)$$

where *IGDP* is initial GDP per capita (initial conditions), *DI is* domestic investment as a percentage of GDP, *XG* is export growth, and *ODA* is official

development assistance as a percentage of GDP. Further discussions on the variables and their theoretical effects are taken in subsequent section.

4.3 Empirical Specifications, Variables and Data

The econometric model motivated by the above discussions is of the form.

$$g_{it} = \beta_0 + \beta_1 IGDP_{it} + \beta_2 DI_{it} + \beta_3 XG_{it} + \mu_{it} \qquad (4.3)$$

As a start to the analysis, equation (4.3) is testable across countries. Gyimah-Brempong (1990) has also estimated a similar specification.

Thereafter, we augment (4.3) by including our main (aid) variable, which is just as likely to affect growth as other included variables. Thus, the modified equation is given by:

$$g_{it} = \beta_0 + \beta_1 IGDP_{it} + \beta_2 DI_{it} + \beta_3 XG_{it} + \beta_4 TODA_{it} + \mu_{it} \qquad (4.4)$$

As far as the objective is to estimate the impact of aid on growth or investment, the best way to proceed is to divide aid into multilateral and bilateral aid since each is motivated by different factors.

If, as argued by some studies on aid allocation e.g. Wheeler (1984), Cassen *et al.* (1994), and Collier and Dollar (2002) that bilateral aid is driven by political, ideological and strategic interests of the donors[25], then one can expect bilateral aid to either have a negative or weak correlation with the recipients' economic growth. On the other hand, the explanation for why multilateral aid is likely to have a positive effect is that it has growth and wider development objectives as its primary concern. CfA (2005) also points out that multilateral aid is more targeted towards poor countries than aid from bilateral donors. This then implies that a positive link between multilateral aid and growth can be expected[26].

From the above insights, therefore, the pertinent question we want to address is: Does multilateral and bilateral aid have different effects on growth when other factors that affect growth are taken into account? To properly address this question, we modify equation (4.4) by splitting aid into multilateral and bilateral components:

$$g_{it} = \beta_0 + \beta_1 IGDP_{it} + \beta_2 DI_{it} + \beta_3 XG_{it} + \beta_4 MODA_{it} + \beta_5 BODA_{it} + \mu_{it} \qquad (4.5)$$

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[25] However, we note that some donors e.g. Scandinavian countries can sometimes give small amounts of aid for other objectives, other than political. Therefore, if larger amount of bilateral aid is given for development reasons, one may expect its impact to be significant.

[26] This classification differs with that of Gyimah-Brempong (1990), who classified aid into loans, grants and food.

The next four paragraphs present a discussion of our variables and data.

Cross-country regressions (Barro, 1991, 1995; Sala-i-Martin, 1997; Bosworth and Collins, 2003) show that many variables can be strong determinants of growth. But data constraints, economic structures and degrees of freedom considerations often limit the choices.

Our choice of variables is motivated by Gyimah-Brempong (1990), Jones (2002), and the mainstream endogenous growth theory, which unlike the neoclassical model, allows for the investment rate to determine economic growth. Recent studies have also identified certain economic policy and institutional variables that should be included in any standard growth model. For instance, Hansen (2004) shows that variations in cross-country growth performance are frequently explained by differences in macroeconomic policies.

We include export growth as a dynamic measure of openness. Export growth generates foreign exchange needed to buy investment goods, which no doubt contributes to the entire growth process (Thirlwall, 2003). Furthermore, Feder (1982) notes that export growth affects economic growth positively either because productivity in the export sector is higher than in the non-export sector or the export sector has a positive externality effect on other sectors of the economy. Like other studies, we control for initial GDP per capita, which in this

study captures initial conditions. As discussed in the previous chapter, FE does not permit the inclusion of time-invariant variables. In this regard, we use real GDP per capita in the year before every average period.

Like the previous chapter, we take 4-year average data running from 1975 to 2002. Regarding the sample, however, we consider 10 countries with adequate and reliable series. Table B2 of Appendix B gives definitions and sources of data, in addition to included countries.

4.4 Estimation Techniques and Issues: Is Aid Endogenous to Growth?

In this chapter we continue our estimation with FE estimator which has been extensively discussed in chapter 3.

However, there may well be reasons to suspect non-orthogonality between regressors and errors, which can arise from several sources, one of which is reverse causation. For instance, aid recipients may receive more aid in response to a worsening economic environment. Because of this, the aid variable will be correlated with negative shocks to the recipient economy. On the other hand, they may also receive more aid in support of good economic performance. This time, aid will tend to be correlated with good economic performance. Either way, it poses some endogeneity problems, where the causal direction is sometimes difficult to discern.

Clearly, if our aid variable(s) are not orthogonal to the error term, as discussed above, it becomes impossible to estimate the coefficients consistently with the classical FE-OLS estimation technique. We would expect foreign aid to be endogenous if aid donors consider GDP growth when allocating aid to West African countries. By construction, any model that includes endogenous regressors violates the assumption of the classical regression model.

A way to deal with the above problem is to use the Instrumental Variables (IV) technique, often used by researchers. Using IV to estimate an equation that contains endogenous regressor(s) is not without its problems. An obvious problem is how to get 'good instruments' that satisfy the twin conditions of instrument relevance and orthogonality with the error term (Bound *et al.*, 1995; Baum *et al.*, 2003; Stock and Watson, 2006). It is usually required that the overidentifying restrictions test be conducted when instruments are in abundance, that is, when the number of excluded instruments in an equation is greater than the number of endogenous regressors[27].

The instrumental variables technique has been widely used in many aid-growth regressions, but we differ with these studies by our instrumentation assumption. We also apply the fixed effects two-stage least squares (FE-2SLS)

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[27] Thus Davidson and Mackinnon (1993, 236): 'Test of over identifying restrictions should be calculated routinely whenever one computes IV estimates.' Sargan's own view cited in Godfery (1988, 145) is that regression analysis without testing orthogonality assumptions is a 'pious fraud'.

technique unlike previous studies that have relied on the 'traditional' OLS-2SLS for their estimation. The FE-2SLS, in addition to using instruments, also accounts for country-specific effects. We use the following instruments: total aid interacted with export (lagged); multilateral aid interacted with export (lagged); multilateral aid (lagged); log of population, given the exogeneity and relevance criteria. We expect a link between these instruments and our aid variables, while expecting zero correlation with errors terms.

As consistency of the estimates is required for inference to be drawn, the Hausman test will be used to determine which estimator will produce consistent coefficient estimates. Here, however, the Hausman test is also a test of the consequence of employing different estimation methods on the same equation. The Hausman statistic is distributed as a chi-square statistic, (χ^2) and is expressed as:

$$H = \left(\hat{\beta}_{FE\,2SLS} - \hat{\beta}_{FEOLS}\right)' \left(Var[FE\,2SLS] - Var[FEOLS]\right)^{-1} \left(\hat{\beta}_{FE\,2SLS} - \hat{\beta}_{FEOLS}\right)$$

Initial methodological work on aid endogeneity focused on total aid. While some studies find aid to be exogenous, others provide evidence of total aid endogeneity. It is therefore difficult to draw any conclusions based on these findings. However, as far as aid endogeneity is concerned, discerning between

multilateral and bilateral aid is the most plausible way of addressing the problem.

In fact, our view is that total aid can be exogenous or endogenous if the two components are lumped together, depending on which component dominates. We posit that multilateral aid and growth can reverse-cause each other since economic circumstance of recipients are of primary importance when allocating multilateral aid. This is not so for bilateral aid where aid donors frequently consider their political and strategic interests. If this line of reasoning holds as we would expect, then bilateral aid is totally exogenous to growth. From this intuition, we proceed to instrument multilateral aid, while we allow bilateral aid to assume exogenous status in our specifications. From our initial data inspection, bilateral aid seems to be of higher magnitude than multilateral aid. In anticipation, we may expect the size of bilateral aid to greatly influence the endogeneity or otherwise of total aid.

4.5. Total, Multilateral, and Bilateral Aid: Some Results

We start by estimating equation 4.3 which excludes the aid variables. On the assumption that other explanatory variables are exogenous and no aid variable is included, we apply the fixed effects ordinary least squares (FE-OLS) estimator. To estimate equation 4.4, we use both the FE-OLS and the FE-2SLS techniques because of our concern for aid endogeneity. Thereafter, we estimate

equation 4.5 which splits total aid into multilateral and bilateral components. We present results for both estimation techniques in the same table to enable us compare their performance quantitatively, as well as qualitatively. If FE-OLS is the appropriate technique, using FE-2SLS will only lead to loss of efficiency. But where estimations are to be based on IV (2SLS), and OLS is used, the point estimates would not be consistently estimated.

4.5.1 Total Aid and Growth

Table 4.1 shows regressions using total aid as the independent variable of interest. As a start, we estimate equation (4.3) above, which is our baseline regression. Here, we regress real GDP growth on initial GDP per capita, investment as a percentage of GDP, and export growth. We find initial GDP, investment and export growth as important factors that explain growth in West Africa.

In (4.1.2), we estimated the impact of total aid on growth using both FE-OLS and FE-2SLS techniques. What we find is that total aid has a weak and negative impact on growth. Following previous studies we instrument total aid. However, this did not produce any strong significant impact on growth. For both techniques, initial GDP, investment and export growth remained strong and stable. Based on the neoclassical growth theory, the coefficient on the initial GDP should be negative, that is, the higher the initial income level, the slower

the growth. In line with theory, all the other variables have the expected signs. Also, we do not find any evidence of FE when total aid is considered.

As Gomanee *et al.*, (2002, 2005) discuss, including investment in the growth equation when aid is already included will lead to multicollinearity or 'double counting'. To check the effect of this, the investment variable was excluded from equation 4.1.3. As it turned out, the overall fit of the model fell, as shown by the R^2. This implies that removing investment from the equation may not be the best way of tackling the 'double counting' problem. Therefore, a generated investment variable will be used in place of domestic investment in section 4.7.

Now, we look at the diagnostics in order to determine the plausibility and in some cases, the robustness of the present findings. First, for the *F-test* of fixed effects, we find little evidence to support the presence of fixed effects when total aid is considered. The effect is marginal for our baseline regression but significant at 5 percent for [(4.1.4) FE-2SLS]. Second, the Hausman test statistic failed to reject exogeneity of total aid variable. In all the specifications, the Hausman test statistics show that the growth equation can consistently be estimated using the FE-OLS. As discussed earlier, this may be suspect since the picture can only be clear when aid is split into multilateral and bilateral components.

A standard assumption in panel data models is that the error terms are independent across cross-sections. To test this assumption, we applied the parametric test statistic proposed by Pesaran (2004). It tests the general hypothesis of cross-sectional independence in panel data models. In all the equations in Table 4.1, we find evidence in support of this hypothesis.

We conclude from our evidence that once account is taken of the effects of other factors, total aid has no independent impact on economic growth in West Africa. These results, then, suggests that splitting total aid into multilateral and bilateral components in addition to controlling for multilateral aid endogeneity may be a more plausible way of addressing the aid-growth effectiveness question.

4.5.2 Multilateral and Bilateral Aid and Growth

Now, we discuss the findings in Table 4.2, which presents results on the impact of multilateral and bilateral aid on growth (equation 4.5) using both FE-OLS and FE-2SLS techniques. First, we discuss results for equation 4.2.1, which includes all the explanatory variables, including our variables of interest. Again, for the FE-OLS, we find that initial GDP, investment and export growth remain important growth determinants, while FDI continued to be negative and weak. However, a clear picture emerges from this specification.

Multilateral aid is not significant but appears with a positive sign, while bilateral aid is negative and only significant at 10 percent.

Table 4.1: The Impact of Total Aid on Economic Growth

Dependent variable: GDP growth (*growth*)							
	FE-OLS	FE-OLS	FE-IV	FE-OLS	FE-IV	FE-OLS	FE-IV
	1	2		3		4	
Initial GDP	-4.23**	-4.54**	-4.95***	-3.77**	-4.47***	-4.42**	-4.88***
	(1.68)	(1.78)	(1.83)	(1.57)	(1.54)	(1.75)	(1.76)
Investment	0.14**	0.16**	0.18**	-	-	0.16**	0.18**
	(0.07)	(0.07)	(0.08)			(0.07)	(0.07)
Export growth	0.08***	0.07**	0.07**	0.10**	0.10***	0.07**	0.06**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
FDI	-0.01	-0.07	-0.15	0.08	-0.07	-	-
	(0.16)	(0.20)	(0.22)	(0.17)	(0.20)		
Toda	-	-0.05	-0.13	-0.01	-0.17	-0.05	-0.16
		(0.05)	(0.09)	(0.05)	(0.11)	(0.04)	(0.11)
R-squared	0.28	0.29	0.27	0.19	0.07	0.29	0.23
F-test of FE	1.83	1.10	2.42	0.86	2.34	1.11	2.34
	[0.0826]	[0.3751]	[0.3279]	[0.5651]	[0.4426]	[0.3706]	[0.0294]
Hausman test			0.73		0.73		0.73
			[0.9812]		[0.9812]		[0.9812]
Observations	70	70	70	70	70	70	70
Test for Cross-Sectional Independence							
Pesaran test							
Equation	1	2		3		4	
	0.645	0.119		0.320		0.139	
	[0.5187]	[0.9051]		[0.7487]		[0.8898]	

Note: 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 significant at 1 percent level. Excluded instruments are todaexplag and logpop.

As far as the signs are concerned, multilateral aid is expected to be positive, while that of bilateral aid may be negative or weak. We re-assess (4.2.1) by using the FE-2SLS technique. We find results that do not differ markedly with those of FE-OLS estimates, only that when we instrument multilateral aid the performance of the aid variables improved significantly, implying that FE-OLS may have biased the results. For this equation, the variables jointly explain around 32 per cent of the variation in real GDP growth.

In equation (4.2.2), we estimate our model without investment. For the FE-OLS technique, the aid variables seem not to be significant but when multilateral aid is instrumented, that is, when FE-2SLS technique is applied, the coefficients become significant. While the significance of the coefficient on the multilateral aid increased from 5 to 1 percent that of bilateral aid remained significant at the 5 percent level. However, export growth loses its significance. Ignoring investment, the R^2 measuring the goodness of fit falls from 32 to 22 percent for FE-OLS and 32 to 24 percent for FE-2SLS. Clearly, this shows that investment is a strong determent of growth in West Africa.

In what follows, a discussion on the diagnostic tests is provided. We find some evidence in support of fixed effects, in particular when the FE-2SLS technique is applied. The FE-OLS estimator continued to reject the presence of fixed effects.

There is also evidence in support of cross-sectional independence in all the equations as detailed in Table 4.2.

Here, the Hausman test statistic rejects the exogeneity of multilateral aid, implying that our theoretical position is indeed correct. The large χ^2 values indicate that the equations with FE-OLS yield inconsistent results. On the basis of this we can draw some conjectures on the impact of aid on growth relying on the FE-2SLS estimates.

Furthermore, in terms of the selected instruments, there is nothing to suggest that they are not related to the endogenous regressor. The relevant test statistic is the (partial) R^2 of the first stage regression suggested by Bound *et al.* (1995). The instruments for aid performed well, suggesting no weak instrument problem. As shown in Table 4.3, the partial R^2 is fairly strong and ranged from 32 to 33 percent, comparing favourably with results reported in the empirical literature. Alternatively, this test may be expressed as the F test of the joint significance of the instruments in the reduced form (first-stage) regression. From these findings, we conclude that the excluded instruments have some explanatory power and have caused no bias in the FE-2SLS coefficients. However, the distribution of the F statistic is nonstandard.

The overidentifying restrictions test, proposed by Sargan (1958) and popularised by Hansen (1982), shows that the instruments are orthogonal to the error term[28]. The Sargan test of overidentifying restrictions of equations 4.3.1 to 4.3.3 in Table 4.3 confirms that the instruments are indeed exogenous. Both (Bound et al. and Sargan) tests taken together suggest that the applied instruments passed the validity test.

We have successfully distinguished between the impact of multilateral and bilateral aid on growth. In contrast to Ram (2004) we show that the effectiveness of multilateral and bilateral aid can be determined even without adding aid-policy and aid-governance interacted variables in the regressions. Also, unlike Rajan and Subramanian (2005) who find that no sub-categories of aid have any significant positive or negative impact on growth, but using a different sample and methodology, we show that multilateral and bilateral aid can have different impacts on growth if the problem of aid endogeneity is properly addressed and country-specific effects taken into account. While they apply a cross-section econometric technique, we follow the panel approach which offers more time dimension and allows for more observations to be included in the regression.

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[28] According to Gujarati (2003), the identifiability of an equation depends on whether it excludes one or more variables that are included in an equation. This is known as the exclusion (of variables) criterion, or zero restrictions criterion (the coefficients of variables not appearing in an equation are assumed to have zero values).

4.6 Aid and Investment: Accounting for 'Double Counting'

Very often, however, investment embodies part of aid. Thus, including both investment and aid in the same equation can lead to 'double counting' and further pose some multicollinearity problems, which will need to be addressed if the coefficients are to be estimated without bias. Previous research has tried to avoid this problem by excluding investment entirely from the regression equation.

This approach may be flawed since investment rate as clearly shown by the endogenous growth theory is a major determinant of growth, and hence its exclusion may under-fit the regression equation. Some attempts have been made in the literature to deal with this issue. Our approach is to follow the lead by Gomanee *et al.* (2005), which relied on the residual generated-regressors approach proposed by Pagan (1984). Before proceeding to generate the variable, we first provide a brief discussion of this approach.

4.6.1 Residual Generated-Regressors

It is now a common practice to estimate equations in which generated variables appear on the right hand side. These variables are often constructed using predicted values or residuals from a supplementary regression. Pagan (1984) has provided a useful discussion on the econometric issues that underpin these two approaches. For the residuals approach, consider a special case of a general model:

$$y = \delta z^{*} + \gamma (z - z^{*}) + e \qquad (4.6a)$$

$$z = z^{*} + \eta = \alpha W + \eta \qquad (6.6b)$$

Table 4.2: The Impact of Multilateral and Bilateral Aid on Economic Growth

Dependent variable: GDP growth (*growth*)						
	FE-OLS	FE-IV	FE-OLS	FE-IV	FE-OLS	FE-IV
	1		2		3	
Initial GDP	-4.68***	-3.38***	-3.97***	-3.01*	-4.46***	-3.72**
	(1.68)	(1.59)	(1.72)	(1.65)	(1.65)	(1.55)
Investment	0.15***	0.10*	-	-	0.15***	0.11**
	(0.05)	(0.05)			(0.05)	(0.05)
Export growth	0.07**	0.05	0.10***	0.06*	0.07**	0.06*
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
FDI	-0.13	0.21	0.01	0.27	-	-
	(0.20)	(0.19)	(0.19)	(0.20)		
Moda	0.14	0.78**	0.22	0.85***	0.13	0.74**
	(0.16)	(0.29)	(0.16)	(0.30)	(0.16)	(0.29)
Boda	-0.19*	-0.33**	-0.18	-0.33**	-0.17	-0.35**
	(0.12)	(0.14)	(0.13)	(0.15)	(0.11)	(0.14)
R-squared	0.32	0.32	0.22	0.24	0.31	0.31
F-test of FE	1.07	2.42	0.87	2.30	1.09	2.34
	[0.4031]	[0.0248]	[0.5534]	[0.0323]	[0.3867]	[0.0294]
Hausman test		17.92		153.87		13.10
		[0.0064]		[0.0000]		[0.0225]
Observations	70	70	70	70	70	70
Test for Cross-sectional Independence						
Pesaran test						
Equation	1		2		3	
	0.318		0.132		0.288	
	[0.7505]		[0.8951]		[0.7736]	

Note: standard errors are in parentheses ( ). Numbers in brackets [ ] indicate p – values. * indicates that a coefficient is significant at 10 percent level; ** indicates5 percent significance level; *** indicates significant at 1 percent level. Excluded instruments are modalag, modaexplag and logpop.

Table 4.3: Some Tests on Instruments for Multilateral Aid

Sargan Overidentification test			
Equation	1	2	3
Chi-Square statistic	2.285	0.613	3.439
P-value	[0.3190]	[0.7361]	[0.1791]
Test of instruments Relevance			
Partial R-squared	0.32	0.33	0.32
F-test statistic	6.51	6.96	6.66
P-value	[0.0010]	[0.0006]	[0.0009]

The term *(z-z*)* represents the part of z that is explained by other factors other than *W*. In this model, $\hat{\delta}$ and $\hat{\gamma}$ can be estimated using a two-step procedure. This involves estimating (4.6b) and then regressing y on $\hat{z}$ and $(z-\hat{z})$.

As pointed out by Pagan (1984), efficient estimates can be obtained from a two-step procedure. However, if the variance estimator of the residual-generated regressor converges to σ_e^2, the 2SLS estimates provide the correct values of δ and the OLS estimates the correct values for γ. If $\delta = 0$, that is, only the part of investment that is not affected by aid appear in (4.6a), OLS would provide the correct estimated variance of γ. This conclusion is independent of the inclusion of other variables in (4.6a). Therefore, the generated variable relies only on the supplementary equation (4.6b).

To construct the part of total investment that is not attributed to aid (DIRES), we split aid into multilateral and bilateral components since the objective of this chapter is mainly to disentangle their independent effects on growth. Our

emphasis on aid types is a major departure from the approach taken by Gomanee *et al.* On this premise, we run an auxiliary regression of investment on multilateral and bilateral aid.

$$DI = \theta_1 Moda + \theta_2 Boda + \varepsilon \qquad (4.7)$$

In this case, we assume that $\theta_1 + \theta_2 = \alpha$, while $Moda + Boda = W$ in (4.6b) above. Here, ε is the residual-generated investment (DIRES). We now substitute DIRES for investment (DI) in the subsequent estimation to see how large and sensitive the impact would be on the aid variables. *A priori* using DIRES will not affect the coefficients on the other variables when the FE-OLS is used, but we expect the size of the coefficients on the other variables alongside with aid variables to change slightly when FE-2SLS is applied. The mathematical proof for the FEOLS case is given in appendix B.

The core finding of this exercise is located in (4.4.2) of Table 4.4. In the FE-2SLS of (4.4.2) which used the constructed variable, DIRES, the significance of the aid variables increased from 10 to 5 percent. In particular, the significance of multilateral aid increased from 5 to 1 percent, while its size increased by 0.02 percentage points (i.e. from 0.78 to 0.80) when compared with (4.2.1) in Table 4.2. This signals an improvement in the specification. From our earlier discussion, the use of DIRES can only affect the aid variables and not the

coefficients of other included variables when FE-OLS is applied. Overall, there appeared to be some measure of stability on the coefficient estimates. Again, around 33 percent of changes in real GDP (growth) are explained by these variables.

Though the present study does not include exactly the same variables and countries like other studies, a fairly standard comparison can be made. In this instance, we conclude that an aid-growth equation (e.g., Ram, 2004) that excludes investment variable underestimates the model as evidenced by large falls in R^2. But including investment without separating it as done by some studies (e.g. Gyimah-Brempong, 1990; Lensink and Morrissey, 2000; Ovaski, 2003) may reduce the size and significance of the aid coefficient.

It is instructive to note that the diagnostics are similar to those in Tables 4.2 and 4.3. This suggests some measure of stability in our results. The Hausman test statistic continued to support our preference for FE2-SLS technique, while tests on the instruments as detailed in Table 4.5 remained significant.

Table 4.4: The Impact of Multilateral and Bilateral Aid on Economic Growth, Four-Year Average Using Generated-Investment [DIRES]

	Dependent variable: GDP growth (*growth*)				
	FE-OLS	FE-OLS	FE-IV	FE-OLS	FE-IV
	1	2			3
Initial GDP	-4.30**	-4.68**	-3.45**	-4.46**	-3.77**
	(1.76)	(1.77)	(1.67)	(1.72)	(1.63)
DIRES	0.15***	0.15***	0.12**	0.15***	0.13**
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)
Export growth	0.08**	0.07**	0.05	0.07**	0.06*
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
FDI	-0.02	-0.13	0.19	-	-
	(0.20)	(0.21)	(0.20)		
MODA		0.24	0.80***	0.23	0.78***
		(0.16)	(0.30)	(0.16)	(0.30)
BODA		-0.22*	-0.33**	-0.19*	-0.35**
		(0.12)	(0.15)	(0.11)	(0.15)
R-squared	0.27	0.32	0.33	0.31	0.32
F-test of FE	1.54	1.07	2.41	1.09	2.33
	[0.1569]	[0.4031]	[0.0253]	[0.3867]	[0.0299]
Hausman test			17.85		13.36
			[0.0066]		[0.0202]
Observations	70	70	70	70	70
Test for Cross-sectional Independence					
	Pesaran test				
Equation	1	2		3	
	0.318	0.132		0.288	
	[0.7505]	[0.8951]		[0.7736]	

Note: 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 significant at 1 percent level. Excluded instruments are modalag, modaexplag and logpop.

Table 4.5: Some Tests on Instruments for Multilateral Aid [when DIRES is used]

Sargan Overidentification test		
Equation	2	3
Chi-Square statistic	2.706	3.655
P-value	[0.2584]	[0.1608]
Test of instruments Relevance		
Partial R-squared	0.33	0.33
F-test statistic	6.98	7.16
P-value	[0.0007]	[0.0005]

4.7 Lagged Aid and Growth

It is often argued that lagged aid is weakly exogenous, and therefore may not be an outcome of growth or income. In this sense, regressing growth on lagged aid would serve as an endogeneity control on aid. Apart from controlling for aid endogeneity, it is also plausible to argue that aid will impact on growth with some lags, usually over four to five years. This means that some aid received today may take some time to translate into increased investment or domestic output. In addition to estimating the contemporaneous impact of aid on growth, this chapter also examines the lagged effect aid over a four-year period. We start off with total aid, and finally end up with aid types-multilateral and bilateral. The results of these estimations are presented in Tables 4.6 and 4.7.

Table 4.6: The Impact of Total Aid (lagged) on Economic Growth

Dependent variable: GDP growth (*growth*)			
	FE-OLS	FE-OLS	FE-OLS
	1	2	3
Initial GDP	-4.03**	-3.44*	-4.49**
	(1.80)	(1.57)	(1.79)
Investment	0.14***	-	0.15***
	(0.00)		(0.05)
Export growth	0.08**	0.09***	0.08**
	(0.03)	(0.03)	(0.03)
FDI	0.20	0.24	-
	(0.14)	(0.15)	
Toda(lagged)	-0.04	-0.04	-0.04
	(0.05)	(0.05)	(0.05)
R-squared	0.29	0.20	0.27
F-test of FE	1.89	1.65	1.79
	[0.0546]	[0.1020]	[0.0708]
Observations	60	60	60
Test for Cross-Sectional Independence			
	Pesaran test		
Equation	1	2	3
	0.119	0.320	0.139
	[0.9051]	[0.7487]	[0.8898]

Note: 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 significant at 1 percent level.

Table 4.7: The Impact of Multilateral and Bilateral Aid on Economic Growth, Four-Year Average, using lagged values of Aid.

	Dependent variable: GDP growth (*growth*)				
	FE-OLS	FE-OLS	FE-OLS	FE-OLS	FE-OLS
	1	2	3	4	5
Initial GDP	-3.35*	-3.04*	-3.89**	-3.49**	-3.93**
	(1.75)	(1.80)	(1.72)	(1.72)	(1.64)
Investment	0.10*	-	0.12**		
	(0.05)		(0.05)		
DIRES	-	-	-	0.12**	0.14***
				(0.05)	(0.05)
Export growth	0.06**	0.07**	0.07*	0.06**	0.07*
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
FDI	0.26	0.32	-	0.21	-
	(0.20)	(0.20)		(0.19)	
Moda(lagged)	0.26**	0.32**	0.20	0.28**	0.24*
	(0.12)	(0.13)	(0.13)	(0.13)	(0.12)
Boda(lagged)	-0.04	-0.05	-0.06	-0.02	-0.04
	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)
R-squared	0.33	0.27	0.30	0.36	0.34
F-test of FE	1.96	1.81	1.75	2.10	1.97
	[0.0681]	[0.0921]	[0.1054]	[0.0497]	[0.0662]
Observations	60	60	60	60	60
Test for Cross-sectional Independence					
Pesaran test					
Equation	1	2	3	4	5
	0.318	0.132	0.288	0.132	0.288
	[0.7505]	[0.8951]	[0.7736]	[0.8951]	[0.7736]

Note: 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 significant at 1 percent level.

4.8 Conclusion

In this chapter we have investigated the impact of aid on real GDP growth in West Africa, paying particular attention to the effect of different aid types. Multilateral and bilateral aid as we argued, may affect growth in different

ways, hence calling into question outcomes from regressions that rely only on total aid.

We find that disaggregating aid into multilateral and bilateral aid gives additional insights into the relationship between aid and growth. Though estimating the relationship between total aid and growth is not without interest, the disaggregated aid-growth model is seen to perform better from our results. Our data allow us to use two estimation techniques; the FE-OLS and the FE-2SLS. We find that multilateral aid has a positive effect on growth when some important growth determinants are taken into account, not necessarily when policy and governance variables are interacted with this type of aid. There is also evidence to suggest that bilateral aid has significant negative effect on real GDP growth when other factors that affect growth are controlled for.

Initial per capita GDP, rate of investment and export growth are all important factors that explain real GDP growth in West Africa.

In conclusion, we do not claim to have resolved the aid-growth debate but we have successfully shown that when a unique sample and the FE technique are used, splitting aid into multilateral and bilateral components, gives a new insight into the aid effectiveness debate.

Chapter 5

Foreign Aid and the Real Exchange Rate in the West African Economic and Monetary Union

5.1 Introduction

The traditional 'Dutch disease' model suggests that under certain assumptions, increases in foreign aid will induce an appreciation of the real exchange rate and a loss of export competitiveness, reducing the potential for growth. In fact, this disease when present can harm export orientation, especially if the export sector can benefit from both static and dynamic gains from trade; for example, increased specialization and learning-by-doing.

Consequently, understanding the behaviour of real exchange rate can help member countries of the West African Economic and Monetary Union [henceforth WAEMU] to avert any loss of competitiveness that may affect their balance of payments position. In addition, WAEMU countries will be concerned with the behaviour of the real exchange rate considering its role during a

macroeconomic adjustment process[29]. Anglophone West African countries operate floating or managed float exchange rate regimes. In this regard, including these countries in this sample could exacerbate any heterogeneity problem. Before 1999, WAEMU countries pegged their currency to French franc. France guaranteed full convertibility for the CFA franc via an 'operations account', which the regional central bank maintained at the French Treasury. There was an incentive for the French treasury to ensure that member countries maintained appropriate fiscal policies so that the guarantee did not become a long-term finance instrument. Under this arrangement, the central bank will assume responsibility for individual governments' large budget deficits, implying that the French Treasury will provide the needed liquidity. The cost of maintaining the zone to France was mainly the unlimited credit line it provided to the central bank, and the bilateral aid it gave to individual countries. The value of French aid was seriously undermined, since it did not ensure fiscal discipline in the WAEMU countries.

A body of literature in development and international economics includes panel data studies e.g. Adenauer and Vagassky (1998), Elbadawi (1999), and Ouattara and Strobl (2004) that have attempted to investigate the impact of foreign aid inflows on real exchange rate for developing countries, including

[29] WAEMU has maintained a fixed exchange rate with France since the late 1940s. Its currency, CFAF was pegged to the French franc at CFAF 50 to 1 French franc in 1958 before the 50 per cent devaluation in 1994. The Euro creation in 1999 led to the replacement of the French franc with the euro, and was subsequently pegged at CFAF 655.957 to one euro.

Africa. However, results emerging from these studies have been mixed. These studies apply the Generalised Least Squares (GLS), Fixed and Random effects, and Generalized Methods of Moments (GMM) estimators.

In fact, the methodological problems associated with the above studies are quite profound. For instance, available panel studies fail to show that a long run stable relationship between real exchange rate and its main determinants, including aid, exists. Similarly, the alternative techniques that have been applied in the literature fail to produce consistent coefficient estimates, thereby raising further doubts on their appropriateness.

The key objectives of this chapter are twofold. First, to determine whether there is a long-run stable relationship between the real effective exchange rate [REER] and its main determinants for WAEMU. Second, and related to the first, is to examine whether foreign aid has led to an appreciation of the REER in the WAEMU. In what follows, the chapter contributes the following to the literature: First, it combines both the panel unit root and cointegration techniques to determine the existence of a long-run relationship between aid and the REER. Second, it uses a new methodology, the Pooled Mean Group [PMG], to examine the aid and Dutch disease issue. This technique not only estimates the coefficients efficiently but also consistently.

Our findings are as follows: First, contrary to the theoretical prediction, we find that foreign aid is associated with a depreciation in the real effective exchange rate between 1975 and 2005. This is not surprising because aid contributes to private investment (as shown in chapter 3), which usually relies on intermediate goods from abroad. If the aid funds are used to import investment goods this offsets the Dutch disease effect. As for other factors: improved terms of trade and labour productivity growth lead to an appreciation of the real effective exchange rate. There is also some evidence that government consumption leads to an appreciation of the real effective exchange rate.

The remainder of the chapter is organised as follows: Section 2 lays out the theoretical framework. Section 3 reviews the empirical literature. Section 4 sets out the econometric model, and discusses the data. Results are discussed in section 5. Finally, some conclusions are given in section 6.

5.2 Theoretical Frameworks

In brief, we provide a discussion of real exchange rate theory and shed some light on why some aspects of the theory are inappropriate for the case in hand. Furthermore, we examine some issues pertaining to the definitions of the real exchange rate. Finally, the theoretical links between aid and the real exchange rate in addition to other determinants of the real exchange rate are considered.

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5.2.1 Real Exchange Rate Theory

Traditional analyses of the movements in the real exchange rate are usually based on the Purchasing Power Parity [PPP] theory. The idea behind the PPP is that through the goods arbitrage, the exchange rate will always adjust to ensure that the 'law of one price' holds[30]. This implies a constant real exchange rate. However, we share the view with other authors that the assumptions associated with this theory make its application inappropriate when considering the level of exchange rates movements, just like in the present case.

There are two main criticisms of the PPP approach. As pointed out by Rogoff (1996) and MacDonald (2000), PPP asserts that prices of identical bundles of goods tend to equalize when converted to a common currency, which is not necessarily the case. The explanation for this revolves around the distinction between tradable and non-tradable goods. There is abundance of evidence in support of PPP for traded goods but not for non-traded goods. Froot and Rogoff (1991), and De Gregorio *et al.* (1994) find that increased government spending tends to cause an appreciation of the real exchange since it falls more on non-traded goods. In this instance, it is possible for fiscal policy to cause a real appreciation of the exchange rate (indirect effect) when aid is used to finance government spending programs.

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[30] Arbitrage occurs where economic agents exploit price differences so as to make riskless profit.

The other reason why PPP theory has not been successful is because it assumes zero transportation costs on goods that are exchanged between countries. In fact, transportation costs can be quite substantial where the distance between countries is wide. As Frankel (1981) argues, PPP holds better when countries are geographically proximate and where trade linkages are high. If, however, there are impediments to trade, for example tariffs, the whole basis of the PPP becomes seriously undermined. Past and recent experiences show that many countries impose some form of restrictions on trade.

Regarding the definition of real exchange rate, two broad aspects are considered in the literature. First is the supply side which is based on the ratio of non-tradable to tradable goods prices (PNT to PT). The main problem associated with defining the real exchange rate as the ratio of *PNT* to *PT* is that the national accounts do not make any distinction between tradable and non-tradable goods. In empirical work, the application of this concept may therefore be problematic.

The other aspect which is relevant to the present study looks at the demand-side. Here, the real exchange rate is defined in effective (multilateral) terms, which for country *i*, (E_i) is expressed as:

$$REER_{it} = \prod_{j=1}^{n} \left(\frac{P_{it} S_{ijt}}{P_{jt}^{*}} \right)^{\varpi_{ij}} \qquad (5.1)$$

In this equation, S_{ij} is the nominal exchange rate defined as the foreign price of domestic currency; P_i is the domestic price level in country i; P_j^* is the foreign price level in country j; ϖ_{ij} is the trade weight of country j in country i's effective exchange rate index. An increase in $REER$ implies currency appreciation or loss in competitiveness. We adopt this definition for our empirical analysis.

While the domestic and foreign price levels can be measured in various ways depending on which definition of the real exchange rate one is interested in, this study uses the consumer price index (CPI). This is appropriate since we are concerned with a comparison of price levels for goods bought by consumers in different countries. The other measures are: (1) relative unit labour costs which is appropriate when one is focusing on the cost competiveness of an economy; (2) the price of an economy's exports compared to the price of its imports. This measures a country's terms of trade, or the relative purchasing power of domestic agents.

In the next section, we will explain how aid can affect the real effective exchange rate.

5.2.2 Foreign Aid and the 'Dutch Disease' Model

The traditional analysis of the impact of aid on the real exchange rate usually relies on the following assumptions: Full and efficient employment of factors of production, that is, countries operate on their production possibility boundaries, irrespective of the combinations of the factors of production; mobility of factors of production between sectors; countries are price takers, that is, the demand for tradable goods is perfectly elastic, in line with the small country assumption of orthodox trade theory. However, these assumptions are too rigid and are often violated.

Generally, capital inflows can generate excess supply of foreign currency, which then leads to the appreciation of the real exchange rate. Since aid is part of capital inflows, the effect will also be to shift the supply curve of foreign currency to the right, hence, causing an appreciation of the real exchange rate. Edwards (1994) recognises the effect of capital inflows on the real exchange rate, but does not consider foreign aid, independently. From a policy view point, it is useful to see how different capital inflows can impact on the real exchange rate. It may be the case that different capital flows can have different effects on the real exchange rate, depending, in part, on the reversibility of

capital inflows[31]. It is also important to WAEMU considering the magnitude of aid it receives in relation to other capital inflows to the zone.

However, it is also possible to hold the view that aid will not necessarily lead to real exchange rate appreciation (Dutch disease) since it can finance more imports. In fact, imports of intermediate goods can be increased with the aid inflows, which then permit greater domestic investment. An extreme example of this would be aid-tying, which requires a recipient country to import from the donor using the aid money (Morrissey and White, 1996). In this case imports can neutralize or limit the Dutch effect of an aid inflow. If imports exceed aid, then it can lead to some depreciation.

Apart from aid, there are other factors that can affect the real effective exchange rate, including labour productivity, terms of trade shocks, and government spending. These factors are briefly discussed below.

5.2.3 Labour Productivity

Balassa (1964) and Samuelson (1964), working independently reached the same conclusion that the real exchange rate appreciates in countries experiencing rapid economic growth (technological progress). This is because labour productivity, which historically, has been a feature of traded rather than non-

[31] This also in line with Corden and Neary (1982)

traded goods sector is higher in, developed than developing countries. Furthermore, productivity is assumed to be the same in the non-traded sector for both countries, while wages are the same in the traded and non-traded sectors within each economy and is positively related to productivity. Because increases in productivity induce a wage rise, prices of goods tend to increase as a result.

However, the main point that arises from the Balassa-Samuelson story is that rich countries tend to have overall high price indices, and poor countries low price indices, when aggregate baskets of traded and non-traded goods are converted into a common currency. In line with other studies (e.g., Abdih and Tsangarides, 2006; Roudet *et al.*, 2007; Li, 2004), we take real per capita GDP relative to the main trade partners as a proxy for the Balassa-Samuelson effect on the real exchange rate.

5.2.4 Terms of Trade

Most African countries export primary commodities whose prices are determined in the world commodity markets and are subject to erratic shocks. Terms of trade (TOT), defined as the ratio of export to import prices can affect the real exchange rate through both income and substitution effects (Edwards, 1989).

The income effect is when the real exchange rate appreciates or depreciates as a result of a rise or fall in the relative price of exports. The rise or fall in the relative price of exports leads to a rise or fall in real income of the economy, hence, a rise or fall in demand and the relative price for domestic goods (non-tradables).

Regarding the substitution effect, the effect of TOT improvement or worsening is not well understood. Assuming non-tradables and tradables are substitutes, an improvement in TOT will cause the price of non-tradables to increase relative to importables and decline relative to exportables. With these opposing effects, the overall change in the relative price of non-tradables to the tradables becomes difficult to disentangle. In brief, we will expect an improvement in terms of trade to cause an appreciation of the real effective exchange rate.

5.2.5 Government Consumption

Changes in government expenditure can also affect the real effective exchange rate through the domestic price level. An increase in government spending leads to a rise in the demand and price for domestic goods, causing an appreciation of the real exchange rate. This is the substitution effect. It is also plausible to contend that an increase in government spending will be financed through higher taxes, leading to a fall in disposable income and a decrease in demand for domestic goods. This represents the income effect of an increase in

government spending. On this basis, the effect of government spending on the real exchange rate will depend on whether the substitution or income effect dominates (Edwards, 1989)[32].

Taking the totality of the above issues into consideration, we present a formal model of the real effective exchange rate as follows:

$$REER = f(prod, tot, govt, aid) \qquad (5.2)$$

where *prod* is labour productivity; *tot* is terms of trade; *govt* is government consumption expenditure; and *aid* is foreign aid.

Next is a review of the relevant empirical literature.

5.3 Foreign Aid and the Real Exchange Rate: The Empirical Literature

What does the available evidence tell us about the impact of aid on the real exchange rate in SSA? Attempting to answer this question, this section examines and discusses some country and cross-country studies.

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[32]Alternatively, the effect of government consumption on the real effective exchange rate will depend on whether consumption is biased towards tradables or non-tradable goods.

Over the past two decades, there has been a steady increase in the number of studies examining the determinants of real exchange rates in developing countries[33]. However, the effect of increased aid inflows on the real exchange rate, or the Dutch disease effect of aid, has received less attention, especially in sub-Saharan Africa [SSA]. The studies on aid and Dutch disease in SSA that we are aware of include: Nyoni (1998) for Tanzania; Sackey (2001) for Ghana; Adenauer and Vagassky (1998) for four countries in West Africa; Elbadawi (1999) for 62 developing countries, including 28 from Africa; and Ouattara and Strobl (2004) for the 13 CFA zone countries. Table 5.1 gives a summary of the main studies on aid and real exchange rate in SSA.

Nyoni (1998) and Sackey (2001) investigate whether high aid inflows to Tanzania and Ghana, respectively, are associated with real exchange rate appreciation, using a cointegration methodology. While Nyoni finds that a one percent increase in aid inflow to the Tanzanian economy is associated with 0.56 percent depreciation of the RER in the long-run, Sackey reports about 0.33 percent depreciation for Ghana. But studies of this nature, with small sample size, usually yield biased coefficient estimates as a result of excessive loss of degrees of freedom. Since lags are frequently taken for time series cointegration estimation, the number of observations may not produce unbiased estimates of

[33] See, e.g. the surveys by Edwards (1989); Hinkle and Montiel (1999); Edwards and Savastano (2000). Elsewhere in the literature, Van Wijnbergen (1986) shows empirically, that excessive aid inflows can harm export competitiveness, especially the non-traditional (manufacturing) sector, through an appreciation of the real exchange rate.

the coefficients. This is more problematic when the size of the coefficients matters, especially the adjustment coefficient.

Recent panel data studies by Adenauer and Vagassky [henceforth AV] (1998), Elbadawi (1999), Ouattara and Strobl [henceforth OS] (2004) have shown differing effects of aid on the real exchange rate. While AV apply the GLS method to four CFA countries to examine the relationship between aid and the real effective exchange rate, Elbadawi and OS use fixed and random effects, and Generalized Method of Moments [GMM] techniques, respectively. AV find that a one percent increase in aid inflows is associated with a 0.07 percent appreciation in the REER in the same year, with a lag impact of 0.06 percent.

In Elbadawi (1999), an equation in which a one period lag of the real exchange rate appears on the right hand side was estimated. In line with the Dutch disease prediction, Elbadawi reported strong evidence of real exchange rate appreciation. There is a serious methodological problem associated with this study, however. The traditional fixed effects technique applied by Elbadawi is not suitable when the lag of the dependent variable appears on the right hand side of the equation. One reason for this is that fixed effects assume exogeneity of the independent variables, and hence the consistency of the estimated

coefficients may be lost in the process. In this circumstance, these estimated coefficients will lead to invalid inferences when used for testing.[34]

In order to avoid any endogeneity problem that may arise from the inclusion of endogenous regressors on the right hand side of an estimating equation, OS applied the GMM estimator for a sample of 13 CFA countries. They find that a one percentage point increase in aid inflows is associated with a 0.10 percentage point depreciation in the real effective exchange rate, contrary to the finding by AV. Though the finding itself may be plausible for reasons we gave in section 5.2, using the difference-GMM, which uses the first difference of the variables, can result in a loss of long-run information that is relevant for a stable relationship between the real exchange rate and its determinants. What this implies is that a long run stable relationship cannot be inferred from this methodology when the information pertaining to it has already been removed. Interestingly, as an Autoregressive Distributed Lag [ARDL] methodology, the PMG can yield valid coefficient estimates even in the presence of endogenous regressors.

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[34] The presence of the fixed effects leads to a correlation between the lagged real exchange rate and the residual, which biases the results. In this case, the coefficient of the lagged variable is negatively biased. As discussed in Baltagi, Griffin, and Xiong (2000), FE model is subject to a simultaneous equation bias from the endogeneity between the error term and the lagged dependent variable.

More generally, these panel studies do not show whether a stable relationship exists between the real exchange rate and its determinants. To tackle these problems, we apply the PMG estimator, which leads us to the estimation of a dynamic specification. The PMG captures the adjustment behaviour of the REER without sacrificing the long-run information unlike the difference-GMM estimator[35].

On the other hand, some related studies conducted on REER in WAEMU, for example, by Abdih and Tsangarides (2006) and Roudet *et al.* (2007), do not take into account any 'Dutch disease' effect of aid. We consider this a serious omission because these countries are large recipients of aid, especially European Union (EU) aid. Not only that, the uneven distribution of other foreign inflows leaves foreign aid as the main source of development finance. For instance, WAEMU members do not attract much foreign direct investment [FDI] unlike the Central African Economic and Monetary Community [CEMAC] countries that have a large presence of FDI in the oil sector. It is also well known that these countries do not have good access to the international capital market.

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[35] According to Hill *et al.* (2008, p.), '... as economists, we like to retain and use valuable information about the cointegrating relationship, and as econometricians, we like to ensure we use the best technique that takes into account the properties of the time series data.'

With the insights emerging from the above review, there is a case for investigating the impact of aid on REER, otherwise known as the Dutch disease phenomenon, using more appropriate techniques and a differently calculated REER. This helps to addresses the methodological issues that have been raised, and estimates the speed of adjustment parameter with greater precision. This parameter relates to the adjustment path to the long-run value of the real exchange rate after any disturbance or misalignment.

Having presented the theoretical model and discussed the empirical literature, we now set out the econometric model and the estimation techniques.

5.4 Econometric Model and Estimation Issues

5.4.1 The Pooled Mean Group Estimator (PMG)

Before considering the PMG estimator, we briefly discuss some of the traditional pooled estimators, pointing out some of the problems associated with them and why they may not be appropriate in the present case.

Estimators, such as fixed effects (FE), IV and GMM have often been employed to estimate dynamic panel data models, and are proposed, among others, by Anderson and Hsiao (1981, 1982), Arellano (1989), Arellano and Bond (1991), and Arellano and Bover (1995). In particular, formulating a fixed effect model

can sometimes be difficult, and depends on the question the researcher seeks to address. The degree of homogeneity in the parameters also needs to be addressed, that is, whether or not to treat the parameters as fixed or random. It is usually the case that random effects are assumed when the sample is drawn from a population of a particular category, and fixed when the study is based on a particular population. But this distinction is not always clear and easy to make. Another issue is that the choice is not clear on whether the effects are correlated with the explanatory variables or not.

Nevertheless, even if it is possible to make some progress on these issues, the dynamic structure of these models can produce inconsistent and misleading estimates of the mean values of the parameters, unless one is willing to assume homogeneity of the slope coefficients. But tests from these models often indicate that the parameters tend to differ across countries. Since it is reasonable to expect the long-run effects among the variables to be indistinguishable across countries, we apply an estimator that imposes weaker homogeneity assumptions so that consistent and efficient estimates of the coefficients can be produced. In fact, this is the main merit of the present estimator. We now introduce this technique proposed by Pesaran *et al.* (1999).

Table 5.1 Summary of the Main Empirical Findings in the Literature

Some Studies on Aid and Dutch disease in sub-Saharan Africa (SSA)			
Study and Country Coverage	*Estimation Technique*	*Variables*	*Results*
Nyoni (1998), Tanzania	*Time –series Cointegration* 1967 to 1993	• ODA as a percentage of GDP • Openness (sum of exports and imports to GDP ratio) • Total government expenditure as a percentage GDP	Aid inflows did not lead to a real exchange rate appreciation. The coefficient on the aid variable is 0.56.
Adanauer and Vagassky (1998), 4 West African Countries	*Panel GLS* 1980 to 1993	• Real ODA (deflated by the dollar import price index) • Real GDP (total factor supplies) • Growth rate differences (Balassa-Samuelson effect) • Terms of trade (one period lag)	Aid causes an appreciation of real exchange rate. They find that a one percentage point increase in aid leads to 0.07 percentage decrease in REER (i.e. an appreciation) in that year, with a lag impact of 0.06 percentage points.
Elbadawi (1999), 62 developing countries, including 28 from Africa.	*Panel Fixed and Random effects*	• ODA % of GNP • Terms of trade • government consumption as a percentage of GDP • trade openness • productivity • capital account variables • nominal exchange rate devaluation • change in domestic credit	Found strong evidence in support of the theoretical prediction that foreign aid leads to real exchange rate appreciation. An estimated elasticity of 0.084.
Sackey (2001), Ghana	*Time-series Cointegration* 1962 to 1996	• ODA as a percentage of GDP • Terms of trade • Government consumption as a percentage GDP • Index of agricultural production (technological progress) • Parallel market premium (Commercial policy stance)	Finds that aid causes RER depreciation in Ghana, in contrast to the Dutch disease prediction.
Ouattara and Strobl (2004), 13 CFA Countries	*Panel GMM* 1980 to 2000	• ODA to GDP ratio • Openness (sum of exports to GDP ratio) • Terms of trade • Domestic credit to GDP ratio • Dummy variable (Devaluation of CFA franc)	Aid caused the real exchange rate to depreciate, rejecting the Dutch disease hypothesis. They find that a one percentage point increase in aid inflows depreciates the real effective exchange rate by 0.10 percentage point.
Rajan & Subramanian (2009)		• Aid to GDP ratio • Exportability index • Aid/GDP*Exportability index	Aid affects a country's competiveness via real exchange rate appreciation.

The PMG estimator[36] follows an autoregressive distributed lag model (ARDL) of order (p q). Thus, the model is expressed as:

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij}^{'} x_{i,t-j} + \alpha_i + \varepsilon_{it} \qquad (5.3)$$

where y_{it} the is real effective exchange rate for country i in time t; x_{it} is the vector of explanatory variables for country i in time t; α_i represents country-specific effects; the coefficients of the lagged dependent variables, λ_{ij}, are scalars; and δ_{ij} are coefficient vectors. Re-parameterizing (5.3) gives the error correction equation:

$$\Delta y_{it} = \phi_i y_{it-1} + \beta_i^{'} x_{it} + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{it-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*'} \Delta x_{it-j} + \alpha_i + \varepsilon_{it} \qquad (5.4)$$

$i = 1, 2, \ldots, N$, and $t = 1, 2, \ldots, T$, where $\phi_i = -(1 - \sum_{j=1}^{q_i} \lambda_{ij})$, $\beta_i = \sum_{j=0}^{q_i} \delta_{ij}$,

$$j = 1, 2, \ldots, p\text{-}1,$$

and

---

[36] The PMG emphasises both the pooling dimension for homogeneity restrictions on the long-run coefficients, and the averaging across countries used to obtain the means of the adjustment parameter and the other short-run coefficients (Pesaran *et al.*, 1999).

$$\delta_{ij}^{*} = -\sum_{m=j+1}^{q} \delta_{im}, \quad j = 1, 2, \ldots, q\text{-}1,$$

The core assumptions of the model that we test are: First, that the ARDL (p q) model (5.3) is stable. This ensures that $\phi_i < 0$, and that y_{it} and x_{it} are related (cointegrated). Satisfying the condition, $\phi_i < 0$ implies that there exists a long-run stable relationship between y_{it} and x_{it}. A cointegrating relationship among the variables will ensure that the stability condition of the model is also satisfied. Second, that the long-run effects are the same across countries. That is:

$$\beta_i = \beta \, , i = 1, 2, \ldots, N$$

A counterpart of PMG is the Mean Group [MG], which estimates the model for each country separately before averaging the coefficients. However, the efficiency of the MG estimator is hampered by a lagged dependent variable bias when T is small. The MG is also inefficient if the slope coefficients are homogenous. The estimates of both MG and PMG allow us to test whether or not the sample (WAEMU countries) can be pooled (assumption 2). We will rely on the Hausman statistic to test this supposition that no systematic difference exists between the coefficients of the estimates.

In WAEMU, members use the same currency [*CFAF*], therefore, some homogeneity in the relationship between the REER and its main determinants can be expected across these countries. Additionally, common technologies and the absence of forward markets are also supportive of long-run slope homogeneity across the members. On the other hand, there may be some short-run differences in the size and effects of some shocks to the economy. We are not concerned with short-run movements in real exchange rates since they are mainly the result of monetary policy dynamics. It is the long-run coefficients, βs, and the error correcting speed of term, ϕ_i, that are of primary interest.

The PMG estimator has been used in estimations involving equilibrium real exchange rates by Abdih and Tsangarides (2006) and Roudet *et al.* (2007). However, this study is the first to apply it to the Dutch disease hypothesis for WAEMU. Additionally, we apply the dynamic fixed effects (DFE) approach also suggested by Pesaran *et al.* to check the robustness of the results. Again, we will rely on the Hausman statistic to determine the extent of any simultaneity bias on the DFE estimates.

5.4.2 Unit root and Cointegration Tests

Evidence from recent studies is often quoted to support the view that most macroeconomic variables, especially real exchange rates, are non-stationary.

This necessitates testing the series for unit roots. Many, perhaps most economists, (e.g. Engle and Granger, 1987; Johansen, 1988, 1995; Pesaran, 1997) working in the field of econometrics have expressed the view that cointegration analysis is concerned with long-run behaviour. Since we are primarily interested in the medium to long-term determinants of the real exchange rate, cointegration techniques are therefore most suitable in the present analysis. In the traditional time series literature, a set of variables that are individually integrated of the same order are cointegrated if some linear combination of them can be described as stationary.

The next two paragraphs discuss the data.

We use annual data from 1975 to 2005 which were obtained from the *IMF International Financial Statistics and World Economic Outlook*. However, empirical analyses (see empirical review section) on the real exchange rate differ on the choice of long-run determinants, partly because of data availability considerations.

Primarily, our choice of variables is motivated by the real exchange rate theory and the Dutch disease model. We also paid particular attention to the empirical literature, data availability and the structure of WAEMU economies. In spite of the abundance of data on foreign aid, only few empirical studies have

considered it as a determinant of the real exchange rate. All variables are in logs, and the summary statistics and graphs are shown in appendix C. In Table C.1, we present means, medians and standard deviations for the key variables in the analysis. The average aid inflow between 1975 and 2005 for the 7 countries is 2.29 percent of GDP. Government consumption expenditure is defined as a percent of GDP, while foreign aid is as previously defined, that is, ODA as a percent of GDP.

Discussion of results is the subject of the next section.

5.5 Results

The first set of regressions tests the variables for unit roots and cointegration. The second set attempts to provide evidence on the presence or otherwise of the Dutch disease phenomenon. In addition, it concerns the relationship between the real exchange rate and other main determinants. Finally, it sheds some light on the stability of our core findings.

(a) Unit Roots and Cointegration

To test for unit roots on the variables, the chapter employs the Im, Pesaran and Shin [henceforth IPS] (2003) *t-bar* test[37]. The IPS test is applied to dynamic panels, which conforms to our chosen methodology, the PMG. It also takes account of serial correlation in the data[38]. An alternative test, proposed by Hadri (2000), is a residual-based Lagrange Multiplier [LM] test, which draws its motivation from the Kwiatkowski *et al.* (1992) conjecture that the time series for each cross-sectional unit is stationary around a deterministic level or a deterministic trend. Here, the Hadri unit root test serves as a robustness check on IPS.

Overall, the results in Table 5.2 suggest the existence of unit roots in the variables. However, at the country level, the ADF and KPSS tests (see Table C.1 in appendix C) show consistently that government consumption tends to be stationary for Benin, Burkina Faso and Togo. Contrary to this, both panel data techniques show that government consumption has a unit root. We therefore accept that government consumption is non-stationary. Again, Stein's (1994) argument that the real exchange rate is stationary is not supported by this evidence. The non-stationarity of the real exchange rate negates the foundation of the PPP, and confirms our theoretical argument against using the PPP.

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[37] For more insights, see Levin, Lin and Chu (2002); Breitung (2000); Maddala and Wu (1999); Choi (2001).

[38] A Monte Carlo experiment by IPS justifies this choice, since it was shown that *t-bar* is powerful even when the value of N is less than 5.

In addition, the various panel unit root tests conducted on the first difference of the variables confirm that the series are indeed I (1) variables, that is, integrated of order one (see Table C.2 in appendix C). The consequences of non-stationary variables for regression modelling are quite profound. Unless non-stationary variables are cointegrated, any regression based on them will yield spurious results. However, as a first step, these results suggest that a meaningful relationship is likely to exist between the real effective exchange rate and its main determinants since they are all integrated of the same order.

Table 5.2: Panel Unit Root Tests

Panel: WAEMU	Series	t-bar statistic	Hadri
	reer	-1.084	8.218[0.000]
	prod	-1.646	5.102[0.000]
	tot	-2.123	3.920[0.000]
	govt	-2.427	0.767[0.009]
	oda	-2.210	5.333[0.000]

For t-bar test, Ho: Unit root; Hadri, Ho: Stationarity. [ ] are P-values. For 1%, 5% and 10% significance levels; the *t-bar* critical values are -2.93, -2.69 and -2.57, respectively.

For cointegration test, this chapter applies the residual-based tests developed by Pedroni (1999) under the null hypothesis of no cointegration. These statistics are uniquely used for testing long-run relationships in dynamic panels with

multiple regressors (see appendix C.6 for additional discussion)[39]. They allow the dynamics, individual effects, and the cointegrating vector to differ under the alternative hypothesis.

As far as the statistics are concerned, Table 5.3 shows that two out of the four within-dimension based tests are significant at the 5 percent level, while the other two are significant at 10 percent. Pedroni (1997, 2004) shows that panel rho-statistic produces the most reliable estimate when T is as large as 100. On the other hand, all the three between-dimension based tests are statistically significant at the 5 percent level.

On the basis of this evidence, we conclude that a long-run economic relationship exists between the real effective exchange rate and its main determinants for WAEMU. This further indicates that aid can be a major determinant of REER.

With this preliminary insight, we now proceed to estimate the long-run REER equation for two different specifications. First, we estimate the REER without the aid term. Second, we augment the first equation by including the aid term. The latter serves as our main specification.

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[39] There are alternative tests by Kao (1999) and McCoskey and Kao (1998). Kao's test is not applicable in this context because it does not allow for multiple exogenous variables in the cointegrating equation.

Table 5.3 Panel Cointegration Tests

Series:	***Pedroni Residual Tests***	
reer , prod , tot , govt , oda	***Test statistic***	***p-value***
Within-dimension tests		
Panel v-Statistic	-2.1257	0.0417
Panel rho-Statistic	3.4042	0.0012
Panel PP-Statistic	1.8016	0.0787
Panel ADF-Statistic	1.9952	0.0545
Between-dimension tests		
Group rho-Statistic	4.1988	0.0001
Group PP-Statistic	2.1375	0.0406
Group ADF-Statistic	3.0521	0.0038

Model includes deterministic intercept and trend.

(b) Dutch Disease

Certainly, in an environment where resources are assumed to be fully employed (traditional assumption of the Dutch disease model), an increase in aid will cause an appreciation of the real exchange rate or loss of export competitiveness. However, the economies of WAEMU suffer from excess labour supply. The Dutch disease argument may therefore not hold perfectly in these countries. Similarly, if the supply of foreign currency was to increase as a result of aid inflows, the REER will therefore appreciate. However, if the volume of imports for investment [intermediate] goods increases as a result of increase in aid inflows, there will not necessarily be any Dutch disease. Though

this study does not investigate any empirical link between aid and imports, theoretically this reasoning is consistent with the 'foreign exchange gap' of the dual gap model (Chenery and Strout, 1966).

The results in Table 5.4 show that the aid coefficient is negatively signed but only significant for the DFE estimator. As pointed out in the earlier chapter, cross-sectional dependence of the errors will violate the classical assumption of panel models. To avoid this problem, we correct the standard errors of the DFE estimates for cross-sectional error variances.

To check if these results depend on the choice of lag length, we altered the lag structure of the ARDL. In particular, we re-assessed the results in table 5.4 using a lag length of 2 for the dependent variable. This also serves as a robustness check on the initial result. As clearly shown in Table 5.5, foreign aid now turns out to be significant for the PMG estimator while it continued to remain strongly significant for the DFE estimator.

For the *CFA* region, Ouattara and Strobl (2004), find that foreign aid is associated with a depreciation of the real exchange rate. Therefore, the finding that foreign aid is associated with a depreciation of the real effective exchange rate is in line with this evidence. However, this is contrary to the studies by AV

(1998) and Elbadawi (1999), which find evidence of the 'Dutch disease' phenomenon or real exchange rate appreciation.

Table 5.4: Panel regression of Dutch disease effect of Aid using annual data (1975 -2005)

Dependent Variable: log of real effective exchange rate (*LREER*)				
	PMG		**DFE**	
Variables	**1**	**2**	**3**	**4**
lprod	0.639***	0.200*	0.284*	0.242***
	(0.157)	(0.107)	(0.157)	(0.062)
ltot	0.269**	0.256***	0.108	0.252***
	(0.127)	(0.102)	(0.164)	(0.078)
lgovt	0.269**	0.268***	0.087	0.191**
	(0.109)	(0.090)	(0.127)	(0.075)
loda		-0.319***		-0.328***
		(0.082)		(0.068)
Adjust. (ϕ)	-0.298**	-0.389***	-0.277***	-0.362***
	(0.136)	(0.112)	(0.079)	(0.085)
	Diagnostics			
Log likelihood	163.131	173.429		
Hausman-test	5.25	7.18	0.01	0.06
	[0.386]	[0.304]	[1.000]	[0.999]
Observations	217	217	217	217

The model is estimated for both PMG and DFE using ARDL (1, 1, 1, 1, 1) specification. Note: Robust Standard errors are in parentheses ( ). Numbers in brackets [ ] indicate p -values. * indicates that a coefficient is significant at 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

Further justification can be provided for this finding. Here, it is more plausible to argue that the aid money, to some extent, may have financed imports of investment goods, so that competitiveness is not affected. This import-driven

domestic investment is a feature of many developing countries, including WAEMU. In chapter two, we established that multilateral aid has had some impact on domestic private investment and hence provides further support for this line of reasoning.

The empirical evidence for the other variables is broadly in line with their theoretical predictions. We conclude that other factors, except government consumption, caused the real exchange rate to appreciate.

As far as the adjustment of the real effective exchange rate to the equilibrium is concerned, if, ϕ, the adjustment parameter is *zero*, no long-run relationships (cointegration) among the variables would exist. However, the significantly negative coefficient of the adjustment parameter suggests that the real effective exchange rate reverts to its long-run value after some shock, and, thus, supporting the evidence of cointegration between the real exchange rate and its observed determinants as earlier established. This implies that the stability assumption of the model, that is, $\phi < 0$ is significantly satisfied.

Furthermore, in all the PMG specifications the Hausman statistics show, consistently, that imposing the long-run homogeneity assumption on the coefficients is adequate and fully satisfied. On this basis, therefore, we conclude that these countries are not too heterogeneous to be pooled. This implies that

the PMG is preferred to the MG (see Table C.5 in Appendix C for MG estimates).

As Baltagi *et al.* (2000) discuss, FE models are subject to a simultaneous equation bias from the endogeneity between the error term and the lagged dependent variable. Here, the Hausman statistics under DFE in Tables 5.4 & 5.5 indicate that the simultaneous equations bias is not present for these data, implying that the DFE is also preferred to the MG. The DFE estimator, like the PMG estimator, restricts the coefficients of long-run estimates to be equal across all countries.

However, we suspect that the large devaluation of the CFAF in 1994 will have profound implications for the competiveness of WAEMU countries. Therefore, the results presented in the tables above, may suffer from omitted variable bias. To deal with this issue empirically, we included a shift dummy in the estimating equations.

(*c*) *The 1994 Nominal Devaluation*

Between 1986 and 1993, CFA zone, including WAEMU countries, experienced a gradual appreciation of its currency. The appreciation of the French franc, coupled with a series of commodity price shocks forced the economies to devalue the CFA franc in January 1994. Before the devaluation, however, the

CFA franc maintained a fixed parity with the French franc. The 'franc fort' strategy pursued by France over this period was largely responsible for this appreciation (Blanchard and Muet, 1993). The strategy aimed to stabilize the French economy after an expansionary policy adopted by the socialist government in 1981-83. In addition, France attempted to gain some monetary leadership in Europe along with Germany, preparatory to the European Monetary Union. Considering the scale of the devaluation, it is important to control the effect of this policy shift in the estimations.

From the results we have presented in Table 5.6, adding the shift dummy sharpens the estimates considerably. Perhaps the most striking feature of this result is that both estimators give similar estimates. More so, the closeness in the estimates of the aid coefficient for both estimators demonstrates that the model is more precisely estimated.

On top of that, both estimates now suggest a faster speed of convergence to the equilibrium of around 40 percent per year. Therefore, we conclude that the shift dummy is relevant for this estimation.

In terms of the overall stability of the result, once account is taken of the currency devaluation, the lag structure (up to 2) does not affect the quality of

the results considerably. The results are therefore stable and robust to the choice of lag length.

Table 5.5: Panel regression of Dutch disease effect of Aid using annual data (1975 -2005)

Dependent Variable: log of real effective exchange rate (*LREER*)				
	PMG		DFE	
Variables	1	2	3	4
lprod	0.808***	0.250***	0.386***	0.309***
	(0.148)	(0.104)	(0.169)	(0.094)
ltot	0.617***	0.287***	0.164	0.280***
	(0.141)	(0.099)	(0.158)	(0.078)
lgovt	0.023	0.240***	0.037	0.105
	(0.104)	(0.085)	(0.127)	(0.105)
loda		-0.287**		-0.236***
		(0.076)		(0.066)
Adjust. (ϕ)	-0.275***	-0.333***	-0.266***	-0.315***
	(0.101)	(0.099)	(0.060)	(0.063)
	Diagnostics			
Log likelihood	228.278	235.997		
Hausman-test	2.12	4.85	5.30	7.14
	[0.832]	[0.564]	[0.623]	[0.387]
Observations	217	217	217	217

The model is estimated for both PMG and DFE using ARDL (2, 1, 1, 1, 1) specification. Note: Robust Standard errors are in parentheses ( ). Numbers in brackets [ ] indicate p -values. * indicates that a coefficient is significant at 10 percent level; ** indicates 5 percent significance level; *** indicates significance at 1 percent level.

A number of conclusions can be drawn from the totality of these results. First, there exists a long run stable relationship between real exchange rate and its main determinants. The long run homogeneity assumption holds even after

accounting for the nominal devaluation of the exchange rate. Second, once account is taken of other factors, foreign aid has not led to real exchange rate appreciation, contrary to the traditional Dutch disease model. Third, the spurious regression problem which often affects the validity of inferences is not a feature of the present study.

Table 5.6: Panel Regression of Dutch Disease Effect of Aid Using Annual Data (1975-2005): Devaluation Dummy Included

Dependent Variable: real effective exchange rate (*REER*)				
	PMG	**DFE**	**PMG**	**DFE**
Variables	**1**	**2**	**3**	**4**
lprod	0.336***	0.179***	0.261***	0.207**
	(0.120)	(0.069)	(0.093)	(0.087)
ltot	0.280***	0.247***	0.359***	0.249***
	(0.104)	(0.084)	(0.093)	(0.082)
lgovt	0.321***	0.191***	0.158**	0.217**
	(0.093)	(0.026)	(0.078)	(0.093)
loda	-0.113***	-0.234***	-0.161***	-0.184***
	(0.041)	(0.058)	(0.044)	(0.060)
dev. dummy	-0.111**	-0.227***	-0.132**	-0.236***
	(0.055)	(0.062)	(0.058)	(0.059)
Adjust. (ϕ)	-0.238***	-0.285***	-0.224***	-0.270***
	(0.053)	(0.058)	(0.043)	(0.049)
	Diagnostics			
Log likelihood	273.826		221.272	
Hausman-test	1.131	0.44	2.85	0.62
	[0.932]	[0.996]	[0.764]	[0.984]
Observations	217	217	217	217
Specification	*ARDL (1, 1, 1, 1, 1)*		*ARDL (2, 1, 1, 1, 1)*	

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.

5.6 Conclusion

In this chapter, we have investigated the impact of aid on the real effective exchange rate - the so-called 'Dutch disease' effect of aid, drawing evidence from the West African Economic and Monetary Union.

Before estimating the real exchange rate equation, we investigated our series for unit roots and cointegration, using both traditional time series and panel data techniques. These two approaches helped us to establish the existence of long-run relationship between the variables. The various unit root tests for the individual variables confirmed the presence of unit roots in all the variables. The findings provide strong support for cointegration, thus permitting a long-run interpretation of the estimates of the regressions.

Applying the PMG and DFE estimators, we show consistently that, aid has been associated with depreciation in the real exchange rate, in contrast with the prediction of the Dutch Disease model. Our explanations for this result are: increased demand for imports of investment goods using the aid money, and some unrealistic assumptions of the Dutch disease model e.g. full employment of resources. Finally, other factors, for example, labour productivity and terms of trade are associated with an appreciation of the real exchange rate. There is some evidence that government consumption of non-tradable goods leads to an appreciation of the real exchange rate.

Chapter 6

Aid Flows, Debt and Economic Performance in Nigeria

6.1 Introduction

In the 1970s the world economy witnessed a rise in oil prices which resulted in increased supply of credit to many developing countries. Similarly, Official Development Assistance to developing countries intensified. In spite of this trend, ODA in Nigeria did not keep pace with the level obtaining in other SSA countries, especially as a percentage of GDP and in per capita terms. In nominal terms, ODA fell from US$81 million in 1975 to US$32 million in 1985. During the 1990s, it maintained an average of around US$200 million per annum before increasing to its highest levels of US$580 million and US$6,415 million in 2004 and 2005, respectively (see Table D.1 in Appendix D).

Meanwhile, with the expansion of international credit and the implementation of several projects outlined in the fourth National Development Plan (1981-1985), Nigeria's foreign debt began to build up. Especially, the official debt stock increased from about US$700 million in 1975 to around US$ 8,500 million

in 1986. Since then, the official debt stock has continued to rise, reaching US$26,600 million and US$30,300 million in 2000 and 2004, respectively (see Table D.3 in Appendix D). However, of greater importance than these changes in absolute levels of debt is the debt burden frequently measured as the ratio of debt to Gross National Product or Gross Domestic Product (see Table D.5 in Appendix D for other debt indicators).

As a result of the rapidly increasing debt levels and the high debt burden, Nigeria agreed to non-concessional debt rescheduling with the Paris Club in 1986, 1989, 1990 and 2000. However, according to the IMF (2004), a combination of weak oil prices and ineffective public debt management caused the rescheduling agreements to have little effect on the debt stock. More specifically, each agreement was followed by renewed arrears; and accumulation from interest charges on late payments and penalty charges added to the overall debt stock.

Though not eligible for debt relief under the Highly Indebted Poor Countries (HIPC) initiative of the World Bank which was launched in 1996 (and presently running under an enhanced scheme) Nigeria successfully negotiated a debt relief (cancellation) in 2006 with its Policy Support Instrument (PSI) pursued

within the National Economic Empowerment and Development Strategy (NEEDS)[40] framework and supported by the IMF.

The question that we try to answer in this chapter is whether capital inflows (including aid) and the high debt burden that has increased over time had any impact on private investment and economic growth in Nigeria.

The remainder of the chapter is organized as follows: Section 2 examines the economic performance of Nigeria between 1975 and 2005. Section 3 briefly looks at the evolution of ODA, the theory of capital imports and growth, and provides some empirical evidence on the relationship between aid, private investment and growth. Section 4 examines the structure and composition of Nigeria's external debt, the theory of the relation between debt, debt service and private investment and growth. In addition, it investigates the empirical relation between official debt and private investment and growth in Nigeria. Finally, section 5 concludes.

To carry out the empirical analyses, the chapter uses the autoregressive distributed lag (ARDL) approach to cointegration proposed by Pesaran and Shin (1995) and further developed by Pesaran *et al.* (2001). The main advantage of using this approach is that it allows stationary and non-stationary variables to be included in the model unlike the vector autoregressive (VAR) model

[40] NEEDS serves as Nigeria's poverty reduction strategy (PRSP).

associated with Johansen. The VAR model requires all variables to be integrated of the same order - 1(1). In addition, the VAR approach tends to be easily over-parameterised, leading to excessive loss of degrees of freedom. Most times, this restricts the number of variables to be included in the system. However, this approach may not be shielded from endogeneity problems. Like in chapter 3, we will address the endogeneity problem by using lagged values of potential endogenous regressors.

The ARDL approach follows a number of steps. First, we test the existence of a long-run relationship (cointegration) among the variables. In practice, the cointegration test is an *F-test* of the joint significance of the lagged levels of the variables irrespective of whether they are I(0) or I(1).

The *F-test* is implemented by comparing the *F*-statistic with the critical values of the lower and upper bounds. If the *F*-statistic is above the upper bound, the null hypothesis of no cointegration can be rejected. Conversely, the null hypothesis cannot be rejected if the test statistic falls below the lower bound. The test is inconclusive if the statistic lies within the band. The critical values for this test are provided by Pesaran *et al.* (2001).

Once cointegration is established, in the second step the long-run parameters are estimated using the ARDL method. This requires selecting the appropriate

lag length for the variables in the private investment and growth equations using the Schwarz information criterion [SIC]. We limit the analysis to the long-run estimates.

6.2 Nigerian Economy - Some Stylized Facts

Nigeria's economy is dominated by oil and gas, and its GDP is largely determined by the activities of this sector. The sector accounts for about 99 percent of foreign exchange earnings, and 80 percent of government revenues (AfDB, 2000 & 2003)[41].

As the figures in Table 6.1 show, Nigeria experienced a disappointing performance between 1975 and 1984 in terms of real GDP growth. However, growth recovered in the following decades and averaged over 4 percent in each decade.

Further examination of growth and private investment is given in Figure 6.1. As the Figure depicts, the country's growth was consistently negative between 1980 and 1984 and showed a sharp downward trend between 1988 and 1994. Growth fell between 1996 and 1998, presumably due to a combination of decreased oil production and rising debt burden. There was quota reduction by the Organization of Petroleum Exporting Countries (OPEC) during this period.

[41] AfDB is African Development Bank

Growth was at its highest level - 11 percent in 2003 which again is partly a result of increased oil production from an average of 1.97 million barrels per day in 2002 to 2.12 million barrels per day in 2003 (AfDB, 2004). Given these facts, it is relevant to highlight that growth has been volatile with large negative swings; therefore, a negative coefficient for the constant term in the regressions may also be expected.

Regarding saving, investment and the trade balance, Table 6.1 shows that saving did not keep pace with investment between 1975 and 1984. Observe from Figure 6.1 that private investment hovered around 10 percent between 1975 and 1979, and later moved below it between 1980 and 1990. Since 2002, private investment as a percentage of GDP has been showing a decreasing trend even as government is making efforts to improve private sector environment.

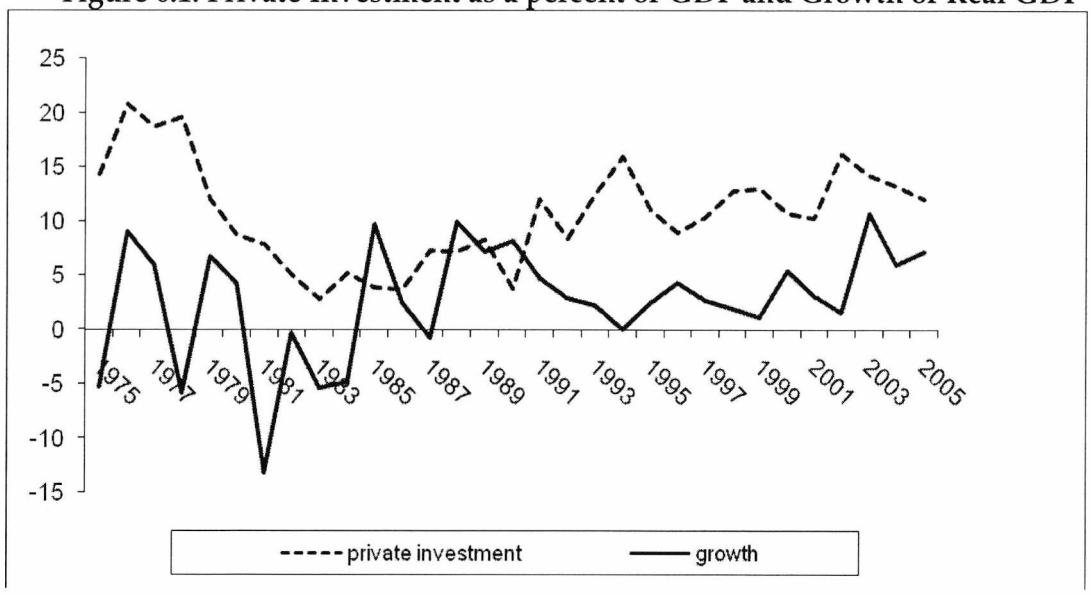
As for the external balance, Table 6.1 shows that the economy's imports were greater than its exports between 1975 and 1984, implying that investment and imports must have been partly financed by capital inflows.

Table 6.1: Macroeconomic Performance Indicators (in percent): 1975-2005

	1975-1984	*1985-1994*	**1995-2005**
GDP growth per annum	-0.84	4.68	4.22
Savings/GDP	21.53	21.16	23.89
Investment/GDP	22.34	17.86	21.22
Private investment/GDP	11.51	8.29	12.07
Public investment/GDP	11.07	9.51	9.17
External balance/GDP	-0.82	3.30	7.62

Source: Own calculation, based on World Development Indicators (2008).

Figure 6.1: Private Investment as a percent of GDP and Growth of Real GDP



6.3 Aid Flows in Nigeria

Aid inflows to Nigeria have been very low, especially when compared with other countries in West Africa. Relative to GDP, the values compare unfavourably with the cross-section average of about 13 percent as given in Table A.1 in the Appendix of chapter 3. As shown in Table D.2 in Appendix D, they peaked at 6.6 percent in 2005. Table 6.2 also shows that foreign aid is mainly composed of bilateral inflows. In per capita terms, the figures we observe in Table 6.2 further show that aid has been very small. It was a little over $1 in 1975 and just about $1.40 in 2000 before peaking at around $45 in 2005. This sudden jump is mainly a result of the debt forgiveness which the country received from bilateral creditors (Paris Club) between 2005 and 2006.

Table 6.2: Official Development Assistance (Million US Dollars) and Aid per Capita for Some Selected Years

	1975	*1985*	*1995*	*2000*	2005
		ODA (Millions US $)			
Bilateral	67.53	15.79	72.15	84.64	5944.55
Multilateral	13.85	15.74	138.74	89.06	471.23
Total ODA	81.38	31.71	210.9	173.70	6415.78
		Aid Per Capita (US $)			
Total ODA	1.33	0.39	1.93	1.39	45.39

In sum, the overall picture that emerges from Table 6.2 above and Table D.2 in the Appendix is that foreign aid as source of external finance remains very small in the country. However, consistent with the previous chapters, we will

investigate its impact on private investment and growth after a discussion on the theory of the relation between capital imports and growth.

6.3.1 Theory of Capital Imports and Growth

Although capital inflows can lead to a higher rate of economic growth, the way they are financed and the terms of borrowing may have offsetting effects on the growth rate. Thirlwall (2006) provides a theoretical model that takes these considerations into account and is thus discussed:

First, it is shown that the rate of growth of output will be faster with capital imports as long as new inflows of foreign capital exceed the loss of domestic saving to pay interest. If, however, interest charges are offset by new borrowing, capital imports will have a positive effect on the rate of growth of output. This can be shown as follows:

$$O = Y + rD \qquad (6.1)$$

where *O (GDP)* is output, *Y (GNP)* is income, *r* is the interest rate and D is debt. The difference between domestic output (GDP) and national income (GNP) is net factor payments abroad (including interest, profits and dividends). From (6.1) we have

$$\Delta O = \Delta Y + r\Delta D \qquad (6.2)$$

Based on a Harrod-Domar growth equation, the change in output is defined as a function of investment:

$$\Delta O = \sigma I \qquad (6.3)$$

where σ is productivity of capital, and

$$I = sO + \Delta D - srD \qquad (6.4)$$

where s is the marginal propensity to save. Substituting (6.4) into (6.3) and dividing by O gives an expression of output growth of

$$\frac{\Delta O}{O} = \sigma\left(s + \frac{\Delta D - srD}{O}\right) \qquad (6.5)$$

What equation (6.5) implies is that the growth of output will be higher than the rate obtainable from domestic saving alone as long as a $\Delta D > srD$, that is, as long as new inflows of capital exceed the amount of outflow on past loan that would otherwise have been saved.

Second, the rate of growth of income will be faster as long the productivity of capital imports exceeds the rate of interest. From (6.2) we have

$$\Delta Y = \Delta O - r\Delta D \qquad (6.6)$$

Substituting (6.4) into (6.3) and the results into (6.6) gives

$$\Delta Y = \sigma(sO + \Delta D - srD) - r\Delta D \qquad (6.7)$$

Since $Y = O - rD$, we can re-write (6.7) as

$$\Delta Y = \sigma sY + \Delta D(\sigma - r)\ , \qquad (6.8)$$

and dividing by Y we have the following expression for the rate of growth of income:

$$\frac{\Delta Y}{Y} = \sigma s + (\sigma - r)\frac{\Delta D}{Y} \qquad (6.9)$$

Equation (6.9) shows that the growth rate of income with capital imports will be higher than that obtained from domestic saving alone as long as the productivity of capital imports (σ) exceeds the rate of interest on foreign borrowing (r).

Now that we have discussed how capital imports can lead to higher growth, we want to know if foreign aid has had any impact on the macroeconomic performance of Nigeria, namely private investment and growth. In this regard, the next section analyses the impact of total ODA and its types on private investment and growth.

6.3.2 The Impact of Aid Flows on Private Investment and Economic Growth

We start by posing the simple question: Can any relationship be inferred between, private investment, growth and foreign aid in Nigeria?

To answer the part of the question that pertains to private investment, we augment equation 3.6 of chapter 3 with aid and some determinants of private investment.

First, the evidence presented in Table 6.3 shows that there is a cointegrating relationship between private investment and its determinants. Apparently, real GDP growth has some positive impact on private investment, while real interest rate does not. Regarding domestic bank credit to the private sector, the coefficient has a significant negative impact in all the specifications. At the theoretical level, debt service variable is expected to have a negative impact on private investment for a typical country with significant debt problems,

everything else remaining the same[42]. In line with this prediction, we find that the debt service discouraged private investment in Nigeria.

Turning to the coefficients on the main variables of interest - aid variables, we find that the coefficient on total aid is not significant. To check if this is as a result of the size of aid values, we substitute total net flows for total aid. As shown in equation 2, it has a significant impact on private investment. Beyond these estimates, however, we test our initial propositions regarding the independent effects of multilateral and bilateral aid components. Evidently, once account is taken of these differences, multilateral aid has a marginal significant positive impact on private investment while bilateral aid does not. This marginal impact is likely to be as a result of the small values of the aid variable.

Finally, we finish our comment of the results in Table 6.3 by comparing it with the cross-country evidence obtained in chapter 3. We note that the size of the coefficients differ, confirming that, cross-section evidence can never describe an individual country's experience exactly. Though cross-country studies offer some useful insights, we hold the view that looking at the relationships among these variables at country level can be another effective way of understanding the implications of foreign aid for private investment and growth. At least, the

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[42] In recession, private investment is likely to fall while public debt may rise, and thus private investment may fall for this reason.

way in which foreign aid affects these macro variables varies across countries - acting in some to build new capacity for production of goods and services, and in others to sustain or increase the level of effective demand (smooth consumption), maintain or provide public goods and in others to improve political ties. An important caveat, however, is that since both cross-country and country-specific regression include different variables in the private investment equation caution should be taken when comparing the exact size of the coefficients[43].

Likewise, we test the impact of foreign aid on output growth, this time using a modified version of equation 4.3 in chapter 4. As far as the results presented in Table 6.4 are concerned, there is evidence of a cointegration between growth and its determinants. There is no evidence, however, that total aid has had any impact on growth in Nigeria, but multilateral aid has had a significant positive impact on real GDP growth. Throughout, export growth has a strong positive effect on output growth, implying that GDP to some extent is determined by the output and exports from the country's large scale mining and oil exploration projects.

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[43] There are of course many variables that can be included in the private investment equation as outlined and applied in the cross-country section. However, since the present chapter involves one country, degrees of freedom consideration becomes very imperative. In this regard, we choose the relevant variables, taking into account the structure of the economy.
To a very large extent, investment is a country-issue, and therefore variables determining it are likely to vary considerably across countries (Deshpande, 1997). In cross-country this variation is partly addressed by using the appropriate estimation procedure - the fixed effects estimator.

Table 6.3: The Impact of Foreign Aid on Private Investment

Variables	*1*	*2*	3
GDP growth(lagged)	0.16*	0.15**	0.18*
	(0.08)	(0.07)	(0.10)
Real int. rate	-0.02	-0.03	-0.01
	(0.05)	(0.05)	(0.05)
Bank credit	-0.12*	-0.20**	-0.13*
	(0.06)	(0.08)	(0.06)
Debt service	-0.23***	-0.19**	-0.22***
	(0.06)	(0.07)	(0.07)
Total Aid(lagged)	0.84		
	(1.02)		
Total net flows(lagged)		0.30**	
		(0.14)	
Multilateral Aid(lagged)			0.92*
			(0.44)
Bilateral Aid(lagged)			0.76
			(1.20)
Constant	13.70**	14.82***	12.65**
	(5.02)	(4.18)	(4.88)
F-test (cointegration)	3.46*	3.84**	3.72**
R-Squared	0.74	0.79	0.76
Serial Correlation	0.446	0.476	0.958
	[0.830]	[0.499]	[0.306]
Normality	0.884	0.725	0.150
	[0.423]	[0.696]	[0.928]
Heteroscedasticity	0.548	0.473	0.390
	[0.216]	[0.498]	[0.438]

Note: 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 significant at 1 percent level. The F-test for cointegration is based on Pesaran *et al.* (2001). The test for serial correlation is the LM test for autocorrelation of up to order 2, the test for normality is proposed by Bera and Jarque (1981), the test for heteroskedasticity is based on White's LM. Order selection is of the ARDL is based on Schwarz Bayesian criterion.

To validate our results, we carried out some diagnostic tests. There is nothing in the estimated models to suggest the presence of autocorrelation in the errors. More so, the errors have a constant variance and are normally distributed.

To summarise, multilateral aid has some marginal impact on both private investment and growth while bilateral aid does not. More so, the size of the coefficient on multilateral aid obtained from the present estimation is different from those of cross-country estimation. This then suggests that an individual country characteristic cannot be fully explained by a cross-section study. The diagnostic tests suggest no violation of the main classical assumptions as regards the error terms. We then presume that the result is a reflection of the data generating process which cannot be captured by this estimation.

Having analysed the relationship between foreign aid, private investment and growth, we now assess the relation between official debt, debt service and private investment and growth. First, however, we begin with a brief discussion of the structure and composition of Nigeria's external debt and the theory of external debt.

Table 6.4: The Impact of Foreign Aid on Growth

Variables	*1*	*2*	**3**
Investment	0.12	0.21	0.25*
	(0.20)	(0.17)	(0.13)
Export growth	0.24**	0.27***	0.28***
	(0.09)	(0.05)	(0.06)
Total Aid(lagged)	0.27		
	(0.83)		
Total net flows(lagged)		0.11	
		(0.26)	
Multilateral Aid(lagged)			0.18*
			(0.10)
Bilateral Aid(lagged)			-0.08
			(0.22)
Constant	-1.03	-0.67	-1.26
	(0.65)	(1.64)	(0.93)
Cointegration	3.54*	4.10**	4.25**
R-Squared	0.56	0.57	0.63
Serial Correlation	1.238	0.299	1.044
	[0.266]	[0.585]	[0.318]
Normality	0.382	2.371	0.703
	[0.826]	[0.306]	[0.508]
Heteroscedasticity	1.678	1.585	1.532
	[0.295]	[0.217]	[0.205}

Note: 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 significant at 1 percent level. The F-test for cointegration is based on Pesaran *et al.* (2001). The test for serial correlation is the LM test for autocorrelation of up to order 2, the test for normality is proposed by Bera and Jarque (1981), the test for heteroskedasticity is based on White's LM. Order selection is of the ARDL is based on Schwarz Bayesian criterion.

6.4 Structure and Composition of Nigeria's External Debt

An analysis of the composition of external debt in Nigeria reveals that the main component has been official debt. Table 6.5 gives the values of debt accumulated from different sources for some selected years up to 2005. First, it looks at official debt stock from bilateral and multilateral creditors. Secondly, it examines the long and short term nature of Nigeria's external debt.

Another typical feature of Nigeria's external debt is that it is mostly long term. Typically, these are debts with a maturity period of over one year. In contrast, short term debt constitutes a small part of total debt stock - 8 percent as at 2005 (see Table D.4 in the appendix).

Table D.6 in the Appendix shows that debt owed to the Paris Club was around 40 percent of the total debt stock in 1986, increasing to over 70 percent in 1997 and peaking in 2004 at 86 percent. Another feature of the debt structure is that large amount of debt was accumulated from private sources in the early 1980s up to the early 1990s, even surpassing debt from bilateral creditors.

Table 6.5: Outstanding External Debt (Million US Dollars) for Some Selected Years

	1985	*1995*	*2000*	2005
Official	2149.05	20492.06	26574.25	18159.25
Bilateral	718.20	15547.89	23272.01	15478.51
Multilateral	1430.86	4944.17	3302.24	2680.74
Long-term Private	11499.74	7949.23	3660.67	2182.94
Total Long-term	13648.79	28441.28	30234.93	20342.18
Total Short-term	4994.47	5651.19	1119.99	1836.10
Total debt	18643.26	34092.47	31354.92	22178.28

Source: Global Development Finance (2008). Official debt is long-term.

Having examined the structure and composition of Nigeria's external debt, we now proceed with a discussion of the theory and some empirical evidence on Nigeria.

6.4.1 External Debt and Debt Service: Theory and Evidence

Formally, theories of external debt and economic performance can be classified under two main headings: First are the neoclassical and the endogenous growth models which argue that 'reasonable' levels of debt promote growth. The second concerns the debt overhang and the liquidity constraints hypothesis which show how 'large' levels of debt can crowd out private investment and have an adverse effect on growth. Let us now briefly examine each of these models in turn.

Both neoclassical and endogenous growth models explain how 'reasonable' current levels of debt can have a positive impact on growth. In the neoclassical environment, the ability of countries to lend and borrow freely leads to growth. Here, an incentive exists for capital-scarce countries to borrow and invest since the marginal product of capital is assumed to be higher than in the rest of the world. Similarly, Eaton (1993) shows that in the endogenous growth environment, increases in the cost of foreign capital that reduces external borrowing leads to lower long-run growth. This still implies that a 'reasonable' amount of external debt can promote growth in capital scarce countries, both through capital accumulation and productivity growth.

Other authors (for example, Krugman, 1988; Sachs, 1989; Cohen, 1993) show how 'large' levels of accumulated debt can have an adverse effect on

investment and growth. In brief, two main hypotheses, namely the 'debt overhang' hypothesis and the 'liquidity constraint' hypothesis, have been developed from these studies and have increasingly been used to investigate the impact of external debt on investment and growth for many developing countries, including SSA countries since the late 1980s.

In models of debt overhang, it is argued that if there is some likelihood that in the future debt will be larger than the country's repayment ability; expected debt service obligations will discourage domestic investment as potential investors will fear that any increased investment will face more tax from government. Also private investors fear that government will have to constrain demand to save foreign exchange on imports. As Agenor and Montiel (1996) argue, there may be expectations that the government's debt service obligations will be financed through distortionary taxes as debt accumulation increases. In this case, therefore, large levels of accumulated debt will lead to lower growth. Related to this is the liquidity constraint hypothesis, which is often explained as a 'crowding out' effect. Here, it is believed that the requirement of debt service will divert resources away from investment and growth. Therefore, any reduction in the current debt service should lead to increased investment (Cohen, 1993).

These two main theories implicitly distinguish between 'reasonable' and 'large' levels of debt. However, there is another theory which tends to take both views into account and considers the 'nonlinear' effects of debt on growth. This theory suggests that foreign debt has a positive impact on investment and growth up to a certain threshold level. Beyond that level, its impact becomes negative. The assumption behind this is that the capital stock increases as more debt is incurred, if more borrowing is used to finance investment. In this sense, as external debt increases, the capacity to repay also increases, but subject to diminishing returns to capital. Beyond a certain level of debt, repayment ability declines as a result of the diminishing returns and the debt overhang considerations explained above (Pattillo, *et al.*, 2002 & 2004).

With these insights, we will want to know if the Nigerian experience is in accordance with these theories. Before proceeding with this investigation, we first discuss some studies that have been carried out for Nigeria.

While some studies, for example, Chete and Akpokodje (1997), have explored the determinants of private investment in Nigeria, they failed to explain the time series properties of the data, for example, cointegration. Their regression results are therefore likely to be spurious. Their approach was simply to include the external debt service ratio in the private investment equation. We enrich the literature by exploring the effects of different types of debt on private

investment in addition to testing whether the debt service variable has had a negative impact on private investment or not. Importantly, we use a different technique - the Bounds Testing approach (ARDL). This approach helps to tackle the problem of spurious regression when variables integrated of different orders are under study.

There are also other studies on investment in Nigeria, for instance, Busari and Fashanu (1998) examined macroeconomic policy regimes and private investment. Similarly, Oladipo and Amaghionyeodiwe (2007) estimate a private investment equation in which political instability is the independent variable of interest. Okafor *et al.* (2004), on the other hand, estimate a private investment equation which includes public investment, private sector credit, nominal exchange rate, lending rate and real GDP as independent variables. None of these studies include an external debt variable. Similarly, recent growth studies for Nigeria, for example, Essien (2002) and Okafor *et al.* (2004) do not investigate either the linear or non-linear effects of official debt, which is what we are interested in doing in this section.

6.4.2 The Effects of Official Debt, Debt Service on Private Investment and Growth

Since Nigeria's external debt is mainly official and long-term, we will estimate their effects on private investment and growth.

In this section, we continue to implement the modified version of equations 3.6 and 4.3 for private investment and growth, respectively. In this regard, equation 1 in Table 6.6 shows that real GDP growth and real interest rate do not have any significant impact on private investment over the sample period. However, there is some evidence that public sector investment has crowded out private investment. Regarding domestic bank credit to the private sector, the coefficient has a significant negative impact in all the specifications.

As for the impact of external debt on private investment, we include official debt as a percentage of GDP in equation 1 and find that it has had some significant impact on private investment - no evidence of debt overhang.

As far as the results are concerned, equations 1 to 3 show that debt service has had a strong negative impact on private investment in Nigeria. Over the years, the country has had problem servicing its debt and the consequence as seen from these results is a crowding out of private investment[44]. This result is similar to the findings for other countries with severe debt problems, e.g. Were (2001) for Kenya and Frimpong and Oteng-Abayie (2006) for Ghana.

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[44] In order to service external debt government may have to generate resources from reductions in government deficits if foreign exchange earnings are weak. Alternatively, government may have to maintain some level of spending by competing for domestic credit with the private sector.

Equation 2 splits external debt into long term debt and short term debt while equation 3 examines the impact of multilateral and bilateral debts on private investment. From the results, there is some evidence that long term debt has had a positive long-run impact on private investment in Nigeria. Splitting official debt into multilateral and bilateral components does not help in explaining the effect of debt stock on long-run private investment.

Regarding the growth specifications, the results presented in Table 6.7 show that investment has not had any significant impact on long-run growth in Nigeria. Here, investment encompasses public and private investment. As expected, the coefficient on the export growth variable is significantly positive in all the specifications. This implies that GDP is largely determined by the output and exports from the country's large scale mining and oil exploration projects.

In equation 1, we include official debt as a percentage of GDP and its square term to capture the diminishing effect of debt on growth. We find that official debt has a non-linear effect on GDP growth in Nigeria. This is consistent with the 'non-linear' prediction which other studies (Pattillo *et al.*, 2002) have found. There is little evidence that debt service as a percentage of exports has a significant impact on growth.

Table 6.6: The Relationship between Debt and Private Investment

Variables	*1*	*2*	**3**
GDP growth(lagged)	0.10	0.10	0.05
	(0.12)	(0.12)	(0.11)
Real int. rate	-0.02	0.003	-0.04
	(0.05)	(0.05)	(0.05)
Public investment	0.86***	-0.78***	-0.46*
	(0.21)	(0.25)	(0.21)
Bank credit	-0.15**	-0.18*	-0.26***
	(0.07)	(0.09)	(0.07)
Official debt(lagged)	0.04*		
	(0.02)		
Debt service	-0.18**	-0.22**	-0.18**
	(0.08)	(0.10)	(0.07)
Long term debt(lagged)		0.03**	
		(0.01)	
Short term debt(lagged)		0.02	
		(0.10)	
Multilateral debt(lagged)			-0.23
			(0.19)
Bilateral debt(lagged)			0.07
			(0.05)
Constant	17.43***	18.28***	20.60***
	(3.42)	(4.21)	(4.14)
Cointegration	4.82**	6.06***	3.92**
R-Squared	0.75	0.80	0.71
Serial Correlation	0.286	0.318	0.540
	[0.593]	[0.573]	[0.462]
Normality	0.938	1.219	0.470
	[0.626]	[0.544]	[0.790]
Heteroscedasticity	0.345	0.158	0.353
	[0.557]	[0.691]	[0.553]

Note: 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 significant at 1 percent level. The F-test for cointegration is based on Pesaran *et al.* (2001). The test for serial correlation is the LM test for autocorrelation of up to order 2, the test for normality is proposed by Bera and Jarque (1981), the test for heteroskedasticity is based on White's LM. Order selection is of the ARDL is based on Schwarz Bayesian criterion.

When we split debt into the long-term and short-term, we find that short term debt has had an overhang effect on growth. Again, like the debt-private investment relationship, splitting debt into multilateral and bilateral components does not deepen our understanding of the impact of debt on

growth. To sum up, high debt burden has crowded out private investment, while debt has had a non-linear effect on growth in Nigeria.

Table 6.7: The Relationship between Debt and Growth

Variables	*1*	*2*	3
Investment	0.12	0.22	0.23
	(0.26)	(0.16)	(0.36)
Export growth	0.28***	0.31***	0.25**
	(0.05)	(0.05)	(0.06)
Official debt(lagged)	0.34**		
	(0.07)		
Official debt(lagged)^2	-0.004**		
	(0.001)		
Debt service	-2.67	-3.13*	0.11
	(1.61)	(1.66)	(0.13)
Long term debt(lagged)		0.11**	
		(0.04)	
Short term debt(lagged)		-0.24***	
		(0.07)	
Multilateral debt(lagged)			-0.21
			(0.19)
Bilateral debt(lagged)			0.08
			(0.14)
Constant	-6.52	-1.65	-7.63
	(5.78)	(3.67)	(4.06)
Cointegration	4.65**	4.36**	4.64***
R-Squared	0.76	0.73	0.52
Serial Correlation	0.487	0.282	0.216
	[0.485]	[0.595]	[0.642]
Normality	0.377	3.490	0.658
	[0.828]	[0.175]	[0.720]
Heteroscedasticity	2.269	0.734	0.073
	[0.132]	[0.392]	[0.787]

Note: 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 significant at 1 percent level. The F-test for cointegration is based on Pesaran *et al.* (2001). The test for serial correlation is the LM test for autocorrelation of up to order 2, the test for normality is proposed by Bera and Jarque (1981), the test for heteroskedasticity is based on White's LM. Order selection is of the ARDL is based on Schwarz Bayesian criterion.

As regards the debt ratio at which growth peaks, that is, the debt threshold, we partially differentiate the non-linear growth equation with respect to official debt. This is shown as follows:

$$\frac{\partial growth}{\partial debt} = \beta_1 + 2\beta_2 debt \qquad \text{(i)}$$

$$\beta_1 + 2\beta_2 debt = 0 \qquad \text{(ii)}$$

where β_1 and β_2 represent the coefficients on official debt and its quadratic term, respectively. Recall, from the regression results presented in Table 6.7, official debt = 0.34 and official debt squared = -0.004. Therefore, substituting these values into expression (ii), and evaluating, we get 43 percent. This implies that official debt of up to 43 percent is not inimical to growth in Nigeria. According to the standard World Bank classification, a severely indebted poor country is one that has a debt to GNP ratio above the critical level - 50 percent[45]. However, the estimation in this chapter is based on debt to GDP (percent). Interestingly, this figure fairly approximates the standard classification.

6.5 Conclusion

This chapter has investigated the impact of foreign aid and external debt on private investment and growth in Nigeria using the ARDL approach. In this

[45] In addition, any of these two critical levels must be surpassed for a country to be severely indebted: debt to exports of goods and services (275%); accrued debt services to exports (30%) and accrued interest to exports (20%).

analysis, estimation was carried out using both aggregate aid and debt, and disaggregated values of aid and debt.

We find that there exists a long-run relationship between private investment and its determinants on one hand and growth and its determinants on the other. Concerning the impact of foreign aid, we find that multilateral aid has had a positive impact on both private investment and growth while bilateral aid has not.

The evidence gathered on the effects of high debt burden in Nigeria shows that debt service obligations have crowded out private investment. As for the relationship between debt and growth, we find that the result supports the non-linear hypothesis. At the disaggregated level we find that long term debt is positively related to private investment while short term debt and growth are negatively related.

On the other determinants of private investment and growth, we find that public investment crowded out private investment while domestic bank credit to the private sector is negatively related to private investment. On the growth front, the findings suggest that export growth was the main determinant of growth in Nigeria over the sample period.

Chapter 7

Conclusions

7.1 Summary of the Main Results

This thesis provides an analysis of the impact of foreign aid on the macroeconomic performance of West Africa, focusing on the related issues of private investment, economic growth and real effective exchange rate. In addition, it assesses the effect of high debt burden on private investment and growth in Nigeria. The five main chapters are written in different styles in the form of independent essays, each addressing the core questions posed in the introduction to the thesis, presented in Chapter 1.

As a start, Chapter 2 took an overview of the theory of foreign aid and development. Then, using a descriptive approach it looked at the trends in savings, investment, growth, exchanges rates and the evolution of foreign aid. We observed that saving and investment are not high when compared with the East Asian countries. As such, growth has been relatively slow and unstable,

with only a few countries experiencing some growth sparks. In brief, the summary of the main findings of the thesis are discussed as follows:

1. *What impact do foreign aid and its uncertainty have on private investment in West Africa?*

Taking as a starting point the approach adopted by previous studies, which revolves around the impact of aggregate (total) aid on private investment, this question is addressed in chapter 3. Here, we used two estimation techniques to examine the question. We find that country specific effects exist in the selected sample which required our core results to be based on a fixed effects estimator. On the impact of different types of aid, the findings we gathered showed that multilateral aid affects private investment positively, but not bilateral aid.

As for whether aid uncertainty affects private investment, from the evidence we gathered it is more of a feature of bilateral aid than multilateral aid, and has a strong negative impact on domestic private investment. This is contrary to the finding by Lensink and Morrissey that controlling for aid uncertainty increases the significance of aid but does not have any significant impact on investment itself.

2. *What is the impact of foreign aid on economic growth in West Africa?*

This is perhaps the core question of the thesis and is addressed in Chapter 4. The chapter, like chapter 3, paid particular attention to the effect of different aid types - multilateral and bilateral aid. In many respects, the findings reflect the evidence gathered from the preceding chapter. We find that disaggregating aid into multilateral and bilateral aid gives clearer insights into the relationship between aid and growth. More specifically, the results disclose that multilateral and bilateral aid have opposite effects on growth, while the former has a significant positive effect, the latter seems to have a negative effect.

Even after accounting for possible 'double counting' in investment resulting from the inclusion of both foreign aid and investment in the estimating equations, multilateral aid continued to impact on growth in a positive way. We do not claim to have resolved the aid-growth debate but we successfully showed that when a unique sample and the FE technique are used, splitting aid into multilateral and bilateral components, better addresses the aid effectiveness puzzle.

3. *Has foreign aid led to an appreciation of the real exchange rate in the West Africa Monetary Union?*

This question is addressed in chapter 5. First, we investigated the series for unit roots and cointegration, using both traditional time series and panel data techniques. The findings suggest evidence of unit root tests and cointegration,

thus permitting a long-run interpretation of the estimates of the regressions. Applying the PMG and DFE estimators, we find that aid has been associated with depreciation in the real exchange rate, in contrast to the prediction of the Dutch Disease model. Our explanations for this result are: increased demand for imports of investment goods using the aid money, and some unrealistic assumptions of the Dutch disease model e.g. full employment of resources.

4. *What effects have foreign aid, external debt and the associated servicing obligations had on private investment and economic growth in Nigeria?*

This is the last question of the thesis and the answer is located in chapter 6. This chapter employs a time series methodology - the ARDL approach to investigate the impact of foreign aid and external debt on private investment and growth. In this analysis, estimation was carried out using both aggregate aid and debt, and disaggregated values of aid and debt.

Regarding the impact of foreign aid, we find that multilateral aid has had a positive impact on both private investment and growth while bilateral aid has not.

In terms of the evidence relating to the effect of high debt burden on private investment in Nigeria, we find that debt service obligations discouraged

private investment. As for the relationship between debt and growth, we find that official debt has a non-linear effect on growth while at the disaggregated level we find that long term debt is positively related to private investment while short term debt and growth are negatively related when a linear model is estimated.

7.2 Limitations of the Study

The thesis has addressed the questions outlined at the beginning of the chapter. Even so, we believe that some empirical issues limit our findings and conclusions. In many cases, poor quality data and small sample size limited us to certain techniques and variables. Application of time series techniques depends on the availability of reliable and consistent data and, for many countries, there were missing data. The empirical chapters are based on a variety of approaches and samples, limiting our ability to link the chapters effectively. To the extent that the thesis uses a relatively small sample size, the results need to be interpreted with caution.

Another frequent limitation in most empirical studies, which the present study suffers, is the effect of country heterogeneity. Chapter three to chapter five, which are based on cross-country analysis, in themselves present a limitation given that the effects of the variables are expected to differ across countries.

The results presented in our country case study on Nigeria - chapter six demonstrates this limitation. Since direct comparison cannot be made on studies that apply different specifications, estimation techniques and sample size, we recognise this as one of the limitations of the study. For instance, our results on aid uncertainty in chapter three cannot be directly compared with that of Lensink and Morrissey (2000).

7.3 Policy Implications

The evidence gathered from the empirical analyses carried out in this thesis 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 and growth issues, is the significant impact of multilateral aid on private investment and growth in West Africa. Furthermore, our findings that there exists a strong presence of country-specific effects means that any regional aid policy at the West African level can yield effective results, especially when organised and pursued within a multilateral framework. This is particularly relevant to the donor community that are

grappling with aid coordination. The finding that multilateral aid has a positive impact on private investment was established in chapter 3.

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

The analysis and findings in chapter 4 reinforced the result from chapter 3, implying that channelling aid through multilateral institutions is a surer way of improving aid coordination and its effectiveness. While the World Bank makes its loans contigent upon the existence and implementation of an agreement with the IMF, both institutions view good policy environment and policy improvement as key to aid effectiveness. In otherwords, grants and concessional lending are frequently based on policy conditionality[46]. These conditions range from fiscal and monetary policies to trade liberalization, and since the 1980s, the conditions have increased, covering all possible sectors. The findings of the present study somewhat captures this view in the sense that channelling aid through multilateral institutions is an indirect way of allocating aid to 'good performers'.

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[46] This was strengthened by the World Bank report 'Assessing aid': an increase of US$10billion in aid, favouring sound economic management, would lift 25 million people per year out of poverty. By contrast, an across-the-board increase would lifet only 7 million out of poverty (World Bank, 1998:16).

Already, efforts are underway in the donor community to mobilize and channel more aid through multilateral agencies. The Commission for Africa set up by Tony Blair (former British Prime Minister) in 2005 is leading this new policy direction. The findings in chapters 3 and 4 are broadly supportive of this policy, and show it can be effective in West Africa. This means that regional investment and industrial policy pursued within the ECOWAS framework can be promoted by multilateral assistance.

Economic measures aimed at using aid inflows to import investment goods that can help quicken the rate of industrialization in West Africa can be an important policy option to policymakers in ECOWAS. This way, the real appreciation effect of aid inflows which may affect the region's competitiveness and the growth effect of multilateral aid can be mitigated. The need for this policy direction is reinforced by our findings in chapter 5.

To the Nigerian policy maker, the findings in chapter 6 lend support to a borrowing policy that limits official debt to around 40 percent of GDP. This policy path will not only enhance growth but also improve public debt management strategies.

In sum, the salient point that resonates from this study is that finance is good for growth. Alone, however, aid may not accelerate growth since the channel through which it flows matters for its effectiveness. The main policy lesson

from this study is that channelling aid through multilateral institutions is key to aid effectiveness.

7.4 Suggestion for Future Research

The thesis has addressed issues, which we believe provide some valuable insights, however, the work carried out in this thesis is by no means exhaustive. So much as we consider bilateral aid, we do not investigate the impact of individual donors' assistance on private investment and growth. The findings of our work raise some important questions which future research can address. All said, we suggest two lines of future research.

The first takes into account the recent evidence in the aid allocation literature that bilateral donors give high weights to development and needs when allocating aid to recipients.

In our view, future research should improve our undertanding of the impact of bilateral aid on investment and growth. It will be a worthwhile exercise to examine the impact of individual donors' aid on investment and growth. The findings by Fleck and Killby (2006a, 2006b) show that World Bank aid allocation tends to be fairly influenced by US interest. In this sense, it will be

useful to extend this research by investigating the impact of World Bank aid and US aid on investment and growth.

Other types of aid are also likely to have different effects on investment and growth. For instance, studying the impact of food aid and technical cooperation on growth is indeed a promising line of future research. Most bilateral aid come in the form of technical assistance and capacity building. We believe that further empirical work on these issues can provide a key policy input in both the donor community and West African countries.

APPENDIX

APPENDIX A

TableA.1. Summary Statistics for the Main Variables (1975-2002)

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
xg	92	4.01	9.59	-40.78	32.80

Table A2: 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 multilateral institutions expressed as a percent of GDP.

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

APPENDIX B

Table B1: Definition and description of Data

Variable	*Definition*
G	Annual percentage growth rate of GDP at market prices based on constant local currency.
IGDP	GDP per capita is gross domestic product divided by midyear population.
FDI	Foreign direct investment is the net inflows of investment to acquire a lasting management interest expressed as a percentage of GDP.
DI	Gross domestic investment consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories expressed as a percentage of GDP.
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.

Source: World Development Indicators

Table B.2: Summary Statistics

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Minimum*	*Maximum*
Growth	70	-0.007	2.449	-5.861	5.636
Initial GDP	70	2.549	0.246	1.720	3.140
Total Aid	70	15.474	11.904	1.780	58.72
Multilateral aid	70	6.013	4.985	0.200	26.100
Bilateral aid	70	9.407	7.199	1.360	33.150
Domestic Investment	70	18.027	6.388	5.028	37.206
FDI	70	1.170	1.559	-0.248	10.722
Export growth	70	5.052	8.469	-10.570	32.800

B.3: Proof – Double counting

Consider the growth equation (4.5) now expressed as:

$$g = \beta_2 DI + \beta_5 Moda + \beta_6 Boda + \beta_m' m + \mu \quad (1)$$

where z is the vector of other variables,

$$DI = \theta_1 Moda + \theta_2 Boda + \varepsilon \quad (2)$$

Now substitute (2) in (1)

$$g = \beta_2(\theta_1 Moda + \theta_2 Boda + \varepsilon) + \beta_5 Moda + \beta_6 Boda + \beta_p' p + \mu \quad (3)$$

$$g = \beta_2\theta_1 Moda + \beta_2\theta_2 Boda + \beta_2\varepsilon + \beta_5 Moda + \beta_6 Boda + \beta_p' p + \mu \quad (4)$$

Recall, $\varepsilon = DIRES$

$$g = \beta_2\theta_1 Moda + \beta_5 Moda + \beta_2\theta_2 Boda + \beta_6 Boda + \beta_2 DIRES + \beta_p' p + \mu \quad (5)$$

$$g = (\beta_2\theta_1 + \beta_5) Moda + (\beta_2\theta_2 + \beta_6) Boda + \beta_2 DIRES + \beta_p' p + \mu \quad (6)$$

Assume for simplicity, $(\beta_2\theta_1 + \beta_5) = \omega_m ; (\beta_2\theta_2 + \beta_6) = \omega_b$

Therefore, (6) can be written as:

$$g = \beta_2 DIRES + \omega_m Moda + \omega_b Boda + \beta_p' p + \mu \quad (7)$$

Clearly, the coefficient on DI in the initial regression (4.5) is same as that on DIRES in (7) above. Also notice that the coefficients on the other variables, represented by β_z remain unchanged.

APPENDIX C

Table C.1 Summary Statistics

	PROD	TOT	GOVT	ODA
Mean	0.301	4.785	2.640	2.287
Median	0.136	4.770	2.628	2.500
Maximum	1.240	5.683	3.221	3.369
Minimum	-0.213	3.795	1.869	-0.247
Std. Dev.	0.384	0.302	0.324	0.643
Observations	217	217	217	217

Note: Variables are in logs

Table C.2 Correlation Statistics

	REER	PROD	TOT	GOVT	ODA
REER	1.000000	0.548216	0.371185	0.471623	0.129530
PROD	0.548216	1.000000	0.285941	0.228016	-0.239378
TOT	0.371185	0.285941	1.000000	0.044403	0.364174
GOVT	0.471623	0.228016	0.044403	1.000000	0.205324
ODA	0.129530	-0.239378	0.364174	0.205324	1.000000

Note: Variables are in logs

Correlation Probability	LRERDM	LRERLIRA	LRERRMB	LRERUSD	LRERYEN	LREER2
LRERDM	1.000000					

LRERLIRA	0.426612	1.000000				
	0.0000	-----				
LRERRMB	0.184952	-0.121906	1.000000			
	0.0063	0.0731	-----			
LRERUSD	0.793492	0.687174	0.270914	1.000000		
	0.0000	0.0000	0.0001	-----		
LRERYEN	0.767869	0.802740	-0.022621	0.895119	1.000000	
	0.0000	0.0000	0.7404	0.0000	-----	
LREER2	0.800794	0.752174	0.176535	0.869778	0.871241	1.000000
	0.0000	0.0000	0.0092	0.0000	0.0000	-----

Table C.3: Unit Roots Tests for Individual Countries

Country	Series	ADF	KPSS
Benin	reer	-1.362	0.169**
	oda	-1.564	0.152**
	prod	-0.722	0.159**
	tot	-2.633	0.090
	govt	-4.937***	0.099
Burkina Faso	reer	-2.696	0.620**
	oda	-2.304	0.351*
	prod	-2.483	0.186**
	tot	-0.853	0.172**
	govt	-5.742***	0.082
Côte d'Ivoire	reer	-2.490	0.083
	oda	-1.423	0.151**
	prod	-1.722	0.130*
	tot	-2.735	0.135*
	govt	-2.987	0.518**
Mali	reer	-2.789	0.136*
	oda	-2.247	0.162**
	prod	-1.986	0.178**
	tot	-1.977	0.149**
	govt	-2.270	0.133*
Niger	reer	-2.414	0.651**
	oda	-2.421	0.119*
	prod	-1.859	0.115
	tot	-3.151	0.142*
	govt	-2.390	0.096
Senegal	open	-3.003	0.122*
	reer	-1.829	0.095
	oda	-3.327*	0.173**
	prod	-0.701	0.151**
	tot	-2.561	0.083
	govt	-1.548	0.103
Togo	reer	-3.226*	0.066
	oda	-2.181	0.185**
	prod	-2.048	0.111
	tot	-2.422	0.129*
	govt	-5.465***	0.097

For ADF, Ho: Unit root; KPSS, Ho: Stationarity. ***, **, and * is 1%, 5%, 10 % significance level, respectively. For 1 %, 5 % and 10 % significance levels, the ADF critical values are -4.30, -3.57 and -3.22, respectively; KPSS critical values are 0.216, 0.46 and 0.119, respectively.

Table C.4 Panel Unit Root Tests Using Various Techniques: First Difference

Variables	*Ho: Unit root*					*Ha: Stationarity*
	LLC	**Breitung**	**IPS**	**Maddala-Wu**	**Choi**	**Hadri**
$\Delta reer$	-4.730 [0.000]	-5.534 [0.000]	-5.218 [0.000]	20.897 [0.000]	176.474 [0.000]	0.377 [0.354]
Δoda	-4.932 [0.000]	-5.364 [0.000]	-4.574 [0.000]	18.421 [0.000]	18.421 [0.000]	0.250 [0.401]
$\Delta prod$	-1.837 [0.033]	-3.517 [0.000]	-1.823 [0.034]	6.486 [0.039]	17.448 [0.000]	0.715 [0.237]
Δtot	-1.790 [0.037]	-3.853 [0.000]	-4.459 [0.000]	17.420 [0.000]	18.442 [0.000]	1.145 [0.126]
$\Delta govt$	-3.612 [0.000]	-3.872 [0.000]	-2.591 [0.005]	9.455 [0.009]	8.786 [0.012]	0.168 [0.433]

Model includes individual effects and individual linear trends. P-values are in brackets.

Table C.5: Mean Group (MG) Estimates

	Equations					
	1	2	3	4	5	6
prod	0.088	0.441	0.161	0.115	0.917	0.426
	(0.742)	(0.505)	(0.238)	(1.038)	(0.581)	(0.400)
tot	0.593	0.650**	0.288	0.488	0.622*	0.274
	(0.427)	(0.312)	(0.157)	(0.500)	(0.346)	(0.201)
govt	0.055	0.127	-0.118	0.020	0.191	-0.080
	(0.269)	(0.273)	(0.127)	(0.331)	(0.316)	(0.179)
oda		-0.053	-0.058		0.031	0.013
		(0.199)	(0.068)		(0.213)	(0.091)
dev.			-0.426***			-0.444***
dummy			(0.037)			(0.052)
Adjust.	-0.338***	-0.388***	-0.694***	-0.300***	-0.347***	-0.615***
(ϕ)	(0.035)	(0.027)	(0.063)	(0.042)	(0.036)	(0.061)
ARDL	*(1, 1, 1)*	*(1, 1, 1, 1)*	*(1,1,1,1,1)*	*(2, 1, 1)*	*(2, 1, 1, 1)*	*(2,1,1,1,1)*

Table C.6: Definition and Sources of Data

Variable	*Definition*
REER	Real effective exchange rate *Source: Information Notice System and IMF Staff calculations.*
prod	Real per capita GDP growth. *Source: World Economic Outlook (WEO).*
tot	Terms of Trade defined as the ratio of an index of a country's export prices to an index of its import prices. *Source: World Economic Outlook (WEO).*
govt	Government consumption expressed as a percent of GDP. *Source: World Economic Outlook (WEO).*
aid	Official Development Assistance as a percent of GDP. *Source: OECD.*

C. 6: Cointegration

The Pedroni's tests are based on the following regression equation[47]:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1it} + \ldots + \beta_{ki} x_{kit} + \varepsilon_{it}$$

$$\text{for } t = 1,\ldots, T ; i = 1,\ldots, N$$

where T is the number of observations over time; N is number of countries in the panel; k is the number of regressors. The slope coefficients $\beta_{1i},\ldots,\beta_{ki}$ are allowed to vary across countries, while α_i *and* $\delta_i t$ are country-specific intercepts and deterministic trends, respectively. These tests are based on the absence of cross-sectional correlation and are constructed from the cointegrating residuals in the above equation.

The first category of these statistics comprises four within dimension based tests which have an alternative hypothesis of common autoregressive [AR] coefficients. These tests pool the AR coefficients across different sections of the panel for the unit-root tests on the residuals. Practically, the tests are implemented by calculating the average test statistics for cointegration in the times series framework across the different sections. The second category includes three tests that are based on between dimension effects, with an alternative hypothesis of individual autoregressive coefficients. This involves averaging the AR coefficients for each of the panel for unit-root test on the residuals.

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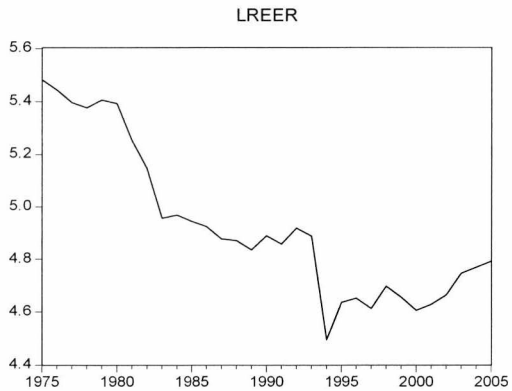
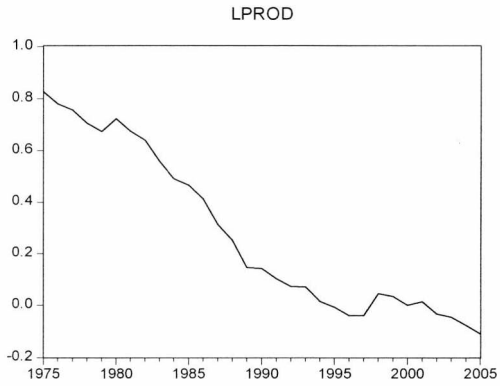
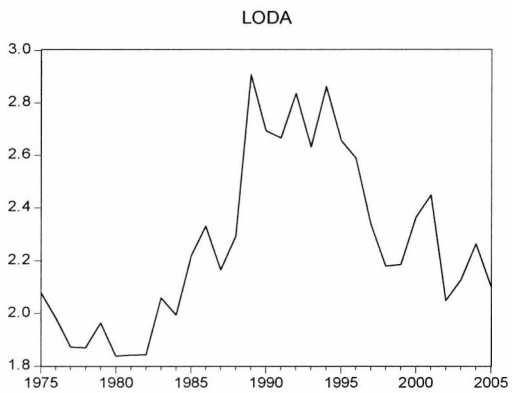
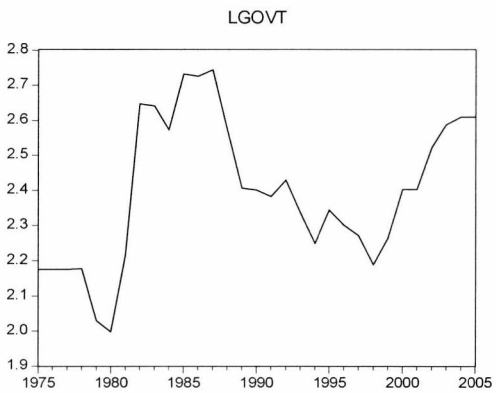
[47] Some studies that have applied Pedroni's test include; Maeso-Fernandez *et al.* (2006), Abdih and Tsangarides (2006) and Roudet et al. (2007), Drine and Rault (2003).

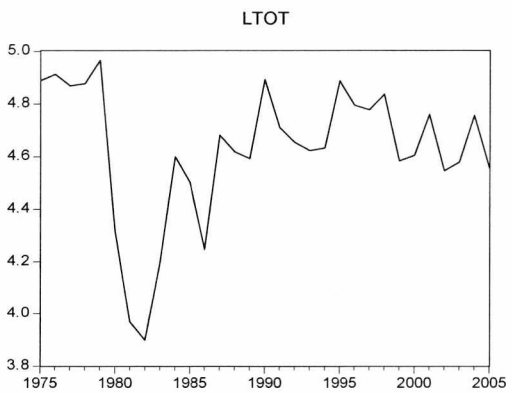
Figure C.1: Real Exchange Rate and Its Determinants - Benin



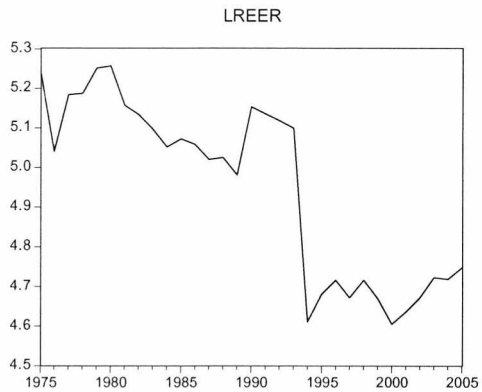


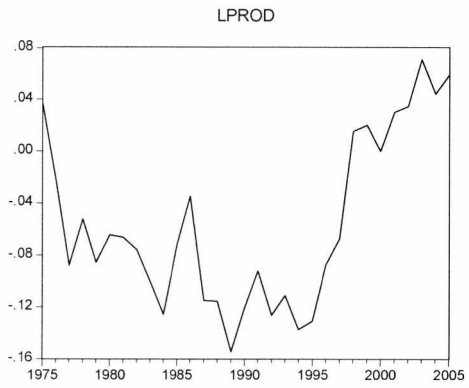


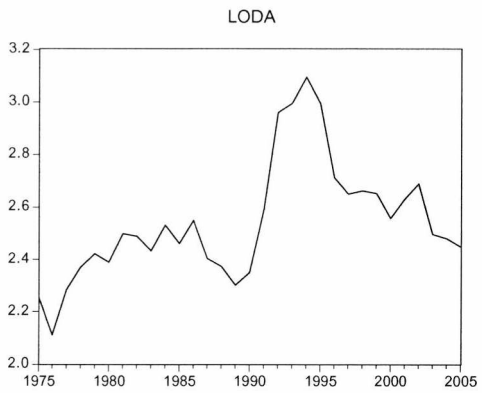


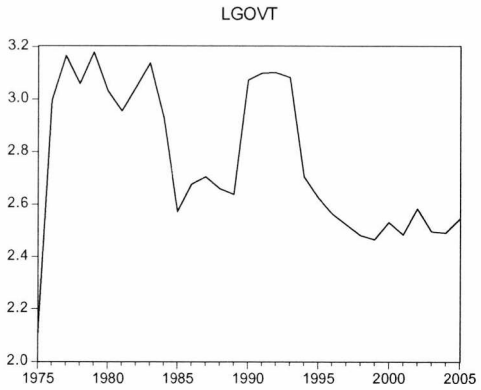


Real Exchange Rate and Its Determinants – Burkina Faso









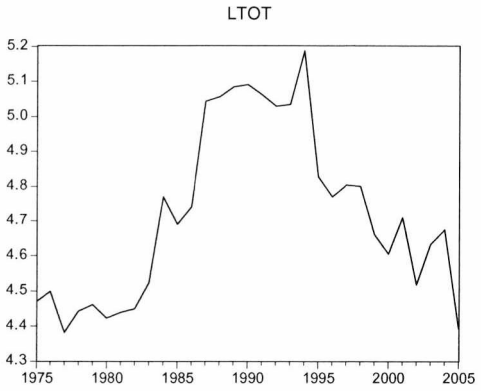
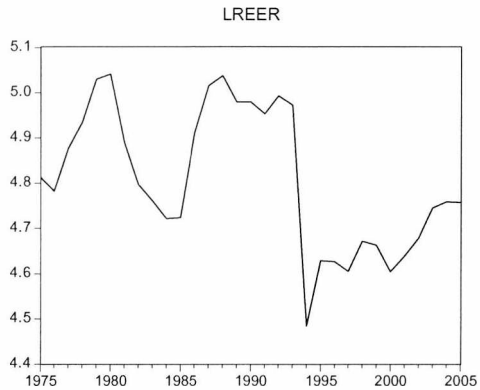
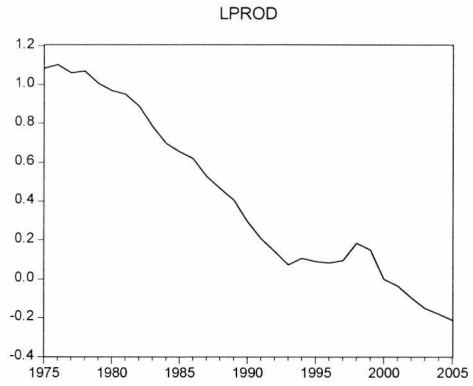
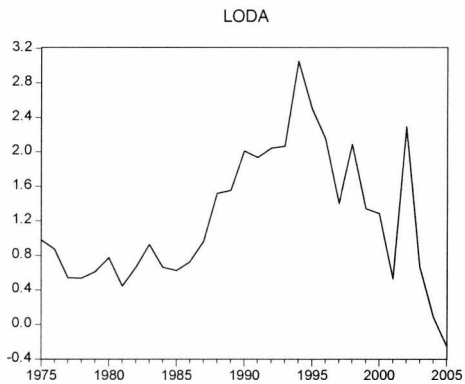
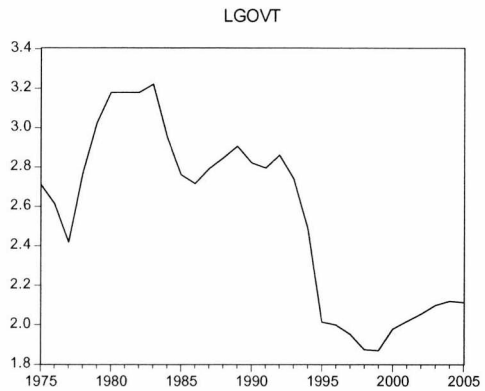


Figure C.3: Real Exchange Rate and Its Determinants – Cote d'Ivoire









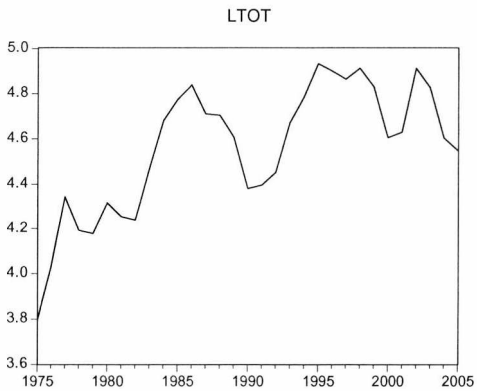
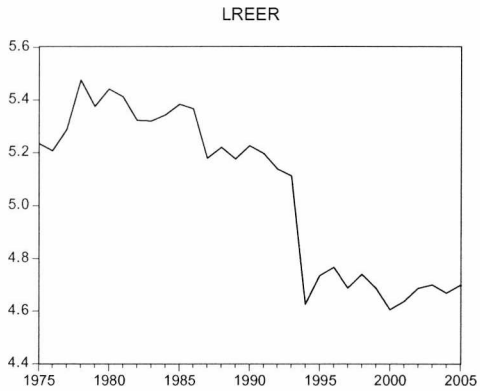
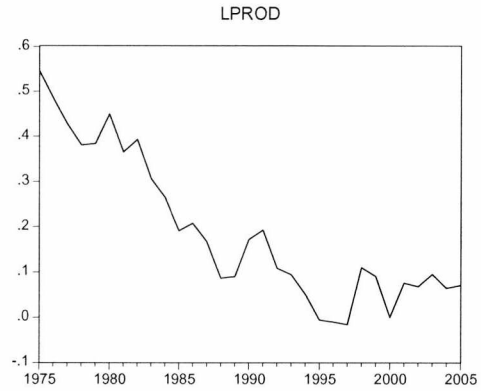
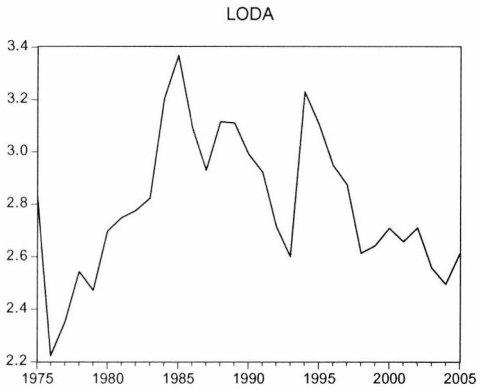
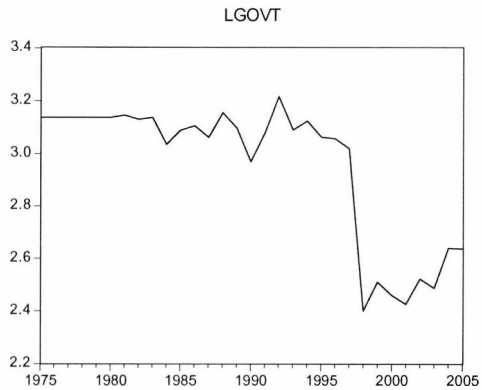


Figure C.4: Real Exchange Rate and Its Determinants - Mali









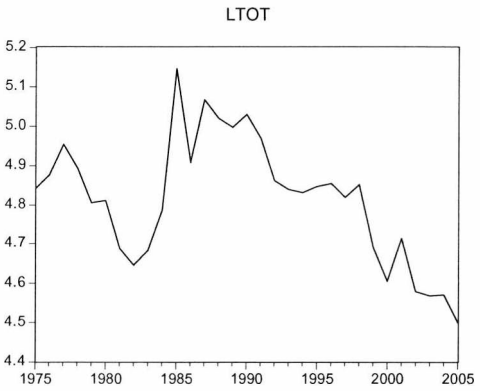
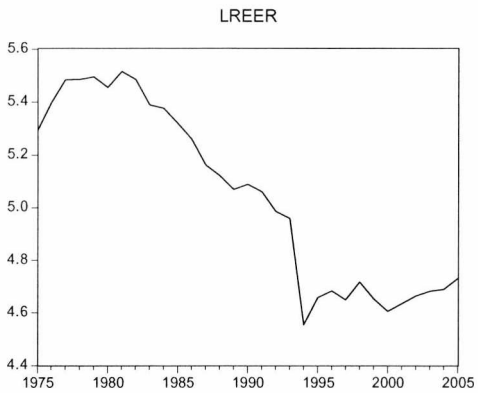
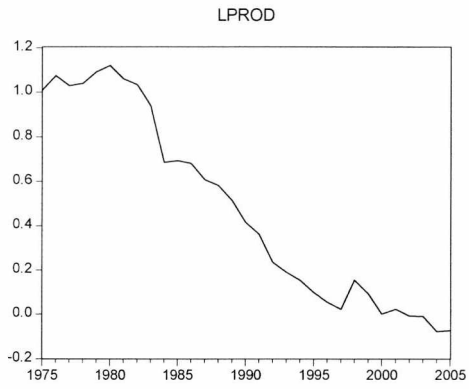
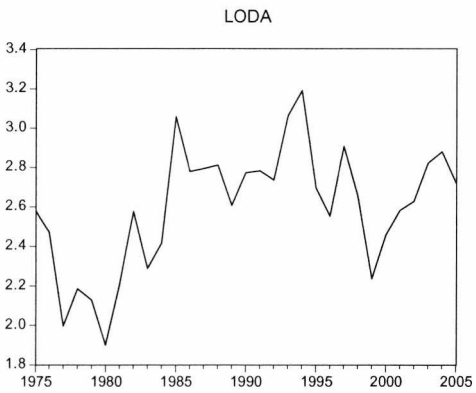
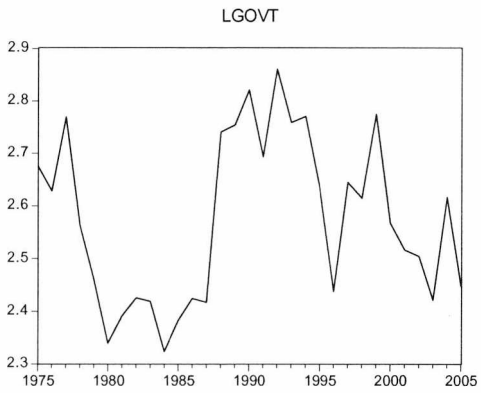


Figure C.5: Real Exchange Rate and Its Determinants – Niger









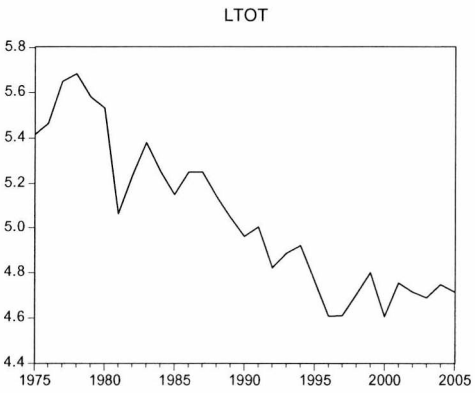
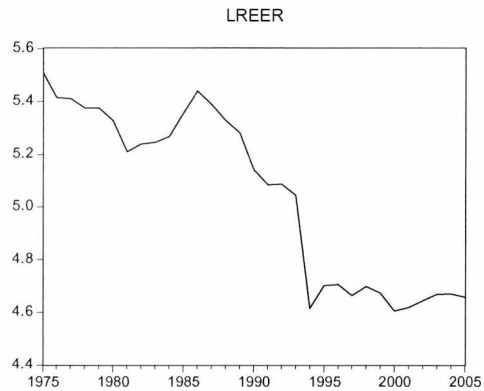
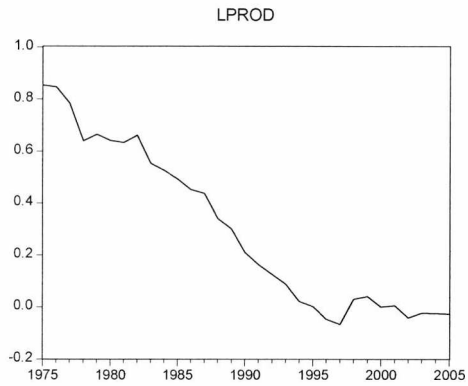
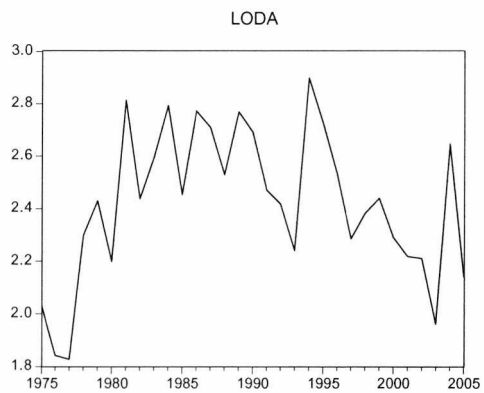
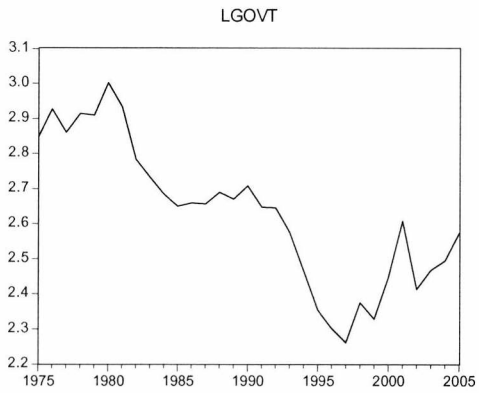


Figure C.6: Real Exchange Rate and Its Determinants – Senegal









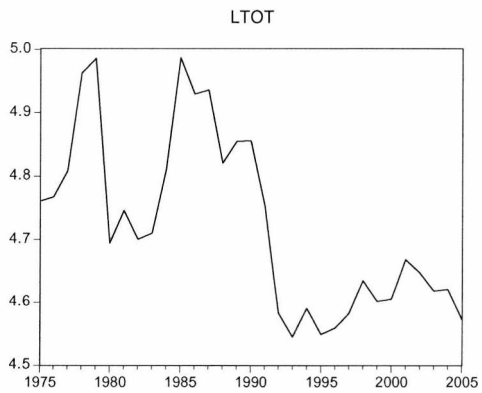
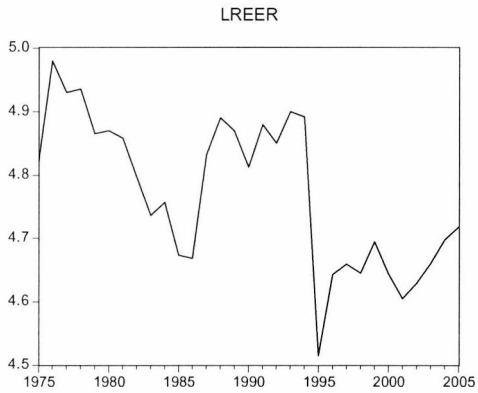
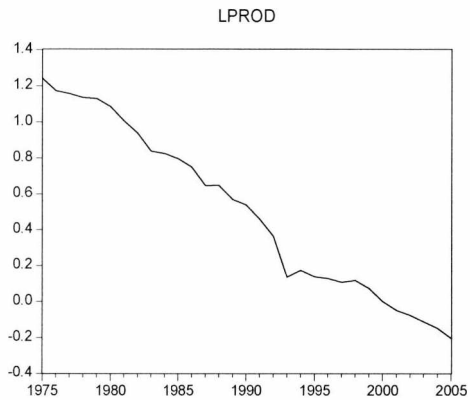
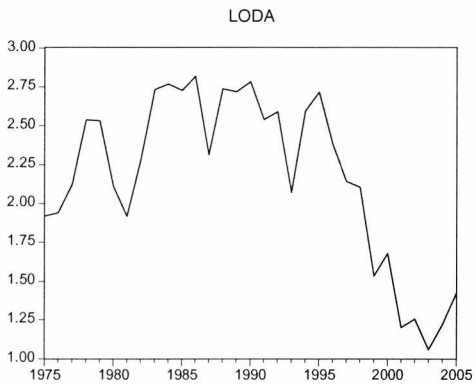
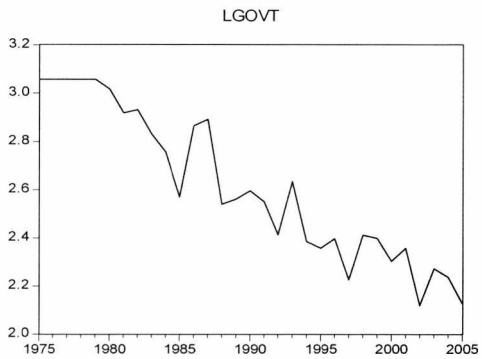


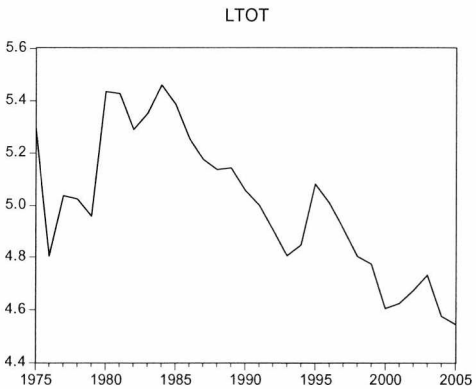
Figure C.7: Real Exchange Rate and Its Determinants – Togo











APPENDIX D

Table D.1: Foreign Aid and Total Net Flows in Million US Dollars (1975-2005)

Year	*Total Aid*	*Multilateral Aid*	*Bilateral Aid*	**Total net flows**
1975	81.38	13.85	67.53	683.08
1976	51.82	5.49	46.33	153.31
1977	42.01	13.24	28.77	415.27
1978	40.15	16.46	23.69	647.2
1979	25.74	15.12	10.62	685.09
1980	34.4	17.53	16.87	1199.86
1981	39.25	22.88	16.37	1658.65
1982	34.95	18.6	16.35	2398.62
1983	46.75	17.57	29.18	2088.47
1984	32.39	17.66	14.73	541.67
1985	31.71	15.74	15.97	-251.43
1986	58.12	18.9	39.22	1136.66
1987	67.62	16.61	51.01	1704.95
1988	118.06	20.96	97.1	-0.21
1989	344	32.35	311.65	2263.56
1990	255.08	73.4	181.68	101.96
1991	258.32	86.68	171.64	1022.09
1992	258.82	117.75	141.07	101.24
1993	288.42	206.38	82.04	1134.69
1994	189.66	142.26	47.4	33.44
1995	210.9	138.75	72.15	-486.65
1996	188.75	142.09	46.66	-324.43
1997	199.75	148.02	51.73	620.33
1998	203.09	169.27	33.82	332.54
1999	151.8	96.1	55.7	-888.43
2000	173.7	89.06	84.64	-1993.85
2001	167.82	61.61	106.21	1082.61
2002	294.03	80.73	213.3	4701.69
2003	308.06	108.75	199.31	2194.24
2004	578.16	263.91	314.25	1320.31
2005	6415.78	471.23	5944.55	7579.55

Source: OECD

Table D.2: Foreign Aid, Total Net Flows as a Percentage of GDP and Total Aid per Capita (US$)

Year	*Total*	*Multilateral*	*Bilateral*	*Total net flows*	**Aid per capita (US$)**
1975	0.29	0.05	0.24	2.46	1.33
1976	0.14	0.02	0.13	0.42	0.82
1977	0.12	0.04	0.08	1.15	0.65
1978	0.11	0.05	0.06	1.77	0.60
1979	0.05	0.03	0.02	1.45	0.37
1980	0.05	0.03	0.03	1.87	0.48
1981	0.07	0.04	0.03	2.77	0.54
1982	0.07	0.04	0.03	4.82	0.47
1983	0.13	0.05	0.08	5.98	0.61
1984	0.11	0.06	0.05	1.92	0.41
1985	0.11	0.06	0.06	-0.89	0.39
1986	0.29	0.09	0.19	5.62	0.69
1987	0.29	0.07	0.22	7.27	0.78
1988	0.52	0.09	0.42	0.00	1.33
1989	1.44	0.14	1.31	9.49	3.75
1990	0.90	0.26	0.64	0.36	2.70
1991	0.95	0.32	0.63	3.74	2.66
1992	0.79	0.36	0.43	0.31	2.59
1993	1.35	0.97	0.38	5.31	2.80
1994	0.80	0.60	0.20	0.14	1.79
1995	0.75	0.49	0.26	-1.73	1.93
1996	0.53	0.40	0.13	-0.92	1.68
1997	0.55	0.41	0.14	1.71	1.73
1998	0.63	0.53	0.11	1.03	1.72
1999	0.44	0.28	0.16	-2.55	1.25
2000	0.38	0.19	0.18	-4.34	1.39
2001	0.35	0.13	0.22	2.26	1.31
2002	0.63	0.17	0.46	10.07	2.34
2003	0.53	0.19	0.34	3.76	2.29
2004	0.80	0.37	0.43	1.83	4.19
2005	6.61	0.49	6.12	7.69	45.39

Source: OECD

Table D.3: Composition of Debt in Million US Dollars (1975-2005)

Year	*Total*	*Long-term*	*Short-term*	*Multilateral*	*Bilateral*	*Official*	**Private**
1975	1687.17	1143.43	543.75	364.74	334.52	699.26	444.16
1976	1337.79	906.23	431.56	406.22	336.63	742.85	163.39
1977	3146.44	985.29	2161.16	450.61	350.14	800.75	184.54
1978	5091.17	2644.70	2446.47	490.44	371.77	862.21	1782.49
1979	6244.58	3961.58	2283.00	523.68	395.47	919.15	3042.43
1980	8921.41	5368.34	3553.07	570.54	421.88	992.42	4375.92
1981	11420.68	6993.45	4427.23	623.11	413.17	1036.29	5957.16
1982	11971.61	9436.87	2534.74	737.42	439.08	1176.50	8260.38
1983	17560.76	12501.85	5058.91	883.00	949.51	1832.51	10669.34
1984	17770.53	12026.11	5744.42	954.83	989.41	1944.24	10081.87
1985	18643.26	13648.79	4994.47	1430.86	718.20	2149.05	11499.74
1986	22211.93	18530.80	3681.13	2233.86	6218.85	8452.71	10078.09
1987	29021.38	27453.74	1567.65	3061.92	8357.58	11419.50	16034.23
1988	29621.03	28074.40	1546.63	2848.95	7922.30	10771.26	17303.14
1989	30122.00	29657.23	464.77	3172.91	11503.46	14676.36	14980.86
1990	33438.92	31935.34	1503.58	3732.25	13275.07	17007.31	14928.03
1991	33527.21	32668.28	858.93	4010.70	15141.57	19152.27	13516.01
1992	29018.71	26809.11	2209.61	4087.47	14239.58	18327.05	8482.06
1993	30735.62	26741.95	3993.68	4339.09	13907.26	18246.35	8495.59
1994	33092.29	28265.82	4826.46	4807.18	15003.87	19811.05	8454.77
1995	34092.47	28441.28	5651.19	4944.17	15547.89	20492.06	7949.23
1996	31406.61	25730.49	5676.11	4492.99	14151.13	18644.12	7086.38
1997	28454.87	22926.22	5528.65	4013.38	12997.98	17011.36	5914.86
1998	30294.50	23730.00	6564.50	4082.80	13586.28	17669.08	6060.92
1999	29127.62	22607.72	6519.90	3768.42	12881.58	16650.00	5957.72
2000	31354.92	30234.93	1119.99	3302.24	23272.01	26574.25	3660.67
2001	31041.59	29398.77	1642.82	2880.61	23052.63	25933.24	3465.53
2002	30475.99	28205.82	2270.17	2891.45	22646.45	25537.90	2667.93
2003	34700.24	31350.24	3349.99	2984.41	25987.03	28971.45	2378.80
2004	37883.09	32637.34	5245.75	2963.92	27340.95	30304.87	2332.47
2005	22178.28	20342.10	1836.10	2680.74	15478.51	18159.25	2182.94

Source: Global Development Finance (2008). Official debt and private debt are long-term.

Table D.4: Debt Types as a Percentage of Total Debt Stock

Year	*Long-term*	*Short-term*	*Multilateral*	*Bilateral*	*Official*	**Private**
1975	67.77	32.23	21.62	19.83	41.45	26.33
1976	67.74	32.26	30.36	25.16	55.53	12.12
1977	31.31	68.69	14.32	11.13	25.45	5.87
1978	51.95	48.05	9.63	7.30	16.94	35.01
1979	63.44	36.56	8.39	6.33	14.72	48.72
1980	60.17	39.83	6.40	4.73	11.12	49.05
1981	61.23	38.77	5.46	3.62	9.07	52.16
1982	78.83	21.17	6.16	3.67	9.83	69.00
1983	71.19	28.81	5.03	5.41	10.44	60.76
1984	67.67	32.33	5.37	5.57	10.94	56.73
1985	73.21	26.79	7.67	3.85	11.53	61.68
1986	83.43	16.57	10.06	28.00	38.05	45.37
1987	94.60	5.40	10.55	28.80	39.35	55.25
1988	94.78	5.22	9.62	26.75	36.36	58.42
1989	98.46	1.54	10.53	38.19	48.72	49.73
1990	95.50	4.50	11.16	39.70	50.86	44.64
1991	97.44	2.56	11.96	45.16	57.12	40.31
1992	92.39	7.61	14.09	49.07	63.16	29.23
1993	87.01	12.99	14.12	45.25	59.37	27.64
1994	85.42	14.58	14.53	45.34	59.87	25.55
1995	83.42	16.58	14.50	45.61	60.11	23.32
1996	81.93	18.07	14.31	45.06	59.36	22.56
1997	80.57	19.43	14.10	45.68	59.78	20.79
1998	78.33	21.67	13.48	44.85	58.32	20.01
1999	77.62	22.38	12.94	44.22	57.16	20.45
2000	96.43	3.57	10.53	74.22	84.75	11.67
2001	94.71	5.29	9.28	74.26	83.54	11.16
2002	92.55	7.45	9.49	74.31	83.80	8.75
2003	90.35	9.65	8.60	74.89	83.49	6.86
2004	86.15	13.85	7.82	72.17	80.00	6.16
2005	91.72	8.28	12.09	69.79	81.88	9.84

Source: Global Development Finance (2008). Official debt and private debt are long-term.

Table D.5: Nigeria's Debt Burden Indicators

Year	EDT/XGS	EDT/GNP	TDS/XGS	TDS/GNP	INT/XGS	INT/GNP
1975		6.22		0.99		0.17
1976		3.77		1.13		0.12
1977	23.65	8.82	1.04	0.39	0.39	0.15
1978	43.85	13.99	1.28	0.41	0.57	0.18
1979	34.63	13.30	2.17	0.83	1.43	0.55
1980	32.12	14.61	4.14	1.88	3.27	1.49
1981	58.61	19.57	9.18	3.07	5.93	1.98
1982	92.84	24.59	16.18	4.29	9.68	2.56
1983	161.50	51.24	23.56	7.47	12.96	4.11
1984	143.85	64.86	32.90	14.83	15.68	7.07
1985	137.89	68.08	32.73	16.16	12.73	6.29
1986	411.70	118.23	38.00	10.91	14.96	4.30
1987	370.52	137.89	14.13	5.26	8.27	3.08
1988	406.77	132.61	30.35	9.90	20.85	6.80
1989	350.85	138.44	24.66	9.73	17.59	6.94
1990	226.38	130.70	22.58	13.04	14.59	8.42
1991	249.89	134.88	21.95	11.85	15.52	8.38
1992	222.26	97.51	28.71	12.60	14.33	6.29
1993	257.77	161.71	12.50	7.84	7.65	4.80
1994	317.33	155.29	17.95	8.78	10.79	5.28
1995	257.37	131.69	13.84	7.08	6.91	3.53
1996	175.35	94.97	14.01	7.59	6.09	3.30
1997	156.58	83.71	7.79	4.16	3.17	1.69
1998	257.56	103.33	11.32	4.54	4.75	1.91
1999	189.18	87.47	6.91	3.19	2.98	1.38
2000	138.90	77.89	8.17	4.58	3.34	1.87
2001	147.74	70.38	12.19	5.81	4.03	1.92
2002	156.05	74.68	7.63	3.65	1.75	0.84
2003	121.36	68.76	5.74	3.25	1.49	0.84
2004	93.46	62.82	4.27	2.87	1.40	0.94
2005	39.42	26.63	15.78	10.66	8.90	6.01

Source: World Bank Global Development Finance (2008). EDT is external debt, TDS is total debt service, INT is interest payments, XGS is total exports of goods and services and GNP is gross national product.

Table D.6: Composition of Nigeria's External Debt

	Debt Stock (million US$)					Shares as a percentage (%) of Debt Stock				
	Official			Private		Official			Private	
Year	Paris club	Non-Paris club	Multilateral	London club	Others	Paris club	Non-Paris club	Multilateral	London club	Others
1985	7833.00	1939.00	1317.00	3560.00	4255.00	41.44	10.26	6.97	18.83	22.50
1986	10228.00	2873.00	1887.00	6088.00	4498.00	39.99	11.23	7.38	23.81	17.59
1987	12589.00	2032.00	2985.00	5860.00	4850.00	44.46	7.18	10.54	20.70	17.13
1988	14400.00	2685.00	2838.00	5960.00	4810.00	46.92	8.75	9.25	19.42	15.67
1989	15871.00	2311.00	3171.00	5680.00	4553.00	50.25	7.32	10.04	17.98	14.41
1990	17171.00	1675.00	3842.00	5861.00	4550.00	51.88	5.06	11.61	17.71	13.75
1991	17793.00	1454.00	4016.00	5988.00	4479.00	52.75	4.31	11.91	17.75	13.28
1992	16454.70	1226.10	4518.00	2120.00	3246.00	59.69	4.45	16.39	7.69	11.78
1993	18160.50	1647.30	3694.70	2055.80	3159.90	63.24	5.74	12.87	7.16	11.00
1994	18334.32	1456.31	4402.27	2057.79	3178.17	62.30	4.95	14.96	6.99	10.80
1995	21669.60	1311.20	4411.00	2045.00	3148.00	66.50	4.02	13.54	6.28	9.66
1996	19091.00	121.00	4665.00	2043.00	2140.00	68.04	0.43	16.63	7.28	7.63
1997	18980.39	79.19	4372.68	2043.00	1612.54	70.07	0.29	16.14	7.54	5.95
1998	20829.93	65.77	4237.00	2043.00	1597.84	72.39	0.23	14.73	7.10	5.55
1999	20507.33	69.34	3933.23	2043.21	1486.10	73.14	0.25	14.03	7.29	5.30
2000	21180.00	143.77	3460.00	2043.21	1446.70	74.91	0.51	12.24	7.23	5.12
2001	22092.93	121.21	2797.87	2043.21	1291.78	77.94	0.43	9.87	7.21	4.56
2002	25380.75	55.55	2960.59	1441.79	1153.18	81.89	0.18	9.55	4.65	3.72
2003	27469.92	51.63	3042.08	1441.79	911.39	83.45	0.16	9.24	4.38	2.77
2004	30847.81	47.50	2824.32	1441.79	783.23	85.82	0.13	7.86	4.01	2.18
2005	15412.40	461.79	2512.17	1441.79	649.80	76.26	2.26	12.27	7.04	3.17

Source: Debt Management Office (Nigeria)

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