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ESSAYS IN ECONOMIC STABILISATION AND LONG TERM GROWTH IN SUB-SAHARAN AFRICA

By

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ABSTRACT

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The thesis consists of three papers. The first paper evaluates the macroeconomic effect of IMF stabilisation programs in a panel of non-oil exporting countries in Sub-Saharan Africa. We make use of the "generalised evaluation estimator" and we correct for selection bias as well as potential endogeneity biases. We found that based on our chosen sample, the presence of IMF programs showed a lagged effect on the current account, inflation and real GDP growth. The rate of inflation responds contemporaneously, hence we argue therefore that IMF stabilisation programs probably bite, however, the issue of sustaining the gains remains.

The second paper explores the issue about the effect of nominal shocks on the current account of the balance of payments, in a small open economy. Developments in the theoretical literature, particularly the New-Keynesian macroeconomics and the New Open Economy macroeconomics have brought such issues to the fore. The contribution by Lane [2001a] showed that nominal shocks could have persistent real effects through the current account of the balance of payments. Such findings might be relevant to the debate about the stabilisation frameworks across developing countries. A related issue is about the use of monetary policy for macroeconomic objectives other than price stability. If unanticipated monetary policy actions could have persistent real effects, then such a policy could be directly designed to help achieve real objectives. Particular reference is made to the debate on the usefulness of restrictive monetary targets and other quantitative targets embedded in IMF stabilisation programs. We explored the empirical question, "Could nominal innovations have persistent real effects through the current account in the context of typical developing countries?" We examine the evidence for a set of six countries in Sub-Saharan Africa using the structural vector autoregression methodology. We found that nominal shocks explain a very significant proportion of long run forecast error variance decomposition of the current account in some, but not all countries. We also found that there are differential responses of the current account to nominal innovations. These might suggest that stabilisation frameworks need to incorporate the peculiarities of each country.

The third paper explores long run growth in Sub-Saharan Africa, in view of the fact that growth and proverty reduction programs have assumed centre stage in IMF/World Bank lending policy. Specifically, we explored the convergence argument, as well as the key variables that potentially influence the dynamics of long run growth in the sub-region. Using dynamic panel data methods, we found that Sub-Saharan Africa is not an example of a convergence club. Rather, countries conditionally converge to their own steady states, and this could explain the increasing heterogeneity in economic conditions across the sub-region. In addition, we found that variables such as - openness, the extent of financial development, and foreign direct investment have beneficial marginal effects on long run growth in the sub-region. On the contrary; distortionary government consumption, inflation, and excessive money expansion have a negative effect on long term growth.

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CHAPTER 1

INTRODUCTION

This thesis focuses on the subject of macroeconomic stabilisation/adjustment and the long run growth process in Sub-Saharan Africa over the period 1980-2000. This topic has come to the fore of debate in recent times in light of the fact that compared to other developing regions in Asia and Latin America, economic performance in the Sub-Region over the last two decades remains inadequate[1]. This is in contrast to the widespread economic stabilisation and adjustment policy packages that have been implemented with the support of the IMF (the Fund) and World Bank [these are often referred to as the Bretton Woods institutions] over the period. But how did the trend of economic decline across the Sub-Region begin in the first place?

In this chapter, we discuss some of the policy initiatives that have been implemented in the Sub-region, and we also outline the main research problems we attempt to explore as well as the general structure of the thesis.

[1] Callisto Madavo, the World Bank's Vice President of the Africa Region noted at a recent World Bank Development Seminar – that while there have been many development and economic successes around the world, there have been many failures particularly in Africa (March 5, 2004).

The problems of these countries probably began after most of them became politically independent, after several decades of colonial rule. Indeed the development thinking at the time could also have played a large role. For example, most development economists at the time recognised that the market system as existed in developed economies, could not work well for developing economies due to their peculiar structural bottlenecks.

Hence, most of their theories called for government intervention in ensuring efficient resource allocation. Economists such as Rosenstein-Rodan[2] and Scitovsky[3] proposed the 'big-push' and the 'balanced-growth' strategy, which called for investments taking place on many fronts simultaneously. Thus, in a bid to 'rapidly develop' their economies, there was heavy spending on development projects and import-competing industries, within the framework of development planning. It was not long before inflation rates began to get out of line, budget deficits widened and their external reserves got depleted.

The first major oil shock in 1974 had also taken its toll on these countries, therefore a number of them had to apply for

[2] Rosenstein-Rodan, P. [1943] 'Problems of Industrialisation in Eastern and Southeastern Europe.' Economic Journal, vol. 53, pp. 202 – 12.
[3] Scitovsky, T. [1954] 'Two concepts of external economies' Journal of Political Economy, vol.52 [2], pp. 143-51.

assistance from the International Monetary Fund [IMF] and the World Bank in order to reverse the decline. Subsequent to the first major oil shock, commercial banks (table 3.1) had also entered the international lending market (Bird, 1989 provides a good review of private bank lending to developing countries and their shortcomings), thus complementing official sources, and providing loans to developing countries for balance of payments support. However their loans were at market rates. Hence as a result of the sharp rises in US interest rates and the second major oil shock in 1979, these borrower countries began to experience repayment difficulties.

At the same time, prices of commodities plummeted and their terms of trade deteriorated sharply, thus exacerbating their debt-service problems. It then became clear that these countries could no longer sustain their repayment schedules to the creditors, especially the private banks. The creditors therefore cut off further lending to these countries at a time when they needed even more[4], and thus began the crisis.

Therefore as new external borrowing became unavailable especially in the private capital markets, most of them were

[4] Bird (1989) pp.19-23 discusses shortcomings of bank lending that may have contributed to the crisis.

compelled to introduce stringent economic controls such as import quotas, foreign exchange rationing, and administered prices in order to control the pressure on their economies. These however only led to further problems, and in the end many had no other option than to turn to the IMF and World Bank[5] for a comprehensive restructuring to help salvage their economies. Thus began[6] the wave of "first-generation" stabilisation programs in these countries from the early 1980s. These often included a comprehensive set of economic stabilisation policy reforms at the outset, and coupled at a later stage by adjustment policy reforms that are expected to lead to sustainable growth.

However, from the early 1990s the IMF and World Bank began to modify their programs to these countries (see Bird, 2004). For example, from the late 1980s, the IMF shifted emphasis to the Structural Adjustment Facility [SAF], and the Enhanced Structural Adjustment Facility [ESAF]. These were further converted and called - the Poverty Reduction and Growth Facility [PRGF], which are administered outside the General Resources Account.

[5] The broad objective of these Bretton Woods institutions is to ensure global economic stability.

[6] Among the studies that explored the determinants of a country's decision to enter into Fund programs are Conway (1994), Joyce (1992), Edwards and Santaella (1993), and Knight and Santaella (1997). In their empirical study, Knight and Santaella (1997) reported a number of significant economic factors that compel a country to participate in Fund programmes. These include: low levels of international reserves, low per capita GDP, debt service to export earnings ratio, real exchange rate volatility, domestic investment, and past participation.

The new feature of these types of facilities is that they are concessional, and meant to assist low-income member countries implementing economic reform programs, so as to strengthen their balance of payments, reduce poverty levels and stimulate sustainable growth. In addition, the rationale for the PRGF is to overcome the moral hazard problem of debt forgiveness, and to ensure that funds are appropriately used.

From the mid-1990s , also the Highly Indebted Poor Country [HIPC] Initiative was jointly introduced by the IMF and World Bank to bring the debt burdens of these countries to sustainable levels;

"...so as to ensure that adjustment and reform efforts are not put at risk by continued high debt and debt service burdens" [HIPC website].

The initial initiative was revised in 1999 but the framework largely remains the same. Eligible countries are those that are eligible for highly concessional assistance from the International Development Association [IDA], and for the IMF's Poverty Reduction and Growth Facility [ESAF/PRGF].

Initially, a debt sustainability analysis is prepared to determine whether a country is facing an unsustainable debt situation. The sustainable debt-to-export levels are defined

at a fixed ratio of 150 percent [on a net present value basis]. Where a country's debt situation is declared unsustainable, the country opts for the HIPC debt initiative. This has two main stages - the decision stage, and the completion stage. Under the first stage, the particular country must have a three-year track record of good performance, coupled with a Poverty Reduction Strategy Paper [PRSP] that was developed with civil society.

The PRSP outlines proposed policies and requirements that would alleviate poverty and stimulate growth in the country. Having met these requirements, the country reaches a decision point, thereby benefiting from significant debt reduction/forgiveness by the Paris Club. If such reduction is adequate, then the country could exit the initiative at the decision point.

If on the other hand, the reduction in debt was not sufficient for the country's debt to be sustainable, then the country goes on to the completion stage where it has to implement the policies outlined in the PRSP, in order to benefit from more concessional debt reduction of up to 90 percent in NPV terms [or even higher] on eligible debt so as to achieve an exit from unsustainable debt.

The debt relief is financed from the HIPC Trust Fund. This Trust Fund was created out of contributions from the IMF, World Bank, multilateral, bilateral and commercial creditors. So far, the objectives of the HIPC initiative look noble. It remains to be seen whether countries will keep a sustainable path after exiting from the initiative so as to avoid the need for further reductions later.

At the Millennium Summit held in September 2000, the United Nations also launched a comprehensive economic and social program dubbed, "The Millennium Development Goals" to help poor regions such as Sub-Saharan Africa, Asia and Latin America. The broad targets under this initiative are:

[a] Eradication of extreme poverty and hunger
[b] Universal primary education
[c] Gender equality and empowerment of women
[d] Reduction in child mortality
[e] Improvement in maternal health
[f] Fighting AIDS, Malaria and other diseases
[g] Ensuring environmental sustainability
[h] Develop a global partnership for development.

This initiative is rather comprehensive, as it includes many of the areas that economic policymakers have tried to tackle

under previous programs over the decades. However, the target dates are far off - ranging between the year 2015 and 2020, hence there remains a short-term gap for alternative policy action to address the economic problems in such countries. It is clear from the discussions so far that there has not been a shortage of policy programs that will stabilise and promote rapid economic transformation in regions such as Sub-Saharan Africa.

One remarkable initiative that has recently been gaining momentum in Sub-Saharan Africa is the 'New Partnership for Africa's Development [NEPAD]' adopted at the 37th Summit of the Organisation of African Unity [OAU] in July 2001. This represents a bold initiative by African leaders, in a bid to stabilise their economies, eradicate poverty, and promote sustainable growth with development in Africa.

The novel thing about this initiative is that it is the farthest in terms of policy coordination and implementation, spearheaded by African leaders themselves. Besides, it is strongly supported by the G-7 countries[7]. Its objectives and targets are also linked with the Millennium Development Goals and other agreed development goals and targets.

[7] For example, the "Commission for Africa", new initiative that was launched in February 2004 by the British Prime Minister, Tony Blair. This initiative aims to generate new ideas and action for a strong and prosperous Africa, using the British Presidencies of the G8 and the European Union as a platform. This program also aims to support existing programs such as the NEPAD and the ideals of the African Union.

Indeed, much as the new agenda being pursued to address the socio-economic problems in Africa in particular are laudable, most of the objectives have been pursued in earlier programs. Hence research is needed to understand the dynamics of such economies, so as to enhance policy effectiveness.After more than two decades of sustained economic stabilisation [supported by the IMF and World Bank], however, there began a wave of criticisms and debate regarding the state of these economies.

There is little doubt about the fact that the acutely precarious economic conditions that were experienced in such countries in the early 1980s have abated, quite considerably. For example, inflation rates (Figure 1.3, Appendix 1A) are now generally much less than the very high levels that existed in the early 1980s in countries such as Ghana, Uganda, Zambia and Malawi.

Also, the negative growth rates have generally disappeared even though growth rates have stalled at an average of about 3 percent across the sub-region. However, most of the countries, particularly in sub-Saharan Africa continue to exhibit considerable instability; their economies remain

very poor and fragile, growth rates have stagnated while debt stocks continue to grow.

Table 1.1: Regional Comparison of Major Indicators

	GDP Percapita Growth (2001-2002)	Debt-Service to Exports Ratio (2001)	Gross Capital Formation (% GDP) 2002	Population Growth 1980-2002	Life Expectancy at birth (2002)	Under-5 Mortality Rate per 1000 (2002)	FDI Flow $'Millions (2002)
S.Sahara Africa	0.5	16.5	18	2.7	46	174	7,822
E.Asia/ Pacif.	5.8	5.5	32	1.4	69	42	54,834
Europe and Central Asia	5.1	7.6	21	0.5	69	37	32,931
L.America/Car.	-2.2	16.1	19	1.8	71	34	44,682
Middle East & N.Africa	1.0	-	23	2.6	69	54	2,653
South Asia	2.6	14.5	22	2.0	63	95	4,164

Source: 2004 World Development Indicators Database (World Bank)

In terms of per capita incomes, a further look at intra-regional comparisons reveals that countries that had higher per capita incomes in 1965 still had higher per capita incomes in 2002. This means that per-capita income differences between countries have either largely remained the same or widened.

As at the end of 2002, the countries that had per capita incomes above one thousand dollars [constant 1995 USD] were

Botswana, Cape Verde, Equitorial Guinea, Gabon, Mauritius, Namibia, Sechelles, South Africa, and Swaziland. On the other hand, most of the countries that had the lowest per capita incomes [e.g. Ghana] have made sustained efforts at macroeconomic transformation. Therefore research is needed to uncover the reasons behind some of the macroeconomic outcomes observed across the Sub-region despite the several decades of macroeconomic reforms.

This thesis focuses on selected issues concerning the macroeconomic effects of these reforms, and also long run growth dynamics in Sub-Saharan Africa. Specifically, we aim to explore the following research questions:

- Within a Sub-Saharan Africa framework, do IMF-sponsored economic programs have intended macroeconomic effects?
- Do nominal shocks have persistent effects on the real exchange rate and the current account of the balance of payments, in the context of Sub-Saharan African countries?
- Why has long run growth in Sub-Saharan Africa stagnated over the last 50 years, contrary to other developing regions?

Indeed, many earlier studies have dwelt on some of these issues in the literature. Recent ones that evaluated the macroeconomic effects of IMF-supported [Fund] programs in developing countries include - Khan [1990], Khan et al [1991], Conway [1994], Killick [1995], Bordo and Swartz [2000], Prezworski and Vreeland [2000], Mercer-Blackman and Unigovskoya [2000], Dicks-Mireaux [2000], Bird (2001a, 2001b), and Bird [2002a, 2002b], among others.

These studies are based on a wide range of methodologies - ranging from the before/after approach, with/without approach, comparison of simulations approach, the generalised evaluation estimator approach [GEE] [see Haque and Khan, 1998 for a review], and a hybrid of other approaches [such as the methodology in Prezworski and Vreeland, 2000].

Under the before/after approach, performance before the program is compared with performance after the program. Clearly this suffers from significant biases if the counterfactual is not controlled for, so as to isolate the treatment effect. Under the with/without approach, the research compares performance of a particular country with that of another on condition that the latter has the same characteristics and features as the former except that the

former has had a program whereas the latter has not. Again, this poses difficulties because it is hardly possible to construct such control groups of countries that have every similarity as the country under study except for the treatment effect.

The comparison of simulations approach, was initially used by Khan and Knight [1981], and Khan and Knight [1985]. This method is quite different from the others, as it does not make use of actual macroeconomic outcomes, but rather relies on simulations of econometric models to make hypothetical comparisons. Even though the methodology is elegant, as it tries to capture the entire interrelationship between policy instruments and target variables, yet to try and cover the whole range of policy measures contained in typical IMF sponsored programs and their outcome variables within a single model, is no doubt an immense task.

Indeed, some new approaches have emerged in recent years as seen in studies such as Prezworski and Vreeland [2000], Mercer-Blackman and Unigovskaya [2000], and Graham Bird [2002a]. For example, Prezworski and Vreeland [2000] represents one of the most rigorous methodologies in evaluating IMF-program effects. The authors model growth as the ultimate objective of Fund programs, and they studied

countries' participation in IMF programs as a Markov process.

However, the focus on only growth may be too restrictive – one needs to model program effects on inflation, current account, and the balance of payments as well. On the other hand, Graham Bird [2002a] and others focus on modelling the determinants of completion of Fund programs, and compliance with conditionalities (Bird, 1998) therein. However, the difficulties with program evaluation (e.g. the counterfactual problem) are ever present in these more recent approaches as well.

The GEE is quite a more popular approach in the empirical literature as used by Khan [1990] and Bordo and Swartz [2000], Dicks-Mireaux [2000], etc. The unique feature of this approach is that one attempts to isolate the counterfactual[8] which had eluded earlier approaches such as the 'before-after', and the 'with-without'. However, the approach in its original form, did not address potential selection biases, or the possibility of endogeneity biases due to the presence of lagged dependent variables in the model specification, nor the effect of correlated unobserved country-specific effects.

[8] Dicks-Mireaux et al (2000) argues that the assumptions behind the construction of the counterfactual in this approach neeed to be tested as valid for the sake of the reliability of the evidence reported.

Another significant shortcoming with the GEE approach is that, studies that were based on it, did not consider the extent of program implementation. For example, a country may have agreed a program with the IMF but actually does not draw on the financing provided[9]. Nigeria is a classic case. Thus for such countries, it is not quite appropriate to model years during which the formally agreed programs were running, as program years.

Moreover, the experience of countries' participation in Stand-By programs of the IMF shows that many countries are often unable to complete programs (Bird, 2002a). Hence the use of a binary indicator may not be appropriate to define whether a program is in place in a particular year or not.

Conway [1994] attempts to correct for some of these shortcomings of the GEE, by modelling program participation, and the effect of heterogeneities in the impact of IMF programs across regions. However, the period of study [1976 - 1986] excludes the later years, from the late 1980s to late 1990s which have seen the intensification of program

[9] It is argued that some countries regard having a program with the IMF as a way to facilitate access to private capital flows, however as pointed out in Bird and Rowlands (2002c), this is not exactly the reality. On the other hand, a relatively recent study by Knight and Santaella (1997) on the economic determinants of countries' decision to participate in a Fund program, found that the significant factors are – the level of international reserves, per capita GDP growth and level, debt service to export earnings, real exchange rate volatility, domestic investment, and past participation in programs.

implementation across the Sub-Region. Also, the issue about the effect of unobserved country-specific effects remains.

We contribute to the debate by modifying the GEE in this regard. Specifically, we correct for selection bias[10], and also use the Anderson-Hsiao[11] instrumental variables approach to address the possibility of endogeneity bias due to the inclusion of the lagged dependent variable and also the effect of correlated unobserved country-specific effects. These modifications are expected to yield more precise estimates and contribute to the debate on the macroeconomic effects of Fund programs. We evaluate the macroeconomic effects of IMF stabilisation programs using a panel of seven non-oil exporting Sub-Saharan African countries - Ghana, Zambia, Uganda, Zimbabwe, Kenya, Malawi, and Ethiopia.

Focussing on the growth rate of GDP, current account, and inflation - we found that IMF stabilisation programs have lagged effects on all three variables with a one-year lag, while the rate of inflation responds in the year of implementation.

[10] See Heckman, 1976
[11] Anderson-Hsiao (1981)

The second part of the thesis evaluates the role of nominal shocks in the dynamics of the current account of the balance of payments within the context of small open developing countries.

Indeed, the dynamics of the current account in developing countries remains a controversial research area as the debate appears to be polarised along the New-Structuralists and the orthodox view. According to orthodox textbook arguments, devaluations for example, would be expansionary due to the fact that demand for locally-produced tradeables will increase (Dorbusch, 1988). Moreover, in the context of typical developing countries, it is further argued that an additional demand pressure would emanate from the price-related demand switch (away from imports) as well as the domestic currency price effect that arises from the increased profitability of producing for export. Thus, these will have an expansionary effect on aggregate output as the tradeable sector expands.

Hence, where an economy is already close to full employment, it was recommended that expenditure switching devaluation be coupled with expenditure reducing policies (e.g. contractionary monetary and fiscal policies), so as to offset the inflationary pressure. This has indeed been the

cornerstone of the Fund's policy stance that exchange rate adjustments (expenditure-switching measures) be accompanied by demand contraction (expenditure reducing) measures.

However, the "New Structuralists" (Krugman and Taylor, 1978; Taylor, 1981) criticise this conventional thinking, and argue that devaluation will be contractionary due to supply bottlenecks in developing countries, such that a policy package (e.g. standard IMF prescriptions) consisting of such expenditure-switching and expenditure-reducing policies will be stagflationary (a contraction in output coupled with increasing inflation).

In the case of industrialised countries however, theory and empirics on the long run dynamics of the current account appear to take a faster route, making remarkable progress since the 1980s. For example, the intertemporal approach was the standard theory of the current account from the early 1980s. This approach used the assumption of capital mobility and consumption-smoothing behaviour to view the current account as a buffer to smooth consumption in the face of shocks to output, investment, and government expenditure. Thus, the current account was modelled as the outcome of

forward-looking behaviour of economic agents - consumption smoothing behaviour[12].

Hence, the current account balance[13] would be the outcome of forward-looking dynamic saving and investment decisions, based on expectations about future productivity growth, government spending demands, real interest rates etc.

Even though the set up looked elegant, yet the empirical application of the intertemporal approach had remained inconclusive. The empirical puzzle uncovered by Feldstein-Horioka (1980) also contributed to the debate at the time. These authors had found an extremely low correlation between investment and savings for a set of industrial countries. Thus they concluded that capital flows were rather excessive, since most domestic investment was impliedly financed by capital inflows etc.

However, the so-called savings-investment puzzle (Feldstein-Horioka, 1980) also attracted several criticisms. For example, time-series data on savings and investment are often found to be non-stationary, and hence if they are not cointegrated, then OLS estimation would no-doubt be

[12] The approach could have be inspired by the "Lucas Critique" , which implied that models would yield more reliable policy conclusions if they were based on forward-looking decisions of economic agents.

[13] We imply intertemporal trade based on the divergence of savings and investment, rather than the intratemporal trade balance often used in the earlier literature.

misleading. Thus, perfect capital mobility, it was argued, might not necessarily imply zero correlation.

Also, as shown in Obstfeld (1986), Cardia (1991) and Ghosh (1995), some shocks can otherwise induce a positive correlation between savings and investment in a small open economy. For example, a persistent but not permanent productivity shock could raise savings because wages are temporarily high. At the same time, investment could also go up since capital is more productive. Hence, a positive correlation between savings and investment might not, in itself imply that capital mobility is low. Summers (1988) and Fieleke (1982) provide further criticisms of the savings-investment correlation tests.

The seminal work by Glick and Rogoff (1995) presented further perspectives on the long run behaviour of the current account, by exploring the implied theoretical relationship between the current account and investment. Theory predicts a negative correlation between investment and current account, and this was observed empirically for a set of industrialised countries. However a puzzle that existed was why on average a rise in investment tended to increase the current account deficit by only one-third as much, but not larger.

The authors thus developed an empirical model of the current account and used the distinction between global and country-specific shocks to explain the observed relationship, across major industrialised countries over the post-war period. For example, global productivity shocks affect investment but should not have a significant effect on the current accounts. The authors found consistent evidence of this proposition. They argued that;

"The importance of global shocks, which accounted for roughly 50 percent of the variance of total productivity, appeared to be an important explanation of why the current account-investment correlation is not closer to one". p(34).

The authors uncovered yet another puzzle even after controlling for global specific shocks. The intertemporal model of the current account would imply that a permanent country-specific productivity shock will induce a rise in the current account deficit beyond the corresponding rise in investment. This could be so because it would take time for the capital stock to adjust. Permanent income would rise by more than current income, and hence consumption rises and domestic savings should fall.

Empirically however, the authors found that even though country-specific productivity shocks were indeed long-lasting (near random walks i.e. had unit roots), yet the effect of such country-specific shocks on investment tended to be two to three times larger than on the current account. When the authors allowed for government consumption shocks, the puzzle remained. However, allowing for slight mean reversion (convergence) in country-specific productivity appeared to resolve the puzzle. Hence this has since spurred further empirical work in the literature.

In a recent paper, Ventura (2003) sought to improve the empirical application of the intertemporal approach to the current account. The author argued that it was possible to go a long way towards reconciling the theory and the data by introducing two additional features to the basic model: investment risk and adjustment costs to investment" (p.1).

He found that these extensions generated new and unexpected theoretical predictions that find substantial support in the data. Hence with a couple of such modifications, Ventura argues that the intertemporal approach to the current account becomes even more potent - providing a fairly good description of industrial country data.

In the case of developing countries however, these theoretical advancements on current account dynamics have hardly been extended to explain the long run dynamics of their current accounts (Ghosh and Ostry, 1995). Thus, even though Ghosh and Ostry (1995) argued that the intertemporal approach might equally be applicable to developing countries, yet the question about the extent of capital mobility in such countries clearly casts some shadow of uncertainty on the consumption-smoothing approach, or its subsequent varieties.

Recent developments particularly in New-Keynesian Macroeconomics (NK) and also the New Open Economy Macroeconomics (NOEM) literature have brought renewed interest in modelling nominal shocks and its effects on the current account and real exchange rates, in a way that impliedly, might be more applicable to developing countries (i.e. the assumption of sticky prices and imperfect competition, etc.). In a related theoretical contribution by Lane [2001a], the author demonstrates that nominal shocks can indeed have persistent real effects in a small open economy, working through the current account of the balance of payments. Such that the Mundell-Flemming outcome of a surplus in the balance of payments following a positive

nominal shock for example, becomes only one of three possibilities.

As is typical of the NOEM (essentially a new workhorse body of models for open-economy macroeconomic analysis) literature, the approach by the author is based on the assumptions of nominal rigidities and market imperfections, and uses a dynamic general equilibrium framework with well-specified micro-foundations (e.g. explicit utility and profit maximization). As Lane (2001b) stated about the NOEM models in general,

"*... allowing for nominal rigidities and market imperfections alters the transmission mechanism for shocks and also provides a more potent role for monetary policy. In this way, by addressing issues of concern to policymakers, one goal of this new strand of research is to provide an analytical framework that is relevant for policy analysis and offers a superior alternative to the Mundell-Flemming model that is still widely employed in policy circles as a theoretical reference point*" (p.236).

However, such results depend on the extent of price and wage stickiness. In the context of developing countries, even though the assumption of imperfect competition is very appropriate, there remains controversy about whether prices and wages are more/less sticky[14] or not sticky at all. Thus it is an empirical issue as to whether nominal shocks can

[14] Menu costs, shoe-leather costs, coordination failure etc. are often referred to in explaining price rigidity.

have such persistent real effects as proposed in the seminal contribution by Lane [2001a] for small open economies.

The essence of it all is that such evidence might contribute to the policy debate about the apparent recidivism of economic stabilisation [coupled with increasing volatility in growth rates] in developing countries and the use of monetary policy within IMF stabilisation programs in general. The point is that, if nominal innovations or monetary policy innovations could drive the current account in the long term, then at least theoretically, this might suggest a scope for appropriate demand management or stabilisation policies to be used directly for adjustment and growth.

In a recent development policy seminar at the World Bank, a former Finance Minister of Ghana, Dr. Kwesi Botchway emphasised the persistent call upon the IMF to modify its policy framework such that countries that have a good track record of implementation can have more room, for example to use monetary policy for the achievement of other real macroeconomic goals.

The question therefore is whether for example, the stalling long run growth rates across regions such as Sub-Saharan

Africa might partly be a reflection of the extent of stabilisation achieved by the battery of policy programs that have been implemented. In effect, whether such nominal shocks have persistent real effects possibly through the type of mechanism identified by the new school of thought.

We therefore ascertain the evidence for a group of Sub-Saharan African countries. We make use of structural vector autoregression methods, and we applied the Blanchard and Quah [1989] decomposition to identify the structural innovations in each case. We found that there are indeed differential responses of the current account to nominal shocks across the countries.

Whereas some countries show a J-curve[15] phenomenon (contrary to the view that developing countries may not experience a J-curve, because it is expected that their version of the Marshall-Lerner[16] condition largely holds), others experienced a temporary improvement in the current account

[15]In general, if the exchange rate of a country decreases, then the price of its exports will fall and the price of imports rises. Initially, one might expect little to happen to the amount of exports and imports demanded as consumers take time to change their preference from imported goods to domestically produced goods. In addition, foreign consumers will take time to adjust from domestic goods to foreign exports. If this was the case, then the trade balance or the current account might be expected to worsen as the value of exports would decrease and the value of imports would increase. In the short term therefore, the balance of payments worsens, as the trade deficit grows, and this is known as the J-curve effect. It is however argued that in the context of developing countries that price their exports in foreign currency, the Marshall-Lerner condition takes a different form – that the sum of the price elasticities should be positive. If that is the case, the devaluations for example will lead to an improvement in the current account such that a J-curve phenomenon may not even arise at all in the case of developing countries.

[16] That the sum of the elasticity of demand for their exports and their elasticity of demand for imports should be at least greater than zero.

following a positive nominal shock, contrary to the view in the development economics literature that the J-curve phenomenon might not be observed for typical developing countries that price their exports in foreign currency (Bird, 1998 p.256). Secondly, nominal shocks explain a very significant proportion of long horizon forecast error variance decomposition of the current account in three of the six countries studied.

These findings are largely consistent with the empirical findings in Lane [2001a, 2001b] and subsequent studies such as Fisher and Huh [2002], although these other studies were based on a different sample. The important point from the analysis is that, there is a lot more that needs to be known about the reaction functions in different countries no matter how similar they may appear to be.

Hence, stabilisation policy must incorporate the peculiarities[17] of each country, and also - rather than assuming one strand of theory (for example the standard Mundell-Flemming model suggests that the current account will ultimately run into surplus following a nominal shock), current account models must incorporate the possibility of

[17] For example, in countries where the currency ratio is very high, the Financial Programming framework needs to incorporate this in forecasting liquidity and reserve management in general.

differential reactions of the current account to macroeconomic shocks.

The third part of the thesis focuses exclusively on long run growth dynamics in Sub-Saharan Africa. This issue has also been topical in recent times, due to the fact that more than two decades of economic stabilisation and adjustment does not provide clear evidence of a sustained improvement in economic conditions. For example as seen on Table 1.1, the region lags behind all other regions of the world in terms of all the major macroeconomic indicators, especially growth. The irony is that this is exactly what the policy programmes supported by the IMF and World Bank sought to address for the last two decades.

Indeed, even though the IMF's stabilisation programs are in principle meant for short-term stabilisation of inflation and balance of payments adjustment, yet its lending programs since the late 1980s have been extended to promoting growth and reducing poverty directly[18]. Thus, both the IMF and the World Bank are currently involved in facilitating long term growth and development across regions such as Sub-Saharan Africa[19].

[18] See Bird (2004b) for a detailed discussion of growth, poverty and the IMF.
[19] Indeed, many have criticised the Fund's shift in emphasis towards a stronger involvement in poverty reduction and growth. See Bird (2004b) p.621-622 for a discussion.

Therefore, it is important to ascertain the causes behind the inability of the region to record significant improvements in long run growth rates, despite more than two decades of the involvement and use of resources provided by these development partners.

Africa's growth puzzle has attracted much empirical interest indeed. Earlier studies include; Sachs and Warner [1997], Montiel [1996], Ghura and Hadjimichael [1996], Temple [1998], Easterly and Levine [1997], Ojo and Oshikoya [1995], Savvides [1995], Brempong and Traynor [1999], Fosu [1996, 1999] etc.

However, a new frontier within the wider empirical literature is beginning to emerge. This perspective is largely stirred on by the seminal paper by Acemoglu et al [2001, 2003] and subsequent contributions by Rodrik et al [2004], Hausman et al [2004], Easterly and Levine [2003], Rodrik [2003], Sachs [2003], etc.

The new literature [e.g. Acemoglu et al, 2001; Acemoglu et al, 2003; Rodrik et al, 2004] argues that, for example, Africa's slow growth peculiarity could be attributed to the effects of colonially established weak institutions [e.g.

political institutions that do not constrain politicians and political elites, ineffective enforcement of property rights for investors, widespread corruption, and a high degree of political instability] that have persisted and continue to serve as a barrier to growth.

Subsequent studies such as Easterly and Levine [2003], Rodrik et al [2004], Sachs [2003] got involved in a debate as to whether geographic endowments such as ecological conditions do affect economic growth indirectly through its effect on institutions; or whether the effect is direct.

What is obvious from this new empirical debate is that, researchers appear to move emphasis from the general 'Barro Regressions'[20] approach [where a wide array of controls were included in one regression], to the case where the interplay between historical institutions, disease factors and geographical endowments are thought to account for the peculiarity of growth in previously-colonised regions such as Africa. This shift in approach could be supported by the fact that the "Barro" growth regressions empirics tended to report different and inconsistent findings [McGrattan and Schmidt, 1998; Levine and Renelt, 1992].

[20] Barro (1990, 1991,); Barro and Lee (1994)

Moreover, as pointed out in Hausman et al [2004], for example, the growth regressions approach of modelling long run growth could be unsatisfactory if growth accelerations or decelerations do not coincide with the averaging often used.

However, as argued by Nerlove [1996] and also in the seminal paper by Caselli, Esquivel and Lefort [1996][21], the inconsistent results often reported by studies based on growth regressions could be attributed to the presence of omitted variable bias as well as endogeneity biases that are not well controlled for.

We contribute to the debate on Sub-Saharan Africa's growth puzzle by correcting for such omitted variable bias and endogeneity biases within the growth regressions framework. This is thus based on the pioneering work by Caselli, Esquivel and Lefort [1996] and also the further modifications suggested in Bond, Hoefler and Temple [2002].

Specifically, we explored economic convergence in Sub-Saharan Africa, and the key variables that potentially influence the dynamics of long run growth in the sub-region. We found that Sub-Saharan Africa is not an example of a

[21] Hereinafter referred to as CEL

convergence[22] club[23]. Rather, countries conditionally converge to their own steady states, and this could explain the observed differences in incomes that have persisted since the 1960s. The speed of convergence is rather slow - ranging between 1.6 percent and 4.7 percent.

The meaning of this slow speed of convergence is that the relative growth differences and increasing heterogeneity in economic conditions observed in the sub-region is evidently due to the fact that countries have markedly different steady states. Thus, the obvious way that growth stagnant countries in the sub-region can take does not only depend on variables that will move the economy from one steady state to another [such as higher savings and investment coupled with a fall in population growth rates], but also variables such as technology and industrialisation that can ensure sustained productivity increases and hence higher long run growth.

In terms of economic policy, we found that countries that are more open, have more developed financial systems, and are attractive to foreign direct investment are likely to grow faster. On the contrary countries which suffer from

[22] Solow [1956]
[23] Club Convergence [Galor, 1996] refers to the theory that per capita incomes of countries that are identical in their structural characteristics converge to one another in the long run, provided that their initial conditions are similar as well.

higher levels of distortionary government consumption, inflation, poverty, and excessive money expansion[24], are likely to grow much less.

Overall, we make the following general recommendations:-

(a) IMF stabilisation programs are found to have lagged effects. However, for such gains to be sustained there is the need to incorporate more flexibility in program frameworks. For example, the call for more flexibility in the use of quantitative monetary targets cannot be over-emphasised. In the case of countries that have shown consistent commitment to program implementation, the periodic targets can be set at lower frequency etc. [for example, half-yearly and/or yearly benchmarks] so that the Central Bank can have more flexibility to use monetary policy for other macroeconomic goals.

(b) The findings about the effects of nominal shocks imply that unanticipated monetary policy actions might have persistent real effects, the extent depending on the particular country. This lends further support to the first recommendation above that, monetary policy might be used for

[24] As a result of the unusually high proportion of currency outside the banking system in these countries, the use of the M2/GDP ratio as a proxy of financial development tends to be misleading. Rather, this ratio is more likely to capture the relatively high money supply expansion which is mostly spurred on by the monetization of budget deficits through increases in reserve money. Hence, a more appropriate measure of financial development might be the ratio of quasi-money deposits as a ratio of GDP.

other macroeconomic goals, but to the extent that the appropriate level of price stability is not sacrificed.

Therefore, in designing stabilisation policy programs, every effort must be made to understand the circumstances of each country [such as the patterns of response to various macroeconomic shocks, the business cycles, etc] in order to enhance the effectiveness of such programs.

(c) The relative difference in per-capita income growth across Sub-Saharan Africa is attributable to the fact that countries converge to different steady states. Hence the need for increased savings and capital accumulation is just as important as efficiency and productivity growth coupled with technological development, in order to ensure sustained high growth rates in the region.

(d) Our study confirmed that openness has a positive effect on long run growth rates across the sub-region. Hence, policymakers in Sub-Sahara Africa must intensify their efforts to ease restrictions on international trade, and also lobby for better market access for their exports, so that the external sector is able to contribute directly to output growth.

In addition, efforts must be intensified to create a receptive environment for foreign direct investment. This requires enhanced economic infrastructure, improved legal systems, consistent policies and frameworks to reduce corruption, investor-friendly laws, developed financial systems, and general macroeconomic and social stability.

Anecdotal evidence suggests that the level of FDI flows for example, to the Sub-region could be attributed to the structure of trade tariffs faced by these countries on their exports. For example, tariff escalation means that it is more profitable to keep exporting raw cocoa and coffee etc. than processed chocolates, coffee drinks etc. Hence countries in the Sub-Region need to intensify their efforts in trade negotiations as well as designing strategic trade policies.

The developed countries must also be urged to eliminate export subsidies which together with the elimination of tariff escalation could help the competitiveness of developing country exports. The thesis consists of six chapters in all. The next chapter [Chapter 2] presents a theoretical review on the effect of macroeconomic policies [such as those that are pursued in typical economic reform programs] on long term growth.

Chapter 3 is the first of the main chapters of the thesis, and this focuses on the macroeconomic effects of Fund-supported stabilisation programs in a panel of Sub-Saharan African countries. Chapter 4 then presents the second paper of the thesis, where we study the real effects of nominal shocks in a small open developing economy setting. Chapter 5 presents the third paper of the thesis, where the dynamics of long run growth in Sub-Saharan Africa is explored. Chapter 6 subsequently concludes the thesis and makes policy recommendations.

Appendix.1A

Fig 1: Average Annual Growth Rates in Sub-Sahara Africa (1985-1999)

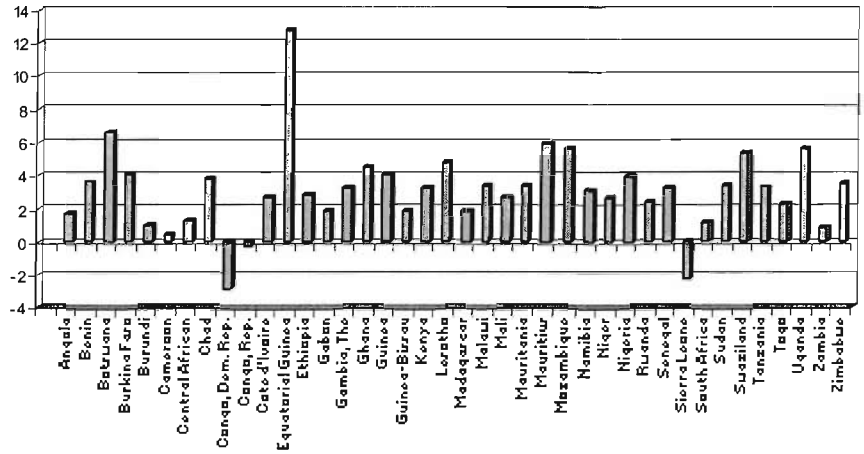


Fig 2: Sub-Sahara Africa: Per Capita GDP (1999)

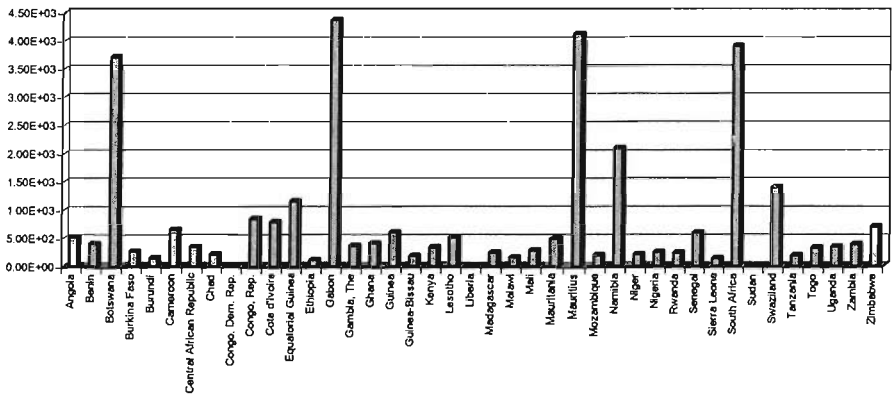
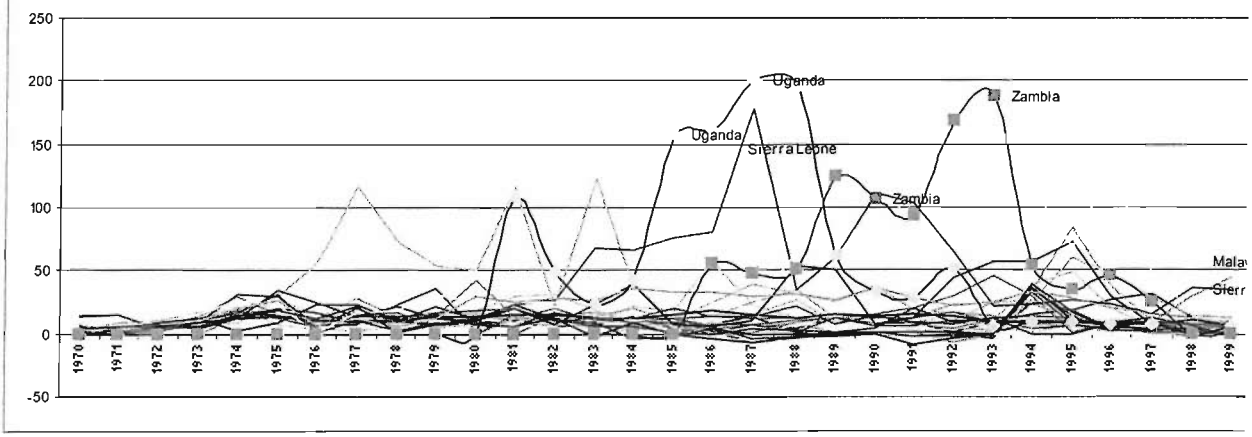


Fig 3: Inflation Rates in Sub-Sahara Africa (1970-1999)



CHAPTER 2

MACROECONOMIC POLICIES AND LONG-TERM GROWTH

In this chapter, we review the theoretical literature on the link between economic policies and long run growth. In particular we discuss the potential effect of fiscal policy, monetary policy and exchange rate policy on long run growth. We also discuss the effect of financial intermediation and development, trade and openness, as well as the stabilisation of high inflation on long run growth. Finally, the chapter ends with a discussion of the (New) Structuralist perspective on macroeconomic stabilisation and long run growth.

2.1 Economic Stabilisation and Long Run Growth - Theory

The link between economic policies and long run growth has remained a controversial one in both the theoretical and empirical literature. The earliest growth theory - the Harrod-Domar growth theory, was based on the assumption of a fixed coefficient production function that resulted in'knife-edge equilibrium' of the economy where 'warranted growth' equals actual growth. Thus any slight shock to the economy will cause the economy to move away from its initial

knife-edge equilibrium and move further away from such equilibrium. Hence, the economy is not expected to be in stable long run equilibrium, or cannot be stabilised in that sense. Subsequent efforts were made to improve on this model as in Kaldor [1955, 1957]; however, the basic framework and prescriptions regarding long run equilibrium of the economy within the Keynesian setup remained largely the same. The seminal paper by Solow [1956] and Swan [1956] changed the fixed proportions assumption in the Harrod-Domar framework but concluded that only exogenous technical change can affect or influence the long run steady state growth path of the economy. In addition, the framework implied that countries with similar production technologies as well as comparable saving and population growth rates should converge to similar steady-state levels of per capita income.

This convergence property means that poor countries starting with a relatively low standard of living and a lower capital/labour ratio will grow faster during the transition as they catch up with the rich countries, but ultimately both groups will arrive at the same level of per capita income. Intuitively, convergence occurs because, with diminishing marginal returns to capital, each increment to

the capital stock generates large additions to output where the capital stock is initially small, and vice versa.

Since population growth and technological progress are assumed to be exogenous in the Neoclassical framework, the model does not explain the mechanism that generates steady-state growth, and therefore does not allow an evaluation of the mechanisms through which government macroeconomic policies can potentially influence the growth process.

Nonetheless, the framework dominated much of macroeconomic thinking until the early 1980s when the 'endogenous' growth theories emerged [Romer, 1986; Lucas, 1988; etc.]. This new strand of theory has focused on the attempt to develop theoretical models in which policy affects long-run steady state growth rate of output. Thus, these models assume that technological progress is endogenous and there are increasing returns to human capital that compensate for the diminishing returns to physical capital. Such that policies that influence the above [particularly, policies that raise capital accumulation and research] can in turn have effect on the long run growth path of the economy.

The endogenous growth framework has thus proved very useful to development economists ever since, as various attempts

have been made to link monetary, fiscal, exchange rate, and other macroeconomic policies to long run economic growth particularly in developing countries. We next review some of these.

2.1.1 Fiscal Policy and Long Run Growth

Indeed, the effect of fiscal policy on economic growth is a controversial and long -standing topic in economic theory, empirical research, and economic policy implementation. In general, when growth is endogenous, one would expect that policy actions affecting the saving rate (e.g. fiscal policy) will have growth effects and not only "level" effects. This means that fiscal policy affects the steady state growth rate on a balanced growth path and not only during the transition from one steady state to the other.

However, the effect of fiscal policy on growth raises further interesting issues. This is because there could be different measures of the stance of fiscal policy, and each of these could have different effects. As Tanzi and Zee (1997) discuss, there are three candidate indicators of fiscal policy - government expenditure, taxes, and public deficits. Clearly, each of these could have different individual effects, and also different effects, when taken together. Even in the case of each individual indicators of

fiscal policy, there could be different natures of these indicators, with different effects. For example, in the case of taxation, its effect on growth will depend on the levels of taxation, the structure of taxation, the extent of tax stability, and the efficiency of tax administration. A high level of taxation is expected to reduce the growth potential of a country because of the negative impact that it might have on work incentives, investment, saving decisions, and on the allocation of resources in general.

Moreover, high taxes in one country could induce capital flight towards lower taxed countries. The negative effect of such taxes is based on the fact that taxes are almost always distortive, because truly neutral taxes do not exist in the real world. Moreover, taxes transfer resources from the more efficient private sector to the less efficient public sector; therefore higher taxes are expected to result in lower growth.

While taxes may reduce growth by being too high, they might also reduce it by being too low. This will happen if the level of taxation is too low to give the public sector of a country the resources necessary to provide essential government services. Of course, the presumption here is that there is a level of resources that can be used more

productively in the public than in the private sector. Furthermore, if over a sustained period of time, government revenue is much lower than total public spending (thus, creating unsustainable macroeconomic imbalances and public debt accumulation) then growth may be reduced because the private sector might come to see the fiscal situation as unsustainable; or because the macroeconomic imbalances could create high inflation or other macroeconomic problems.

At least in theory, there must be a level of taxation that could be considered "optimal" from a growth point of view because it would be just sufficient to finance the essential public services in an efficient way. When the tax level of a country exceeds this optimal level, a lowering of it could lead to faster growth and vice versa. However, in the context of countries in Sub-Saharan Africa, tax rates are already generally high whereas essential public services can hardly be financed sufficiently. Thus it is unclear whether a lowering of tax rates could stimulate growth in the context of developing countries such as Sub-Saharan Africa.

The structure of taxation has also been shown to have important effects on growth in a country. In other words, not all taxes have the same impact on the economy. Taxes that are imposed with high marginal rates are believed to be

more damaging because according to economic theory, the dead-weight cost of taxes grows with the square of the marginal tax rate.

For this reason, on efficiency grounds, value added taxes (that are basically proportional taxes on consumed income) are preferred by many tax experts to personal income taxes that are often applied with high marginal tax rates on both consumption and saving. When income taxes are applied with high marginal tax rates, they are likely to have significant negative effects on variables such as work effort, saving, and investment that are important determinants of growth. In other words, revenue neutral tax reforms can affect a country's capacity to grow by changing the distortionary impact of taxes.

Still in the realm of taxes and its impact on growth, some schools of thought have argued that "old taxes are good taxes" because economic operators have got used to them and the economy has already incorporated their effects. For example, existing taxes might already have been capitalised in the prices of assets. Even though, as argued, there are tax changes that improve the efficiency of the economy, it is also true that when tax systems are changed frequently in their structural and level aspects, these changes introduce

"tax uncertainty", and this could have negative effects on growth. Tax reforms cannot be made frequently and cannot be stretched over too long a period of time when they are made. Uncertainty makes more difficult economic decisions involving the future. It, thus, encourages individuals to postpone making some decisions.

This can happen especially when tax uncertainty is likely to create time consistency problems. For example, a tax reform may introduce tax incentives to stimulate investment. But, because the incentive will cost revenue to the government, the investors may fear that they may be removed or reduced after the investments have been made. Hence the stability of taxes could also affect its impact on growth in an economy.

We next discuss the effect of public spending, another indicator of the stance of fiscal policy, on growth. It is indeed a fact that, a government collects taxes to finance its spending. Therefore one cannot or should not separate the revenue side from the expenditure side of the budget. If a government collected taxes in the most neutral way and used the revenue collected to finance, in the most efficient way, public spending that is essential to the functioning of the economy, then clearly, this would promote growth.

However, this scenario is rarely the case in reality. Whereas the taxes collected are often far from being neutral, the expenditure made is not all essential to the functioning of the economy, and they are made with substantial degrees of inefficiency. They are thus unproductive.

In terms of the objective of growth, unproductive expenditure often tends to be a large proportion of total spending, and hence the challenge in empirical work is how to separate productive from unproductive expenditure and distortionary from neutral taxes. Most of the effort in applied work has considered three types of expenditure variables - public investment spending, public consumption spending, and social welfare or redistributive spending[25].

There is little doubt the fact that there are some types of government activity or spending that are essential, and without which the economy cannot function well, and will not grow. Thus these types of core spending may be just as important to growth as direct inputs such as capital and labour. Such core spending includes - spending for essential administrative services, justice, basic research,

[25] Indeed some of this literature has also considered public spending that creates human capital and spending that contributes to innovation such as that for research and development.

basic education and health, public infrastructure, internal and external security and so on. The level of this type of spending depends on how efficient the government is in using the resources available. The less efficient is the government, the higher must be the spending level. But the role of the government and needed spending depends also on the level of development of the country and on the sophistication of its markets.

Hence in the context of developing countries it is unclear whether an increase (or decrease) in such spending will necessarily imply increased (decreased) productive public spending that will directly spur growth or otherwise.

On the other hand, while redistributive spending could be justified on ethical or political grounds, yet much of it is unlikely to contribute to growth in spite of some arguments made in its favour. For example, much of the spending for health and pensions goes to individuals who have already left their productive activities and cannot thus contribute to growth. In summary therefore, an increase in efficiently executed core spending can promote growth while an increase in non-core spending is expected to reduce growth.

The third type of government expenditure is 'public investment', which is different from productive or core spending. These are often directed to the creation of physical infrastructures that are believed to crowd in private investment and to reduce some private costs. Thus, there is little doubt about the fact that public investment may contribute to growth, and that for example, reducing government consumption to finance higher public investment would be a growth stimulating policy. Similarly, raising tax revenue to allow higher investment spending could be a growth promoting policy.

The only instance that might pose a threat to growth is when such higher investment spending is financed through a higher fiscal deficit. This could be the case given that most of such public investment decisions are made politically and not based on objective cost-benefit analysis. Thus, there is always a strong possibility that at least some of the investments could be white elephants with little value to the economy.

Thus, the increase in the fiscal deficit and in the public spending that would accompany the increase in investment spending could send some negative signals to the market and could even crowd out some private investment. However, in

general, one expects that properly defined public investment and efficiently executed public projects would bring about higher growth.

The discussions above illustrate the difficulty with predicting *a priori*, the effect of fiscal policy variables on growth. Thus, the empirical literature has persisted in trying to offer a clear understanding about the growth effects of such fiscal variables, without alluding to any specific existing theory. Indeed there were several empirical studies of the relationship between fiscal policy and growth, conducted even before the relevant endogenous growth models were developed.

For example, Landau (1983) using cross-sectional data from 104 countries found a negative relation between public consumption as a share of GDP and growth per capita using Summers-Heston data, while Kormendi-Meguire (1985) using cross-section/time series data for 47 countries found no statistically significant relation of the same variables for the post-World War II period. Barth-Bradley (1987) also found a negative relation between real GDP growth and the share of consumption spending in GDP for 16 OECD countries for the period 1971-1983.

On the other hand, Barro (1989) with data from 98 countries in the post-World War II period found that government consumption decreases per capita growth, while public investment does not affect growth. Levine-Renelt (1992) found that most results from earlier studies on the relationship between long-run growth and fiscal policy indicators were fragile to small changes in the conditioning set.

In the second generation of studies, for example, Easterly-Rebello (1993) used cross-section data for 100 countries for 1970 to 1988 and panel data for 28 countries for 1870-1988. They found that public transportation, communication and educational investment were positively correlated with growth per capita, and aggregate public investment was negatively correlated with growth per capita, although they admitted that many fiscal policy variables were highly correlted with initial income levels and fiscal variables were potentially endogenous.

Cashin (1995) estimated a positive relationship between government transfers, public investment and growth and a negative one between distortionary taxes and growth from panel data for 23 developed countries between 1971 and 1988. Devarajan et al (1996) on the other hand, showed that public

current expenditures increased growth, whilst government capital spending decreased growth in 43 developing countries over the 1970 to 1990 period. Then, Kneller et al (1999, 2001) showed that the biases relating to the incomplete specification of the government budget constraint present in previous studies were significant and after taking them into account, they found for a panel of 22 OECD countries for 1970 to 1995 that, distortionary taxation hampered growth, while non-distortionary taxes did not.

Secondly, productive government expenditures increased growth, while non-productive expenditures did not. Moreover, long-run effects of fiscal policy were not fully captured by the five-year averages commonly used in empirical studies.

Several other studies also examined the relation between fiscal policy and growth, e.g. De la Fuente (1997), Brons et al (2000), Poot (2000), etc. In particular, Poot (2000) did a survey of published articles on the fiscal policy-growth phenomenon over the period 1983 to 1998. He reported that there was no conclusive evidence for the relationship between government consumption and growth.

On the contrary, there was definitive evidence about a positive link between long term growth and education

spending, and a negative growth impact of defence spending. The final piece of evidence reported by the latter was that there was a rather robust positive association of infrastructure spending with long term growth.

It is clear therefore that there is widespread non-robustness of coefficient signs and statistical significance across the studies so far. This could be due to several reasons. Indeed studies differ in terms of countries included in the sample, period/method of estimation, and measures of public sector activity etc. Hence, it is not surprising that the results reported differ.

Data quality is also a problem since, for example, various countries have different conventions for the measurement of public sector size and there are limited data at the required level of disaggregation. Also, the dynamic effects of fiscal policy are either ignored completely or not modelled carefully in existing empirical work, i.e. not sufficient attention is paid on distinguishing the transitional from the long-run effects of fiscal policy.

Moreover, it is likely that there is dependence between explanatory variables and the rate of growth, and correlation of the fiscal variables with initial GDP.

Furthermore, the linear structure imposed on most empirical models is convenient but not necessarily realistic and consistent with the underlying theory. These might therefore explain the inconclusiveness of the effects of fiscal policy on long run growth both in the theoretical as well as empirical literature.

2.1.2 Monetary Policy and Long Run Growth

The potential effect of monetary policy on long run growth is also an old controversy both in the theoretical and empirical literature. The early Classical Macroeconomic theory, which preceded Keynesianism and Monetarism, and which developed during the late nineteenth and early twentieth centuries, was characterised by its focus on economic fundamentals ('real' economic conditions) such as individuals' propensity to save, the state of technology, and so on.

In the classical view, monetary policy played no long run role in determining real economic activity. In particular, it had no long-run effect on the level of real interest rates. Classical theorists acknowledged that monetary policy might have a minor influence over economic activity (particularly interest rates) in the short run. In the long

run, however, they viewed money as having a direct influence only on prices.

This early view of the influence of money on prices came to be known as the quantity theory of money. Like many economic concepts, the quantity theory has a rich history of reinterpretations. In its earliest formulation, Fisher (1926) argued that an economy's general price level is a function of the quantity of money in circulation, the economy's efficiency, or velocity of circulation (the average number of times in a year money is exchanged for goods), and volume of trade (the quantity of goods purchased with money).

Fisher argued that in the long run, there was a 'natural' level of real economic activity determined by economic fundamentals that could not be affected by increases in the amount of money in the economy. That,

"*...An inflation of the currency cannot increase the product of farms and factories... the stream of business depends on natural resources and natural conditions, not on the quantity of money*" (p.155).

This hypothesis that there was a natural long run level of real economic activity, together with the assumption that the only role of money is to serve as a unit of account,

formed the basis of Fisher's quantity theory analysis that prices varied proportionately to changes in the quantity of money. Thus, if velocity of money and the value of transactions were fairly stable - at least in the long run - as the economy approached its natural level, then changes in the quantity of money would be met with proportional changes in the price level.

Fisher recognised that monetary policy might have some temporary effects on real economic activity, commenting that *"the quantity theory will not hold true strictly and absolutely during transition periods"* (p.161). Such effects were attributed to temporary changes in velocity. If velocity was fairly stable in the long run (as he assumed) then it had to be the case that prices varied proportionately with the supply of money.

In a subsequent refinement of the quantity theory, the Monetarist school that emerged in the 1950s still arrived at the same long run superneutrality argument pioneered by the Classical school in the quantity theory of money. However, the mechanism through with changes in money supply influenced the price level alone in the long run, was extended.

The Monetarists' refinement of the Fisher quantity theory of money was largely driven by Milton Friedman, an economist at the University of Chicago. Friedman argued that for a theory to be able to make predictions regarding the effects of changes in monetary policy or changes in the price level, it is necessary to establish some assumptions about what differentiates the behaviour of money supply from the behaviour of money demand. In Friedman's words,

"The quantity theory is in the first instance a theory of the demand for money. It is not a theory of output, or of money income, or of the price level. Any statements about these variables require combing the quantity theory with some specifications about the conditions of the supply of money…" (Friedman, 1956 p.4).

Friedman's version of the quantity theory is based on the postulate that there is a stable demand for real money balances. He assumed that in the long run, the level of money demand depends on economic fundamentals such as real income, the real interest rate, and the nature of the technology for conducting transactions. Under this assumption, changes in the nominal supply of money engineered by the monetary authority will have no long run impact on the real demand for money and consequently lead inevitably and exclusively to changes in the price level.

This observation is shown to be true both for one-time changes in the money supply and for changes in the rate at which the money supply is growing, which would result in changes in the inflation rate but not in the levels or growth rates of real variables. In sum, even the Monetarists' restatement of the quantity theory still maintained that changes in monetary policy would have no real effects in the long run - that is, money would be long-run superneutral.

In the wake of the Great Depression, the Keynesian school emerged following the publication by John Maynard Keynes of his General Theory (1936). One of the main goals of this strand of theory was to identify the cause of the persistently high rates of unemployment that were afflicting virtually the entire world during the Great Depression.

The Keynesian school, thus sought to identify government policies that could help reduce these high levels of unemployment. Even though the new theory discussed the long-term implication of government policies, the focus was on the short run. Besides, even though monetary factors played a role in determining real economic activity (unlike the Classical theory), the analysis emphasised fiscal policy.

Keynes maintained that fiscal policy was the most potent tool that a government could use to lift the economy out of a recession or depression. In fact, his theory predicted that under certain conditions, increases in the money supply would be unable to drive interest rates down low enough to stimulate economic activity by generating additional demand for credit. This was referred to as the *liquidity trap*. In such liquidity trap situations, the implication was that money was superneutral even in the short run.

Thus the early Keynesians focused attention on fiscal policy. Maynard Keynes himself rejected the quantity theory approach to determining the price level. For him, the magnitude of the money supply in the economy was only one of a number of factors affecting the general level of prices. Another important factor was the level of employment. In the view of Keynes, it was impossible to determine the ultimate impact of a change in the quantity of money on the price level without considering the economy's overall level of employment. More specifically, Keynes believed that,

> *"an increase in the quantity of money will have no effect whatever on prices , so long as there is any unemployment"* (1964, 295).

Because persistent unemployment was seen as the central problem facing industrialised economies, it was argued that

economies could go for extended periods of time without observing significant changes in the price level. This was indeed the case in the 1950s, and this led credence to the view of the Keynesian school that focussing on fiscal policies that might help solve chronic unemployment problems was likely to be more fruitful than devoting a lot of energy to analysing price level determination.

However, inflation subsequently began to spiral out of control both in the United States and Western Europe, and this development was what stimulated interest in analysing the causes of and cures for inflation. This led to the emergence of the Phillips curve relationship, which has had a profound and lasting effect on the development of subsequent theory about the relationship between inflation and real economic variables.

It all began in 1958 when British economist, A.W. Phillips published an empirical analysis of historical data for the U.K labor market. He had hoped to find empirical support for the Keynesian hypothesis that the rate of wage inflation depended on the tightness of the labour market. But he found that, from 1861 to 1957 the growth rate of nominal wages was negatively related to the rated of unemployment.

This relationship seemed to link the real side of the economy (the unemployment rate) to the nominal side (nominal wages). And since wages were the biggest single component of firms' costs, most economists were thus willing to assume that persistent increases in wage rates would eventually force firms to begin increasing their prices, producing economy wide price inflation.

In summary, Keynesian theory held that it as possible to use fiscal or monetary policy to increase or decrease the level of aggregate demand and through it the level of employment. Secondly, the Phillips curve described a link between the level of aggregate demand and the rate of inflation. Hence, Policymakers at the time began to think of demand management polices as involving a trade-off between the unemployment rate and the inflation rate. Thus, if the Phillips curve was stable over time, then this trade-off could exist in both the short run and the long run.

The first formal attempt to incorporate a Keynesian view about the long-run real effects of monetary policy was presented by James Tobin. Contrary to the view of the earlier Classical school, Tobin saw real economic activity in general, and real interest rates in particular, as being

determined jointly by economic fundamentals and by monetary policy - even in the long run. As Tobin argued,

"...Keynes gave reasons why in the short run monetary factors and portfolio decisions modify, and in some circumstances dominate, the determination of the interest rate and the process of capital accumulation. I have tried to show here that a similar proposition is true for the long run. The equilibrium interest rate and degree of capital intensity are in general affected by monetary supplies and portfolio behaviour, as well as technology and thrift" (Tobin,1965, p.684).

Simply, the analysis presented by Tobin, focussed on portfolio adjustments instead of money illusion, as the channel by which monetary policy could have long-run real effects. According to him, both money and physical capital were elements of an individual's portfolio of savings. For a given real rate of return on capital, an increase in the rate of inflation would make money less attractive and capital more attractive, inducing individuals to reduce their holdings of money in favour of holdings of physical capital. Consequently, one would observe additional accumulation of capital, a higher capital stock, and a higher output level in the long run.

The Monetarist school also offered perspectives on the real effects of monetary policy, by focussing on the Phillips relationship. In particular, Friedman (1968) and Phelps (1967) argued that the Keynesian position was based on two

assumptions that may or may not hold. The first one relates to the nature of monetary policy, and the other about economic agents' responses to the effects of monetary policy. The first assumption is that increases in the money supply often cause "monetary surprises" or unexpected increases in the rate of inflation.

The second assumption was that economic decisionmakers' (agents) reaction to monetary surprises often involved temporary money illusion, which is a temporary failure to recognise that there has been an increase in the price level. The basic idea here is that although monetary surprises increase the prices of all goods and services, economic agents usually notice the effects of these increases on particular prices in which they have a special interest - their wages or the prices of the goods they produce - well before they notice their effects on the overall price level.

Until they discover that the overall price level has increased, they mistakenly believe that the increases in the money (nominal) prices of the goods they care about represent increases in the real prices (relative prices) of those goods. This mistaken belief can lead households or firms to make decisions about saving, consumption, work

effort, investment, production, and so forth that are quite different from the decisions they would have made otherwise. As a result, by creating monetary surprises monetary policy can influence the level of real economic activity.

The above could be illustrated with the basic AS/AD framework. An increase in the growth of money supply will lead to a fall in interest rates The lower interest rates will stimulate spending which will in turn have a multiplier effect on the overall level of economic activity. Thus within the AS/AD framework, the increase in money supply growth shifts the AD to the right , thus resulting in an increase in output and prices along the original aggregate supply curve.

In Friedman's view, this change in the equilibrium will be strictly a short-run phenomenon. As soon as households and firms realize that lower interest rates and faster-rising wages and product prices are also associated with a more rapid rate of increase in the overall price level - as soon, that is as they realize that real wages and prices have not changed - the households will reduce their supply of labour and the firms will cut back their production.

This is reflected in a leftward shift in the aggregate supply schedule that exactly offsets the effects of the increase in aggregate demand. In the end the economy returns to the original long-run natural level of economic activity but a higher rate of inflation. As Friedman wrote,

"...Rising income will raise the liquidity preference ...and the demand for loans; it may also raise prices, which will reduce the real quantity of money. These three effects will reverse the initial downward pressure on interest rates in something less than a year. Together they will tend, after ... a year or two to return (real) interest rates to the level they would other wise have had" (pp.5-6).

Indeed, Friedman's theory of the short-run effects of monetary policy is sometimes described as the liquidity effect theory. This theory is based on the belief that in the short run the decisions of firms and households are influenced by money illusion. Hence, an increase in production and employment occurs not because there has been a change in economic fundamentals but because a more rapid rate of monetary growth has produced a higher rate of inflation.

In sum, the Monetarists held firm to the Classicalist premise, through the money illusion hypothesis, that in the long run all real economic variables such as the real interest rate or the real unemployment rate have a natural level that is determined by economic fundamentals and is

completely independent of the nature of monetary policy. In their view, temporary money illusion was the only mechanism by means of which monetary policy could affect real economic activity.

Hence, any attempt by policy makers to continually stimulate economic activity with changes in the growth rate of money supply would translate mostly into an ever-increasing rate of inflation. While it might be possible for monetary policy to influence the level of interest rates and real economic activity in the short run, once households and firms recognized that the rate of inflation had increased, the aggregate supply would shift back and the real effects of an increased inflation rate would disappear. Further reductions in interest rates and further stimulus to economic activity could be attained only through further increases in the rate of inflation.

Clearly, until the early 1970s, the view in the economics literature as regards the real effects of monetary policy was that, the Keynesians through the effort of James Tobin recognised that money could have long lasting real effects, whereas the Monetarist-Classical schools maintained that any real effects of monetary policy can only arise in the short run through the monetary surprises/money illusion

phenomenon. In the long run therefore, money was super neutral.

The years since the 1970s have witnessed the development of "neoclassical" macroeconomics - a relatively new school of macroeconomic thought that is based largely on classical principles even more firmly than monetarism. One of the most influential branches of neoclassical macroeconomics is real business cycle theory.

According to real business cycle pioneers such as Lucas (1972), Sargent and Wallace (1976), Kydland and Prescott (1982) and Nelson and Plosser (1982, the cyclical pattern of recessions and expansions has little to do with monetary policy and can be explained almost entirely by "real shocks" - technological developments, changes in tax policy, and other unpredictable changes in economic fundamentals. Thus, the real business cycle theorists believe monetary policy has few or no effects even in the short run. The two pillars of the real business cycle approach were based on the assumption that economic agents had rational expectations and the use of a dynamic general equilibrium model.

A dynamic general equilibrium model is a model that takes into account the inter-temporal nature of many economic

decisions and recognizes that economic variables interact with each other. Therefore, to determine the consequences of a postulated policy experiment one has to consider the relevant economic variables simultaneously and through time. Lucas (1972) in particular presented very rigorous description of a situation in which money is super-neutral in the long run, and also a situation in which the short run run real effects of monetary policy are bound to be rather limited, even in a scenario involving accelerating prices.

In sum, the neoclassical school does not even anticipate a short run real effect of monetary policy. The latter is thought to be neutral in both the short run and long run.

In the wake of the emergence of the neoclassical theory came the New Keynesian School which evolved from the earlier Keynesian tradition. The New Classical School had criticised many of the tenets of the early Keynesians, and hence the New Keynesians emerged in response to the New Classical School. The primary disagreement between the new classical and new Keynesian schools is over how quickly wages and prices adjust. New classical economists built their macroeconomic theories on the assumption that wages and prices are flexible. They believe that prices "clear" markets - balance supply and demand - by adjusting quickly.

New Keynesian economists however believe that market-clearing models cannot explain short-run economic fluctuations, and so they advocated models with "sticky" wages and prices. New Keynesian theories thus rely on this stickiness of wages and prices to explain why involuntary unemployment exists and why monetary policy had such a strong influence on economic activity. The reasons for such stickiness in wages and prices were attributed to menu costs, the staggering of prices, coordination failures, and efficiency wages theories.

These represented substantial departure from the assumptions of classical and new classical economics, which provided the intellectual basis for economists' usual justification of laisez-faire. In the New Keynesian theories, recessions are caused by some economy-wide market failure. Thus, new Keynesian economics provides a rationale for government intervention in the economy, such as counter cyclical monetary or fiscal policy.

There is currently a new strand of the New Keynesian theory known as the New Open Economy Macroeconomics (NOEM). This approach was heralded by the seminal paper by Obstfeld and Rogoff (1995b). The NOEM is essentially a new workhorse

model for open-economy macroeconomic analysis that incorporates nominal rigidities and market imperfections into a dynamic general equilibrium model with well-specified micro-foundations.

The approach makes extensive use of explicit utility and profit maximization situations that allows a researcher to conduct welfare analysis and credible policy evaluation in general. As described in Lane (2001b):

"…Allowing for nominal rigidities and market imperfections alters the transmission mechanism for shocks and also provides a more potent role for monetary policy. In this way, by addressing issues of concern to policymakers, one goal of this new strand of research is to provide an analytical framework that is relevant for policy analysis and offers a superior alternative to the Mundell-Flemming model that is still widely employed in policy circle as a theoretical reference point".

Indeed, this new strand of theory had also maintained that monetary policy could not have long run real effects, but rather that it is expected to have pronounced effects in the short run. Clearly, the economics literature on the real effects of monetary policy continues to expand, and there is as yet no conclusive position on the matter.

The empirical literature is similarly divided on the neutrality/non-neutrality argument. For example, King and Watson (1992) produce evidence both for and against the long

run super-neutrality argument. They reported that for the United States during the post-war period the data do not appear to be consistent with the hypothesis that, over the long run, money is super-neutral or that nominal interest rates move one-for-one with inflation. Other references include; Ball and Romer (1990), and Romer and Romer (1994).

2.1.3 Exchange Rate Policy and Long Run Growth

The subject of exchange rate policy is indeed a vivid one, particularly as it relates to developing countries. Since the early 1970s, exchange rate arrangements in developing countries has evolved from fixed or pegged exchange rates, to floating exchange rates, and then to a hybrid of intermediate arrangements - managed float, crawling peg, etc. For example, in the early 1970s, all developing countries had pegged or fixed exchange rates. By 1985, about ten developing countries had independently floating regimes, and by 1995 this figure had risen to 35 (source: Bird, 1998 p.257).

In general, countries may maintain exchange rates as floating or else fixed. Under a floating exchange rate regime, balance of payments disequilibrium should automatically be restored to equilibrium without the need for government policy. In the case of a fixed exchange rate,

however, devaluation or a revaluation may generally be used to restore equilibriuim. Such a policy action is expected to directly affect the current account of the balance of payments, and hence growth.

However, in the case of developing countries, there were apprehensions among policymakers since their exports were already priced in foreign currency. But it is argued that once their version of the Marshall-Lerner condition (that the sum of the export demand elasticity and import demand elasticity should be greater than zero) is fulfilled, then devaluation can still achieve its objective even in the context of developing countries.

The Marshall-Lerner Condition shows the conditions under which a devaluation or revaluation would lead to an improvement or worsening of the current account, hence growth. But this prediction about the effect of changes in exchange rates on the current account crucially depends on the extent to which a change in import and export prices (if at all) affect the quantity of imports and exports demanded.

If the exchange rate of a country decreases, then the price of its exports will fall and the price of imports rises. Initially, one might expect little to happen to the amount

of exports and imports demanded as consumers take time to change their preference from imported goods to domestically produced goods.

In addition, foreign consumers will take time to adjust from domestic goods to foreign exports. If this was the case, then the trade balance or the current account might be expected to worsen as the value of exports would decrease and the value of imports would increase. In the short term therefore, the balance of payments worsens, as the trade deficit grows, and this is known as the J-curve effect.

However, after a while, the situation is expected to improve as the trade deficit gets smaller and then moves to a surplus. In the longer time period, once consumers' preference have adjusted to the changes in imports and export prices, then the amount of exports and imports demanded will change. The amount by which they change will determine the effect on the current account of the balance of payments. On the other hand, the extent of the change will depend upon the price elasticity of demand for imports and exports.

If demand for exports is first assumed to be relatively price elastic, then the fall in the price of exports caused

by the fall in the exchange rate will lead to a proportionately greater increase in the quantity of exports demanded. This would improve the balance of payments.

If on the other hand, demand for imports is assumed to be relatively price elastic, then the rise in the price of imports caused by the fall in the exchange rate will lead to a proportionately greater decrease in the quantity demanded of imports. This would also improve the current account of the balance of payments. The importance of the price elasticity of demand for imports and exports is thus very crucial.

The Marshall-Lerner condition implies that if balance of payments disequilibrium is to be restored to equilibrium, then it is important that the sum of the price elasticity of demand coefficient for exports and imports is greater than one. If this condition is not met, and the sum of the price elasticity of demand for exports and imports is less than one, then a fall in the exchange rate will bring about a worsening of the balance of payments.

The fall in the price of exports will lead to a proportionately smaller increase in the number of exports demanded and the rise in the price of imports will lead to a

proportionately smaller reduction in the amount demanded. Both of these factors will contribute to a deterioration of the balance of payments. Therefore, in assessing the likely impact of a policy that will lead to a fall in the value of a currency, one must consider the price elasticity of demand for both exports and imports.

This has thus been the focal point of the argument in development economics that in the case of typical developing countries whose exports are usually priced in foreign currency (usually US dollars) and also the price elasticity of demand for their exports (usually primary products) is normally low, devaluation is not likely to yield the desired relative price changes, but is rather more likely to lead to sustained deficits in the trade balance of the current account (or balance of payments)and hence devaluation may otherwise lead to a fall in growth.

However, it is argued that the appropriate form of the Marshall-Lerner condition in the case of developing countries is that the sum of the elasticities (import demand and export supply) should be greater than one, to ensure that a devaluation will lead to an improvement in the current account of the balance of the payments. Thus it is

argued that the J-curve effect may not arise at all in the context of developing countries.

In the context of developing countries that price their exports in foreign currency, if such exchange rate changes could be accompanied by appropriate fiscal and monetary restraint in order to keep inflation in check, then one can expect at least a local currency effect that increases the profitability of producing for the world market. Hence, the increase in domestic production of tradeables - (e.g. exportables coupled with an increase in national production and consumption of import-substitutes (importables)) is expected to result in a more efficient re-allocation of resources that in turn leads to higher growth in the long run.

Another view relates to the effects of exchange rate policy that involves easing foreign exchange restrictions, on economic growth. In many instances, such restrictions on foreign exchange transactions relate to capital account transactions in the balance of payments. These restrictions are often imposed when domestic economic distortions have

created strong incentives for residents to remove funds from the country - i.e. engaging in capital flight[26].

The view is that the removal of such restrictions can have important beneficial effects on economic growth by generating additional resources for investment internally. Indeed, the removal of restrictions on outflows may also help by assuring foreign creditors that they will be able to repatriate their funds when desired, and also assuring both domestic and foreign investors that their capital will be less subject to taxation.

Also, the enhanced liquidity provided to domestic residents by increased integration between domestic and foreign financial markets may induce them to undertake less liquid but more productive investment projects than they would have done under financial autarky. Finally, financial integration may in turn affect growth indirectly by fostering deeper domestic financial markets, thus reinforcing the growth benefits of financial deepening.

Indeed, the currency crises of the 1990s (in particular the crisis of the European Currency Mechanism in 1992-1993, the

[26] Indeed private agents try to circumvent these restrictions on capital movements through a thriving parallel market in foreign exchange, where foreign exchange transactions are executed at substantial premium over the official rate.

Mexican crisis in 1995, the Asian crisis in 1997, and the Russian crises in 1998) have indeed renewed interest in exchange rate policy and its role in the macro economy. The experience from these crises has given rise to a new orthodoxy, which can be defined as a "bipolar" approach (Fisher, 2001). According to this view, in order to avoid the danger of a currency crisis, it is necessary to choose one of two extreme mechanisms: a floating regime in which the exchange rate freely adjusts to current market conditions or a hard peg under which the exchange rate is fixed and held up under all pressures.

A hard peg of the exchange rate can be carried out through a currency board, where the issuance of the domestic currency is based on 100% coverage in the foreign currency reserves to which it is pegged or by replacing the domestic currency with a foreign currency such as the dollar (dollarisation) or euro (euro-ization).

Even though this bipolar view has been widely accepted in the literature as appropriate for avoiding currency crises, the seminal work by Calvo and Reinhart (2000) showed that such frameworks hardly exist in practice. Also, Williamson (2000) argues that the proposals of the bipolar approach makes it impossible or difficult to maintain the degree of

competitiveness of the exchange rate for emerging economies compatible with rapid economic growth in the long term.

On the other hand, supporters of the bipolar approach base their views on what economists call the impossible trinity theorem according to which it is impossible to achieve three things at the same time: liberal capital flows, stable exchange rate of the domestic currency and the possibility to implement a sovereign monetary policy (setting interest rates).

As a conclusion, a view emerges that with globalisation and liberal capital flows, the only internally cohesive options are those proposed by the bipolar approach: floating exchange rate (where in return for relinquishing control over the exchange rate we secure the opportunity for an independent monetary policy) or a hard peg regime (where the price for stability of the exchange rate is the loss of sovereignty in carrying out monetary policy).

Yet in response, Williamson draws attention to the fact that the principle of the "impossible trinity" does not signify that a country must choose two and abandon one of the three impossible-to-reconcile elements. He believes that an option exists in which each of the three elements is compromised on

to some extent but no element is abandoned. Hence, it is worth seeking a middle ground, which would allow countries to influence the exchange rate while maintaining some independence of monetary policy and without exposing the country to a currency crisis.

Within the context of developing countries, empirical evidence (e.g. Fry, 1997; Durlauf and Quah, 1999; etc.) on the potential effect of exchange rate policy on growth appears to suggest that in general, the parallel market premium (the differential between the official and the 'black market' exchange rate) has a significant and negative effect on long run growth.

This means that maintaining an overvalued official exchange rate tends to reduce long-run growth. In a related study, Kamin and Klau (1997) reported that whereas devaluations had significant contractionary effect in the short run, there was no evidence that these were contractionary in the long run. Moreover, there was no significant systematic difference between the effects of devaluations on output across different regions. Clearly, such findings highlight that the long run effect of exchange rate policy, just as the other macroeconomic policies, remains a debateable issue.

2.1.4 Financial Intermediation/Development and Long Run Growth

The role of finance and financial institutions has long been recognised in the economics literature (Walter Bagehot, 1873; Joseph Schumpeter, 1912), even though mainstream economic theory, since the time of Adam Smith and David Ricardo, had focused on the role of "real" factors in the determination of economic outcomes. Indeed, the financial sector and its role were separated by default from the real sector. As Auerbach and Siddiki (2004) stated,

"...The classical dichotomy postulates that finance, if it is not to obscure the role of these real factors, is to be seen as a diaphanous veil through which real outcomes may be viewed. A doubling or halving of the amount of money in an economy will have its effect upon the general price level, but relative prices within the economy - the relationships between the prices of apples, labour and land - will stay the same: prices of every single good or service in this 'frictionless' economy will rise or fall by the same percentage as a result of this change in the stock of money. Since real outcomes in the economy - the allocation of goods and services - are dictated by relative prices, they will therefore be unaffected by changes in the stock of money. Changes in the stock of money will only affect the general price level - the monetary economy" [p.233]

However, a renewed interest in the role of financial intermediaries began in the wake of the seminal work by Mackinnon (1973) and Shaw (1973). The debate has been stimulated further by the fact that in the last two decades or so, financial liberalisation has constituted a major part

of the policy advice offered by international institutions such as the World Bank and IMF.

In general, growth theory suggests two channels through which the financial sector might affect long run growth. These are; through the impact on capital accumulation [human and physical capital], and through its impact on the rate of technological progress. Thus one could analyse the intermediation role played by financial institutions to see how they can impact on the two channels above and hence long run growth.

These include: mobilisation and pooling of savings; trading, diversification and management of risk; acquiring information about possible investments and allocating capital; monitoring borrowers and exerting corporate control; facilitating the exchange of goods and services.

The traditional argument has been that financial development has a dual effect on economic growth. On the one hand, financial institutions enhance the efficiency in the use of investment funds and capital accumulation; and on the other hand, facilitate an increase in the rate of saving and investment in the economy. These were first emphasised by Goldsmith (1969), who added that the growth process in turn

had feedback effects on financial markets by creating incentives for further financial development.

The seminal work by McKinnon (1973) and Shaw (1973) indeed stimulated renewed interest in the potential role of finance in the real economy. Essentially, the authors focussed on the effects of public policy relating to financial markets, on saving and investment. Thus, policies that led to financial repression (e.g. interest rate ceilings) only succeeded in reducing the incentive to save, and hence lower investment and growth. Thus they conclude that financial liberalisation must be good for growth, since higher real rates will encourage households to save and invest; and hence higher growth.

Hence, the McKinnon-Shaw hypothesis has constituted the reference model upon which the Bretton-Woods Institutions based their stance against financial repressive policies (especially common in developing countries) whereby governments maintained fiat ceilings on interest rates and credit etc.

The McKinnon-Shaw framework has had its fair share of criticism across the theoretical and empirical literature. For example, the neo-Keynesian school [Burkett and Dutt,

1991] have insisted that financial liberalisation may well reduce effective demand and economic growth, and increase instability in the financial system. Others such as Joseph Stiglitz have argued that what appears to be a financial liberalisation leading to a market clearing equilibrium may merely be a form of upward financial repression.

Thus Stiglitz and Weiss (1992) noted that it is rather the availability of credit rather than its cost, which is important to developing countries in particular. The neo-Structuralist school [Taylor, 1983] have also maintained that, increases in saving in formal financial institutions following financial liberalisation may only be at the expense of the informal money markets in the context of developing countries.

In practice however, most of the channels through which the effect of financial development on long run growth could be anticipated appear to be ambiguous. For example, regarding the potential effect of increased financial intermediation on saving rates and allocation of capital, this could be ambiguous. This is because the development of financial markets offers households the possibility of diversifying their portfolios and increases their borrowing options. This therefore has implications for the proportion of agents

subject to liquidity constraints, and hence affects the saving rate. Hence one cannot tell a priori what the effect would be on saving and capital accumulation, following an increase in financial development.

It is also often argued that financial deepening tends to reduce the overall level and structure of interest rates, and also narrows the spread between the rate paid by borrowers and that paid to lenders. Hence financial development or deepening should increase saving and hence capital accumulation and growth. Indeed, even though these factors are bound to affect saving behaviour, in each case the effect is ambiguous. The effect on saving for example will depend on the magnitude of the substitution and income effects.

In terms of allocation of capital, it is also argued that financial intermediaries are expected to facilitate the efficient allocation of resources to investment projects that provide the highest marginal return to capital. Therefore productivity growth is enhanced. Indeed this could be the case. However, as pointed out by the neo-Keynesian school, there could be information asymmetries, externalities and economies of scale in the lending process

which could cause market failures and result in financial instability.

Moreover, there is a potential for disintermediation and lower growth through the "conduit" effect. This means that financial intermediaries could be growth-retarding since they appropriate a share of the saving. This occurs in the form of fees and commissions that are received by them in return for their intermediation services.

In the empirical literature, there were some earlier studies such as Diaz-Alejandro (1985). The authors reviewed the experience in Latin America and reported that financial deepening was not likely to raise savings; hence, the contribution of financial deepening, if any, could rather be the increase in the marginal productivity of capital, instead of the volume of savings and investment.

Recent empirical studies that have evaluated the effect of financial development on growth have largely been based on large cross-country studies. These include: King and Levine (1993); Levine and Zervos (1998); Levine (1998, 1999); Levine, Loayza and Beck (2000); De Gregorio and Guidotti (1995); Demetriades and Hussein (1996); Ghatak (1997); and Fry (1997). Other studies also focussed on the efficiency of

financial liberalisation. These include; Roubini and Sala-i-Martin (1992); Fry (1998); Bandiera et al (2001); and Demetriades and Luintel (2001).

King and Levine (1993) used three different kinds of indicators of financial development - liquid liabilities as a ratio of GDP in 1960; deposit bank domestic credit as a ratio of aggregate credit; and gross claims on the private sector as a ratio of GDP. Based on data for 80 countries, the authors reported that there was a strong positive relationship between each of the financial development indicators and the three growth indicators - real per capita GDP growth; real per capita capital growth; and productivity growth.

Demetriades and Hussein (1996) used an alternative time series method, and reported that there was a stable long-run relationship between real per capita income and at least one of the key financial indicators in 13 out of 16 countries considered. Thus they largely confirmed the findings in King and Levine (1993) even though they argued that the latter's results only represented a contemporaneous relationship and not a long term one.

Fry (1997) also studied 85 developing countries from 1971 to 1995, and reported that there was an "inverted U-shaped" relationship between the annual rate of economic growth and financial development measured by real interest rates. This meant that too low or too high real interest rates could be bad for economic growth; and specifically, growth was maximised when real interest rates are within the range of negative five percent and positive fifteen percent.

Even with studies that dwelt on the efficiency of financial liberalisation, the evidence provided was that finance is largely good for growth. For example, De Gregorio and Guidotti (1995) focussed on the effect of financial liberalisation on growth by extending the Barro (1991) growth model, and including financial variables. As an indicator for financial liberalisation, the authors used the share of private sector credit as a percentage of GDP. The authors reported that financial liberalisation generally increases economic growth, and also that the relationship was relatively stronger in low and middle income countries than in high income countries.

Fry (1998) also used a simultaneous equation model and data for 16 developing countries over the period 1970-1988. The author reported that financial repression as measured by the

square of the real interest rate and the black market exchange rate premium reduced the investment to GDP ratio and export growth. This in turn reduced output growth rates. Indeed, they reported that output growth was also directly reduced by financial distortions, possibly through a reduction in the efficiency of investment.

A relatively sophisticated recent study by Bandiera *et al.* (2001) based on panel cointegration methods, examined the effect of financial reform in the form of interest rate deregulation, on aggregate private saving in eight developing countries. The authors however reported mixed results. The effect of financial reform on saving was reported to be significantly negative for Korea and Mexico; but positive for Ghana and Turkey. In the case of Chile, Indonesia, Malaysia and Zimbabwe, the authors reported no clear effect. Overall, the authors reported that the negative effect of financial liberalisation outweighed the positive impact, and hence in aggregate, financial liberalisation was believed to reduce private saving.

Two case studies on the direct effect of financial development on growth - by Ghatak (1997) and Demetriades and Luintel (1996) respectively, also offer evidence in support of the fact that financial development is good for long run

growth. Ghatak examined the effect of financial development of economic growth in Sri Lanka during the period 1950-1987.

The author reported that interest rates and financial deepening (measured by real monetary growth) increased economic growth. Demetriades on the other hand examined the case of Nepal between 1962-1992 by exploring the relationship between financial policies and economic growth. This author also reported that real per capita income was associated positively with financial deepening and negatively with the number of bank branches.

An influential study by Levine and Zervos (1998) also reported that initial levels of stock market liquidity and banking development are positively and significantly correlated with future rates of economic growth, capital accumulation, and productivity growth.

The authors also reported that the link between stock markets, banks and growth run robustly through productivity growth rather than physical capital accumulation. Moreover, stock market size (market capitalization/GDP) was not robustly correlated with growth, capital accumulation and productivity improvements. In other words, simply listing on

the stock exchange does not necessarily foster resource allocation.

Finally, Levine (1998, 1999) and Levine, Loyaza and Beck (2000) tried to assess whether the finance-growth link was driven by simultaneity bias. They thus decided to use an instrumental variable that adequately explained cross-country differences in financial development, but was uncorrelated with growth beyond the link with financial development. Based on data for 71 countries and over the period 1960-1995, the authors reported that the strong link between financial development and growth was not due to simultaneity bias. Moreover, they reported a very strong connection between the exogenous components of financial development and long-run economic growth.

Clearly, the empirical literature appears to offer evidence that financial development is more likely to stimulate growth.

2.1.5 Trade, Openness and Long Run Growth

The relationship between commercial openness and growth has also been topical in the theoretical and empirical economics literature. As the case is for other types of macroeconomic policies, there is no conclusive prediction (neither in the

theoretical nor empirical literature) as to the effect that increases in trade or trade liberalisation potentially has on output growth.

In general, one can begin exploring the theoretical effects of trade and openness on long run growth by first reviewing the trade theories - traditional trade theory, dynamic trade theory, and the new trade theory. According to the traditional trade theory, free trade or trade liberalisation through a reduction in import and export barriers (for example, import and export tariffs, NTBs, etc) is clearly welfare-improving.

Such improvement in welfare is attributable to gains from specialisation (for example, increased efficiency due to production according to comparative advantage) and also consumption gains (e.g. increased choice of goods at lower prices for consumers). This means that under the assumption of perfect competition in product and output markets, there would be static gains following trade openness or trade liberalisation. These static gains imply a once and for all increase in output and only a short run increase in the rate of output growth.

On the other hand, according to dynamic trade theory (Baldwin, 1992; Funk, 1996; Rutherford and Tarr, 1999), the static gains from trade - as a result of specialisation and reallocation of existing resources - are small in comparison with the dynamic gains due to an increase in the growth rate and the volume of additional resources made available to, or employed by the trading country (Kreinin, 1998).

Dynamic gains are said to arise from the accelerated accumulation of physical capital and human capital (perhaps due to a higher rate of domestic and (or foreign saving), enhanced technological transmissions and improvements in the quality of macroeconomic policy. Other sources include, forward and backward linkages of the expanding sectors (mostly in the exports sector), efficiency enhancements (e.g. improved managerial skills and less slack in the production process).

In addition, dynamic trade theory draws attention to indirect gains from trade, in contrast to the static traditional trade theory which emphasises efficiency gains from trade. It is these dynamic gains that are reflected in increased growth rates of output in the medium and long run.

Contrary to the conclusions in the traditional and dynamic trade theories, the new trade theory (Krugman, 1986; Grossman, 1992) posits that under the assumption of imperfect competition (e.g. due to economies of scale, and externalities), restrictions to trade might be welfare-improving. Under imperfect competition, trade restrictions are said to be used in winning relative market power (e.g. monopoly, oligopoly power, or to become a winner under monopolistic competition).

Such market power could then be used to get rid of foreign competitors through predatory pricing etc. Since, such market power means that one can increase output and market share, this in effect, will allow production at decreasing average cost in industries characterised by economies of scale. Indeed, in such a situation smaller foreign competitors cannot survive the market because they cannot produce under economies of scale.

Clearly, national welfare will rise in the economy that has relatively more market power; even though such a gain will be static (i.e. average costs do not fall indefinitely). Of course, dynamic gains could also arise but only if there are factors such as high entry costs, high learning effects, and

significant externalities (spill-overs) in the protected industries.

One can also analyse how the assumption of positive externalities (driving a wedge between private and social marginal costs) in the production process, can be welfare-improving. For example positive externalities such as; (i) the accumulation of physical and human capital (i.e. the improvement of skills through education of workers, on-the-job training for engineers, learning-by-doing etc.), (ii) knowledge production (i.e. learning how to imitate [blueprint], adapting technology to one's needs, and innovation or creating new technology).

The issue here is that the existence of positive spillovers in production could lead to an increase in the long-run rate of growth. Such permanent growth due to positive externalities could result in constant or even increasing returns for the reproducible factors such as physical and human capital. Thus this makes growth in the steady state possible and hence long run growth could happen with positive externalities.

Our next step in exploring the effect of trade and openness on long run growth is to look at the impact of trade policy

within the traditional growth theories. Even though the neoclassical growth theory was originally set within the closed-economy framework[27], yet when applied to open economies, one expects that openness should imply an expansion of the traded goods sector which is believed to be more productive and hence lead to faster growth.

Secondly, financial openness could reduce the risk premium that external creditors require in order to lend to the domestic economy. This will increase aggregate savings and capital accumulation and hence growth. Finally, openness means exposure to new technologies and hence an increase in knowledge production and transfer of technology. This will mean an increase in technical progress and hence higher long run growth. Although, the increase in savings and capital accumulation attributable to trade and openness is not expected to go beyond a short term impact on the rate of per capita income growth, yet if the technology channel is significant, then one could anticipate a long run effect.

The endogenous growth theory (lucas, 1988; Romer, 1986; Romer, 1991) is the main reference for the potential long run effect of trade policy on growth. According to the

[27] For example, a rise in savings increases investment under the realistic assumption of limited international capital mobility. Note the findings of Feldstein-Horioka (1980) and the Explanations in Schmidt-Hebbel et al (1996).

theory, long run increases in output growth arises from three factors, which are in turn interdependent. The first is endogenous technical progress.

It is explained that innovation, imitation and adaptation of new technologies are essentially driven by the profit-maximizing behaviour of firms. And that, even though there might be externalities associated with such enterprise, yet the costs are possibly covered by temporary profits through mark-up pricing (Grossman and Helpman, 1991; Aghion and Howitt, 1992; etc). Hence technical progress can have a permanent effect on growth rates.

Another source of increases in technical progress is attributed to trade liberalisation, thus making long run growth permanent. It is argued that stronger capital goods imports, increased transfer of technology, higher foreign direct investment, and more incentives to imitate and innovate, all enhance technical progress; and are all associated with trade liberalisation.

According to the *AK* growth model, an increase in savings and investment does not negatively affect the incentives to accumulate more capital. In other words, there is constant or increasing returns to scale for the accumulable factor

capital (physical and human capital). In addition, the nonreproducible factors such as land were unimportant. Therefore capital accumulation could be a profitable long run business (Jones, 1995; Rebelo, 1991), and if trade liberalisation positively affects savings and capital accumulation, then one can expect then that more trade and openness can promote growth in the long run.

The role of externalities in bringing about long run growth is also recognised in the endogenous growth literature. For example, positive spillovers can be linked to higher rates of capital accumulation (in a broader sense), and hence constant or increasing returns for the accumulable factor (Romer, 1986). Romer (1986) refers to positive externalities of physical investment and knowledge, whereas Lucas (1988) cites the positive externalities of human capital accumulation.

Thus positive externalities, thought to be stronger in open economies, can permanently increase the rate of economic growth. This thus underlies policy advice to developing countries, to open up to trade and investment with technologically advanced countries.

From the theoretical survey so far, it is clear that higher levels of trade and openness is most likely to lead to higher growth in both the short run and the long run. But what does the empirical evidence say? We next review the evidence from some of the recent studies done on the long run effects of trade and openness on growth.

The empirical literature can be split into studies based on cross-country approaches on one hand; and studies based on time series approaches on the other. One can in turn, also split the literature into those that provide direct evidence about the long run effect of trade on growth on one hand; and the others that provide indirect evidence of this phenomenon, working through productivity increases. We present the evidence using the latter framework by reviewing the direct evidence first, before the indirect evidence.

Among the cross-country literature, recent studies that have reported a positive effect of trade and openness on long run growth include - Dollar (1992); Sachs and Warner (1995); Harrison (1996); Edwards (1998); Frankel and Romer (1999); etc. However, the results in these studies has been criticised by Rodriguez and Rodrik (2001) who criticize the measures of openness used in most of the studies, as well as the econometrics behind their estimations. Indeed, as

outlined in Winters (2004), the empirical literature faces several challenges. The first difficulty relates to the definition of "openness" or the appropriate measure of openness. In practice, openness is often associated with a liberal trade regime (low tariffs, very few non-tariff barriers, etc.).

However, in the empirical studies, the authors often make use of different measures. For instance, the findings in Dollar (1992) rely heavily on real exchange rate volatility, whilst the subsequent study by Sachs and Warner (1995) construct an index of openness using tariff and non-tariff indicators, black market exchange rate premia, socialism, and the structure of exports trade. Similarly, Pritchett (1996), Harrison (1996), and Rodriguez and Rodrik (2001) all made use of different indicators.

Another challenge is how to establish causation from trade liberalisation to economic growth. Indeed, some studies such as Frankel and Romer (1999), and Irwin and Tervio (2002) tried to get around this problem by making use of the component of openness that is believed to be independent of economic growth. Specifically, this is made up by the part of bilateral trade flows that could be accounted for by exogenous variables such as; land area, population, borders,

and distances. The authors reported a general relationship running from increased trade to increased growth.

Clearly, this approach uses instrumental variables to correct for endogeneity biases. As is normally the bane of instrumental variable methods, Rodriguez and Rodrik (2001) and Brock and Durlauf (2001) have criticised the type of approach in Irwin and Tervio (2002) on the basis that these geographical variables could be showing their own effects on growth rather than the effect of trade openness they are meant to measure. Indeed, this is a familiar problem with the use of instruments to overcome the causation problem.

Another challenge in the empirical work is that liberal trade policies often need to work in conjunction with other policies, if the effects of the former is to be sustained to the long term. These other policies referred to include; those that encourage investment, facilitate human capital accumulation, and allow effective conflict resolution. However, one is not able to "identify the necessity of such variables rather than their additivity" in the growth model, within the normal linear regression framework.

Thus the cross-section framework faces several pitfalls. However, the findings suggest an overwhelming support for

the view that openness enhances growth to the long term (Jones, 2001; Easterly and Levine, 2001; etc.). As already pointed out, the indirect evidence based on intermediate effects in the causal relationship between trade and long term growth, has also been growing steadily.

The main conduit suggested in this strand of empirical literature is the effect on productivity of changes in some measure of trade openness etc. Examples of studies include; Coe *et al.* (1997); Hay (2001); Ferreira and Rossi (2001); Subraimanian (1999); Lee (1996); and Kim (2000). Others are; Bigsten *et al.* (1998); Kraay (1997); Tybout and Westbrook (1995); and Aw *et al.* (1999).

According to the analysis by one of the most influential studies namely, Coe *et al.* (1997), developing countries are assumed to get access to their OECD trading partners' stocks of knowledge (measured by accumulated investment in R&D) in direct proportion to their imports of capital goods from those countries. Therefore the authors construct an index of developing countries' access to foreign knowledge based on an import-weighted sum of industrial countries' stocks of knowledge.

The authors reported that, when this index is interacted with the importing country's openness, the resulting measure shows a statistically significant and positive effect on total factor productivity growth. However, their methodology has faced its own share of criticisms even though the basic effect running from trade and openness to productivity growth is not rejected.

Also, in the empirical literature on trade liberalisation and productivity growth are a number of case studies that have shown that reductions in trade barriers were followed by significant increases in productivity mainly through increased import competition. These include; Hay (2001) and Ferreira and Rossi (2001) on Brazil; Jonsson and Subraimanian (1999) on South Africa; and Lee (1996) on Korea. But these also face their own criticisms. For example, Kim (2000) who also studied the case of Korea argued that the apparent increase in total factor productivity in the case of Korea, was actually attributable to the "compression of margins" and to economies of scale.

The author conceded that import competition made some contribution alright to TFP growth, and also directly on "technology" but that import competition could not be the major factor. Some other studies such as Bigsten *et al*

(1988); Kraay (1997); Tybout and westbrook (1995) and Aw *et al.* (1999) also explored the link between exporting and technological advancement. Whereas Bigsten *et al.* (1988) reported a positive effect of exports on productivity increases in the case of Africa; the other studies reported no significant effects for their respective regions.

Other views in the empirical literature on trade liberalisation have focussed on the aspects of the interaction between trade liberalisation and other policies, that together result in economic growth (Mosley, 2000; Krueger, 1978; 1990). However, in all of the above (see Winters, 2004 F.11-18), it is clear that there is hardly a coherent, and conclusive argument regarding the potential long run effects of trade and openness on economic growth. Especially, in the case of developing countries, the best might be to use evidence from country case studies.

2.1.6 High Inflation/Stabilisation and Long Run Growth

Similar to the literature on the long run real effects of monetary policy, the effect of inflation on long run growth has also been subject to intense scrutiny in both the theoretical and empirical literature. The short run effects of inflation on growth are well established thanks to the Phillips curve relationship and the neo-Keynesian approaches

(Akerlof et al, 1996), as well as the efficient firm hypothesis. According to the efficient firm hypothesis, an environment of low inflation generates conditions that lead to more rapid economic growth even to the long run.

According to the hypothesis, enterprises operating in inflationary environments can easily pass cost increases along to their customers in the form of higher prices, and are therefore under little pressure to offset escalating costs with productivity enhancements, such as re-engineering and downsizing. On the other hand, an environment of low inflation restricts firm's ability to raise prices, and forces them to respond instead by operating more efficiently and increasing productivity. As a result, aggregate output increases and the economy is able to grow more rapidly even to the long run.

In general, one can identify four main predictions in the economics literature regarding the impact of inflation on output and growth in the long run. The first prediction is implied in Sidrauski (1967) that inflation has no long run growth effects at all. The author showed that money was neutral and super-neutral in an optimal control framework with money in the utility function. Basically, the setup is based on the neoclassical framework, with the assumption

that people choose the saving ratio to maximise their happiness. Hence money has an implicit transactions feature in the Sidrauski setup. This is reflected in the notion that people's happiness is directly related to their holdings of real money balances.

Thus, the main result in Sidrauski's economy was that an increase in the inflation rate does not affect the steady-state capital stock. So, neither output nor output growth is related to changes in the inflation rate.

The second prediction relates to the seminal work by Tobin (1965) whose analysis was also based on the neoclassical growth framework. The author showed that money was a substitute for capital and hence an increase in the money supply and inflation will stimulate a reallocation of portfolios resulting in an increase in the capital share of the portfolio. Hence, an increase in inflation will have a positive effect on long-run growth.

The third prediction about the long run effects of inflation on growth also relates to the paper by Stockman (1981). The author also used a cash-in-advance model in which money is complementary to capital, accounting for a negative relationship between the steady-state level of output and

the inflation rate. Hence an increase in the inflation rate results in a lower steady-state level of output and a decline in people's welfare.

Stockman's insight is prompted by the fact that firms frequently put up some cash in financing their investment projects. Sometimes the cash is directly part of the financing package, whereas other times, banks require compensating balances. Stockman models this cash investment feature as a cash-in-advance restriction on both consumption and capital purchases. Since inflation erodes the purchasing power of money balances, people reduce their purchases of both the cash good and capital when the inflation rate rises. Correspondingly, the steady-state level of output falls in response to an increase in the inflation rate in so far as money acquisition is necessary for capital accumulation.

The fourth prediction evolves from a relatively recent class of models (e.g. Huybens, 1999) that have shown that inflation could have a negative effect on long-run growth, but only if the level of inflation is above some particular threshold level.

There is indeed a large collection of empirical evidence on the long run effect of inflation on growth. These include, Fischer (1991), De Gregario (1993), Gomme (1993), Kormendi and Meguire (1985), Bullard and Keating (1995), Barro (1997), Levine and Renelt (1992), etc.

The majority of studies in the empirical literature report that inflation and growth are systematically and negatively related, even though a few studies such as Levine and Renelt (1992), Bullard and Keating (1995) etc. fault this conclusion. Levine and Renelt contend that the inflation-output growth relationship is simply too tenuous. On the other hand Bullard and Keating in their paper question the notion of trend used (multiyear averages) in most of the earlier studies.

Indeed most of the empirical studies used regression methods to arrive at their conclusions. Interestingly, most of such studies report a negative and significant correlation between inflation and per capita output growth. Of course, Fischer (1991) used nonparametric methods to investigate the inflation-growth relationship. His study was based on 73 countries. In the analysis, he selected two smaller groups of countries whereby one group consists of those that grew

at least one standard deviation faster than the average rate.

The other group consisted of those that grew, at most, one standard deviation slower than the average rate. The author reported that the slow-growth countries had an average inflation rate slightly above 30 percent, while the fast-growth countries average only 12 percent inflation.

A major concern in the empirical literature on the inflation-growth relationship is about the robustness of the findings across studies. As argued in Levine and Renelt (1992), when one controls for a set of essential growth determinants such as physical and human capital accumulation rates, there does not appear to be a significant systematic relationship between inflation and output growth. Therefore Levine and Renelt conclude that the relationship was fragile.

Indeed, according to the theoretical literature, inflation effects operate through movements in capital accumulation (both human and physical capital). Such that, if one controlled for capital accumulation directly in the regression, then it is quite likely that inflation will show an insignificant effect on output growth.

For example, the growth literature (e.g. Barro and Sala-i-Martin (1995)) shows that per capita output growth is the sum of total factor productivity growth and growth in both physical and human capital. Consequently, it is hard to imagine how policy variables such as inflation could still have a significant effect on real growth when measures of physical and human capital accumulation are also included in the regression model.

Aside the Levine and Renelt argument, Sarel (1996) also raised questions about the linearity of the relationship between inflation and growth. The idea is that a 1-percentage point increase in a low inflation rate may have a smaller effect on output growth than a similar percentage point increase in a moderate to high inflation environment.

The author finds that the effect of an increase in the inflation rate depends on whether the initial rate is high or low. Specifically, an inflation rate increase did retard output growth when the inflation rate is moderate or high (defined as an inflation rate exceeding 10 percent) but is not significantly related to output growth when inflation is low (less than 10 percent). Therefore the cross-country evidence suggests that the inflation-output growth

relationship is robust but most likely depends on the inflation environment.

Others have also argued that persistent high inflation might signal a loss of macroeconomic control, which could adversely affect domestic investment in physical capital or capital accumulation [Fischer, 1993]. Yet another view is that, high and unstable inflation could affect long run growth through the uncertainty effect. This implies that relative prices become more volatile, thereby reducing the information content of price signals and thus distorting the efficiency of resource allocation which slows total factor productivity growth, and hence long run growth.

Whereas several empirical studies [e.g. Barro, 1997] provide evidence to support the view that low inflation is consistent with higher growth across countries, there remain questions about the transitional effects on growth as high inflation is stabilised. Some have argued that a disinflation policy could be followed by slow growth, before actually recovering after some time. Also, as pointed out in Bruno and Easterly [1998], there could be threshold effects and non-linearities in the relationship between inflation and growth. These issues indeed remain inconclusive and subject to empirical verification.

A final issue in the empirical literature about long run growth effects of inflation relates to whether multiyear averages should be used to measure the trend rate of output growth. Indeed, statistical methods permit the extraction of trend from annual observations. This implies that much greater country-specific variation in the trend will occur when the dataset has a time series of trend rates than when the trend is single valued. Greater variability in the time series highlights the basic trade-off facing a researcher.

That, potentially, too much of the high-frequency (real business cycle) movement in the series will be incorporated into the trend measure. Consequently, regressions with more variable trend rates of output growth potentially pollute the attempt to identify the relationship between long-run output growth and inflation.

In this regard, the paper by Bullard and Keating (1995) indeed used a novel methodology. The authors identify trend inflation and output for fifty-eight countries, whereby trend is associated with long-run relationships between series with stochastic trends. The authors did not pool results across countries, (as in most previous studies) but instead they estimate separate regressions for each country,

permitting each country's long-run relationships and short-run dynamics to be different.

They reported that there were no systematic long-run relationships between inflation and the level of output. In other words, permanent changes in the inflation rate are not systematically related to the level of output.

The above survey demonstrates the inconclusiveness in the theoretical and empirical literature regarding the long run effect of inflation on economic growth. The evidence is indeed mixed.

2.2 The (New) Structuralists, Economic Stabilisation and Growth

The Structuralist school of thought in economics emerged in Latin America in the immediate post-war years, and has been associated with Raul Prebisch and the Economic Commission on Latin America. The approach has since assumed an alternative stance with regards to the 'monetarist' orthodoxy. The view of the early structuralist school was that developing countries were bound to face adverse terms of trade due to the fact that income elasticity for their exports (mainly raw materials) to industrial countries was lower than the income elasticity for industrial country exports to them.

As Agenor and Montiel (1999) noted,

" … *The central policy recommendation for long-run growth that emerged from this prognosis was that production specialisation along classical comparative advantage lines was to be avoided. Policy intervention was required to change the structure of production in the periphery. Industrialisation should be promoted in developing nations by protecting indigenous 'infant industry' against competition from the 'center' through the use of trade barriers and foreign exchange controls, as well as by providing special advantages to the industrial sector in the form of cheap imported inputs (secured through an overvalued exchange rate), cheap credit, and cheap labour (promoted by turning the internal terms of trade against agriculture)*", p.16.

Thus, the popular strategy at the time was import substitution and this was widely adopted across developing countries. In terms of macroeconomic analysis, the Structuralists argued that in the case of developed countries, markets do not clear and institutions are not as developed as in the industrialised countries. Hence developing economy macroeconomic models were proposed, that incorporate the structural features of these countries (Taylor, 1979; 1981).

The New-Structuralist strand (Krugman and Taylor, 1978; Taylor, 1981) emerged in the late 1970s within the traditional structuralist school. The New-Structuralists mainly focussed on short-run macroeconomic stabilisation issues contrary to the long run perspective implicit in the structuralist tradition. For example, the New-Structuralists

criticised orthodox stabilisation programs that focussed on demand management, arguing that this will not be appropriate to stabilise inflation. They attributed inflation to cost-push factors - conflicting distribution claims and rules for price formation that expands the conflict into a cascade of price increases (Taylor, 1988). These are therefore due to structural weaknesses rather than excess aggregate demand. Moreover, the New Structuralists argue that firms in developing countries generally rely on bank credit since the capital markets are either non-existent or under-developed.

Hence, when interest rates are raised in order to restrict aggregate demand, this tends to raise production costs to these firms who in-turn passes the higher costs onto consumers. In the case of new firms that cannot pass-on such higher costs, they simply get 'crowded' out. Moreover, in the view of the New Structuralists, reductions in public investment are believed to cause a net fall in private investment since crowding-in outweighs crowding-out[28]. Therefore, it would be better to crowd-in private investment through low interest and high public investment policies. In sum, orthodox stabilisation programs that emphasise contractionary demand-side policies rather lead to rising

[28] Contrast this with the IMF- and World Bank-sponsored programmes that seem to assume that reducing fiscal deficits (which is normally done through cuts in public investment) would be beneficial for long-run growth.

inflation, and a decline in output, real income and employment. Devaluation, which is also a standard component of orthodox stabilisation programs is also said to be stagflationary, since there would be both a contractionary effect on aggregate demand, coupled with rising prices of imports. Besides, capital formation in developing countries tends to have high import content since intermediate inputs have to be imported etc. Therefore in their view, devaluation will only result in a contraction in output together with rising inflation. Empirically however, there is no consensus on these views proposed by the New-Structuralists.

For example, the effect of fiscal policy (which is often synonymous with changes in public expenditure) on private investment in thirty-three developing countries was examined in a recent study by Hermes and Lensink (2001). The authors found that different measures of fiscal policy had different impacts on private investment. Secondly, different measures of government spending also had different impacts on private investment, and in some cases the effects were non-linear. Such findings suggest that neither the New-Structural nor Orthodox stabilisation views can be confirmed *a prior*. It is all an empirical issue that might differ from country to country.

The discussions so far in this chapter demonstrate the scope and potential for the use of macroeconomic policies in stabilising the macroeconomy and consequently promoting long run growth. To a large extent, IMF programs are underpinned by much of the discussions (particularly in section 2.1), and arguably some of the New Structuralist prescriptions (Agenor and Montiel, 1999 p.18). Hence in the next chapter, we study the stabilisation effect of having these programs in place in a set of Sub-Saharan African countries to ascertain the short run effects (if any) of these programs, if any. We study long run issues in subsequent chapters.

Chapter 3

The Macroeconomic Effects of IMF-Sponsored Economic Reform Programs - Evidence from Sub-Saharan Africa

In this chapter, we evaluate the macroeconomic effect of IMF-sponsored economic programs in a panel of Sub-Saharan African countries. As already reviewed in chapter 1, several methodologies have been proposed in the literature. This ranges from the before/after, the with/without, the comparison of simulations approach, and the generalised evaluation estimator (GE).

Even though the GE has been widely applied for nearly two decades, we argue that the approach remains useful as it directly attempts to account for the counterfactual problem (albeit, based on assumptions that might not hold for some samples). Hence, once we correct for the possible endogeneity biases due to the presence of the lagged dependent variable, and also address the selection bias problem, we expect that the methodology could give a more precise understanding of the macroeconomic effects of the economic programs implemented in the last two decades in Sub-Sahara Africa. Specifically,

we make use of three alternative estimators to assess the effectiveness of such policy programs on the current account, inflation and real GDP growth. We hypothesise that the presence of such economic stabilisation programs has a significant effect on the three macroeconomic variables.

3.0 Introduction

As described in the main introduction [Chapter 1], following decades of macroeconomic decline [e.g. negative growth rates, high rates of inflation and unemployment, worsening terms of trade and balance of payments deficits, and a general impoverishment of the population], most African countries [and other developing countries] were compelled to embark on a comprehensive program of socio-economic reforms [SAPs] supported by the IMF/World Bank in order to salvage their economies.

Many of these countries had begun to face problems (as illustrated) from the late 1960s, after most of them became politically independent. In a purported bid to 'rapidly develop' their economies, these countries had engaged in heavy spending on development projects and import competing industries. Consequently, inflation rates began to rise,

budget deficits widened and their external reserves got depleted.

The first major oil shock in 1974 had had its toll on these countries (Bird, 1989), therefore a number of them had already applied for assistance from the International Monetary Fund [IMF] and the World Bank in order to reverse the decline. Subsequent to the first major oil shock, commercial banks also entered the international lending market (Table 3.1), complementing official sources, and providing loans to developing countries for balance of payments support (see Bird, 1989).

However their loans were at market rates. As Bird (1989) noted, their lending operations had a number of shortcomings relating to both efficiency and equity considerations:

"... The banks moved rapidly into balance of payments financing following the rise in the price of oil in 1973-4 and then endeavoured to extricate themselves in the 1980s. In general terms they were quick to lend to developing countries following the (temporary) upsurge in commodity prices, and anxious to reduce their lending as borrowers encountered declining terms of trade and debt difficulties. Such instability is enhanced by the tendency towards 'herd behaviour' that characterises the banking community...." (p.21)

Following the sharp rises in US interest rates and the second major oil shock in 1979, these borrower countries

began to experience repayment problems. At the same time, prices of commodities plummeted and their terms of trade deteriorated sharply. It then became clear that these countries could no longer sustain their repayment schedules to the creditors, especially the private banks.

TABLE 3.1: HIGHLY INDEBTED COUNTRIES: DEBT OUTSTANDING (DOD) - US$'M

	1975	1980	1981	1982	1983
Official Creditors	19,598.8	37190.4	42742.4	47,933.2	250,013.0
Private Creditors	29,906.2	109,625.6	126,847.7	151,216.8	193,025.8
Total	49,505.1	146,816.0	169,590.1	199,150.0	250,013.0

Source: Bird (1989, p6). Originally from World Debt Tables, 1987-8 edn.

The creditors therefore cut off further lending to these countries at a time when they needed even more, and thus began the crisis.

As new external borrowing became unavailable especially in the private capital markets, some of the countries were compelled to introduce stringent economic controls such as import quotas, foreign exchange rationing, and administered prices to help maintain some stability. These however only led to further problems, and in the end many had no other option than to turn to the IMF and World Bank[29] for a comprehensive restructuring to help salvage their economies.

[29] The broad objective of these Bretton Woods institutions is to ensure global economic stability.

Thus began the wave of "first-generation" stabilisation programs in these countries.

However, after nearly two decades of sustained economic stabilisation, there has been outpouring of discontent among researchers as well as policy makers, regarding the allegedly dismal outcomes in most of the cases. Most of the countries, particularly in Sub-Saharan Africa indeed continue to exhibit considerable instability, and their economies remain relatively poor and fragile (Table 1.1).

Joseph Stiglitz, who was the 2001 Nobel laureate for Economics, in his book, "Globalisation and its Discontents" reaffirms this. The author[30], who was Senior Vice President and Chief Economist at the World Bank and currently a professor at Harvard and Columbia University, sharply dismisses the IMF and its policy programs as "Washington Consensus Policies"[31] that have rendered Third World countries and former Communist states actually worse off now than they were before. Stiglitsz argued:

"...The IMF failed in its original mission of promoting global stability; it has also been no more successful in

[30] He was also Chairman of the Council of Economic Advisors during the Clinton Administration.

[31] The term is often used in reference to a supposed consensus between the IMF, the World Bank, and the US Treasury about the 'right' policies for developing countries. It is argued that contrary to the original Keynesian orientation of the IMF [which emphasised market failures and the role for government] with which it was established, the Washington Consensus has replaced it with the free market ideology, thus signalling a radically different approach to economic development and stabilization. Indeed, the ideas in the Washington Consensus were originally developed for Latin America in order to address specific problems caused by excessive state intervention at the time.

the new missions that it has undertaken, such as guiding the transition of countries from communism to a market economy" (p.5).

Despite the several subsequent counter-interventions by Thomas Dawson[32], Kenneth Rogoff[33], and Michel Camdessus[34] in response to Stiglitz's "polemics", the fact remains that the dragon of poverty and macroeconomic instability in developing countries is far from being slain. Attempts made so far at evaluating the effect of the stabilisation programs in developing countries have produced mixed results [see Khan, 1998].

The conclusions differ widely among studies and there isn't much in terms of a clear-cut and accurate assessment of the effect of the Fund-supported programs (Bird, 2001a). Hence the 'chicken-fight' between researchers at the Fund, on the one hand, and others - including policy makers, independent researchers, and those in the academia - on the other, could be understood. The main problem with most of the existing evaluation studies is that, they often involved very large cross-country analyses [e.g. Bordo and Swartz, 2000], and the econometric methodology tended to assume that economic parameters are the same across these countries and stable

[32] Speech given by Thomas Dawson [the current Director, External Relations Department, IMF] at the MIT Club of Washington. June 13,2002.
[33] Formerly, Economic Counsellor and Director of the Research Department, IMF. See IMF News for various speeches
[34] Former Managing Director of the IMF. See *Nouvel Observateur*, September 12, 2002.

over time, etc. Haque and Khan [1998] compare the approach of case studies to the use of large cross-country studies and argued;

"...Large cross-country samples, in contrast, are more amenable to the application of standard statistical techniques, since there are a sufficient number of data points. But in the process, one loses some of the country-specific aspects of programs, including importantly the degree to which the policies in the program were implemented" [p.20].

This is what motivated this paper. We expect that the use of smaller regional panels could reduce the potential biases by capturing the extent of implementation of programs implicitly. If countries are less heterogenous (with respect to variables such as; correlated terms of trade shocks, levels of reserves, geography, climatic conditions, exports, imports, colonial history, etc), then factors that prompt these to enter or exit programs are expected to be relatively similar (see Knight and Santaella, 1997). Hence the potential omitted variable problems could be less important. It is thus expected that our approach would yield more reliable inferences compared to earlier studies that used largely heterogeneous cross-country data.

We make use of selected policy variables such as the fiscal deficit, domestic credit, and the real exchange rate. Our target macroeconomic variables include the growth rate of

real GDP, inflation, and the current account balance. The set of countries consists of seven non-oil exporting/non-CFA countries in Sub-Saharan Africa [See Table 3.6 for the program years]. These were chosen based on data constraints. Indeed most of the countries had too much gaps in some of the data, especially for the fiscal deficit and the current account balance.

The econometric methodology involves the use of fixed effects [LSDV] estimation, as well as the instrumental variable estimator for dynamic panel data proposed by Anderson and Hsiao [1982]. The next section of the paper reviews the conventional approaches to economic stabilisation particularly in developing countries, while section 3.3 discusses the Fund's approach to economic stabilisation. Section 3.4 reviews the empirical literature. Section 3.5 covers the empirical analysis - methodology, estimations, and results. Section 3.6 summarises and concludes the study.

3.1 Economic Stabilisation

Economic stabilisation refers to a deliberate effort on the part of a country's authorities to restore stability following a macroeconomic shock to the economy. In general, shocks could be either external or internal, or a

combination of both. External shocks include worsening terms of trade, sudden improvement in the trade position [e.g. sudden discovery of oil], decline in inflows, movements in world interest rates, changes in world output, etc.

Internal shocks include; capital flight by national asset-holders, local financial crises, adverse climatic conditions and natural disasters, wars and civil conflicts, etc. In other cases, business cycles, reckless exchange rate management, domestic credit expansion, and the effect of general policy failures by governments [especially in developing countries], all lead to the need to stabilise the economy.

The main indicators that signal the need for such economic stabilisation are, accelerating inflation rates, and unsustainable balance of payments deficits. Indeed, this is observed for all the countries in our panel, prior to implementing a stabilisation program.

The discussion here is mainly focussed on economic stabilisation in developing countries, with particular focus on first-generation programs, implemented in collaboration with the IMF/World Bank. The incentives for countries to agree to such IMF-supported programs stem from the fact

that, apart from the benefit of financial support coupled with technical assistance, there is thought to be the added benefit of signalling and credibility enhancement (Bird, 2002b), as well as better access to international capital markets with a "seal of approval" associated with their flirtation with the IMF (this however has been shown not to be the case in practice, see Bird, 2002c).

The economic literature on the causes of economic instability [e.g. rising inflation and balance of payments problems] is mainly divided between the Monetarist school and the Structuralist school.

The Monetarist school explains the causes of rising inflation using the supply and demand for money. In their view, the supply of money is assumed to be determined independently of the rest of the system, and largely by government borrowing from the Central Bank. On the other hand, demand for money depends mainly on factors such as the price level, interest rates, pace of economic activity etc.

Therefore, according to the Monetarist school, the price level is the only variable that uniquely adjusts to equate demand to supply of money. The level of output is assumed constant or determined from the supply side. Therefore

increases in money supply would lead to excess demand for commodities, or increase the "real balances" [money supply divided by the overall price index] above the level desired by wealth-holders. As they spend their excess balances, this results in rising prices.

Structuralist theory on the other hand attributes inflation to two main factors [Taylor 1988]. The first is, conflicting distributional claims, which is often signalled by relative price shifts. For example, social groups [e.g. workers under contracts] with fixed money wages may be hurt by initial price increases as a result of shortages of particular products subject to output. As real incomes are affected by such price changes, organised groups raise their own prices in an attempt to cushion themselves against general inflation [e.g. workers call for increased nominal wages].

This phenomenon leads to a price spiral as "indexation" of price increases one-to-one, appears. Ultimately, the initial conflict leads to inertial inflation where this period's average price increase becomes an unbiased predictor of the rise in each of next period's prices. The second factor, according to the Structuralists consists of a set of rules for price formation that expands the earlier conflict into a cascade of price increases throughout the system, thus

reinforcing the first factor [Taylor 1988]. Thus, the Neo-Structuralists argue that contractionary demand-side policies in developing countries for example, only lead to a decline in output, employment and real income, instead of a fall in the rate of inflation in the economy.

On the effect of devaluation, the "New Structuralists"[35] (Krugman and Taylor, 1978; Taylor, 1981) criticise conventional theory. The general textbook perspective was that devaluation would be expansionary due to the fact that demand for locally-produced tradeables will increase (Dorbusch, 1988). Thus in developing countries, it is expected that an additional demand would occur through price-related switch of demand away from imports, and also the domestic currency price effect that arises from the increased profitability of producing for export. These will be expected to have an expansionary effect on aggregate output as the tradeable sector expands.

For example, where an economy is already close to full employment, it was recommended that expenditure switching devaluation be coupled with expenditure reducing policies (e.g. contractionary monetary and fiscal policies), so as to offset the inflationary pressure. This has indeed been the

[35] These consists of economists writing in the structural tradition, who have turned their attention to short-run macroeconomic stabilisation. This is largely championed by Lance Taylor.

idea behind the Fund's policy stance that exchange rate adjustments are accompanied by demand contraction measures.

However, the New Structuralists argue that devaluations will be contractionary due to supply bottlenecks in developing countries, so that a policy package (e.g. standard IMF prescriptions) consisting of such expenditure-switching and expenditure-reducing policies will only result in stagflation (a contraction in output coupled with increasing inflation).

Another common factor [apart from inflation] that also signals the need for economic stabilisation particularly in developing countries is foreign exchange shortages or gluts in a few cases, emanating from any of the external shocks earlier cited. For example, as a result of the heavy reliance of local capacity on foreign exchange [i.e. import of raw material, intermediate inputs, machinery, and equipment], shortages of the latter often leads to a decline in investment and a fall in output growth. On the other hand, foreign exchange gluts also have adverse effects [e.g. the Dutch Disease effect] and therefore lead to the need for stabilisation.

Empirically for example, Knight and Santaella (1997) in their study investigated the economic factors that compel a country to embark on IMF-supported stabilisation programs. The significant factors found were: (i) levels of international reserves, (ii) the real effective exchange rate, (iii) the external debt service ratio, (iv) the growth of GDP per capita, (v) the rate of investment, (vi) the level of GDP per capita, and past arrangement with the Fund.

There have been three distinct approaches to economic stabilisation in developing countries [see Agenor et al, 1999 p.355]. These are: orthodox money-based [MBS], exchange rate-based [ERBS], and heterodox programs [HBS]. In the case of MBS, as the name suggests, money is used as the nominal anchor. The approach emphasises demand management [without the use of direct wage-price controls or guidelines] and using the price system [resource substitution] to induce improvement in internal and external balance.

It begins with fiscal adjustment, based on the view that austerity [reduced fiscal spending, tight credit etc.] will lower aggregate demand. Then, with output fixed or determined from the supply side, the fall in aggregate demand would then cause the overall price level to fall.

Since prices of traded goods are determined from the world market, this means that according to the law of one price, such an austerity program would affect only the prices of non-traded commodities, which will decline. Thus, demand contraction leads to a rise in relative prices of tradables, and this is expected to shift resources towards the production of tradables, thereby stimulating import substitution (production of tradables) and export growth, and improving the current account also. Devaluation is often used to enforce this shift in relative prices, albeit at some inflation cost.

The problem with the MBS is that the linkages may get broken along the way. For example, the law of one price may not hold for some goods produced in a typical developing country [Taylor 1988]. Moreover, the use of demand contraction and changes in relative prices may not help in the case of non-commodity items. For example, net service payments and capital flows depend more on expectations about growth and stability in the national economy.

Also, the balance of payments and credit extended to the private sector are alternative sources of money creation. Therefore fiscal adjustment alone, with limits on public sector borrowing from the central bank does not necessarily

guarantee that the money stock will stop growing, so as to limit aggregate demand. Consequently, fiscal adjustment alone does not guarantee that money, as a nominal anchor would be efficient.

The ERBS approach, as its name also suggests, uses the exchange rate as the nominal anchor. It emerged during the late 1970s as an alternative to the MBS due to the former's perceived shortcomings [e.g. not bringing inflation down quickly in chronic high-inflation countries. The theoretical foundation of the ERBS approach is traced to the monetary approach to the balance of payments [Agenor et al, 1999], and based on the belief that purchasing-power parity [PPP] held more or less continuously.

If PPP indeed held, then the domestic price level would be determined directly by the exchange rate, and therefore reducing the rate of depreciation of the exchange rate would directly stabilise the rate of inflation. Then, external balance could be achieved by restricting aggregate demand.

Output growth on the other hand was assumed to depend on domestic supply conditions, and could therefore be promoted by undertaking market-oriented structural reforms [structural adjustment]. Also, trade reforms are included,

since it is perceived that low and uniform tariffs would promote economic growth, and also help in inflation stabilisation by ensuring that the law of one price holds.

The history of the ERBS clearly describes exchange rate policy in developing countries in particular between the 1970s and 1980s. Throughout the period before the 1990s, fixed exchange rates were used in almost all developing countries as currency pegging was deemed more appropriate for avoiding the potential instabilities that an otherwise floating regime could entail. Thus the debate at the time was more on whether devaluation was beneficial or not. As Bird (1998) noted,

"*...Whereas the Fund emphasised the conventional wisdom, arguing that devaluation has an expansionary effect on domestic aggregate demand, the new structuralists claimed that it would be demand contractionary and therefore stagflationary, within a developing country context*" (p.255).

From the early 1980s most of the developing countries began to move away form currency pegging and towards crawling pegs, managed floats, or some other form of flexible exchange rate regimes.

However, the emergence of macroeconomic models that emphasised policy rules, time consistency and credibility -

brought renewed interest in the use of pegged exchange rates. For developing countries that were experiencing rapid inflation for example, exchange rate-based stabilisation was seen to be the panacea, as it would solve the credibility problem by using the exchange rate as a nominal anchor to fight inflation. Thus the debate shifted to the choice between the "nominal anchor" approach (based on pegged exchange rates) on one hand, and the "real targets" approach that involved a greater flexibility in the nominal exchange rate (with a view to 'target' the equilibrium 'real' exchange rate) on the other. Bird (1998) provides a detailed evaluation of each of the two approaches - nominal anchors or real targets.

Among the general arguments that have been made in favour of nominal anchoring is that, it helps to maintain certainty against the currency to which the domestic currency is pegged, and hence reduces the need for hedging against exchange rate movements. Finally, it is argued that pegging helps to contain the effect of exchange rate depreciation on inflation.

On the contrary, the points against pegging are that, it allows the real exchange rate to become misaligned since the disequilibrating effects of shocks to the economy on the

balance of payments, can no longer be addressed using the exchange rate as a tool. Moreover, if the exchange rate is pegged, then deficits in the current account that result from currency misalignment can be difficult to deal with. This is because, as a result of pegging, there tends to be limited holdings of international reserves, limited access to private international capital, and limited scope for alternative balance of payments adjustment policies. Therefore, critics of the nominal anchor approach argue that exchange rate policy should rather aim at targeting the equilibrium real exchange rate. However, the empirical evidence remains inconclusive about the relative potentials of these two approaches (Corden, 1993; Fielding, 1997; Vegh, 1992).

The emergence of heterodox stabilisation programs is fairly recent, from the mid-to-late 1980s. It is based on the idea that inflation has a strong inertial component, arising from the existence of explicit or implicit backward-looking indexation in nominal variables [nominal wage, exchange rate, and monetary aggregates], and an initial lack of credibility. In that case, even if the economic fundamentals are right, inflation would still be high, and thus policies that restrict aggregate demand in a bid to "align" the

fiscal and monetary fundamentals, would only result in a deep and prolonged recession [Agenor et al, 1999].

The heterodox approach therefore uses elements such as an exchange-rate freeze and incomes policies to supplement a credible fiscal program, which is believed to help stabilise chronic inflation while avoiding the short-run damage to economic activity, which is often associated with the orthodox programs. We next discuss the IMF's approach to economic stabilisation, which is our main focus.

3.2 IMF Approach to Economic Stabilisation

The IMF has a mandate to offer financial and technical assistance to members that undertake economic adjustment, and this derives from its articles of agreement. Thus, when a member country is experiencing balance of payments difficulties, it could enlist the help of the Fund in order to restore external viability. Mussa and Savastano [1999] identify about six phases over which the involvement of the Fund is based.

These are - inception, blueprint, negotiation, approval, monitoring [revisions/suspension], and completion. Essentially, the role of the IMF begins with its staff

meeting the local authorities of the country that wants to access help from the Fund.

The meeting is often aimed at helping the authorities to put together a preliminary Fund policy program, [a kind of borrowing proposal] that in their opinion could restore a sustainable balance between aggregate demand and supply, and also restore the economy on a sustainable growth path. This is then incorporated in a letter of intent from the country authorities to the Executive Board of the IMF for review [inception, blueprint, and negotiation]. At the approval stage the Executive Board will review the Staff report and the letter of intent and arrive at a decision whether to approve or reject the proposed program.

If approved, the program document will constitute a working document [Financial Program], which would guide all subsequent dealings between the Fund and the borrowing country. The next is the monitoring stage, which is critical for the success or failure of the program, and involves a continuous assessment of performance against predetermined criteria. If this goes well, then the program moves onto the completion stage.

In general, Fund programs have three main components, which together are aimed at an 'orderly restoration of external viability' [Mussa and Savastano, 1999]. These are: [i] securing sustainable external financing [ii] adoption of demand-restraining measures[36], and [iii] implementation of structural reforms[37]. There remains a wide controversy in the literature as to whether these three could be regarded as complements/substitutes. For example, Mussa and Savastano argue that it all depends on the source of the disequilibrium, which might differ from country to country.

Thus, if a country's external reserves got depleted due to unsustainable fiscal imbalances, then emphasis will be placed on the component of demand restraining measures. On the other hand, where the external reserves were depleted as a result of a natural disaster, or adverse terms of trade, or contagion effects, then indeed more emphasis would be placed on the first component of restoring external financing. However, Bird and Rowlands [2002c] suggest an alternative relationship between the three components. The authors argue that there is a trade-off between external financing and the speed of adjustment, such that;

[36] These comprise fiscal policy, monetary policy, and exchange rate policy that seek to restore and preserve viable equilibrium between aggregate expenditure and aggregate income.

[37] These comprise all types of measures aimed at reducing government-imposed distortions and other structural and institutional rigidities that prevent an efficient allocation of resources in the economy. Typical activities include; trade and price liberalisation, tax reform, privatisation, foreign exchange market reform, pension reform, financial sector reform, labor market reform, government spending reform.

"...if it is assumed that structural adjustment takes a longer time than adjustment via demand restraint, a decline in external financing will imply substituting demand restraint for structural adjustment. External financing and aggregate demand compression are short-run substitutes, whereas structural adjustment and external financing tend to be complements in the short run" [p.25].

In practice, however, the particular mix of the components in each case depends on the situation of the country as well as the stage reached in the adjustment process. For example, in the initial stages of a program all three components may be pursued, however as the crisis is contained and confidence restored, the external financing component becomes less emphasised as more attention is placed on stabilising domestic demand and structural reforms.

The technical design of Fund stabilisation programs [called Financial Programming] is based on a variant of the monetary approach to the balance of payments [MABP] theory, as originally outlined in Polak [1957]. In effect, the financial programming and policy model [FPP] integrates monetary, income, and balance of payments analysis with primary focus on the balance of payments effects of credit creation by the banking system. A relatively simple version is presented below.

Basically, the FPP model is aimed at determining the magnitude of domestic credit expansion required to achieve a desired balance-of-payments target, given a predetermined exchange rate. The first equation of the model is the balance sheet identity for the banking system, which equates assets [in the form of credit to the nonbank sector ***DC*** and claims on foreigners ***R***] to monetary liabilities ***M*** such as:

$$M = DC + ER \qquad [3.1]$$

Where ***E*** is the nominal exchange rate. In the relationship, ***R*** and ***M*** are endogenous and ***DC*** is an exogenous policy variable under the control of the monetary authorities. The second equation is the definition of velocity of money, υ as nominal GDP ***Y*** divided by the money stock ***M*** [using the popular quantity theory of money ***MV=PY***] :

$$M = \upsilon^{-1} Y \qquad [3.2]^{38}$$

According to the version of the MABP often used for the analysis, the money market is required to be in flow (but not necessarily stock) equilibrium and this implies that:

$$\Delta M = \upsilon^{-1} Y - \upsilon_{-1}^{-1} Y_{-1} (i.e. \Delta M = M_t - M_{t-1}) \qquad [3.3]$$

If we assume that the nominal exchange rate and velocity are both constant and that nominal output is exogenous, the model can then be solved for the change in the stock of

[38] $\upsilon = Y / M$

international reserves ***R*** as a function of υ and ***Y***, as well as of the monetary policy instrument ***DC***:

$ER = M - D$, hence

$$\begin{aligned} E\Delta R &= \Delta M - \Delta DC \\ &= \upsilon^{-1}(\Delta Y) - \Delta DC \end{aligned} \qquad [3.4]$$

Alternatively, given a target value for the change in reserves [the balance of payments] and projections for υ and ***Y***, the required expansion in the stock of credit can be derived from:

$$\Delta DC = \upsilon^{-1}(\Delta Y) - E\Delta R \qquad [3.5]$$

The Polak Model however makes nominal output endogenous, thus the solution varies from the above. The model assumes that all domestic income is spent with no hoarding or accumulation of idle cash balances. Injection of liquidity is exogenously determined, and assumed to come from exports [***X***], the capital account [***F***] and domestic credit [***DC***]. Imports [***M***] are the only source of outflow of liquidity, and are endogenous. It is assumed to depend on last period's income. The following equations are referred to:

$$\begin{aligned} &Y_t = Y_{t-1} + X_t + \Delta F_t + \Delta DC - M_t \\ &Mt = mYt - 1 \end{aligned} \qquad [3.6]$$

These are the liquidity and imports identity. A relationship between money and income could be specified as:

$\Delta M = Y_t - Y_{t-1}$.

Next, the usual definition of changes in money is stated as:

$\Delta M = \Delta DC + \Delta R$.

Then, substituting for imports, the liquidity identity can be restated as:

$$Y_t = Y_{t-1} + X_t + \Delta F_t + \Delta DC - mY_{t-1}$$
$$\Delta Y_t + mY_{t-1} = X_t + \Delta F_t + (\Delta M - \Delta R)$$
$$= X_t + \Delta F_t + \upsilon^{-1}\Delta Y - \Delta R$$

So, $$\Delta R = X_t + \Delta F_t + \upsilon^{-1}\Delta Y_t - \Delta Y_t - mY_{t-1} \qquad [3.7]$$

The above could be re-organised as a balance of payments identity as:

$$\Delta R = X_t - \alpha(Y_{t-1} + \Delta Y_t) + \Delta F_t, \qquad [3.8]$$
$$0 < \alpha < 1$$

Thus, with nominal output endogenous, we have two equations - the money market equilibrium [**3.4**] and the balance of payments identity [**3.8**], to solve for the equilibrium set ΔR^* and ΔY^*. Hence, this set of equations represents the core of the IMF's programming exercise and are used to derive the quantitative performance criteria.

Indeed from the mid-1990s, the focus of the IMF's intervention in developing countries shifted to structural adjustment lending to ensure that economic stabilisation and growth objectives are achieved together. Thus, the Structural Adjustment Facility [SAF], Enhanced Structural Adjustment Facility [ESAF], and the Poverty Reduction and Growth Facility [PRGF] have become the dominant framework for the IMF's support in many developing countries.

However, since the PRGF framework is still in the early years, we do not attempt to separate the effect of the earlier FPP framework from it. Rather, we consider the joint effects of the stabilisation programs as well as the PRGF programs based on the assumption that macroeconomic stability continues to play a significant part in the implementation of the PRSPs.

3.3 Review of Empirical Literature

As discussed in the introduction, there is growing debate in developing countries about the outcomes of the programs and for that matter the effectiveness of the Fund's policy prescriptions and credit arrangements. Critics such as Tony Killick earlier argued that Fund programs do little in the way of improving the economic situation in developing countries ([Killick 1984], Taylor [1983]). Taylor [1988]

went even further to say that Fund programs actually worsen the economic situation by inducing stagflation.

Indeed, Stiglitz [2002] presents the most vicious criticism of the Fund's programs ranging from its first-generation stabilisation programs, to Eastern Europe's transition to market economies, and the recent economic crises in Asia. The paper argues that the IMF has been implementing "Washington Consensus" policies and has:

"...seriously mismanaged the processes of privatisation, liberalisation, and stabilisation - and that by following its advice many Third World countries and former Communist states are actually worse off now than they were before".

On the other hand, the IMF maintains that its intervention in such economies have actually been beneficial. For example, in a survey of the cross-country evidence conducted by the IMF (Ul Haque and Khan, 1998), it is argued that on balance, IMF programs lead to a significant improvement in the balance of payments situation, even though the effect on growth and inflation may be less clear.

Bird (2001a) also summarizes the results of some other empirical studies that have evaluated the effect of IMF programs. For example, in a later study, Killick (1995) found that both the overall and the current account of the balance of payments improve due to IMF programs. As Bird (2001a) described Killick's study;

"...both the overall and current account balances strengthen, especially over a three-year period, in part by import compression (rather than import strangulation) but also by relatively large increases in export volume, which rise through time. This performance was secured against a background of deteriorating commodity terms of trade" (p.1850).

Therefore the evidence about the effect on inflation is less clear (Ul Haque and Khan, 1998), and the findings appear to depend on the methodology. Thus, Bird (2001a) argued that the demand-reducing effects of IMF programs seem to be offset by the effects of devaluation and liberalization.

On economic growth, Conway (1994) found differences between short run and long run effects of Fund programs - implying that contemporaneous reductions were followed by lagged increases. Similarly, Killick (1995) again reported that the effect of Fund programs on growth only turned positive after a period of time. Dicks-Mireaux et al (2000) also report positive growth effects. Hutchison (2001) on the other hand reported a significantly negative effect on output growth over one to two years. Przeworski and Vreeland (2000) also reported that IMF programs had an enduring adverse effect on economic growth. Bird (2001a) summarized the evidence thus;

"...On the positive side IMF programs do seem to be associated with a statistically significant and enduring depreciation in the real exchange rate. Perhaps connected with this, they also appear to be associated with some significant strengthening in the balance of payments. But, their impact

on fiscal and monetary restraint is less significant or not significant at all, and the effects on inflation and economic growth are generally insignificant or significantly negative." (p.1851)

The IMF also refers to an alleged additional feature that might be associated with the presence of Fund programs. This is about the supposedly signaling and credibility effects (Bird, 2002b), that arise under the third goal of the Fund programs[39] - securing sustainable external financing. This, it is argued, is important because of the view that Fund programs help to mobilize capital from other sources. Thus the good thing about conditionality is that it acts as an anchor (against the time-inconsistency problem), regarding the commitment by the authorities to implement and sustain their policy measures. For example, Dhonte (1997) maintains that Fund programs facilitate additional capital inflows due to the signaling effect of conditionality.

However, Bird (2002b, p.1858-60) explains why this is not likely to be the case in reality. Fund programs are normally associated with restrictive monetary and fiscal policy, as well as devaluation of the local currency. The resulting higher interest rates are expected to dampen consumption and investment, and these can hardly constitute a pull-factor for foreign inflow of foreign capital. Indeed, the higher

[39] The other two, as already discussed are: (i) demand restraint (ii) structural reforms.

domestic interest rates could in principle attract some of those, however, if the higher interest cost results in widespread corporate bankruptcy, then foreign capital might at best respond little. Moreover, the fact that the country has formally signed into the program does not mean that they will follow through to the end. In particular, considering the significant number of programs that was not completed etc. Hence, foreign investors might rather adopt a wait-and-see attitude to such reforms. There are also further issues about whether there isn't a causality problem. For example whereas reforms could facilitate the inflow of foreign capital, yet it is also possible that the prospect of future IMF lending in the event of trouble, is actually what induces the inflow of foreign capital. Another idea is that if Fund lending is a substitute for private capital (which means that it is rather the lack of access to private capital that brings on board IMF facilities), then the relationship could rather be negative.

Therefore it will all depend on the type of country or type of flow. The empirical evidence on the catalytic effects of Fund programs also remains unclear. For example, the experience of Latin America has been suggested often as a typical case of restored capital flows. However, some have criticized the example since it has been argued that the

restoring of capital flows to Latin America is probability more to do with push factors rather than policy-induced pull factors. The recent empirical studies on the catalytic effect such as (Bird and Rowlands, 2002c) suggest that there is hardly any significant evidence of positive catalysis.

In a relatively recent official address, the Trade Minister of Ghana [one of the few countries in SSA often cited by the Fund as a success story, thanks to Fund facilities] stated;

"*...government is looking at changing from the current regime of blanket trade liberalisation, to a protectionist stance. As it is now, trade liberalisation has not helped in the growth of the economy.*" [*Ghanaweb; Dec.17, 2002*].

This affirms the apprehension among policy makers as well as researchers. Indeed, faced with the severe social costs, there have been violent riots in the 1990s against the IMF programs in countries such as, Venezuela, Nigeria, Indonesia, and South Korea.

Accordingly, various researchers [both within and outside the Fund] continue to devote much research work (using different methodologies, or improving on the methods used by the existing studies) on assessing the effectiveness of Fund programs. Regarding the existing studies, various methodologies have indeed been used so far. We next review the main ones.

The methodologies can be classified into five main categories[40]:

- The 'before and after' [BA] approach
- The 'with or without' [WW] approach
- The 'generalised evaluation estimator' approach [GE]
- The 'Comparison of simulations' approaches [SIM].
- Other Approaches

The BA approach [e.g. Killick [1984], Zulu and Nsouli [1985], Pastor [1987]] primarily involves a comparison of the macroeconomic outcomes [e.g. balance of payments, current account, inflation rate, and growth rate of GNP], in the program period, with those outside the program period. Therefore all that is required here is to look at the state of the economy at the onset of the reform program, and to compare it to the fundamentals at some date, or time period after the implementation of the reforms.

The approach is therefore straightforward and simple to apply. However it suffers from the disadvantage of attributing all of the possible changes in outcomes to

[40] This section draws heavily on Haque and Khan [1998]

program factors [i.e. due to the reforms]. The fact of the matter is that the Fund's policy prescriptions constitute just one of the several macroeconomic shocks that may have impacted on these economies over the program period.

Other factors such as terms of trade shocks, movements in international interest rates, debt-service difficulties, productivity shocks, unexpected cuts in programmed aid flows/grants for budgetary support, labour unrest, ethnic/racial conflicts and destruction, as well as climatic conditions [e.g. rainfall patterns] all play active roles in the macroeconomic outcomes. It is therefore important that the influence of these other non-programmed factors be isolated in order to draw meaningful conclusions regarding the effectiveness of the Fund's policy prescriptions.

The WW approach [e.g. Donovan [1981], Loxley [1984], Gylfason [1987]] usually involves selecting a set of countries that have embarked on Fund programs, and a second set [control set] consisting of similar countries that have not. The idea is to ensure that these two sets of countries have similar macroeconomic fundamentals in the pre-program period, and have been exposed to similar non-programmed macroeconomic shocks over the reform period in the case of the first set. It is therefore expected at least

theoretically, that any changes in outcomes between the two countries could be attributed to program factors.

However, in practical terms, it is quite difficult to achieve such a perfect sampling of countries, due to the peculiar structure of each economy. Moreover, the selection of the first set, i.e. program countries, is not random. It has an element of adverse selection in the sense that, these are countries that had relatively poor economic performance [an essential requirement for Fund financial support] anyway. There would therefore be a bias in any such comparisons since the relative structures initially could itself be a cause for differences in subsequent performance.

The weaknesses in the BA and WW approaches led to the emergence of the "generalised evaluation estimator" [GE] approach [e.g. Goldstein and Montiel [1986], Khan [1990], Conway [1994], Dicks-Mireaux, et al [1997]]. This approach is based on the concept in WW and tries to correct for the problem of selection bias that may occur due to differences in initial characteristics. Also, the GE approach includes an estimation of the counterfactual so as to take account of the possible effects in the absence of the program policies, while controlling for exogenous influences. Indeed, the

method is less straightforward, as it requires sophisticated estimations, which may not be easily implemented.

The fourth category, the "comparison of simulations" [SIM] [e.g. Khan and Knight [1981], Khan and Knight [1985]], is quite different from the first three as earlier discussed. The approach does not necessarily concern itself with actual macroeconomic outcomes, but rather relies on simulations of econometric models to compare hypothetically, the performance of policies in a typical Fund-supported program and an alternative policy package.

The SIM approach focuses on the relationship between policy instruments and policy targets, and as such provides better information on how programs are expected to work than the other methods that look at the outcomes for policy targets. However, in practice it is also bereft with many problems. The first is that in practice there is as yet no single formal model that covers the whole range of policy measures contained in a typical Fund program [see Khan et al, 1991].

To design such a model, that would capture the entire complex ways by which policy variables in a typical Fund program relate to their ultimate objectives, would be a daunting task indeed. In addition, the effect of policies

could be different in a real setting due to credibility factors, rather than when such effects are simulated by a test-tube approach. The reaction of economic agents to such policies is lost in the SIM approach.

The fifth category involves a hybrid of approaches that have been used in recent studies to evaluate Fund programmes. These include, Conway [1994], Killick [1995], Przeworski and Vreeland [2000], Graham, Bird [2002], Mercer-Blackman and Unigovskaya [2000], and Gomulka [1995].

The study by Przeworski and Vreeland cited growth as the ultimate objective of all Fund programs. They studied countries' participation in IMF programs as a Markov Process, and estimate growth [corrected for selection bias] for a sample of 79 countries. On the other hand, Conway, Killick and Graham Bird, focus on the determinants of completion of Fund programs, and compliance with conditionalilties therein.

The argument here is that, the level of participation and compliance, as well as the effect of conditionalities, all have implications for program effectiveness. Clearly, the evaluation studies differ widely in terms of scope and methodology. However, the GE estimator is thought to hold

promise since it attempts to account directly for the counterfactual. However, as Dicks-Mireaux et al (2000) argued, one needs to test the validity behind the construction of the counterfactual which is based on the assumption that policy reaction functions are similar etc. Also there is the assumption about parameter homogeneity and constancy that need to be tested before reliable evidence based on the GE approach could be reported.

Nevertheless, the A-H estimator is by default able to get rid of country-specific effects that might otherwise render the reaction functions different across countries. This indeed is our preferred estimator, and the output (Table 3.5) is our preferred results. Our paper therefore modifies the GE approach by correcting for selection bias [selection on observables] and also using appropriate estimators that can address the potential biases that can arise from a simple pooled OLS estimation of the GE estimator.

3.4 Empirical Analysis

The primary aim of this chapter is to provide empirical evidence on the macroeconomic effects of IMF programs in seven non-oil exporting [and non-CFA] countries in Sub-

Saharan Africa. Even though, the SBAs[41] are traditionally the main stabilisation facilities, our focus in this paper is on both the concessional and non-concessional facilities.

This is due to the fact that the distinction between stabilisation facilities and other facilities became blurred when SAF/ESAF facilities were introduced from the late 1980s. By definition, concessional facilities[42] consist of ESAF/PRGF, and SAF [see Appendix] while the non-concessional facilities[43] consist of SBA, EFF, SRF, and CFF. Even though countries such as Ghana had earlier agreements with the Fund, the study will concentrate on programs from the early 1980s, after the second major oil shock.

We next present the empirical approach, which is based on the generalised evaluation [GE] estimator [Goldstein et al, 1986; Khan, 1990]. The target or dependent variables we consider are three of the main macroeconomic variables - current account as a ratio of GDP, inflation rate, and the growth rate of real GDP. For the policy instruments, we will focus on domestic credit, real exchange rate, and the fiscal deficit. These are in keeping with the IMF's Articles of Agreement, which defines the mission of the IMF as:

[41] See appendix for the definition of the various facilities.
[42] ESAF - Enhanced Structural Adjustment Facility. SAF - Structural Adjustment Facility. PRGF - Poverty Reduction and Growth Facility
[43] SBA - Stand-by agreement. EFF - Extended Fund Facility. SRF - Supplemental Reserve Facility. CFF - Compensatory Financing Facility [CFF].

"...to facilitate the expansion and balanced growth of international trade, and to contribute thereby to the promotion and maintenance of high levels of employment and real income and to the development of the productive resources of all members as primary objectives of economic policy".

3.4.1 The Generalised Evaluation Estimator

Let the target variable in the j^{th} country be determined by the reduced form model:

$$Y_{ijt} = \beta_{0ij} + X'_{it}\beta_j + W'\alpha_j + \beta_j^{IMF} d_{it}^{IMF} + \varepsilon_{ijt} \qquad [3.9]$$

Where:

Y_{ijt} is the target variable [e.g. balance of payments, current account, inflation rate, and growth rate] in country **j**.

X'_{it} is a vector of policy instruments [domestic credit, exchange rate, and the fiscal deficit] as already described.

W' is a vector of foreign exogenous variables [e.g. terms of trade, world interest rate, etc.]

d_{it} is a dummy which takes the value unity if a Fund program is in place and zero otherwise; ε_{it} is a random shock.

For ease of analysis, we make the rather strong assumption that the parameters β_0, β and α are uniform across countries and over time. Therefore we can drop the country notations and rewrite equation [3.9] as:

$$Y_{it} = \beta_0 + X_{it}^{'}\beta + W'\alpha + \beta^{IMF} d_{it}^{IMF} + \varepsilon_{it} \qquad [3.10]$$

The parameter β^{IMF} is meant to capture the effect of Fund programs on the target variable Y_{it}.

Equation [3.10] implies that in those years that there is no Fund program (the dummy assumes zero), X'_{it} will represent purely the non-program policies. Thus, the vector X'_{it} will be directly measurable only for the periods in which no program policies were in place. For program years however, it has to be estimated. This is done by estimating a policy reaction function[44] such as:

$$\Delta X_{it} = \gamma'(Y_{it}^{d} - (Y_{it})_{-1}) + \eta_{it} \qquad [3.11]$$

Y_{it} is as defined earlier.

Y_{it}^{d} is a vector of desired values for the target variables.

η_{it} is a vector of random shocks

γ' is a parameter matrix, and

Δ is the usual first difference operator.

We assume that γ in the policy reaction function is stable for the program years across countries. On the other hand, given the fact that all the countries under consideration

[44] see Khan [1990], and Goldstein and Montiel [1986]. Reaction functions might indeed be different for the sample of countries, however our preferred estimator (the A-H estimator) is able to eliminate any such heterogeneities due to country-specific effects.

have made repeated use of Fund stabilisation facilities [recidivism][45], and the presence of the Fund in each country[46], one can expect that in the non-program years, policy formulation might reflect the rule in the stabilisation years and vice versa. All the same, we maintain the assumption that γ is stable.

Hence, equation [3.11] implies that the change in macroeconomic policy instruments between the previous and current periods in a country will be a function of the difference between the desired value of the target variables this period, and their actual value last period. In order to derive the generalised evaluation estimator, equation [3.11] is therefore used to substitute out the unobservable policy changes that would have occurred in the absence of a Fund program.

Since $\Delta X_{it} = \gamma'(Y_{it}^d - (Y_{it})_{-1}) + \eta_{it}$,

$$X_i = \gamma'\{Y_i^d - (Y_i)_{-1}\} + \eta_i + (X_i)_{-1}$$

$$\Delta Y_{it} = \beta_0 + (Y_{it})_{-1} + [\gamma'\{Y_{it}^d - (Y_{it})_{-1}\} + \eta_i + (X_{it})_{-1}]\beta + W'\alpha + \beta^{IMF} d_{it}^{IMF} + \varepsilon_{it}$$

$$= \beta_0 + (1 - \gamma'\beta)(Y_{it})_{-1} + (X_{it})_{-1}\beta + W'\alpha + \beta^{IMF} d_{it}^{IMF} + (\varepsilon_{it} + \eta_i\beta) \quad [3.12]$$

[45] see Bird [2002]

[46] The IMF representatives play active roles in policy formulation in the countries such that even in years when the authorities do not have a formal Fund program, they still solicit the Fund's views, because such 'seal of approval' eases access to international capital markets

Equation [3.12] is the G/E estimator and the coefficient of d_{it}^{IMF} represents the effect of the Fund programs. [The missing term $\beta\gamma' Y_{it}^{d}$ is assumed to be taken up in the constant term].

3.4.2 Selection Bias

As discussed by Heckman [1976], non-random selection renders OLS estimates biased. Because countries are not randomly selected to 'engage' in Fund-supported programs, then OLS estimation of [3.12] would yield biased estimates. Therefore we employ the so-called 'Heckman correction' and derive a 'selectivity' variable [inverse Mills ratio] that will be included in [3.12]. OLS is then expected to yield unbiased estimates.

The methodology is presented below:

Rewrite [3.12] as: $y_{it} = Z'\Theta + \beta^{IMF} d_{it}^{IMF} + \xi_{ij}$

Then, assume that countries have a continuous and measurable desire to participate in Fund programs F_i. Hence we can specify a program participation function that would relate F_i to observable variables such as:

$$F_{it} = W'_{ij}\varphi + U_{ij} \qquad [3.13]$$

where W_{ij} is the vector of domestic factors that determine a country's decision to participate in a Fund program. U_{ij} is

assumed to be $N[0, \sigma_u^2]$. The participation of a country in a Fund program thus occurs when F_i crosses some threshold as:

$$d_{it}=1 \quad \text{if } F_{it} > F^*$$

$$d_{it} = 0, \text{ otherwise}$$

It is also assumed that the errors terms in [1.12] and [1.13] are correlated. Then the expectation of a target variable conditioned on program participation [see appendix] can be written as:

$$\begin{aligned} E(Y_i / d_i = 1) &= Z'\Theta + \beta^{IMF} + E(\xi / d_i = 1) \\ &= Z'\Theta + \beta^{IMF} + \rho\sigma_\xi \left[\frac{\phi(\omega'\varphi)}{\Phi(\omega'\varphi)} \right] \end{aligned} \qquad [3.14]$$

where Φ is the cumulative distribution function of the standard normal distribution and ϕ is the probability density function of a standard normal distribution. Therefore [1.12] is restated corrected for selection bias as:

$$y_{it} = Z'\Theta + \beta^{IMF} d_{it}^{IMF} + c\lambda_{it} + \xi_{it} \qquad [3.15]$$

where $\lambda_{it} = \frac{\phi(\omega'_{it}\varphi)}{\Phi(\omega_{it}'\varphi)}$. Hence, equation [3.13] can be estimated by probit estimation, and the selectivity variable λ_{it} [LAMDA] derived and included in the estimation of equation [3.15]. As already explained, the target variables are - the current account balance to GDP [CAY] ratio, the rate of inflation, and the growth rate of real GDP [Grwth].

The three policy instruments are - the percentage change in domestic credit [PCDC], the real exchange rate [RER], and the fiscal deficit as a ratio of GDP [FDY]. This does not mean however that these are the only policy instruments under Fund stabilisation programs. The percentage change in terms of trade is included to represent exogenous influences. The dummy variable d_{it} indicates the presence of a stabilisation program in each period.

Thus, the size and sign of the parameter β^{IMF} will signify the effect of Fund programs on each target variable. However, the use of intercept dummies to assess policy effects has been the subject of much controversy. The main concern is that such dummies do not reflect the extent of completion of programs in a particular year. Also, persistence effects will make any such coefficient unbiased. In this study, we use an alternative variable "Use of IMF resources" [LIMFCR][47], which is found to be appreciably correlated with the program dummy. We expect that such a variable will reflect the true dynamics of programs and as such address the aforementioned concerns about the use of deterministic dummies. Even though the variable includes other Fund facilities that might not be directly for

[47] Outstanding net repurchase obligations to the Fund

stabilisation purposes, yet the most part should reflect stabilisation facilities.

3.4.2.1 Results of Probit Estimation of [3.13]

In order to derive the program selectivity variable λ_{it} [LAMDA], a probit estimation of [3.13] is done for the seven countries, and over the period 1980-2000. The explanatory variables are - external reserves [measured in months of imports], fiscal deficit, debt service ratio, investment ratio, growth rate of real GDP, and the real exchange rate. The lagged dependent variable is also included in order to capture persistence effects. The result of the estimations is presented in the table 3.2 below:

Table 3.2: Selection Bias Estimation
Dependent Variable - DUM. The estimation method converged after 7 iterations

Regressor	Coefficient	Standard Error	T-Ratio (Prob)
Reserves	-.37405	.12089	-3.0941 (.002)
Fiscal Deficit	.0025586	.030381	0.0842 (.933)
Debtservice	.030377	.011487	2.6446 (.009)
Investment ratio	.031251	.030047	1.0401 (.300)
Lagged Dummy	.2311	.047753	4.8398 (.000)
Growth	-.030927	.024238	-1.2760 (.204)
RER	.0049146	.0031360	1.5672 (.109)
C	-2.5702	.72796	-3.5307 (.001)

Maximised Value of the log-likelihood function = -71.0537
Goodness of fit = .77397

The results show that having an IMF program in the previous year has a positive and significant effect on the probability that a country will turn to the IMF in a

particular year. Higher growth rates and reserves cover reduce the probability of having a program, while higher fiscal deficits, real exchange rate, and higher debt service ratios increase the probability of turning to the IMF. The results are almost the same as those obtained by [Bordo, M. and Swartz, A.J., 2000 p.73]. These results are used to derive the selectivity variable, LAMDA that will be included in the GE estimator for the estimations.

3.4.3 Pooled OLS Estimation of equation (3.15)

Despite the fact that equation [3.15] is dynamic in nature and therefore requires an appropriate dynamic panel estimator [due to potential endogeneity biases], for comparison with the other estimators, we present results for a static pooled OLS estimation in Table 3.3 below:

TABLE 3.3: POOLED OLS ESTIMATION

	Current Account		Inflation		Growth	
Infla (-1)	-0.93 (1.9)	-0.98 (2.0)	0.95 (5.7)	0.95 (4.2)	0.179(1.39)	0.10 (1.35)
Grwth(-1)	-0.28 (1.79)	-0.27 (1.8)	-0.02 (1.2)	-0.02 (1.2)	0.048 (0.42)	0.052(0.45)
CAY(-1)	0.57 (3.3)	0.58(3.0)	-0.04 (0.26)	-0.038(0.24)	-0.023(0.28)	-0.029(0.4)
PCDC(-1)	-0.08 (0.98)	-0.95 (0.93)	0.051 (1.59)	0.051 (1.6)	-0.063(0.15)	0.029(0.07)
FDY(-1)	0.07 (0.75)	0.07 (0.75)	0.04 (2.56)	0.04 (2.56)	0.171(1.6)	0.17(1.7)
TOT(-1)	-0.32 (0.66)	-0.31 (0.59)	0.013 (2.05)	0.013 (2.08)	0.851 (2.09)	0.874(2.09)
RER(-1)	-0.25 (0.52)	-0.02 (0.55)	0.095(0.18)	-0.11 (0.19)	0.042(2.2)	0.046(2.82)
LAMDA	-0.016 (1.5)	-0.017(1.6)	-0.754 (2.7)	-0.75 (2.7)	0.065(0.58)	0.472(0.46)
LIMFCR	*0.21 (1.14)*	-------	-------	*0.079 (0.22)*	*0.356(0.73)*	------
Y (-1)	*0.06 (0.46)*	*0.105(0.86)*	*0.048(1.37)*	*0.046 (1.28)*	*-0.035(0.02)*	*0.075(0.31)*
AR(1)	-1.098 (0.4)	1.089(0.27)	1.65 (1.05)	1.66 (0.097)	-1.70 (0.08)	-1.75(0.079)
AR(2)	0.998 (0.32)	0.994(0.32)	1.78 (0.074)	1.80 (0.071)	-0.65 (0.52)	-0.666(0.51)
Wald (Joint	23.3 (0.0**)	36.1 (0.0**)	166 (0.0**)	135 (0.0**)	29.8 (0.0**)	50.28(0.0**)

*t-statistics are in brackets. ** refers to strong rejection of the null of joint insignificance*

The results suggest that IMF programs do not have significant macroeconomic effects. However, this finding suffers severely from potential endogeneity and omitted variable bias due to the dynamic nature of [3.15], and also the presence of correlated individual-specific effects. We next use the fixed effects estimator that attempts to correct for individual effects.

3.4.4 Fixed Effects [LSDV] Estimation

Table 3.4 below presents results of fixed effects estimation of [3.15]. Clearly, the program variable [IMFCR] shows a lagged improvement for all three variables, about a year after the implementation of a program[48]. In the case of the current account ratio, the program variable even improves in the same program year.

Indeed this is consistent with the earlier results in Khan [1990] except for the effect on inflation. The little difference could be attributed to the fact that we controlled for individual effects. For all the three equations, the significant lagged dependent variable confirms persistence in the variables. Of course, such persistent effects are typical of developing countries.

[48] The positive effect on growth reported here, could be due to productivity increases as capacity utilization improved as imports of intermediate goods improved. Thus, growth can still show a positive effect even though investment may be dampened by the contractionary effects of typical IMF stabilisation programs.

In the current account equation, the significant variables are - inflation, growth, fiscal deficit, terms of trade, and the selectivity variable. The signs are also as expected. Higher inflation rates lead to subsequent deterioration in the current account as imports might become cheaper, of course depending on the exchange rate.

Similarly, the growth rate suggests a negative effect on the current account. The fiscal deficit variable has a negative effect on the current account, and this apparently agrees with the view that private sector balance is usually stable, so that changes in the government balance have a direct effect on the trade balance [Killick, 1984].

The terms of trade also shows a negative effect on the current account. This confirms the Harberger-Laursen-Metzler effect [Cashin and McDermott, 1998] that says that an adverse shock to a country's terms of trade will cause the current account to deteriorate. The strange outcome in the current account equation is that the real exchange rate variable is not significant. This could reflect the elasticity pessimism view that real exchange rate adjustment in developing countries can do little to increase exports since the price elasticity of demand for their exports is

low. The view therefore is that since both the imports elasticity and exports elasticity are low, hence the

TABLE 3.4: FIXED EFFECTS (LSDV)

	Current Account		Inflation		Growth	
Infla (-1)	-0.59 (-1.69)	-0.59 (-1.7)	0.67 (7.8)	0.67 (8.6)	-0.27 (2.6)	-0.29 (-0.7)
Grwth(-1)	-0.27 (-2.9)	-0.27 (-2.8)	-0.03 (-1.6)	-0.03 (-1.6)	-0.44 (-4.8)	-0.44 (-4.8)
CAY(-1)	-0.46 (-4.05)	-0.45 (-4.1)	0.01 (0.4)	0.01 (0.51)	-0.03 (-0.3)	-0.05 (-0.4)
PCDC(-1)	-0.29 (-0.80)	-0.85 (-0.7)	0.03 (1.9)	0.03 (1.9)	0.26 (0.75)	0.28 (0.8)
FDY(-1)	-0.31 (-2.35)	-0.29 (-2.1)	0.042 (2.34)	0.04 (2.1)	0.18 (1.72)	0.19 (1.67)
TOT(-1)	-0.23 (-1.74)	-0.15 (-1.6)	0.01 (1.7)	0.01 (1.46)	0.66 (0.8)	0.63 (0.90)
RER(-1)	-0.21 (-0.61)	-0.02 (-0.5)	-0.02 (-2.0)	-0.02 (-2.1)	-0.04 (-0.3)	-0.04 (-0.2)
LAMDA	-0.01 (-2.57)	-0.02 (-2.6)	-0.04 (-1.4)	-0.04 (-1.4)	-0.29 (-0.1)	-0.29 (-0.1)
LIMFCR	*0.39 (1.64)**	------	*-0.05 (-1.0)*	------	*0.30 (0.9)*	-----
'' (-1)	*0.19 (2.3)***	*0.26 (2.4)***	*-0.14(-1.6)**	*-0.18(-1.6)**	*0.57(1.69)**	*0.60(1.79)**
I1	-7.2 (-2.9)	-1.7 (-2.2)	0.26 (4.1)	0.21 (5.5)	-6.74 (-2.9)	-4.39 (-1.5)
I2	-1.5 (-4.5)	-5.8 (-4.2)	0.29 (5.0)	0.25 (5.5)	-5.8 (-1.9)	-3.3 (-0.9)
I3	-6.3 (-2.6)	-0.9 (-1.1)	0.3 (4.7)	0.26 (4.8)	-6.1 (-2.7)	-2.8 (-1.4)
I4	-7.2 (-3.1)	-2.17 (-2.4)	0.22 (3.7)	0.18 (3.5)	-6.5 (-2.6)	-4.3 (-1.4)
I5	-5.7 (-2.6)	-0.54 (-0.6)	0.19 (3.32)	0.15 (3.3)	-6.4 (-2.7)	-4.21 (-1.3)
I6	-7.4 (-1.6)	-2.4 (-2.5)	0.24 (3.7)	0.20 (3.3)	-5.8 (-2.8)	-3.69 (-1.5)
I7	-6.8 (-3.1)	-2.07 (-2.1)	0.17 (3.0)	0.14 (2.8)	-4.5 (-1.8)	-2.26 (-0.8)
R^2	0.36	0.34	0.88	0.98	0.22	0.21
AR(1)	-1.1 (0.26)	-1.05 (0.29)	1.54 (0.14)	1.55 (0.1)	-1.12 (0.24)	-1.68 (0.59)
AR(2)	-0.7 (0.52)	-0.69 (0.49)	1.63 (0.13)	1.6 (0.14)	-1.53 (0.13)	-1.54 (0.15)
Wald (Joint)	588.7 (0.0)	135.5 (0.0)	419.1 (0.0)	347.8 (0.0)	433.06 (0.0)	419.44 (0.0)

traditional Marshall-Lerner condition may not hold for developing countries[49]. However, it is argued that the appropriate form of the Marshall-Lerner condition in the case of developing countries is that the sum of the two elasticities should at least be greater than zero. If this condition is met, then real exchange rate adjustment could result in a favourable effect on the current account. Clearly, the results suggest that this is not the case.

[49] See discussions in chapter 2

The inflation equation also shows that the significant variables are - lagged inflation, growth, fiscal deficit, domestic credit, terms of trade and the real exchange rate. Again, the signs are as expected. The lagged inflation confirms the role of inertia that arises from a sluggish adjustment of inflationary expectations or the existence of staggered wage contracts [Prakash and Phillips, 2000.p.3].

The results for the fiscal deficit and domestic credit are as expected. Increases in the fiscal deficit leads to higher rates of inflation, working through higher money growth or else through a payments crisis and nominal exchange rate depreciation.

The significant variables in the growth equation are - lagged growth, inflation, and fiscal deficit. These are in line with the findings in Khan [1990]. The negative effect of lagged growth suggests persistence effects while the negative effect of inflation confirms the uncertainty view [Barro, 1980].

The uncertainty view says that inflation creates uncertainty that affects the ability of economic agents to extract information from relative prices, thus leading to inefficient resource allocation and hence lower growth.

Indeed recent studies on developing countries such as Ghura [1995], Savvides [1995] and Ojo and Oshikoya [1995] all find that the rate of inflation has a negative effect on growth.

The effect of the fiscal deficit reinforces the negative uncertainty effect of inflation. According to Schmidt-Hebbel [1994], fiscal adjustment could affect growth through either the resource flow channel or through improved financial intermediation and a stable macroeconomic environment. In the resource flow channel, a reduction in fiscal deficits by a combination of lower public investment and higher public savings will raise capital formation and growth[50].

On the other hand, lower fiscal deficits might reduce the crowding-out effect, thereby leading to improved financial intermediation and a more stable macroeconomic environment. These therefore lead to improved resource allocation and hence higher growth.

The fixed effects [LSDV] estimation sought to eliminate potential biases due to possibly correlated individual effects. However, there remain potential biases due to the effect of the dynamic nature of [3.15]. This means that the estimates from the LSDV estimation might not be consistent.

[50] This however requires that the reduction in public investment is lower than the indirect contribution of higher public savings to private investment.

In the next section, we tried to control for these biases by the use of a dynamic panel estimator proposed by Anderson and Hsiao [1982].

3.4.5 Instrumental Variable Estimator for Dynamic Panel Data

The nature of the generalised evaluation estimator in [3.15] is dynamic due to the inclusion of the lagged dependent variable as an explanatory variable. The potential effect of this is that the assumption of strict exogeneity of the regressors no longer holds [see Hsiao, 2003 p.70] and as such, the ordinary least squares estimator or the other static fixed/random effects estimators, that have been widely used in the empirical literature, can be shown to be inconsistent and inefficient.

Hence, in such a case, it is better to use any of the panel dynamic estimators - Maximum likelihood estimator; Generalised Least squares estimator; IV estimator [Anderson and Hsiao, 1982]; or GMM estimator [Arellano and Bond, 1991][51]. In view of the dimension of our panel [i.e. small N and relatively large T], we chose the Anderson-Hsiao Instrumental Variable [see appendix III] estimator[52] and re-estimated [3.15]. The estimator is illustrated below:

[51] See Appendix II

[52] This estimator is consistent either as T tends to infinity or as N tends to infinity, or both, and it is independent of initial conditions.

Assume the GE estimator is re-written in the form[53]:

$$y_{it} = \gamma y_{i,t-1} + \beta' x_{it} + v_{it}, \qquad i = 1, \ldots, N$$

$$t = 1, \ldots, T$$

where $|\gamma| < 1, v_{it} = \alpha_i + u_{it}$,

Taking first differences of the above,

$$y_{it} - y_{i,t-1} = \gamma(y_{i,t-1} - y_{i,t-2}) + \beta'(x_{it} - x_{i,t-1}) + u_{it} - u_{i,t-1},$$

for $t = 2, \ldots, T$.

Clearly, $y_{i,t-2}$ or $(y_{i,t-2} - y_{i,t-3})$ are correlated with $(y_{i,t-1} - y_{i,t-2})$ but are not correlated with $(u_{it} - u_{i,t-1})$. Hence any of them can be used as an instrument for $(y_{i,t-1} - y_{i,t-2})$ and then estimate consistently γ and β by the instrumental variable method. Hence, both:

$$\begin{pmatrix} \gamma_{iv} \\ \beta_{iv} \end{pmatrix} = \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} (y_{i,t-1} - y_{i,t-2})(y_{i,t-2} - y_{i,t-3}) & (y_{i,t-2} - y_{i,t-3})(x_{it} - x_{i,t-1})' \\ (x_{it} - x_{i,t-1})(y_{i,t-2} - y_{i,t-3}) & (x_{it} - x_{i,t-1})(x_{it} - x_{i,t-1})' \end{pmatrix} \right]^{-1}$$

$$\times \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} y_{i,t-2} - y_{i,t-3} \\ x_{it} - x_{i,t-1} \end{pmatrix} (y_{it} - y_{i,t-1}) \right]$$

and

[53] The time-invariant program dummy is replaced by a time-variant instrument, "use of IMF resources"

$$\begin{pmatrix}\gamma_{iv}\\ \beta_{iv}\end{pmatrix}=\left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}y_{i,t-2}(y_{i,t-1}-y_{i,t-2}) & y_{i,t-2}(x_{i,t}-x_{i,t-1})'\\ (x_{i,t}-x_{i,t-1})y_{i,t-2} & (x_{i,t}-x_{i,t-1})(x_{i,t}-x_{i,t-1})'\end{pmatrix}\right]^{-1}$$
$$\times\left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}y_{i,t-2}\\ x_{it}-x_{i,t-1}\end{pmatrix}(y_{i,t}-y_{i,t-1})\right]$$

will yield identical estimates that are consistent. Anderson-Hsaio considers the additional case where the model includes a time-invariant variable such as sex, religion, etc. That case calls for an additional step where the estimated γ and β are substituted in the expression below: Let the time invariant variable be represented by Z. Then, substitute the estimated β and γ into the equation:

$$\bar{y}_i-\gamma\bar{y}_{i,-1}-\beta'\bar{x}_i=\rho'z_i+\alpha_i+\bar{u}_i,\quad i = 1,\ldots..,N$$

The coefficient of ρ is obtained by OLS. But in this paper, we use a time-variant instrument rather than the program dummy. Hence the final step is no longer necessary.

Table (3.5) presents the estimates from the A-H estimator. Clearly, it turns out that the rate of inflation rather shows an improvement both in a program year as well as a year after. In the LSDV results, it was the current account. Hence the change is attributable to the elimination of endogeneity bias from the inclusion of the lagged dependent

variable. However, the effect of the lagged program variable remains significant as was found in the LSDV estimates.

There were also changes in the coefficients of some of the explanatory variables. In the current account equation, the rate of inflation and fiscal deficit are no longer significant, while the real exchange rate is now significant. This suggests that real exchange alignment has a favourable effect on the current account, apparently supporting the Marshall Lerner condition for developing countries. Also in the inflation equation, the growth rate is no longer significant, while the real exchange rate is now significant.

The changes are even more pronounced in the growth equation. The current account balance, terms of trade, and the real exchange rate are now significant. The significant effect of the real exchange rate confirms the view of the Fund that exchange rate policies that bring about a shift in relative prices in favour of the production of tradable goods will have a positive effect on growth [Bleaney and Greenaway, 2000 p.497]. The fiscal deficit is however no longer a significant determinant of the growth rate.

TABLE 3.5: ANDERSON-HSIAO INSTRUMENTAL VARIABLE ESTIMATOR						
	Current Account		Inflation		Growth	
Infla (-1)	0.09 (0.91)	0.094 (1.0)	0.81 (5.5)	0.89 (5.9)	0.025(1.54)	0.022(1.4)
Grwth(-1)	-0.28 (-1.9)	-0.27 (-1.9)	-0.08 (-0.5)	-0.18(-0.49)	-0.463(-1.7)	-0.39(-1.98)
CAY(-1)	-0.12 (-3.7)	-0.13 (-4.7)	-0.09 (-0.5)	-0.076(0.5)	-0.56(-3.30)	-0.571(-3.4)
PCDC(-1)	-0.03 (-0.5)	-0.05(-0.07)	0.31 (1.88)	0.233(1.69)	-0.17(-0.24)	-0.10(-0.13)
FDY(-1)	0.07 (0.4)	0.07 (0.42)	0.29 (3.17)	0.278(2.7)	0.198(0.60)	0.195(0.54)
TOT(-1)	-0.42 (-1.6)	-0.37(-1.6)	0.16 (0.73)	0.47(0.55)	0.161(2.29)	0.011(1.95)
RER(-1)	-0.01 (-1.7)	-0.09(-1.6)	0.16 (1.76)	0.166(1.7)	0.055(3.08)	0.05(5.13)
LAMDA	-0.03 (-3.0)	-0.03 (-2.9)	-0.25 (-1.7)	-0.242(-1.6)	0.023(1.09)	0.026(1.17)
LIMFCR	*0.18 (1.34)*	------	*-0.64(-1.67)*	------	*0.333(0.54)*	-------
'' (-1)	*0.31 (1.65)*	*0.52 (3.49)*	*-0.66(-1.74)*	*-0.44(-1.68)*	*0.289(4.6)*	*0.248(3.01)*
AR(1)	-1.25 (0.2)	-1.2 (0.23)	-0.47 (0.63)	-0.473(0.63)	-1.41(0.16)	-1.343(0.17)
AR(2)	-0.89 (0.3)	-0.75 (0.45)	-1.14(0.172)	-0.283(0.80)	-0.55(0.58)	-0.783(0.43)
Wald (Joint)	606.3**	926.3**	545**	332**	437**	461**

*t-statistics are in brackets. ** refers to strong rejection of the null of joint insignificance.*

3.5 Summary and Conclusion

This study provides evidence on the impact of Fund-supported stabilisation programs in a panel of seven non-oil exporting [and non-CFA] Sub-Saharan African countries over the period 1980-2000. This period has seen a sustained use of the Fund stabilisation facilities by the panel of countries. The paper makes use of the generalised evaluation estimator [proposed in Goldstein [1986] and Khan [1990]] and we adjusted the estimator for selection bias [Heckman, 1976]. A fixed effects [LSDV] regression of the above suggests that the current account, inflation, and growth improve significantly a year after the implementation of a Fund program. The current account balance even improves in the same year.

In a bid to address possible endogeneity bias due to the presence of the lagged dependent variable in the GE

estimator, the Anderson-Hsiao Instrumental Variable estimator was also estimated using the same data. The results largely confirm the earlier findings in the fixed effects [LSDV] estimation, that all three variables improve significantly a year after the implementation of a program. However, the inflation rate rather than the current account, improves in the same year that a Fund program is implemented.

Clearly, there was still the possibility of biases due to correlation among the explanatory variables in the GE estimator. We explored the presence of any such effects by estimating several versions of the model, deleting some variables. It is however apparent that the use of alternative dynamic panel estimators such as the GMM-differences, and GMM-systems proposed by Arellano and Bond [1991], Arellano and Bover [1995] and Blundell and Bond [1998] would yield important consistency gains. The dimension of our panel in this study makes it difficult for us to explore the latter estimators.

In sum, the results of our study differ a bit from the findings in studies such as Khan [1990] and Bordo and Schwartz [2000]. Whereas we found that the current account, inflation and growth, all show significant effects a year

after the implementation of a Fund program, those studies reported that the rate of inflation and the current account balance do not have significant effects from the implementation of Fund stabilisation programs.

Of course, the difference in results could be explained by the difference in samples, study period, controlling for correlated country-specific effects, and also endogeneity bias. The policy instruments - fiscal deficit, domestic credit, and the real exchange rate largely have the theoretical effects on the target variables.

Thus, the finding in our paper implies that the IMF's stabilisation policies appear to bite with a lag - after the first year of implementation. However, the issue of sustaining the macroeconomic gains remains. Such issues are taken up in subsequent chapters when we explored the determinants of long run growth in Sub-Saharan Africa.

APPENDIX 3A

If Y has density $f(y)$, the distribution of Y truncated from below at a point c (i.e. $Y \geq c$) is given by:

$$f(y/Y \geq c) = \left[\frac{f(y)}{P(Y \geq c)} \right],$$

If Y is standard normal, then the truncated distribution has mean $E(Y/Y \geq c) = \lambda_1(c)$, where $\lambda_1(c) = \left[\frac{-\phi(c)}{1-\Phi(c)}\right]$, and variance $V(Y/Y \geq c) = 1 - \lambda_1(c)\{\lambda_1(c) - c\}$.

If however, Y is truncated from above [i.e. Y≤c], then the truncated distribution has mean $E(Y/Y \leq c) = \lambda_2(c)$, where $\lambda_2(c) = \left[\frac{\phi(c)}{\Phi(c)}\right]$.

If Y is not standard normal, but is normal with mean μ and variance σ^2, then the truncated distribution $Y \geq c$ has mean $E(Y/Y \geq c) = \mu + \sigma\lambda_1(c^*) \geq \mu$ where $c^* = \frac{c-\mu}{\sigma}$. Similarly $Y \leq c$ has mean $E(Y/Y \leq c) = \mu + \sigma\lambda_2(c^*) \leq \mu$.

Finally, it can be shown that if (Y,X) have a bivariate normal distribution (see Marno Verbeek p.366),

$E(Y/X \geq c) = \mu_y + (\sigma_{yx}/\sigma_x^2)[E(X/X \geq c) - \mu_x$

$= \mu_y + (\sigma_{yx}/\sigma_x)\lambda_1(c^*)$, and

$E(Y/X \leq c) = \mu_y + (\sigma_{yx}/\sigma_x^2)[E(X/X \leq c) - \mu_x$

$= \mu_y + (\sigma_{yx}/\sigma_x)\lambda_2(c^*)$

Hence [see Haque and Khan, 1998]

$$E(Y_i / d_i = 1) = Z'\Theta + \beta^{IMF} + E(\xi / d_i = 1)$$
$$= Z'\Theta + \beta^{IMF} + \rho\sigma_\xi \left[\frac{\phi(\omega'\varphi)}{\Phi(\omega'\varphi)} \right]$$

Also,

$$E(Y_{ij} / d_i = 0) = Z'\Theta + \rho\sigma_\xi \left[\frac{-\phi(\omega'\varphi)}{1-\Phi(\omega'\varphi)} \right]$$

Such that,

$E(Y_{ij} / d_i = 1) - E(Y_{ij} / d_i = 0) = \beta_j^{IMF} + \rho\sigma_\xi \left[\frac{\phi(\omega'\varphi)}{1-\Phi(\omega'\varphi)} \right]$, which gives an indication of the inherent bias. {nb: $\rho = \frac{Cov(X,Y)}{VarX.VarY} = \frac{\rho_{xy}}{\rho_x.\rho_y}$}

Appendix 3B

Given that $y_{i,t} - y_{i,t-1} = \beta(y_{i,t-1} - y_{i,t-2}) + (e_{i,t} - e_{i,t-1})$, the vector of transformed error terms is therefore: $\Delta\varepsilon_i = \begin{bmatrix} \varepsilon_{i,2} - \varepsilon_{i,1} \\ ..... \\ \varepsilon_{i,T} - \varepsilon_{i,T-1} \end{bmatrix}$.

The associated matrix of instruments is:

$$Z_i = \begin{bmatrix} y_{i0} & 0 & \cdots & 0 \\ 0 & [y_{i0}, y_{i1}] & & 0 \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & [y_{i0}, y_{i1}, \ldots, y_{i,T-2}] \end{bmatrix}$$

Hence the set of all moment conditions can be written concisely as $E\left[Z_i' \Delta\varepsilon_i \right] = 0$. [Note that these are *1+2+3+4+…..+ (T-1)* moment conditions]. To derive the GMM estimator, rewrite the set of moment conditions as:

$E\{Z_i'(\Delta y_i - \beta\Delta y_{i,-1})] = 0$.

Since the number of moment conditions will typically exceed the number of unknown coefficients, β can be estimated by minimizing a quadratic expression in terms of the corresponding sample moments:

$$\min\left[\frac{1}{N}\sum_{i=1}^{N}Z_i'(\Delta y_i-\beta\Delta y_{i,-1})\right]'W_N\left[\frac{1}{N}\sum_{i=1}^{N}Z_i'(\Delta y_i-\beta\Delta y_{i,-1})\right],$$ where W_N is a symmetric

positive definite weighting matrix. Differentiating the above expression and solving for β gives the GMM estimator:

$$\hat{\beta}_{GMM}=\left(\left(\sum_{i=1}^{N}\Delta y_{i,-1}'Z_i\right)W_N\left(\sum_{i=1}^{N}Z_i'\Delta y_{i,-1}\right)\right)^{-1}\times\left(\sum_{i=1}^{N}\Delta y_{i,-1}'Z_i\right)W_N\left(\sum_{i=1}^{N}Z_i'\Delta y_i\right)$$

Clearly, a decision has to be made about the choice of weighting matrix. This would result in either one-step estimation or two-step estimation [see Verbeek, 2000p.331]. In general however, the optimal weighting matrix is determined as:

$$W_N^{opt}=\left(\frac{1}{N}\sum_{i=1}^{N}Z_i'GZ_i\right)^{-1},\ \text{where}\ G=\begin{pmatrix}2&-1&0&\cdots\\-1&2&\ddots&0\\0&\ddots&\ddots&-1\\\vdots&0&-1&2\end{pmatrix}$$

The case of dynamic models with other exogenous explanatory variables is just a straightforward extension of the above. In that case, different sets of additional instruments are constructed and included in the instrument matrix.

APPENDIX 3C

Table 3.6: Program years for each country (1974-2000)

	GHANA	ZAMBIA	UGANDA	ZIMBABWE	KENYA	MALAWI	ETHIOPIA
1974	*						
1975					*		
1976		*					
1977							
1978		*					
1979	*	*			*	*	
1980					*	*	
1981		*	*			*	*
1982			*		*	*	
1983	*	*	*	*	*	*	
1984	*	*			*	*	
1985	*				*	*	
1986	*	*					
1987	*						
1988					*	*	
1989	*		*				
1990	*		*				
1991	*		*				
1992	*		*	*			*
1993			*	*	*		*
1994			*	*	*	*	*
1995	*	*	*	*		*	*
1996	*	*	*		*	*	*
1997	*	*	*		*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	

APPENDIX 3D

IMF Lending Facilities

According to Section (v) of the Fund's Articles of Agreement (Article 1)[54], one of its objectives is "*…to give confidence to members by making the Fund's resources temporarily available to them under adequate safeguards, thus providing them with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity*". In effect, this provision allows the IMF to provide financial assistance to member countries who are experiencing payment difficulties, under a variety of policies and facilities. We review below, the range of such lending facilities available

a) Credit Tranche Drawings and Stand-By Arrangements [SBA]

The credit tranche policy of the Fund is also referred to as "regular" or "basic" lending policy. Comprising four separate tranches, each tranche is the

[54] See IMF Factsheets and Publications for a history, objectives, and organisation of the IMF.

equivalent of 25 percent of the member's quota. The second through to the fourth tranche are collectively referred to as "Upper Credit Tranche Drawings". Typically, a credit tranche purchase may be made outright, or under a stand-by arrangement to support a short-term program of stabilisation (usually one or two years). Under a stand-by arrangement, a member only makes use of the facility when the need arises and subject to the observance of some specified performance criteria, and/or other terms under the arrangement. Therefore there may be no initial purchases and it could still happen that no purchases would be made at all over the period. It is only a contingency facility to support the implementation of a set of agreed programs by the member, and approved by the Fund.

Normally, credit tranche drawings are repayable in eight quarterly instalments, starting after three-and-a-half years and ending within five years from the date of drawing. The member could still make early repurchases or repayment if its balance of payments and reserves situation improves markedly.

b) Extended Fund Facility [EFF]

The EFF was created in 1974 in response to the need to provide financial support to members over a longer period, normally 3 years or more, and meant for use in correcting structural weaknesses causing balance of payments problems. Hence whereas stand-by arrangements support short-term demand management programs and seek to promote a more appropriate pattern of demand between traded and non-traded goods/services, the EFF is targeted at structural measures to improve the way economies function[55]. Nevertheless, the standard of conditionality for the EFF is the same as for the stand-by arrangements, only it is much more difficult in making a case for EFF need, and the obligations for its use are more stringent. The amount that can be borrowed is normally up to 100 percent of the member's quota annually and 300 percent cumulatively. Of course, higher amounts could still be approved in exceptional cases. The interest rate charged is equivalent to the General Resource Account (GRA) rate of charge, which is set as a proportion of the weekly SDR interest rate and is applied to the daily balance of all outstanding GRA drawings, during each IMF financial quarter. In addition, there is a surcharge. This applies to both SBA and EFF and it is pegged at 100 basis points above the basic rate of charge, where credit exceeds 200 percent of a member's quota. If otherwise the credit amount exceeds 300 percent of the member's quota, then the surcharge is 200 basis points above the basic rate of charge.

Repurchases must be made in 12 equal semi-annual instalments starting four-and-a-half years and finishing in ten years after the purchase.

c) Compensatory Financing Facility [CFF]

In recognition of the particularly high vulnerability of LDC exports of primary products, this facility was created in 1963 to provide financial assistance to members who were experiencing BOP difficulties due to export shortfalls that are temporary and largely due to factors beyond the member's control. Such factors include; cyclical changes in external demand and also natural factors such as, drought, flood or bushfires. The CFF initially covered only shortfalls in earnings from merchandise exports, but in 1979 it was extended to include shortfalls in receipts from travel and workers' remittances. Yet again in 1981, at the insistence of the FAO and World Food Council, the scope of the facility was further extended to support members who face payment difficulties as a result of cereal crop failure, or suffer due to a sharp increase in the cost of cereal imports.

The CFF is usually approved as part of another program supported by SBA, EFF, or PRGF and purchases have the same repurchase obligations and expectations. Although it has access limits[56], yet it is not considered

[55] This includes tax and financial sector reforms, privatization of public entreprises, and steps to enhance the flexibility of labor markets.

[56] It has cumulative limits of 45 percent of quota for each case (export shortfall or cereal crop failure) but 55 percent joint limit for both.

in computing access limits under SBA and EFF, and does not attract surcharges.

(d) Supplemental Reserve Facility [SRF]

This is another special facility for members who are experiencing a sharp fall in international reserves due to a sudden loss of market confidence and hence capital flight. It has a variable surcharge, ranging between 300 and a maximum of 500 basis points above the basic rate of charge. The surcharge increases by 50 basis points every six months after the first year of drawing, and the member is expected to repay after 18 months or obliged to repay not later than 30 months.

e) emergency Assistance

This is also an arrangement whereby the Fund assists a member with balance of payments financing needs following natural disasters or post-conflict situations. In general, the limit of access is 25 percent of a member's quota, but can be higher depending on the circumstances. Again, the emergency assistance does not affect the limits on access for SBA and EFF. Also, there is no surcharge on purchases (only GRA) rate of charge is applied), and repurchase must be made between 3-5 years from the date of purchase[57].

f) Structural Adjustment Facility [SAF], Enhanced Structural Adjustment Facility[ESAF] /Poverty Reduction and Growth Facility[PRGF]

Administered outside the General Resources Account, these concessional Fund lending facilities were established to assist low-income member countries with economic reform programs, so as to strengthen their balance of payments, reduce poverty levels and stimulate sustainable growth. It therefore falls outside the class of GRA facilities, and repayment is expected between 5-10 years.

[57] It is to be noted however that, except for reserve tranche drawings, all other facilities from the General Resources Account attract a one-time service charge as well as an upfront commitment fee (25 basis points for amounts up to 100 percent of quota and 10 basis points for higher amounts). This fee is however refunded in subsequent periodic drawings under the arrangement.

CHAPTER 4

Nominal Shocks, Current Account and Real Effects in Small Open Developing Economies

4.0 Introduction

This chapter addresses the following questions in the context of small open developing economies; [i] how important are nominal shocks? [ii] Can nominal shocks have persistent real effects, working through the current account? [iii] What are the implications for policy?

As already outlined in Chapter 1, whereas theoretical advancements are being made in exploring the dynamics of the current account in developed countries, the same cannot be said about the case for developing countries[58]. For example, the intertemporal approach that has been used for more than two decades to explain current account dynamics is clearly more appropriate for developed economies where there is a greater degree of capital mobility (Feldstein and Horioka, 1980). Such that forward-looking behaviour of economic agents (e.g. consumption smoothing) can be modelled.

[58] Indeed as discussed in Chapter 2.2, the New Structuralists perspective on the current account in developing countries is clear. To them, nominal shocks such as devaluation will at best lead to stagflation. However, we want to use the general equilibrium framework based on microeconomic structures to revisit the issue, since there is no conclusive evidence on the suitability of the New Structuralists' position either.

This model was thus based on the assumption of capital mobility and consumption-smoothing behaviour to view the current account as a buffer to smooth consumption in the face of shocks to output, investment, and government expenditure. Impliedly, the current account balance would be the outcome of forward-looking dynamic saving and investment decisions, based on expectations about future productivity growth, government spending demands, real interest rates, etc.

Thus even though Ghosh and Ostry (1995) argued that the intertemporal approach was equally applicable to developing countries, yet the apparent financial autarky that characterises developing countries, means that it is unlikely that consumption-smoothing behaviour could adequately explain current account dynamics in a developing country context.

Meanwhile, in the developed country context, Glick and Rogoff (1995) had presented further perspectives on the behaviour of the current account, by exploring the implied theoretical relationship between the current account and investment. The theoretical prediction of a negative correlation between investment and current account was

observed empirically for a set of industrialised countries. But a puzzle that was observed was why on average a rise in investment tended to increase the current account deficit by only a third as much. Glick and Rogoff therefore developed an empirical model of the current account and used the distinction between global and country-specific shocks to explain the observed relationship, for industrialised countries over the post-war period. This has also spurred further empirical work as various studies attempt to explain the puzzle.

In a recent paper by Ventura (2003), the author sought to improve the empirical application of the inter-temporal approach. The author introduced two additional features to the basic model; investment risk and adjustment costs to investment, and they found that these extensions generated new and unexpected theoretical predictions that were supported by the data.

These demonstrate the depth of theoretical and empirical effort in explaining current account dynamics particularly in the industrialised countries, whereas very little has been presented in the case of developing countries.

Nevertheless, recent developments in the macroeconomics literature, particularly the New Keynesian approach and also the New Open Economy Macroeconomics [NOEM] theory[59] pioneered by the work of Obstfeld and Rogoff [1995], might be relevant for studying some of these phenomena in the context of developing economies (imperfect markets, sticky prices, etc). In particular the effect of nominal innovations in the real economy has attracted renewed interest under the NOEM approach.

For example, real business cycle theory argues that prices and wages are completely flexible even in the short run, such that nominal variables such as the money supply and the price level do not influence real variables such as output and employment at all.

On the contrary, the New Keynesian and the NOEM theory refer to market imperfections that make wages and prices sticky. Among the factors cited as responsible for sticky prices are - menu costs, pricing to market behaviour, coordination failures, etc. In that context, to the extent that the rigidities exist, then shocks to aggregate demand will influence output at least in the short run.

[59] This new literature uses microfoundations that the traditional Mundell-Flemming framework lacked.

Clearly, the New Classicals and the New Keynesians have different views about the propagation of shocks and hence stabilisation policy in general[60]. Whereas the former advocates non-activism [policy rules], the latter calls for policy activism [discretionary stabilisation policy] in order to control built-in instabilities in the economy that are brought on by changes in the attitudes and expectations of economic agents.

The subject of nominal innovations and real effects has therefore attracted a lot of interest both in the theoretical and empirical literature, especially in recent times. However, almost all the effort is directed at modelling developed economies such as the G7 and OECD countries. Of course, the implication if any, of price stickiness in developing countries remains unclear. Much as the cited factors behind price stickiness in developed economies does not appear to be significant in the context of typical developing economies, yet the distorted nature of these economies and their markets leads one to expect some price stickiness and its implications.

[60] Indeed, the New Structuralist School (Chapter 2.2) also have a totally different view of how developing economies in particular work, and hence stabilisation policy. For example, according to the New Structuralists, contractionary demand-side policies in a bid to stabilise the economy, only lead to falling output, employment and real income, instead of the often cited decline in the rate of inflation etc. Besides, they argue that exchange rate devaluation could rather be stagflationary due to its contractionary impact on aggregate demand together with the effect of import price hikes on inflation.

From the perspective of policy, the importance of exploring the real effects of nominal innovations becomes paramount. Such evidence could contribute to the policy debate about the apparent recidivism of economic stabilisation programs, against the background of increasing volatility in growth rates across regions such as Sub-Saharan Africa.

The other issue is that if unanticipated monetary policy actions could have persistent real effects, then that might give room for Central Banks to exercise some margin of flexibility as regards the medium-term monetary stance in order to respond to other macroeconomic disturbances provided this does not jeopardize the primary goal of price stability. For example, there is considerable debate [Stiglitz, 2002] about the effects of IMF-sponsored economic stabilisation policies [see Mussa and Savastano, 1999 pp.23-27].

Part of the criticism is that the programs focus excessively on demand management through the use of rigid quantitative performance criteria [fiscal and monetary targets that are often achieved by relatively high interest rates], which have been applied for well over twenty years now. Consequently, such critics attribute the low and stagnant

growth in much of the developing world [particularly in Sub-Saharan Africa] to factors such as tight monetary policy, high interest rates, excessive exchange rate depreciation, etc. As Stiglitz [2002] puts it,

"...the IMF's insistence on developing countries maintaining tight monetary policies has led to interest rates that would make job creation impossible even in the best of circumstances...Liberalisation has thus, too often, not been followed by the promised growth, but by increased misery" [p.17].

But in all the above, one asks: What else can monetary policy do?

In a recent paper by Lane [1999, 2001], which is an extension of the sticky-price utility maximizing dynamic general equilibrium model by Obstfeld and Rogoff [1995], the author showed that nominal shocks could affect the current account and real exchange rates in the long run. Thus unanticipated monetary policy actions could have persistent real effects. However, this depended on the assumption of imperfect competition and rigid prices.

Lane tested this new model on post-war US data and found that monetary shocks were significant in driving the US current account. Fisher and Huh [2002] also tested the same view and found that nominal shocks have a significant long

run effect on the trade balance and real exchange rate of the G7 countries over the post-Bretton Woods period. Subsequently, Billmeier [2002] also investigated the theoretical model presented by Lane, using G-7 and OECD data and found support for the view that nominal shocks drive the current account in these countries.

Thus, this area has begun to spur empirical research lately. However, since the model dwells implicitly on price stickiness and imperfect competition in the goods and factor markets, it is unclear what the case of typical developing countries will present, since price stickiness and its implications in such economies remain unexplored theoretically. Hence, whether nominal shocks drive the current account in less developed economies is an empirical issue.

This is what motivates this chapter, and we complement the empirical effort by providing evidence in the context of typical small open developing economies in Sub-Saharan Africa. We use structural vector autoregression techniques as the methodology in this chapter. The chapter is presented in six sections.

The next section reviews the theory about the real effects of money. Section 4.2 discusses some empirical results in the existing literature. Section 4.3 presents the empirical methodology, and Section 4.4 covers the empirical results. Finally, section 4.5 discusses the results and policy implications, and then concludes.

4.1 Theory

The controversy about the role of monetary factors in the real economy dates back to the Classicalist era and the subsequent Keynesian revolution. Whereas Classical theory recognised that money could have real effects in the short run [David Hume, 1752], the subsequent early Keynesians downplayed the role of money [Obstfeld, 2001].

Later contributions especially by Meade [1951] revived the thinking on the role of monetary factors by embedding the Keynesian developments within a much broader framework that also embraced monetary factors. Subsequent empirical articles by Robert Mundell and J.M Flemming re-introduced the idea of a self-regulating adjustment mechanism that had been central to the Classical framework[61]. Thus, monetary

[61] According to the long-held open economy version of the IS/LM framework, an anticipated positive monetary shock in the domestic economy initially shifts the LM curve out, output increases and interest rates fall. But the higher output and income leads to higher imports, which worsens the current account. If capital is highly mobile, then outflows of capital will depreciate the domestic currency to clear the foreign

factors and the role of international capital flows re-occupied centre stage.

From the late 1960s, Mundell was intrumental [together with the Chicago school] in reactivating the earlier monetary approach to the balance of payments [MABP] theory[62] [Obstfeld, 2001].

At the same time, models incorporating a wider spectrum of assets were being developed [Foley and Sidrauski, 1971][63]. In particular, the portfolio balance approach emerged to complement the monetary approach to the balance of payments. Thus these two approaches were to herald the époque of descriptive models of the long run adjustment of monetary flows, current accounts, goods prices, and, somewhat later, of floating exchange rates [Obstfeld and Stockman, 1985].

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exchange market. This depreciation will bring about expenditure switching effects towards home goods as these are rendered cheaper than imports, and hence the IS curve also shifts – thus boosting the initial increase in output and incomes even further.

[62] In an open economy, the MABP theory has important implications for macroeconomic policy. For example, under the most basic set of assumptions, if there are fixed (or pre-announced) exchange rates, the nominal quantity of money becomes an endogenous variable and monetary policy has no effect on inflation, or on the rest of the economy even in the short run. All the monetary authorities can hope to do is affect the composition of high powered money; changes in domestic credit results in instantaneous and opposite changes in the stock of international reserves, with total nominal money being unaffected. However, the MABP implies that only tradable goods exist [i.e. PPP and the law of one price held permanently].

[63] Sidrauski [1967] also introduced the monetary growth theory, however the long run neutrality of money was maintained.

From then on, the rational expectations[64] assumption began to feature in the Mundell-Flemming framework. As earlier mentioned the Mundell-Flemming stance was that a change in the path of home money supply raises domestic price level and forces a depreciation of the home currency through the purchasing power parity mechanism.

Dornbusch [1976] extended the Mundell-Flemming framework by dwelling on a perfect foresight model with sticky nominal output prices to explain his overshooting result. However, the conclusions about the real effects of monetary factors remained largely the same - monetary factors have real effects but only in the short run, due to rigid prices. In the long run however, monetary factors impact on prices.

In the 1970s, there were efforts to apply optimal growth theory to open economies [for example, Hamada [1969]]. This culminated in the development of the intertemporal approach to the current account in the early 1980s. This approach implied that saving and investment levels represent optimal forward-looking decisions. However, the approach focussed more on short run dynamic issues - such as the dynamic

[64] Indeed, several equilibrium rational expectations proponents assign a potent role for monetary policy shocks. For example Reuven Glick et al [1995], Glick and Wihlborg [1990], Glick et al [1995], and also earlier views by Barro [1976], Barro [1978], Kimbrough [1984], King [1982], Mishkin [1982], Weiss [1980]. The view is that incomplete information enables nominal shocks to have real effects, which vary across exchange rate regimes. However, such real effects of monetary disturbances decrease in magnitude as the variance of the monetary shock increases [Glick et al, 1995].

effects of temporary and permanent shocks, and about external sustainability. Thus, the intertemporal approach lacked an explicit view on the role of monetary factors and the adjustment mechanism that was the focus of earlier approaches.

The emergence of the New Classicalist [NC] theory in the 1970s and New Keynesian [NK] theory thereafter, renewed the debate about the role of stabilisation policy in general. The NC theory assumes that markets clear, and the expectations of individuals and firms conform to rational expectations. Thus, high rates of unemployment are not evidence of a gap between actual ouput and potential output that can be reduced through stabilisation policy. Rather, they argue that such a situation occurred as the result of output fluctuations due to random errors.

Hence, since wages were flexible, any excess unemployment that exists is essentially voluntary. The NC school therefore implies that neither fiscal policy nor monetary policy can be used to stabilise the economy, since the expectation of individuals and firms will be influenced by these very policies. Any systematic fiscal and monetary policies will prove ineffective due to time inconsistency

and credibility problems inherent in the formulation of economic policy.

Unanticipated monetary or fiscal policy could affect real variables but as all other economic agents catch up with the policymakers[65]; this also would lose its potency. Thus, the NC school advocates rigid policy rules that would address the credibility problem, instead of an active stabilisation policy.

The NK School on the contrary, believes that prices do not adjust instantaneously to clear markets. If there occurred a sudden shift in demand or supply, then prices will not adjust quickly enough to clear markets. Hence the economy can remain in a state of disequilibrium for years.

The NK School does not see the issue about policy credibility as important. Rather, since wages and prices tend to be sticky and inflexible, real output can be affected by unanticipated changes in fiscal and monetary policy, as well as the systematic component of these variables [Gordon, 1990]. Thus the NK School calls for policy activism, on the grounds that stabilisation policy is

[65] The futile attempt to "fool all the people all the time".

necessary even where individuals and firms' expectations are rationally formed.

The relatively recent New Open Economy Macroeconomics [NOEM] heralded by Obstfeld and Rogoff [1995a] has joined the debate about the role of monetary policy in the real economy. The NOEM is essentially a new workhorse model for open-economy macroeconomic analysis, which incorporates nominal rigidities and market imperfections into a dynamic general equilibrium model with well-specified micro-foundations. The approach makes extensive use of explicit utility and profit maximization situations, which allow a researcher to conduct welfare analysis and credible policy evaluation in general. It is argued by Lane [2001[b] that,

"…. *Allowing for nominal rigidities and market imperfections alters the transmission mechanism for shocks and also provides a more potent role for monetary policy. In this way, by addressing issues of concern to policymakers, one goal of this new strand of research is to provide an analytical framework that is relevant for policy analysis and offers a superior alternative to the Mundell-Flemming model that is still widely employed in policy circles as a theoretical reference point*" (p.236).

Indeed, the NOEM approach assigns an even greater role for monetary policy in the real economy. This is largely based on the assumption of imperfect competition, such that output in the short run is demand-determined.

Obstfeld and Rogoff [1995] present two versions of a two-country general equilibrium [infinite horizon] model of a small open economy. In the first version, there is a single tradable good whereas the second version considered a two good [tradable and nontradable] framework where consumption is modelled as a log separable index. For both versions, the authors show that much as money has a significant real effect in the short run, yet money is neutral in the long run[66]. Thus money is thought to have no long run or persistent real effects.

However, the extension by Lane [2001] to the sticky-price small open economy model [Obstfeld and Rogoff, 1995] with nontraded goods shows that monetary innovations could indeed have long run real effects on the current account and the real exchange rate.

Lane's extension uses CRRA preferences, and models aggregate consumption as a constant elasticity of substitution index over consumption of traded and non-traded goods. Hence, this specification makes the model capable of generating different kinds of current account responses to a monetary shock, depending on the relative strengths of the

[66] As Obstfeld and Rogoff [1996] concedes, "...one of the most difficult tasks in international economics involves "building a bridge between the real economy and its monetary side" [Obsfeld and Rogoff, 1996 p.605]

intertemporal elasticity of aggregate consumption and the intratemporal elasticity of consumption between tradables and nontradables.

Therefore, when aggregate consumption is modelled with constant elasticity of substitution over traded and non-traded goods, then nominal shocks could have long-run effects on the real exchange rate and the trade balance. Fisher and Huh [2002, p.498] argued that if aggregate consumption were modelled as a log separable index over consumption of traded and non-traded goods, then nominal shocks might have no long run effects [as was the case in Obsfeld and Rogoff, 1996 p.661] on the real exchange rate and the trade balance.

As noted, the point of departure for Lane's model is where aggregate consumption is modelled as a CES index over consumption of traded and non-traded goods, whereas the case in Obstfeld and Rogoff uses a log separable index over consumption of traded and non-traded goods[67]. Indeed, Obstfeld and Rogoff concede that,

"... *If the period utility function were not additive in tradables and nontradables, nontraded goods consumption*

[67] If tradables and non-tradables enter the utility function log-seperably, this implies that one does not allow consumption of non-traded goods to affect the marginal utility of traded goods consumption. Hence, the time path of tradables consumption is flat even after a monetary shock, leading to a current account in perfect equilibrium even in the short run.

would affect the marginal utility of traded goods consumption, and money shocks would generally affect the current account and net foreign assets". [p.694].

For example, a positive unanticipated money shock in Lane's model results in an increase in production and consumption of the non-traded good [prices are sticky in the short run, and nontraded goods output is demand determined][68] while the price of the traded good rises [as the nominal exchange rate depreciates] in both the short run and long run.

However, the effect of the depreciation on consumption of the non-traded and traded goods will depend on a substitution effect [measured by the intratemporal elasticity of consumption between the traded and non-traded good, θ] and an income effect [measured by the intertemporal elasticity of present over future aggregate consumption, σ].

Lane [2001] considered three cases: [i] $\sigma = \theta$, [ii] $\sigma < \theta$, [iii] $\sigma > \theta$. In an instance where the income effect dominates the substitution effect [case [ii]], it means that consumption of both goods will increase even in the current period, and the current account goes into deficit. But for

[68] This follows from the new open economy framework that, in an imperfect competition setting where equilibrium prices are set above marginal costs and prices are sticky in the short run, output will be demand determined at least in the short run, since firms are not losing money on the additional production [See Lane, 2001a] for a survey of the new open economy macroeconomics].

long run equilibrium of the current account, consumption of the traded good must eventually fall in the long run[69].

This will thus require the real exchange rate to depreciate in the long run. Alternatively, if the substitution effect dominates [case (iii)], then consumption of the traded good falls in the current period and the current account moves into short run surplus. In the long run, the real exchange rate must appreciate [the relative price of nontradables in terms of tradables must rise] to bring the current account back to long run equilibrium.

Therefore it is only when the substitution effect and the income effect are equal [case (i)] that nominal shocks are not expected to have long run effects on the real exchange rate and the current account. This is where Fisher and Huh [2002] argue that such an instance is consistent with the assumption of log separable preferences over the traded and non-traded goods as found in Obstfeld and Rogoff [1996p.690]. Hence in such an instance, the optimal path for consumption of the traded good is perfectly flat and a nominal shock does not generate a trade imbalance or a real effect at any point in time.

[69] To permit the trade surplus that is required to finance interest payments on the external debt that was incurred.

It is clear therefore from the foregoing that there is theoretical ambiguity regarding the effect of monetary policy on the path of real variables such as the real exchange rate and current account. Hence it is subject to empirical verification to determine the actual effect in particular instances.

However Lane [2001a] concedes that his model is,

"*…. clearly a highly stylised model, with a simplistic account of the sources and duration of price stickiness and lacking an explicit description of the monetary transmission mechanism, and a role for capital accumulation*" [p.11].

As such, rather than estimate a structural econometric model, Lane suggests the complement of SVARs, which employ theory in a less restrictive way to test the conclusions of the model. Hence, in order to test the model empirically, Lane used SVARs to explore the role-played by monetary shocks in US external account fluctuations. Monetary shocks were found to be a significant source of variation in the external account (and the real exchange rate) and could help explain its volatility.

Also, Fisher and Huh [2002] adopted the analysis in Lane [2001a] and estimated a structural VAR model for the G-7 countries using the identification that nominal shocks can have long run effects on a country's real exchange rate.

They also found that nominal shocks have a significant long run effect on each country's real exchange rates and trade balance. Thus there appears to be little controversy so far about the empirical validity of this extension by Lane [2001a].

However, the model is yet to be tested on typical developing country data, and this is the aim of the present paper. Therefore we use the model in Lane [2001a] as our reference structural model to explore answers to the research problem already discussed.

4.2 Review of Empirical Studies

As far as we are aware, Edwards [1994] represents the most significant theoretical and empirical contribution to the understanding of the propagation of nominal shocks in the context of developing countries. Edwards develops a model of real exchange rate determination that incorporates the peculiar macroeconomic features of developing countries such as, exchange controls, trade barriers, and dual exchange rate systems.

The model established that both real and nominal factors play a role in determining short-run ["actual"] real exchange rates, but again, only real factors [referred to as

fundamentals] are thought to play a long-run role in influencing the equilibrium real exchange rate. This is attributed to forces that work in the system to eliminate nominal disequilibria and move it towards a stable equilibrium.

For example, a nominal disturbance such as a once-and-for-all unanticipated increase in the stock of domestic credit will raise the real stock of domestic money [assuming the initial stock of international reserves remains the same]. This results in an excess demand for nontradables, which in turn causes a real appreciation. Thus the actual real exchange rate appreciates relative to its long-run equilibrium value [overvalued real exchange rate].

The system then begins to work its way back to equilibrium through a decline in the stock of international reserves, as the public gets rid of the excess domestic money. The real exchange rate continuously depreciates through reductions in the price of non-tradable, moving back towards its long-run sustainable [equilibrium] level.

Hence according to Edwards' model, a monetary disturbance only results in a new composition of domestic money [for the domestic credit shock - a higher level of domestic credit,

and a lower level of international reserves]. Only real shocks affect the long-run real exchange rate, such as - tariff increases, the level and composition of government consumption, terms of trade disturbances, and capital flows.

The model is therefore akin to earlier views in the literature as well as the recent fundamental equilibrium real exchange rate literature [Williamson, 1994; Hinkle and Montiel, 1996].

In the context of developed economies however, there are many research papers that have attempted to gauge the real effects of money and monetary innovations. The effort has in part, concentrated on testing the long-run neutrality/non-neutrality of money hypothesis. Recent papers include Romer and Romer [1994], Cochrane [1995], Gordon and Leeper [1994], Fisher and Seater [1993], King and Watson [1997]. However the controversy remains, as diverse findings are reported in most of these studies.

Other studies that dwelt on developed economies, focused on the effect of monetary shocks on the real exchange rates and/or the trade balance using vector autoregression methods. These include Eichenbaum and Evans [1995], Strongin

[1995], Cushman and Zha [1997], Koray and McMillin [1999], Clarida-Gali [1994], Rogers [1999], Prasad [1999].

However, the methodologies adopted in each of these papers appear to matter for the findings. For example, the SVAR-based studies that use PPP as a long-run identifying assumption[70] [Clarida and Gali, 1994, Prasad, 1999 etc.] conclude that nominal shocks have no real effects. However Rogers [1999] used a different identifying restriction, and reported that monetary shocks were important for the real pound-dollar rate.

Lee and Chin [1998] also used a sticky-price model to motivate a structural VAR analysis of the current account and the real exchange rate for seven major industrialised countries, based on a minimal set of assumptions for identification. They found empirical support for the sticky price intertemporal model of Obsfeld and Rogoff [1995] that money shocks have large effects on the current account and exchange rate in the short run, but not on either in the long run. In addition they found that permanent shocks to productivity had large long-term effects on the real exchange rate, but relatively small effects on the current account.

[70] Which means that nominal shocks are restricted to have no long-run effects on the real exchange rate.

Yet another strand of empirical studies used dynamic general equilibrium models to explore the link between money shocks and the real exchange rate [Obsfeld and Rogoff, 1995; Beaudry and Devereux, 1995] focussing on developed economies. In particular, Beaudry and Devereux [1995] construct a dynamic general equilibrium model, based on the key assumptions of increasing returns to scale in technology and very short-term endogenously sticky prices, which led to a result of significant "monetary non-neutralities".

Hence, according to their model, a monetary shock leads to an immediate and persistent real and nominal depreciation, which has a persistent positive effect on output, consumption and investment.

Clearly, there remains a gap to be filled in the empirical literature as regards the real effects of nominal innovations in the context of a small open developing economy. Thus our paper contributes to this gap by studying the case of six Sub-Saharan African countries (within a dynamic general equilibrium framework), to see how the evidence for developing countries compares with the findings for developed economies in the empirical literature.

4.3 Empirical Analysis

The main approach in this paper is to use structural vector autoregression [VAR] analysis to explore the short run and long run effects of macroeconomic shocks on the current account of six countries in Sub-Saharan Africa. Based on the Blanchard and Quah [1989] identification scheme, we label these as - nominal, demand, and real shocks.

Thus, we use impulse response analysis and forecast error variance decompositions, to study the short run and long run effects. Before estimating our VARs, the variables are tested for long run relationships, to help decide on either using levels or first differences in the VAR. The variables considered are - log ratio of real output to US output [Y/Y^*], current account as a ratio of domestic output [CAY], and prices as a ratio of US prices [P/P^*]. We proxy 'the rest of the world' by US aggregates, given that US aggregate output constitutes a considerable proportion of world output.

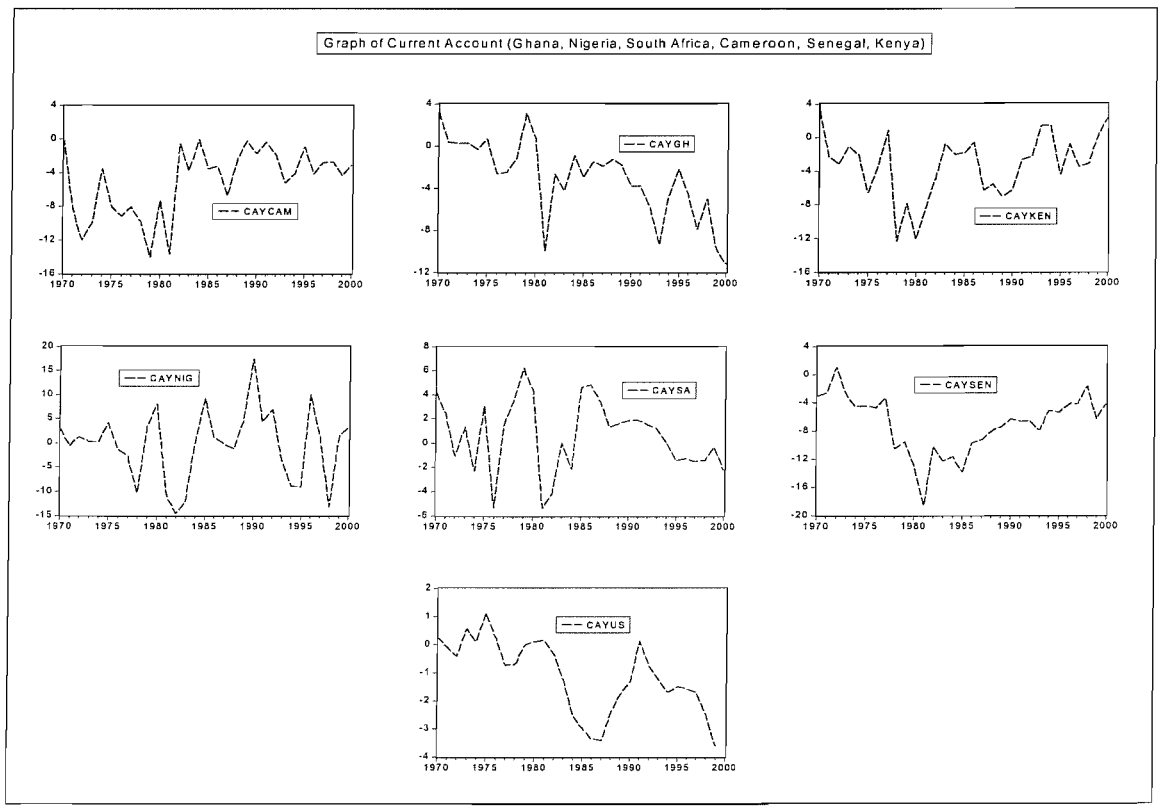
Studies such as Lane [2001], Fisher and Huh [2002], Rogers, [1999] also made use of similar approaches. For example, Lane [2001] considered a two-country case [home and rest of the world [RoW]] where home represents the United States and RoW represents the non-US G-7 countries such that the RoW

variables were constructed as a GDP-weighted average of national variables for the countries.

4.3.1 Data

As is typical with developing countries, quarterly data on output and the current account are just not available. One would have preferred to use quarterly data, but we were compelled to use annual data. Data is mainly obtained from the World Bank's World Development Indicators and the IMF Statistics. Figure 4.1 provides the current accounts for the six countries in Sub-Saharan Africa that we focus on, together with the current account for the US for the purposes of comparison.

Figure 4.1: Current Accounts of Countries



In terms of volatility, the current accounts in Sub-Saharan Africa over the last three decades are quite revealing. The effect of the second oil shock is clearly visible for all countries, whilst Ghana's current account shows the steepest deterioration since 1980.

On the other hand the Nigerian current account has been the most volatile among the sample of countries, especially between the period 1978 and 2000.

Indeed all the sample of countries have experienced relatively wide fluctuations in their current accounts for the last twenty years despite the fact that most of them have had economic stabilisation programs [supported by the IMF] in place. Our research objective is thus appropriate; to ascertain the extent to which nominal shocks drive the current account in these countries.

4.3.2 Long Run Restrictions

In order to identify the structural shocks, we make use of long run restrictions [Blanchard and Quah, 1989, King et al, 1991] on the impact matrix. The same type of identification was used in papers such as Clarida and Gali [1994], Prasad and Gable [1998], Lee and Chinn [1998], Lane [2001] and Fisher and Huh [2002]. This is briefly explained below.

The technique uses the moving average [MA] representation of a VAR. Assume the MA form of a reduced form stationary vector X_t is[71]:

$B(L)X_t = e_t$,

$X_t = \mu + C(L)e_t$

where L is the lag operator, $C(L) = \sum_{i=0}^{\infty} C_i L^i$, and $C_0 = I$.

Hence, a structural MA form could then be derived:

$X_t = \mu + \Gamma(L)\varepsilon_t$

since $e_t = A^{-1}\varepsilon_t$,

where $\Gamma(L) = \sum_{i=0}^{\infty} \Gamma_i L^i$, and $\Gamma_i = C_i A^{-1}$

for $i = 1, 2, 3 \ldots\ldots, \infty$, and $\Gamma_0 = A^{-1}$

In effect $\Gamma(1) = C(1)A^{-1}$

$$Var(e_t) = Var(A^{-1}\varepsilon_t)$$
$$\sum_e = A^{-1}\sum_\varepsilon A^{-1\prime}$$
$$\sum_e = A^{-1}IA^{-1\prime}$$
$$A\sum_e A' = I$$

Hence, $\Gamma(1) = C(1)\sum_e A'$

[71] Where X_t is a stationary vector in (Y/Y^*, CAY, P/P^*).

Typically, one imposes the required long run restrictions [in our case, one imposes three long run identifying restrictions] on the $\Gamma(1)$[72] for exact identification:

$$\Gamma(1)=\begin{pmatrix} \sum_{l=0}^{\infty}\lambda_{11}(l) & 0 & 0 \\ \sum_{l=0}^{\infty}\lambda_{21}(l) & \sum_{l=0}^{\infty}\lambda_{22}(l) & 0 \\ \sum_{l=0}^{\infty}\lambda_{31}(l) & \sum_{l=0}^{\infty}\lambda_{32}(l) & \sum_{l=0}^{\infty}\lambda_{33}(l) \end{pmatrix}$$

Hence, restricting elements [1,2], [1,3] and [2,3] to zero identifies the three shocks. Nominal and demand shocks have zero long run effect on real output as in elements [1,2] and [1,3]. Finally, nominal shocks have zero long run consequences [2,3] for the current account. Therefore, the structural shocks can be recovered from the reduced form shocks for innovation accounting.

4.4 Results

We present our findings in this section. The three variables were first tested for unit roots individually to ensure that our VAR satisfies the stability condition. Next, we tested for cointegration among the three variables, so as to decide the appropriate representation to use for impulse response and forecast error variance analysis.

[72] To make it lower triangular

4.4.1 Unit Root and Cointegration Tests

The unit root tests are based on the Augmented Dickey-Fuller tests. A constant and trend was included in the levels estimation, whereas only a constant was included for the first differences estimation to determine stationarity. Hence the critical values for the levels tests are -3.47 [5%] and -4.08 [1%]. For the differences estimation, the critical values are -2.90 [5%] and -3.52 [1%].

Table 4.1: Unit Root Test of Variables

	Ghana	Nigeria	S. Africa	Cameroon	Senegal	Kenya
log(Y/Y)*	-3.094	-0.0512	-2.829	-1.8587	-3.86**	-1.1554
CA/Y	-3.634*	-4.496**	-4.089**	-2.0222	-1.5603	-1.286
log(P/P)*	-0.7401	-2.264	-2.6406	-3.034	-2.8172	-2.233
dlog(Y/Y)*	-2.891*	-3.222**	-4.048**	-2.930**	------	-5.521**
dCA/Y	----- -	------	------	-3.4672**	-7.87**	-3.751**
dlog(P/P)*	-3.917**	-3.263**	-4.885**	-3.101**	-4.27**	-3.139**

From the above table, the question of cointegration in levels among the three variables is rather remote, since some of the variables are stationary even in levels [e.g. the current account for Ghana, Nigeria and South Africa - and real output ratio for Senegal].

Consequently, the VAR for Ghana, Nigeria and South Africa includes [*dlog(Y/Y*), CA/Y, dlog(P/P*)*], whilst the VAR for Cameroon and Kenya are [*dlog(Y/Y*), dCA/Y, dlog(P/P*)*].

Finally the VAR for Senegal includes [*log(Y/Y*)*, *dCA/Y*, *dlog(P/P*)*]. Due to the fact that we are using annual data, a lag length of 1 was used in all the VARs. The respective impulse responses and forecast error variance analyses are presented in the next sections.

4.4.2 Impulse Responses (Nominal Shock)

It is clear that the short run effect of nominal shocks on the current account is dissimilar across countries. None of the countries shows a lasting surplus, but rather there appears to be fluctuations around a zero current account.

Following a positive nominal shock, the response of the current account in Cameroon and Kenya is positive [in line with Mundell-Flemming prescriptions], whilst the rest of the countries show a negative response - a kind of J-curve effect. The latter case [Ghana, Nigeria, South Africa, Senegal] imply that a positive nominal shock results in an initial worsening of the current account, but moves into surplus thereafter. This phenomenon appears to be strong particularly in the case of Ghana and South Africa.

In the case of Cameroon and Nigeria, the current account response appears to be persistent, oscillating around a zero balance. In the case of the other countries, the effects die

out relatively quickly. In sum, the current account response to a positive nominal shock appears to differ across the Sub-Saharan Africa countries considered.

Of course, this is consistent with the model presented in Lane [2001] where nominal shocks can bring about different current account responses, depending on the relative strengths of the intratemporal elasticity of consumption between the traded and non-traded goods on one hand; and the inter-temporal elasticity of present over future aggregate consumption on the other.

Indeed one can also explain the differential current account responses by the extent of pricing to market. Such that, the extent to which goods are priced in domestic currency will affect the extent of expenditure switching - that in turn affects the current account response.

4.4.3 Forecast Error Variance Decomposition

This section discusses the relative importance of nominal shocks in explaining the variance of the current account. The values denote the percentage-share of variance of the n-step ahead forecast error of a particular variable that is accounted for by the respective shocks. As seen in the

tables in the appendix, the current account indeed explains most of its error variance at short horizons.

However, things begin to change for different countries as the forecast horizon increases. For example, supply [real] shocks become most important at long horizons for the current account in the case of Nigeria; whereas nominal shocks account for most of the error variance in the case of Cameroon at long horizons. Table 4.2 below presents a summary of the long horizon proportions for all the six countries.

Table 4.2 Variance Decomposition of Current Account - Comparison at long horizons

Country	*Supply(Real) Shock*	*Demand Shock*	*Nominal Shock*
Ghana	45.54	49.19	5.26
Nigeria	81.65	2.51	15.83
South Africa	13.81	63.19	23.63
Cameroon	27.61	0.06	72.33
Kenya	16.07	80.35	3.58
Senegal	12.35	82.02	5.62

The striking finding is in the case of Cameroon. The results suggest that nominal shocks explain up to 73 percent of the forecast error variance at long horizons. Of course, Lane [2001a] also found for the US that monetary shocks explained about 50 percent of the forecast error variance of the

current account at a horizon of about 20 quarters. In the case of Cameroon, the results most probably have to do with its membership of the second CFA Monetary zone[73], such that nominal shocks are linked to the balance of payments as in a typical fixed exchange rate regime.

The other significant finding is for Nigeria and South Africa, the two largest economies in Sub-Saharan Africa. In the case of Nigeria, nominal shocks explain about 16 percent of the forecast error variance. Similarly, in the case of South Africa, nominal shocks explain about 24 percent. For the other countries - Ghana, Kenya and Senegal, nominal shocks are relatively insignificant. These explain between 4-7 percent of the forecast error variance.

4.5 Summary and Policy Discussions

This paper deals with an old issue that continues to be of much relevance to policymakers - the impact of unanticipated monetary policy actions on the real economy. The New Classical School implies that agents form their expectations rationally, such that any such action can only have temporary effects. The New Keynesian School on the other hand argues that prices and wages are sticky, such that following a sudden shift in demand or supply; prices do not

[73] The other members are: Central African Republic, Chad, Republic of Congo, Equatorial Guinea, and Gabon.

adjust to clear markets instantaneously. Hence, the economy remains in a state of disequilibrium for years.

Hence, the New Keynesians expect both anticipated and unanticipated monetary policy actions to have real effects. In terms of policy prescriptions, the New Classicals advocate policy non-activism [policy rules] in order to address the credibility problem, instead of an active stabilisation policy.

On the contrary, the New Keynesians advocate for policy-activism [active stabilisation policy] in order to restore equilibrium following a sudden shock to supply or demand. The NOEM theory takes the issues further, arguing that unanticipated monetary policy innovations can have significant real effects, albeit in the short run [Obstfeld and Rogoff, 1996 p.690-694].

A recent extension to the latter framework by Lane [2001] shows that unanticipated monetary policy innovations can have different real effects, and even to the long run - working through the current account and real exchange rates. This startling result was tested on post-war G-7 data by Lane [2001] and Fisher and Huh [2002]. Both studies found significant support for the new proposition.

We extend the literature by applying the above to typical developing open economies in Sub-Saharan Africa to see if nominal shocks drive the current account, and to what extent. Our results confirm the theoretical exposition in Lane [1999, 2001] that nominal shocks can have different current account responses across countries and across time.

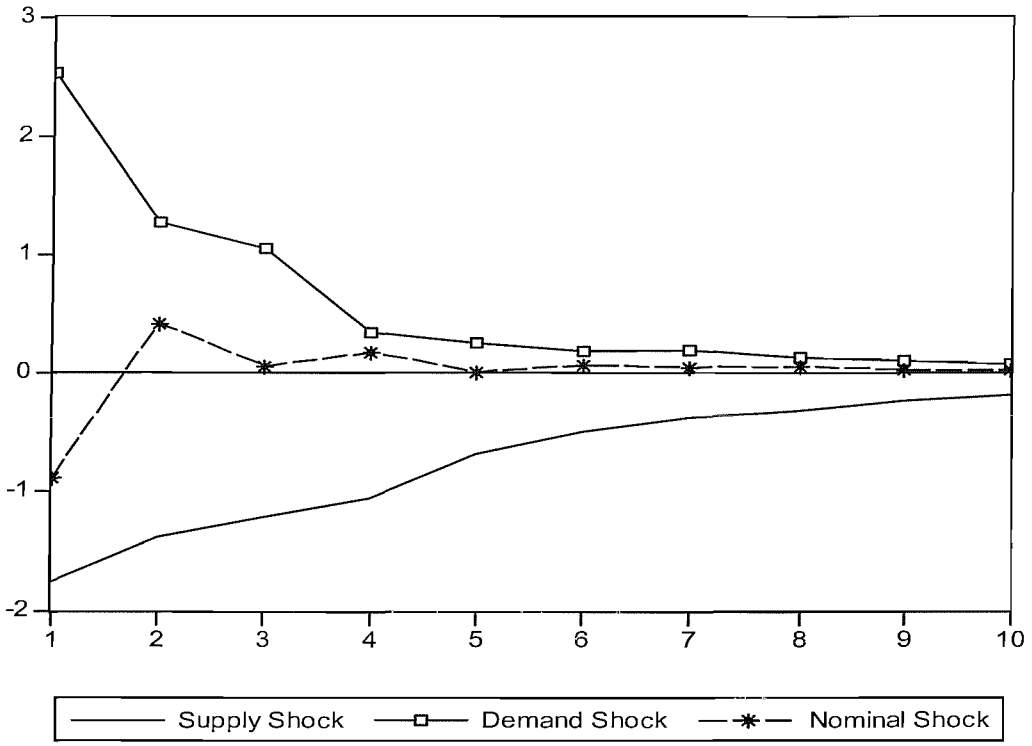
Whereas some countries experience a surplus following a positive nominal shock, others experienced a deficit. Moreover, in some countries, nominal shocks explained a high proportion of the forecast error variance of the current account at long horizons, whilst for other countries, the proportion was negligible.

The main implication of our findings is that current account models must reflect the fact that current account responses to nominal shocks might differ across countries. Besides, rather than assuming a particular theoretical stance (e.g. the standard Mundell-Flemming model implies that a positive nominal shock ultimately results in current account surpluses) analytical models must recognise the three possible effect of a nominal innovation - deficit in the current account, neutral effect on the current account, or a surplus in the current account of the balance of payments.

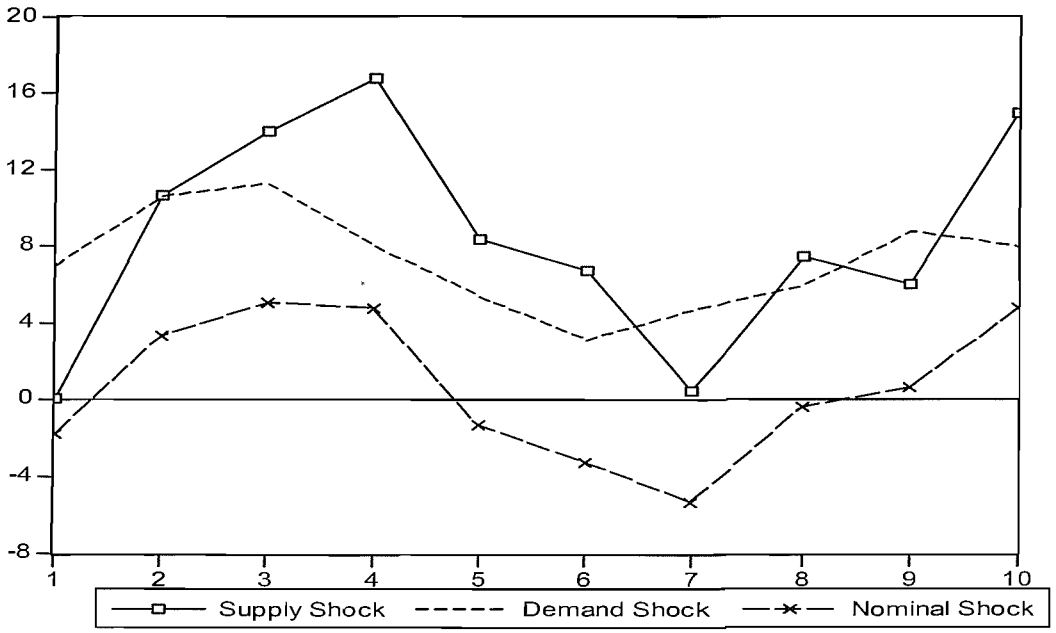
Finally, the results also have implications for stabilisation policy, particularly in countries where nominal shocks drive the current account even at long horizons. The point here is that, to the extent that the goal of price stability is not threatened, then monetary policy might have a role to play in the achievement of other macroeconomic goals such as output stabilisation in the medium term.

Appendix 4A (Figure 4.2)

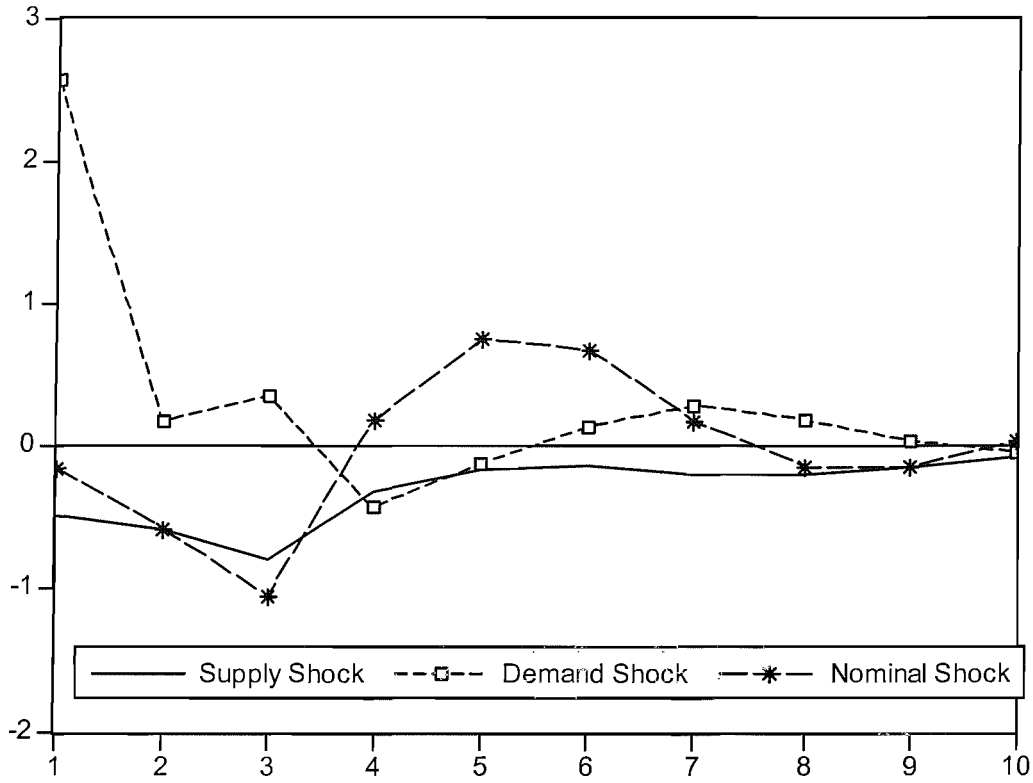
Ghana:
Response of Current Account
to Structural One S.D. Innovations



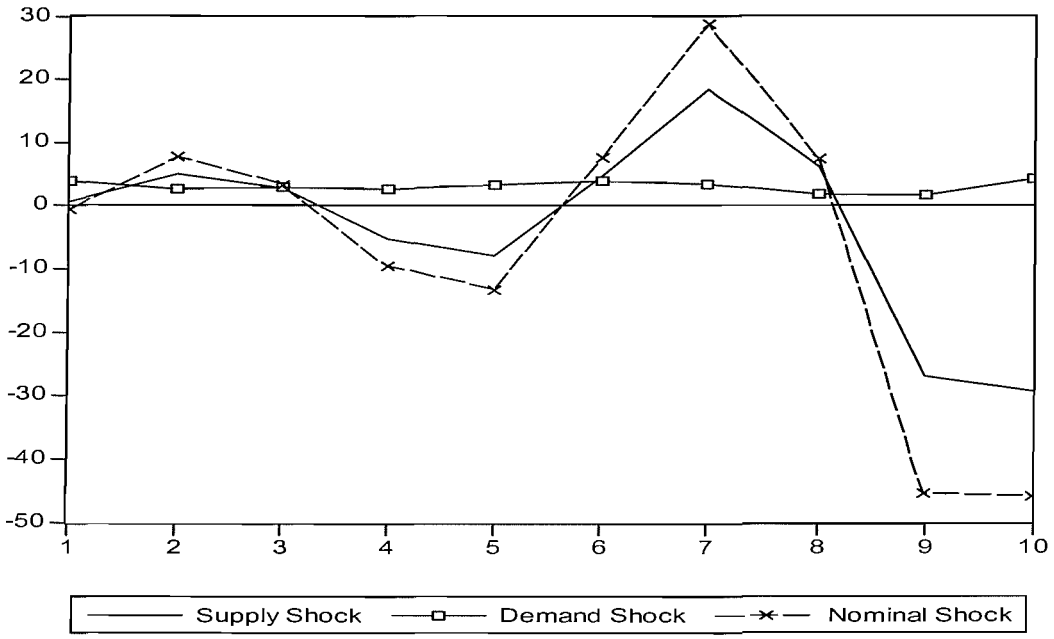
Nigeria:
Response of Current Account to Structural
One S.D. Innovations



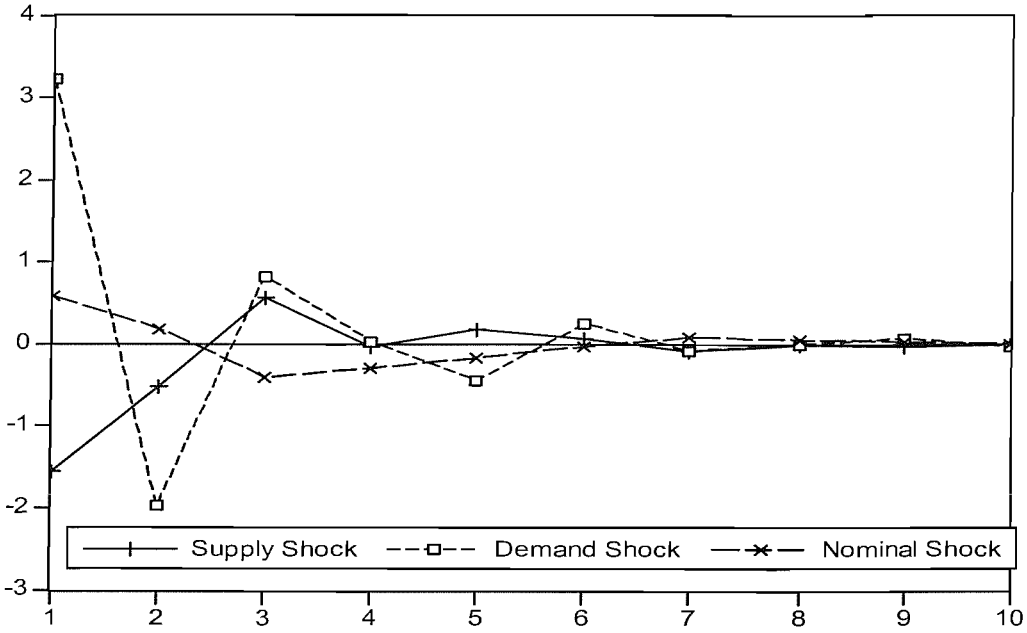
South Africa:
Response of Current Account to Structural
One S.D. Innovations



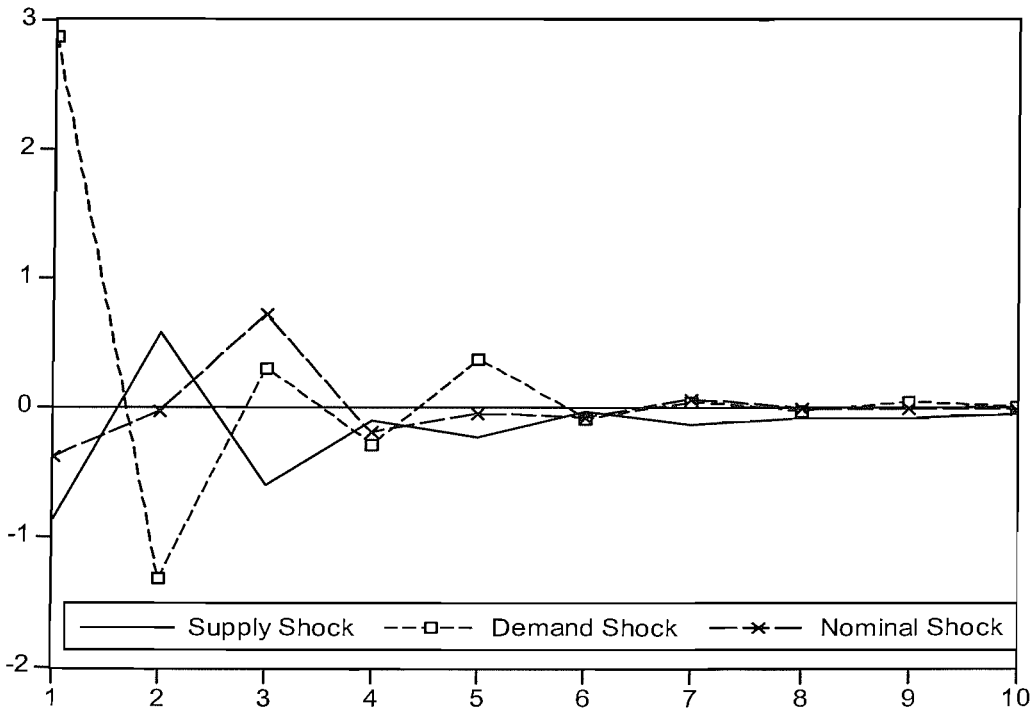
Cameroun:
Response of Current Account
to Structural One S.D. Innovations



Kenya:
Response of Current Account
to Structural One S.D. Innovations



Senegal:
Response of Current Account to Structural
One S.D. Innovations



Appendix 4B

Table 4.3 Variance Decomposition of Current Account - Ghana:

Period	S.E.	Real Shock	Demand Shock	Nominal Shock
1	3.203512	29.87449	62.36888	7.756629
2	3.734822	35.73042	57.35571	6.913865
3	4.065386	39.14800	55.00348	5.848529
4	4.217415	42.63774	51.77265	5.589608
5	4.280274	43.96755	50.60581	5.426640
6	4.313544	44.63350	50.00107	5.365424
7	4.334641	44.96109	49.71722	5.321686
8	4.348399	45.19936	49.50024	5.300397
9	4.356342	45.34515	49.37030	5.284554
10	4.360796	45.43096	49.29290	5.276147
14	4.366345	45.53128	49.20309	5.265622
15	4.366664	45.53712	49.19786	5.265017
16	4.366851	45.54053	49.19480	5.264667
20	4.367090	45.54485	49.19093	5.264223
21	4.367103	45.54509	49.19071	5.264197
27	4.367122	45.54543	49.19041	5.264163
28	4.367122	45.54544	49.19040	5.264162
29	4.367122	45.54544	49.19040	5.264162
30	4.367123	45.54544	49.19040	5.264161

Table 4.4 Variance Decomposition of Current Account - Nigeria:

Period	S.E.	Supply (Real Shock)	Demand Shock	Nominal Shock
1	7.207081	0.019769	93.82251	6.157717
2	14.22648	54.88968	30.54823	14.56209
4	15.35096	55.19064	30.97838	13.83098
5	18.70863	57.29682	22.91238	19.79080
6	19.01700	56.20245	23.54184	20.25571
7	20.17692	59.47142	21.50753	19.02104
8	21.95434	60.26368	18.52657	21.20975
9	22.19486	59.38401	19.67415	20.94184
12	26.38054	64.88325	15.19544	19.92131
13	29.31955	67.68402	12.36516	19.95082
16	36.83539	72.43110	8.772641	18.79626
17	39.55859	73.63145	8.083151	18.28539
27	117.6718	80.73048	3.138890	16.13063
28	132.3011	80.91322	3.010177	16.07660
29	148.9588	81.08988	2.927880	15.98224
33	241.2436	81.43085	2.657832	15.91132
36	346.8675	81.54614	2.582818	15.87105
45	1035.789	81.64307	2.520748	15.83618
48	1492.252	81.64938	2.516510	15.83411
49	1685.429	81.65066	2.515538	15.83380
50	1903.598	81.65147	2.514709	15.83382

Table 4.5 Variance Decomposition of Current Account - South Africa:

Period	S.E.	Supply (Real) Shock	Demand Shock	Nominal Shock
1	2.614927	3.455830	96.16175	0.382423
2	2.747972	7.638959	87.45562	4.905418
3	3.072017	12.85201	71.31448	15.83350
4	3.123361	13.46222	70.88548	15.65231
5	3.218607	12.95712	66.90812	20.13477
6	3.292444	12.55112	64.09670	23.35219
10	3.337370	13.17430	63.43450	23.39120
11	3.340696	13.16090	63.31410	23.52500
12	3.343172	13.15093	63.22774	23.62134
16	3.344766	13.17740	63.20261	23.61999
17	3.344883	13.17717	63.19833	23.62450
23	3.345034	13.17811	63.19414	23.62775
27	3.345039	13.17816	63.19399	23.62785
28	3.345039	13.17816	63.19399	23.62785
33	3.345040	13.17816	63.19398	23.62786
46	3.345040	13.17816	63.19397	23.62786
47	3.345040	13.17816	63.19397	23.62786
48	3.345040	13.17816	63.19397	23.62786
49	3.345040	13.17816	63.19397	23.62786
50	3.345040	13.17816	63.19397	23.62786

Table 4.6 Cameroon: Variance Decomposition of Current Account:

Period	S.E.	Supply Shock	Demand Shock	Nominal Shock
1	4.023918	3.121774	95.15857	1.719657
2	10.17918	18.27952	16.46167	65.25882
3	11.30210	18.46080	13.44876	68.09044
4	18.93787	24.86334	4.834542	70.30212
5	19.50641	25.38028	4.683504	69.93621
6	31.28411	26.15957	1.853295	71.98714
7	40.22868	27.55881	1.135279	71.30591
8	47.21101	26.74548	0.924212	72.33031
9	78.30234	27.67347	0.336364	71.99016
14	316.3278	27.98933	0.073435	71.93724
21	2366.608	27.71571	0.058258	72.22603
24	4946.065	28.23138	0.075199	71.69342
29	19293.84	28.26765	0.093973	71.63838
30	25849.52	27.16285	0.126405	72.71075
43	1198709.	27.90242	0.054970	72.04261
47	3240349.	27.16615	0.122608	72.71124
48	4815640.	28.04983	0.057822	71.89235
49	4997925.	27.50167	0.166862	72.33147
50	8793972.	27.61207	0.062284	72.32565

Table 4.7 Kenya: Variance Decomposition of Current Account

Period	S.E.	Supply (Real) Shock	Demand Shock	Nominal Shock
1	3.627955	18.23565	79.12464	2.639709
2	4.163698	15.43466	82.37141	2.193935
3	4.303368	16.20984	80.81075	2.979409
4	4.313521	16.13792	80.43580	3.426276
6	4.352406	16.04463	80.42140	3.533962
12	4.356277	16.06608	80.34960	3.584321
14	4.356292	16.06604	80.34956	3.584394
16	4.356295	16.06607	80.34948	3.584457
22	4.356295	16.06607	80.34947	3.584461
24	4.356295	16.06607	80.34947	3.584461
28	4.356295	16.06607	80.34947	3.584461
32	4.356295	16.06607	80.34947	3.584461
36	4.356295	16.06607	80.34947	3.584461
45	4.356295	16.06607	80.34947	3.584461
47	4.356295	16.06607	80.34947	3.584461
48	4.356295	16.06607	80.34947	3.584461
49	4.356295	16.06607	80.34947	3.584461
50	4.356295	16.06607	80.34947	3.584461

Table 4.8 Senegal: Variance Decomposition of Current Account

Period	S.E.	Supply (Real) Shock	Demand Shock	Nominal Shock
1	3.011113	8.174813	90.28342	1.541765
2	3.336996	9.701002	89.03754	1.261455
4	3.496723	11.84459	82.52867	5.626740
5	3.523515	12.08074	82.35754	5.561715
7	3.528851	12.17989	82.18847	5.631641
8	3.529903	12.22430	82.14604	5.629661
9	3.531154	12.27092	82.10276	5.626320
10	3.531593	12.29050	82.08249	5.627010
15	3.532752	12.34572	82.03062	5.623663
18	3.532923	12.35390	82.02291	5.623190
24	3.533011	12.35811	82.01894	5.622948
27	3.533020	12.35854	82.01854	5.622923
35	3.533025	12.35878	82.01831	5.622909
39	3.533025	12.35879	82.01830	5.622909
40	3.533025	12.35879	82.01830	5.622909
43	3.533025	12.35879	82.01830	5.622908
47	3.533025	12.35880	82.01830	5.622908
49	3.533025	12.35880	82.01830	5.622908

Appendix 4C

A Simple Two-Sector Model to Illustrate the Real Effects of Nominal Shocks in a Small Open Economy

This is the two-sector [traded and non-traded goods sector] intertemporal model similar to that used by Lane [2001a] to illustrate the real effects of nominal shocks in a small open economy. Assume that the nontraded goods sector is monopolistically competitive, with an elastic labor supply. The traded goods sector on the other hand has a homogenous traded good whose production is exogenous and its price obeys the law of one price. Hence, domestic aggregate demand conditions matter more for the nontraded sector than for the traded sector.

The implication is that an aggregate demand shock primarily affects the nontraded sector, even though there could be spillover effects on the traded goods sector and hence the current account. Such a spillover effect could result from the effects of a shift in consumption of nontradables on optimal consumption of tradables. For example, if tradables consumption and nontradables consumption are complementary, then a boom in the nontraded sector is associated with an increase in demand for imports and hence a current account deficit occurs.

On the other hand, if nontraded and traded goods are perfect substitutes, then a boom [rise in output and consumption] in the nontraded good sector results in a fall in tradables [imports] consumption, and hence this results in a current account surplus. It is also implied that the optimal current account is zero.

The utility function of a representative home citizen is modelled as a CRRA in aggregate consumption, while aggregate consumption is in turn expressed as a CES index over consumption of traded and nontraded goods. The intuition behind the setup of the model is that monetary shocks can generate different current account responses depending on the relative strengths of the intertemporal elasticity of aggregate consumption and the intratemporal elasticity of consumption between tradables and nontradables. But if the two elasticities have the same value, then a monetary shock will have a zero impact on the current account.

Assume that each representative home citizen is endowed with a constant quantity of the traded good each period, but has a monopoly over production of one of the nontradables $z \in [0,1]$. The lifetime utility function of a representative agent j (producer) is thus:

$$U^j = \sum_{s=t}^{\infty} \beta^{s-t} \left[\frac{\sigma}{\sigma-1} C_s^{\frac{\sigma-1}{\sigma}} + \frac{\chi}{1-\epsilon} \left(\frac{M_s}{P_s} \right)^{1-\epsilon} - \frac{\kappa}{2} y_{N_s}^2 \right] \qquad \text{...(A4.1)}$$

where σ, ϵ, and $\kappa > 0$. The consumption index C aggregates consumption of traded and nontraded goods as:

$$C = \left[\gamma^{\frac{1}{\theta}} C_T^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_N^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}, \qquad \theta > 0 \qquad \text{...(A4.2)}$$

where θ is the constant elasticity of substitution between traded and nontraded goods. The second term in the objective function reflects the utility derived from holding real balances, for instance in facilitating transactions. The third term captures the disutility of work effort. The flow budget constraint faced by agent j is given by:

$$P_{Tt} B_{t+1} + M_t = P_{Tt}(1+r) B_t + M_{t-1} + p_{Nt}(j) y_{Nt}(j) + P_{Tt} y_{Tt} - P_t C_t - P_{Tt} \tau_t \qquad \text{...(A4.3)}$$

B_t denotes the number of real bonds [in units of the tradable good] that pay off a real return r, which is given exogenously.

The consumption price index is also given by;

$$P = \left[\gamma P_T^{1-\theta} + (1-\gamma) P_N^{1-\theta} \right]^{\frac{1}{1-\theta}} \qquad \text{...(A4.4)}$$

The representative producer/agent j of the nontraded good faces the demand function:

$$y_N^d(j) = \left[\frac{p_N(j)}{P_N} \right]^{-\mu} C_N^A, \qquad \mu > 1 \qquad \text{....(A4.5)}$$

where C_N^A is aggregate consumption of nontraded goods and the index function for nontraded consumption and prices are respectively:

$$C_N = \left[\int_0^1 c_N(z)^{\frac{\mu-1}{\mu}} dz \right]^{\frac{\mu}{\mu-1}} \quad \text{...(A4.6)}$$

$$P_N = \left[\int_0^1 p_N(z)^{1-\mu} dz \right]^{\frac{1}{1-\mu}} \quad \text{...(A4.7)}$$

Agent/producer j receives an exogenous endowment y_{Tt} of the traded good each period. Finally, assume zero government expenditure so that all seigniorage revenues are returned to the population in the form of lump-sum transfers

$$\tau = -\left[\frac{M_t - M_{t-1}}{P_{Tt}} \right], \quad \text{....(A4.8)}$$

For simplicity, assume that $\beta = \frac{1}{1+r}$, which rules out the desire to borrow and lend in the steady-state.

Using [A4.1], [A4.3], [A4.4] and a transversality condition, the first order conditions yield the following:

$$\frac{C_{Tt+1}}{C_{Tt}} = \left[\frac{\left(\frac{P_t}{P_{Tt}} \right)}{\left(\frac{P_{t+1}}{P_{Tt+1}} \right)} \right]^{\sigma-\theta}, \quad \text{....(A4.9)}$$

$$\frac{C_{Nt}}{C_{Tt}} = \frac{1-\gamma}{\gamma} \left(\frac{P_{Nt}}{P_{Tt}} \right)^{-\theta}, \quad \text{....(A4.10)}$$

$$\frac{M_t}{P_t} = \left[\frac{\chi C_t^{\frac{1}{\sigma}}}{1-(\frac{\beta P_{Tt}}{P_{Tt+1}})} \right]^{\frac{1}{\epsilon}}, \qquad \text{...(A4.11)}$$

$$y_{Nt}^{\frac{\mu+1}{\mu}} = \left(\frac{\mu-1}{\mu\kappa} \right) \left(C_{Nt}^{A} \right)^{\frac{1}{\mu}} C_t^{-\frac{1}{\sigma}} \left(\frac{P_{Nt}}{P_t} \right), \qquad \text{...(A4.12)}$$

Equation [A4.9] is the Euler equation characterising the dynamic evolution of consumption. This obviously depends on the sequence of relative prices, such that if the aggregate price level relative to traded goods prices is currently low compared to its future value, then the agent chooses present consumption rather than future consumption[74].

However, it is also possible that the decision to consume [traded goods] today, could affect the consumption of the nontraded goods as well, depending on whether they are substitutes or complements. Therefore the question as to whether consumption of the traded good dominates or other wise depends on the size of the intertemporal elasticity of substitution, σ compared to the intratemporal elasticity of substitution, θ. If $\sigma > \theta$, then consumption of the traded good increases more if the consumption based real interest rate is currently low.

[74] The consumption-based real interest rate is lower

Equation [A4.10] characterises the relation between consumption of nontraded goods and consumption of traded goods, where θ is the elasticity of substitution. This means that if the relative price [nontraded vrs traded] is unity, then consumption of the nontraded good is larger the smaller is γ, the share of tradables in the consumption index. Equation [A4.11] expresses demand for real balances as an increasing function of consumption and a decreasing function of the nominal interest rate. Equation [A4.12] characterises equilibrium supply of nontraded goods - the higher is the consumption index C, the lower is the level of production, as agents increase leisure in line with consumption of other goods.

Steady-State Equilibrium

In the model presented by Lane [2001], the author defines a steady-state production and consumption of nontraded goods:

$$y_N = C_N = \left[\frac{\mu - 1}{\mu\kappa}\right]^{\frac{\sigma}{\sigma+1}} (1-\gamma)^{\frac{1}{1+\sigma}} \qquad \text{...(A4.13)}$$

This is established by normalising the endowment of the traded good so that the relative price of nontraded goods in terms of traded goods is unity the steady state [i.e. $P_N/P_T=1$]. Thus the endowment is such that $y_T = \frac{\gamma}{1-\gamma} y_N$ in the steady-state. The above equation implies that nontraded

good production will be higher the more competitive the nontraded good sector [μ], the less taxing is work effort [the smaller is κ] and the larger the weight placed on consumption of nontraded goods in the utility function [i.e. the larger is $(1-\gamma)$].

An Unanticipated Money Shock

In the non-traded goods sector, prices are assumed to be sticky - set one period in advance. Therefore one expects that a monetary shock will have real effects. We however want to distinguish between the short run and long run effects of such a monetary shock. Assume for any given variable X, $\tilde{X} \equiv \left(X_1 - \bar{X}_o\right)/\bar{X}_o$ denotes the short run percentage deviation in X from $\bar{X}_o$, the initial steady-state value of X, and $\hat{X} = \left(\bar{X} - \bar{X}_0\right)/\bar{X}_0$ denotes the long run (steady-state) percentage deviation.

This implies that the new steady-state is attained after one period , following some initial aggregate demand shock. Consider a surprise permanent expansion in the money stock $\tilde{M} = \hat{M} > 0$. Because nontraded good prices are sticky, this implies that $\tilde{P}_N = 0$. From equation (ix), $\tilde{C}_T$ and $\hat{C}_T$ are related taking logs as:

$$\hat{C}_T - \tilde{C}_T = (\sigma - \theta)(\tilde{P} - \tilde{P}_T) - (\sigma - \theta)(\hat{P} - \hat{P}_T) \qquad \text{[A4.14]}$$

Also, given constant endowment, steady-state consumption of the traded good can only be increased by the income earned from the accumulation of foreign assets

$$\hat{C}_T = r\frac{dB}{C_0} \qquad \text{(A4.15)}$$

Meanwhile, the accumulation of foreign assets *dB* is generated by the short-run current account surplus:

$$\frac{dB}{C_0} = \tilde{Y}_T - \tilde{C}_T = -\tilde{C}_T \qquad \text{(A4.16)}$$

Therefore the relation between $\hat{C}_T$ and $\tilde{C}_T$ is obviously:

$$\hat{C}_T = -r\tilde{C}_T \qquad \text{(A4.17)}$$

This means that if we increased consumption of the tradable good by one unit in the short run, then we effectively decrease consumption of the same tradable good in the steady state [long run] by *r*.

In a similar way, using equation [10], we can establish the link between steady-state changes in the consumption of nontraded and traded goods by taking logs as:

$$\hat{C}_N - \hat{C}_T = -\theta\left(\hat{P}_N - \hat{P}_T\right) \qquad \text{(A4.18)}$$

We have already established that steady-state change in nontraded goods consumption is just equal to the steady-

state change in nontraded production. From the nontraded good supply equation in [12] and the optimized relationship between C_N and C:

$$\hat{C}_N = \hat{y}_N = \frac{(\sigma-\theta)\gamma}{1+\sigma}\left(\hat{P}_N - \hat{P}_T\right) \qquad \text{(A4.19)}$$

Next, using [18] and [14], express the steady-state change in tradables consumption as a function of the steady-state change in the relative price of nontraded goods in terms of traded goods:

$$\hat{C}_T = \left[\theta + \frac{(\sigma-\theta)\gamma}{1+\sigma}\right]\left(\hat{P}_N - \hat{P}_T\right) \qquad \text{(A4.20)}$$

The short run price stickiness of nontraded goods prices means that $[\tilde{P}_N = 0]$, hence nontraded production is driven by the level of demand, as in equation [10]:

$$\tilde{y}_N = \tilde{C}_N = \theta\tilde{P}_T + \tilde{C}_T \qquad \text{(A4.21)}$$

To complete the model, the short-run and steady-state monetary equilibrium equations are given by:

$$\epsilon\left(\hat{M} - \tilde{P}\right) = \frac{\theta}{\sigma}\left[\tilde{P}_T - \tilde{P}\right] + \frac{1}{\sigma}\tilde{C}_T - \frac{1}{r}\left[\hat{P}_T - \tilde{P}_T\right]$$

(A4.22)

$$\epsilon\left(\hat{M} - \hat{P}\right) = \frac{\theta}{\sigma}\left[\hat{P}_T - \hat{P}\right] + \frac{1}{\sigma}\hat{C}_T \qquad \text{(A4.23)}$$

Hence, using equation [14] - [23], we can solve for the short-run as well as steady-state effects [on P_T, y_N, C_N, P_N, and C_T] of an unanticipated permanent monetary disturbance. Lane [2001] presents the solutions in the form:

$$\tilde{P}_T = c_1 \hat{M} \tag{A4.24}$$

$$\tilde{y}_N = \tilde{C}_N = c_2 \hat{M} \tag{A4.25}$$

$$\tilde{C}_T = c_3(\sigma - \theta)\hat{M} \tag{A4.26}$$

$$\hat{P}_T = c_4 \hat{M} \tag{A4.27}$$

$$\hat{C}_T = -\frac{c_3(\sigma - \theta)}{r}\hat{M} \tag{A4.28}$$

$$\hat{P}_N - \hat{P}_T = -c_5(\sigma - \theta)\hat{M} \tag{A4.29}$$

$$\hat{y}_N = \hat{C}_N = -c_6(\sigma - \theta)^2 \hat{M} \tag{A4.30}$$

where c_1, c_2, c_3, c_4, c_5, and c_6 are non-negative and are functions of the parameters $\sigma, \theta, r, \gamma$. Clearly, the relative size of σ and θ will determine what happens to consumption of traded goods in both the short run and the long run. For example, consider an aggregate demand shock emanating from the effects of a monetary shock. Such a monetary shock causes a short-run boom [consumption and production] in the nontraded sector, and the price of nontraded goods fall.

Hence the relative price of traded goods rises, which constitutes a real depreciation. In the case where $\sigma = \theta$, intertemporal and intratemporal substitution effects cancel out and so, there is no spillover effect on consumption of traded goods. In that case, there is no effect on the current account in both the short run and long, and there are no long-run real effects from the monetary shock.

In the case where $\sigma > \theta$, this means that the intratemporal elasticity of substitution between consumption of nontradables and tradables is low, relative to the intertemporal elasticity of substitution between consuming the tradable good now or in the future. In this instance, the boom in the nontraded sector spills over to consumption of the traded good. Accordingly, the current account goes into deficit.

However, in the long run or steady state equilibrium, the current account must remain in zero balance. This requires that long run consumption of tradables must fall to permit the trade surplus that is required to finance interest payments on the external debt incurred. This in turn requires a long run real depreciation to drive the current account back to equilibrium.

In the other case where $\sigma < \theta$, the intratemporal substitution effect of the short run real depreciation dominates the intertemporal substitution effect. Hence, consumption of tradables rather falls, thereby resulting in a current account surplus. In the long run however, there has to be a real appreciation to enable the current account to be restored to zero equilibrium balance. This particular

case corresponds to the Mundell-Flemming model where a monetary shock leads to a current account surplus. The present model thus shows that there can be one of three outcomes following a monetary shock: no current account effect, a deficit current account effect, or a surplus current account effect.

CHAPTER 5

EXPLAINING LONG RUN ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

5.0 Introduction

This chapter explores the dynamics of long run growth in Sub-Saharan Africa. This subject has also become topical in recent times as even the IMF has shifted focus (Bird, 2004b) from its traditional function of lending for short-term balance of payments adjustment, to financing programs that will facilitate growth and poverty reduction in developing countries. Thus both the IMF and the World Bank are now involved in development financing, and this depicts the extent of commitment to boost growth and development in developing regions such as Sub-Saharan Africa.

In spite of this, the stalling rate of long run growth across Sub-Sahara Africa in particular continues to puzzle both policymakers and researchers. Over the last fifty years or more, so much has been spent on development assistance and especially over the last two decades or more; several structural reforms have been undertaken in most of the countries in the regions. However, long run growth rates have largely remained almost the same as they were when these countries began their journeys some fifty or more

years ago. As shown in Chapter 3, growth rates appear to respond favourably to reforms, albeit with a lag. However, the puzzle is why such short run growth impulses are not reflected directly in long term growth rates; and indeed living conditions, which are unfortunately rather worsening. This is what has motivated this chapter, to explore the determinants of long run growth as far as the region is concerned.

Indeed several studies have investigated this phenomenon, but these often report different and inconsistent findings. We thus aim to correct for the possible econometric shortcomings that could as well account for the inconsistent findings in the existing studies, and to provide some new evidence that can guide policy. This is rather important, considering the level of commitment that the international community has begun to show[75], as far as growth and poverty reduction in Sub-Sahara Africa is concerned.

We use the growth regressions approach based on the standard neoclassical exogenous growth framework that has regained much empirical appeal in recent years. Indeed, we take note of the endogenous growth literature on economic

[75] For example, the Prime Minister of the United Kingdom, Tony Blair has launched a bold initiative (Economic Commission for Africa) to help facilitate current efforts at promoting growth in Sub-Saharan Africa.

divergence/convergence. However, our augmentation of the basic Solow specification is expected to account for the role of human capital etc.

The chapter applies the dynamic panel GMM estimation technique that has been employed in recent times to enhance the growth regressions approach since the seminal paper by Casselli, Esquivel and Lefort [1996]. The advantage about the technique is that by default, one is able to take care of possible endogeneity biases and also biases due to omitted variables. The presence of these potential biases might explain the inconsistent results reported in various growth studies.

Specifically, we focus on the growth convergence debate [absolute, conditional, club] as well as the role of controls such as money growth, openness, financial development, poverty, foreign direct investment, inflation, and government distortions that have been cited in papers such as Azam et al [2002 pp.180-195], Fosu [1999], Sachs and Warmer [1997], Temple [1998], Easterly and Levine [1997] etc. to explain the growth process in Africa.

The convergence issue in particular has been widely studied in the wider literature. Studies such as Barro [1991],

Mankiw, Romer and Weil [1992], Caselli, Esquivel and Lefort [1996]] confirm economic convergence among countries. More recent ones such as Lucas [2000] have even predicted that in about a century, diffusion of knowledge would ensure convergence in income distribution across all nations of the world. Such that we should all be equally rich and growing by then.

On the other hand, studies such as Bernard and Durlauf [1995], and Durlauf and Johnson [1995] etc. find no evidence of a tendency towards economic convergence in the wider context. Given the inconclusiveness of findings about convergence across regions, we ask the empirical question: What can we learn about possible intra-regional or club convergence on the lower end? This question is important, given the fact that regions such as Africa do have relatively significant disparities in intra-regional per capita income levels as well as growth rates.

Our empirical approach is thus based on the framework by Caselli, Esquivel and Lefort [1996][76] that has sought to address the perceived empirical shortcomings [omitted variable bias and endogeneity bias leading to inconsistent estimates etc.] associated with the single cross-sections

[76] Also Nerlove (1996). Their approach is based on Arellano and Bond [1991].

growth regressions approach. A subsequent study by Bond, Hoeffler and Temple [2001] has suggested that in the case of finite samples, and also persistence and weak instruments, the "difference" GMM estimator upon which the CEL approach is based should be augmented as indicated in Blundell and Bond [1998].

Thus we make use of the two approaches to test for convergence and also the determinants of long run economic growth in Sub-Saharan Africa. The latter has been explored by earlier cross-sectional studies such as Saviddes [1995], Ghura and Hadjimichael [1996], Sachs and Warner [1997], Easterly and Levine [1997], Collier and Gunning [1999] etc. However our correction for both omitted variable bias and endogeneity biases should produce more precise understanding of the long run growth dynamics in Sub-Saharan Africa.

The data for the study is obtained from the World Bank's World Development Indicators and also the Penn World Tables, and the sample of countries is shown in the Appendix. The period of study is 1965 - 2000, and we transform the set of observations into a panel of five-year non-overlapping averages.

5.1 Recent Empirical Evidence on Growth in Africa

In terms of the wider empirical growth literature, there is an ongoing debate [Acemoglu, Johnson, and Robinson [AJR], 2001; Acemoglu, Johnson, Robinson and Thaicharoen [AJRT], 2003; Rodrik, Subramanian and Trebbi [RST], 2004; Acemoglu, Johnson, and Robinson [AJR], 2003; Rodrik, 2003] about the role of institutions, geography and disease factors in explaining economic outcomes across previously colonised regions of the world.

These authors have indeed introduced a new dimension to empirical work on the varied growth experiences across the world. The seminal paper by AJR [2001] and later AJRT [2003] started it all, when the authors exploited differences in the mortality rates faced by European colonialists to estimate the effect of institutions on economic performance across regions that were colonialised before the pre-war years.

They found that economic outcomes were largely dependent on the type of institutions that have persisted since the colonial era. In places where Europeans faced high mortality rates due to the different disease environment, they could not settle and they were much more likely to set up

extractive institutions. These institutions, which include - political institutions that do not constrain politicians and political elites, ineffective enforcement of property rights for investors, widespread corruption, and a high degree of political instability, have largely persisted even after independence.

AJRT [2003] further argued that - distortionary macroeconomic policies, including high inflation, large budget deficits and misaligned exchange rates - are mere symptoms of the effect of such weak institutions.

Consequently, when the authors corrected for the effect of institutions, they found that macroeconomic distortions had only a minor impact on economic outcomes. RST [2004] confirmed the earlier findings in AJR [2001] even when the former used a different instrument for the effect of institutions. They found that the effect of institutions "trumps" everything else! Once institutions were controlled for, conventional measures of factors such as geography and trade had at best very weak direct effects on incomes.

However, Sachs [2003] disagrees with the finding that "institutions rule". Instead, the author argues that geographical factors still have potential direct effects on

per capita incomes, even after controlling for the quality of institutions. Thus far, the recent wider empirical literature seems to reach a consensus that historical factors as well as geography explain the growth puzzles in regions such as Africa.

In terms of the specific empirical literature on growth in Africa, the causes of the region's growth tragedy have long attracted much empirical interest. Studies in this area include - Easterly and Levine [1997], Sachs and Warner [1997], Montiel [1996], Ghura and Hadjimichael [1996], Temple [1998], Easterly and Levine [1997], Ojo and Oshikoya [1995], Savvides [1995], Collier and Gunning [1999], Gyimah-Brempong and Traynor [1999], Ghura [1995], Fosu [1996], Fosu [1999], Azam et al [2002] etc.

Most of these studies employ different methodologies [Azam et al, 2002] but largely based on a general model specification often in line with the new growth theories. The range of explanatory variables often include [Table 5.7 on page 139] - [i] initial conditions [ii] investment [iii] index for political structure, [iv] market distortion, [v] natural resource abundance [vi] trade openness, [vii] ethnic fractionalisation, [viii] population, [ix] neighbourhood effects, [x] inflation, [xi] climate and geography, etc.

However, the argument in Caselli, Esquivel and Lefort [1996] implies that most of these studies suffer from either an omitted variable bias [due to inappropriate treatment of correlated unobserved country specific effects] or endogeneity bias due to the dynamic nature of growth regressions or both.

No wonder the studies report varied range of findings [Azam et al, 2002 p.178-179]. For example, Ghura and Hadjimichael [1996] investigated long run growth in Sub-Saharan Africa over the period 1981-1992. Using feasible generalised least squares techniques on a panel of 29 Sub-Saharan African countries; the authors found support for conditional convergence, even though absolute convergence was rejected.

On the control variables, the authors found that both private and public investment had a positive and significant effect on growth. Other variables that affected long run growth significantly were the budget deficit, inflation, real exchange rate, and population growth.

Sachs and Warner [1997] presented one of the most comprehensive analyses of the sources of slow growth in developing countries with a particular emphasis on Sub-

Saharan Africa over the period 1965 - 1990. The authors included a wide range of explanatory variables such as openness, geography, climate, natural resources, institutional quality, inflation, life expectancy, neighbourhood effects, ethnic fractionalisation, and population growth.

They found that both natural factors and inappropriate economic policies were responsible for the slow growth in developing countries including Sub-Saharan Africa. Among the natural factors are - natural resource dependence, tropical climate, and limited access to the Sea. Examples of economic policy factors are - openness to international trade, government saving, market-supporting institutions, life expectancy, and demographic factors. Contrary to findings in other studies such as Barro [1991] and Easterly and Levine [1997], the authors found no support for factors such as - neighbourhood effects, ethnic diversity, and the so-called Sub-Saharan African "dummy".

Easterly and Levine [1997] also contributed some valuable empirical perspective on the growth tragedy in Sub-Saharan Africa in particular. The paper investigated both the direct and indirect effect of ethnic diversity on growth. The paper makes some interesting observations. First, it was reported

that ethnicity had a significant negative direct effect on growth. Second, it was found that high levels of ethnic diversity were strongly linked to high black market premiums, political instability, poor financial development, low provision of infrastructure, and low levels of education.

Since these variables were also found to have a negative effect on growth, this means that ethnic diversity has both a direct as well as an indirect effect on growth. The paper also found evidence of non-linear convergence in growth rates.

Temple [1998] sought to extend the analyses in Easterly and Levine [1997] and Sachs and Warner [1997] by explicitly exploring the effect of initial conditions and social arrangements on growth in Africa. Using a novel estimation technique of "re-weighted least squares", the paper found that more than half of the variation in growth rates could be explained by observable variables capturing initial conditions. Further, it was found that social capital mattered for growth in the sense that countries that had relatively low social capital were more likely to have dismal policy outcomes, low investment and slow growth.

Saviddes [1995] in an earlier effort also studied the determinants of per capita growth rates across Africa for the period 1960-1987. Using a fixed effects[77] panel model based on endogenous growth theory, the paper found support for both absolute and conditional convergence. It was further reported that both economic and political variables influence growth in Africa.

The economic variables include - initial conditions, investment, population growth, trade orientation, inflation, financial development, and government expenditure. The study made the additional observation that growth in CFA countries was worse than in non-CFA countries over the period.

Ojo and Oshikoya [1995] also studied the determinants of long-term growth in a cross-section of African countries over the period 1970-1991. As is usual in much of the growth regressions literature, the authors included variables such as initial per capita income, investment, population growth, macroeconomic policy [inflation and exchange rates], external factors [export growth, external debt, and terms of trade], political environment, and human capital development.

[77] Nickell [1981] demonstrates that the inclusion of fixed effects in a dynamic model biases the coefficient of the initial value of the dependent variable included as an explanatory variable downward towards zero and therefore toward support for the convergence hypothesis.

The paper finds that, on average the most significant variables influencing long-term growth in the sample of African countries over the study period were - investment, external debt, population growth, and the macroeconomic environment.

Hence, even though the empirical studies described above do provide interesting insights into the long run growth process in Africa, yet they probably suffer from the potential biases as mentioned and will be discussed further in the next section [see Montiel, 1996p.79][78]. Hence the validity of the conclusions might have suffered as well.

Moreover, the practice of studying the African case with a simple slope dummy [African dummy] in a general cross-country regression on developing countries is not satisfactory. Our paper takes a different approach by incorporating the new empirical issues proposed by CEL [1996] and BHT [2001] for a distinct panel of Sub-Saharan African countries.

[78] Montiel discusses some of these empirical problems [pp.79-82] associated with cross-country growth studies in Africa. The author cited some of the empirical difficulties as - heterogeneity biases, lack of robustness of the results, and endogeneity biases.

5.2 Dynamic Panel GMM Approach

The classic paper by Caselli, Esquivel and Lefort [1996][79], hereinafter called CEL, made an outstanding contribution to the cross-country growth regressions approach. The authors challenged the existing single cross-section empirical literature about the treatment of the country specific effect [which led to omitted variable bias] and also the issue of endogeneity among the explanatory variables. Consider the general specification often used in most cross-country studies of growth:

$$InY_{i,t} - InY_{i,t-\tau} = \phi InY_{i,t-\tau} + \gamma X_{i,t-\tau} + \eta_i + V_t + \varepsilon_{i,t} \quad \ldots\ldots \quad (5.1)$$

where $X_{i,t}$ is a vector of control variables determining economic growth, η_i is a country-specific effect, ξ_t is a time specific effect. V_t is a period specific constant, and $\varepsilon_{i,t}$ is an error term. ϕ, γ are parameters.

CEL argues that, for cross-section regressions in particular, OLS can only be consistent if the individual country effect is uncorrelated with the explanatory

[79] Nerlove [2002]p.274-301 also makes interesting contribution to the literature by examining the properties of various estimators [excluding GMM] in a growth regression context. The author argues that most of the estimators yielded inconsistent results in growth regressions thereby calling into question some of the conclusions reached on convergence and determinants of growth in cross-country studies.

variables. This is clearly not the case[80], if one looks at equation [3] thus:

$$E\left[\eta_i(InY_{i,t-\tau})\right] = E\left[\eta_i(\phi InY_{i,t-2\tau} + \gamma X_{i,t-2\tau} + \eta_i + V_{t-\tau} + \varepsilon_{i,t-\tau})\right] \neq 0, \quad \ldots \qquad [5.2]$$

since $E\left[\eta_i^2\right] \neq 0$.

CEL further illustrates that omission of the country-specific effect η_i only leads to a downward bias in the convergence coefficient. Secondly, there is always a possibility of endogeneity[81] of a subset of X_i, such that treating them as exogenous, only introduces endogeneity bias into the results. CEL also challenged the panel data studies at the time, such as Barro and Lee [1994], Barro and Sala-i-Martin [1995], Loayza [1994], and Islam [1995].

For example, Barro and Lee, in their paper, applied the GLS estimator and used instruments for the potentially endogenous variables [i.e. by using the lagged values of such variables]. However, CEL criticised their solution that it can only be consistent under the assumption of random individual effects[82]. Moreover, as already shown in [4], the

[80] CEL argue that the omission of the individual specific effect translates into a downward bias in the estimate of the convergence coefficient

[81] For example, investment in human capital and population growth

[82] Meaning that effects are correlated over time but not with other regressors

lagged dependent variable is expected to be positively and directly related to the country specific effect.

Hence, it can hardly be assumed that individual effects are random. By induction therefore, CEL argues that whereas these studies attempt to correct for endogeneity bias, they did not address the issue of correlated individual effects adequately and hence their results suffer from omitted variable bias.

In the case of Loayza [1994] and Islam [1995], it is argued that these also ignored the endogeneity question completely. CEL summed it all up thus,

"….*almost all existing cross-country regressions, either based on cross-section or panel-data techniques, have been estimated inconsistently* [p.369]".

Casselli, Esquivel and Lefort [1996] therefore proposed a consistent estimator based on the general method of moments [GMM] approach [Arellano and Bond, 1991][83], which is able to address both issues of omitted variable bias and endogeneity bias. To explain the approach, rewrite [5.1] as:

$$y_{i,t} - y_{i,t-\tau} = \phi y_{i,t-\tau} + \gamma X_{i,t-\tau} + \eta_i + V_t + \varepsilon_{i,t} \quad \text{.....[5.3]}$$

$$\text{Hence,} \quad y_{i,t} = \Phi y_{i,t-\tau} + \gamma X_{i,t-\tau} + \eta_i + V_t + \varepsilon_{i,t} \quad \text{.....[5.4]}$$

[83] See appendix

where $\Phi = (1+\phi)$, and $y_{i,t} = InY_{i,t}$

Taking first-differences,

$$y_{i,t} - y_{i,t-\tau} = \Gamma(y_{i,t-\tau} - y_{i,t-2\tau}) + \Pi(X_{i,t-\tau} - X_{i,t-2\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad \text{.....} \quad [5.5]$$

Hence, equation [5.5] can therefore be estimated consistently by the method of moments. The Sargan test of overidentifying restrictions is then used to test the validity of the set of instruments. CEL adopts this estimator, and applies it to an expression for the behaviour of a country's growth rate around the steady state [See Appendix 5]:

$$InY_{i,t} - InY_{i,t-\tau} = -(1-e^{-\lambda\tau})InY_{i,t-\tau} + (1-e^{-\lambda\tau})\frac{\alpha}{1-\alpha}\left[In(s) - In(n+g+d)\right] + \eta_i + \varepsilon_{i,t}$$

.....[5.6]

Where $\lambda = (n+g+d)(1-\alpha)$.

Using panel data from Summers and Heston [1991], CEL estimated the above and obtained -0.473 as the coefficient of $InY_{i,t-\tau}$. This implies that $\lambda = 0.128$. Hence a faster yearly convergence rate of 12.8 percent was reported instead of the 0.02 that was maintained in the literature [Mankiw, Romer and Weil, 1992].

Following the introduction of the GMM-systems estimator [Arellano and Bover [1995], Blundell and Bond [1998]], as an alternative to the GMM-differences estimator[84], a subsequent paper by Bond, Hoeffler and Temple, 2001 [BHT] extended the CEL approach further. BHT showed that, if time series are persistent, the first-differenced GMM estimator can be,

"...poorly behaved since lagged levels of the series provide only weak instruments for subsequent first-differences" [p.3].

This problem is worsened in finite samples. Hence they recommended the use of a more efficient GMM-systems estimator [based on Blundell and Bond, 1998] for estimating empirical growth models. BHT applied the systems GMM estimator to the dataset of CEL and reported a much lower rate of conditional convergence [around 2% per year] than the latter.

We thus contribute to this literature by extending the approach in CEL [1996] and BHT [2001] to a panel of Sub-Saharan African countries. The next section reviews the convergence/divergence debate and discusses some of the recent empirical findings.

[84] see Appendix 2 for detailed exposition

5.3 Economic Convergence - Recent Empirical Evidence

According to neoclassical growth models for closed economies [Ramsey [1928], Solow [1956]], Cass [1965], and Koopmans [1965]], the per capita growth rate of a country tends to be inversely related to its starting level of income per person. Such that, given similar preferences and technology, the assumption of diminishing marginal product of capital means that poor countries grow faster to catch up with rich countries [since the former has a lower capital to labour ratio and consequently higher marginal product of capital], and hence this results in absolute convergence among countries.

Even where country heterogeneities are allowed, so that countries differ in aspects such as technology, population, and propensities to save, convergence is expected to occur in conditional terms - convergence to different levels of per capita income but to the same steady state growth rates. Barro and Sala-i-Martin [1995] p.383 refers to another type of convergence, σ convergence, which is based on cross-sectional dispersion of per capita incomes among countries.

According to the latter, convergence occurs if the dispersion [measured as the standard deviation of the logarithm of per capita incomes] among a group of countries

declines over time. It is explained that the first type of convergence, dubbed β convergence [where poor countries grow faster than rich ones] tends to generate σ convergence [reduced dispersion of per capita incomes]. However, this process could be

"...offset by new disturbances that tend to increase dispersion" [op.cit].

Apart from the Neoclassical assumption of diminishing marginal returns to the capital input that underlines economic convergence, other causes of convergence have been identified in the literature. For example, the technology catch-up models [Abramovitz, 1986] postulate that being backward in productivity levels implies a potential for rapid growth.

Barro and Sala-i-Martin [1995] explained this further with a diffusion of technology model [Leader-Follower Model]. They showed that technology diffusion occurs as followers copy the new ideas patented by the Leader. However, since the cost of imitation and adaptation rises as the pool of uncopied ideas gets smaller,

"...this cost structure implies a form of diminishing returns to imitation and thereby tends to generate a pattern of convergence.....In the steady state; the leading and following countries grow at the same rate. Thus equalisation of growth

rates occurs in the long run even if countries differ in costs of research and development, levels of productivity, and the willingness to save" (ch.8).

Barro and Sala-i-Martin [1995 ch.9] also argues that migration of workers with low human capital from poor to rich economies tends to speed up the convergence of per capita income and product. Another contribution by Lane [2001(b)] showed that international trade also brings about convergence of per capita incomes across countries. Lane proposes a credit channel between international trade and economic convergence, which is transmitted through the positive effect of trade openness on a country's access to the international capital markets.

Hence such countries can borrow to finance a more rapid domestic investment, and hence a faster output growth rate. Of course, the literature abounds with studies showing the positive effect of trade on growth [e.g. Grossman and Helpman, 1991; Frankel and Romer, 1999]. The main argument in this literature is that international trade brings about specialisation in production, transfer of technology, and increased competition among domestic firms.

From the discussions, it is evident that the debate in the theoretical literature is shifting from whether growth

convergence or divergence occurs, to the new frontier of determining how growth convergence comes about[85].

Indeed, the concept of growth convergence has been widely researched in the empirical literature as well, especially beginning from William Baumol [1986]. In the original formulation, this was done by estimating a relationship [see appendix 1] such as:

$$\frac{1}{T}.\log\left(\frac{y_{i,t+T}}{y_{i,t}}\right) = \alpha - b.\log(y_{i,t}) + \gamma.X_{i,t} + \varepsilon_{i,t} \quad \text{.....[5.7]}$$

where i indexes economies and $X_{i,t}$ is a vector of variables [such as the savings rate, depreciation rate of the capital stock, and population growth rate] that control for the determinants of steady-state output per capita. The left hand side of equation [5.7] is the growth rate of economy i measured over an interval of T years. The term $-b.\log(y_{i,t})$ captures initial positions such that an estimated value of $b > 0$ is interpreted as evidence of conditional convergence.

To date, the empirical literature continues to expand as various studies employ a wide range of methodologies to test

[85] For example the Club convergence hypothesis, that proposes the existence of multiple steady state equilibria rather than a one globally stable steady state etc.

for convergence. The range of methodologies is presented in Table *5.1*. Much of the earlier empirical literature used the cross-sectional approach as well as correlation between per capita growth rates and the starting level of per capita output.

For example, Barro [1991] tested the partial correlation for a set of 98 countries, and obtained a figure of -0.74. This was interpreted to mean that higher initial per capita GDP is negatively associated with subsequent per capita growth. The results from cross-sectional regression also yielded a significantly negative coefficient [-0.0075] for initial level of per capita GDP, thereby confirming support for the convergence hypothesis of neoclassical growth models.

Barro and Sala-i-Martin [1992] also used similar estimation methods to test for convergence across the 48 contiguous states in America. The paper also tested convergence across a broad sample of countries, and for both cases, reported a convergence rate of around 2 percent per year. Other studies that also used similar techniques and reported convergence are Baumol [1986], Delong [1988], Dowrick and Nguyen [1989], Mankiw, Romer and Weil [1992].

Table 5.1: Convergence - Empirical Methodologies

METHODOLOGY	RESEARCH STUDIES
Numerical Simulation	Lucas [2000], Tamura [1996], Taylor and Rada [2003]
Clustering and Classification	Azariadis and Drazen [1990], Durlauf and Johnson [1995], Franses and Hobijn [1995]
Distribution Dynamics	Bianchi [1997], Jones [1997], Quah [1993, 1994, 1996, 1997]
Time Series Approach	Aubyn [1999], Lee, Pesaran and Smith [1997], Bernard [1992], Bernard and Durlauf [1995], Greasley and Oxley [1997]
Dynamic Panel GMM	Caselli, Esquivel and Lefort [1996], Benhabib and Spiegel [2000], Easterly, Loayza, and Montiel [1997], Forbes [2000], Levine et al [2000], Bond, Hoeffler, and Temple [2001]
Panel Data (π -Matrix) Approach	Islam [1995], Knight, Loayza and Villaneuva [1993], Loayza [1994]
Panel Data	Barro and Lee [1994], Barro and Salai-i-Martin [1995]
Cross-Sectional Estimation	Barro [1991], Barrow and Salai-i-Martin [1992], Baumol [1986], Delong [1988], Dowrick and Nguyen [1989], Mankiw, Romer and Weil [1992]
Technology Gap Approach	Chatterji [1992]

In the early literature, Chatterji [1992] used a distinctive technique for testing convergence, based on the technology gap framework of Gomulka [1971]. According to the technology gap argument, the evolution of technical progress starts from the basic idea that the rate of technological progress depends on the distance to the world leader in technology [for example, the USA]. Hence, technology is spread through

the world economy by a transfer of technology from the world leader[86].

An important feature in the technology diffusion models is that all countries eventually converge to the same steady state. Chatterji [1992] exploited this model and assumed the existence of multiple equilibria. Thus in their empirical model, the relation between the growth rate of per capita income and its initial level was assumed to be non-linear. The variable gap was defined as the difference between the log of per capita income in the US in year *t* and the log of per capita income in country *i*. The period of study was 1960-1985, and the empirical relationship was specified as:

$$gap_{i,1985} = \delta_1 gap_{1960} + \delta_2 gap_{1960}^2 + \delta_3 gap_{1960}^3 + \varepsilon_i \quad \ldots\ldots \quad [5.8]$$

Thus, strong convergence is indicated by $-1<\delta_1<0$, and $\delta_2 = \delta_3 = 0$.

Beginning with studies such as Islam [1995], Knight, Loayza and Villaneuva [1993], Loayza [1994] and Barro and Lee [1994], the empirical literature moved on from the traditional cross-sectional analysis to panel data analysis where the time series dimension of the cross-sections are

[86] The models assume that poor countries try to copy technologies that exist in rich countries but often are constrained by factors such as insufficiently educated population. On the contrary, rich countries have abundance of such capabilities.

considered for the estimations. Under the panel approach, the familiar equation for testing convergence is reformulated as a dynamic panel data model, and different panel data estimators are then used to estimate it.

The approach can be regarded as superior to the single cross-section approach since it takes care of correlated individual country-specific effects [omitted variable bias] by way of allowing for differences in the aggregate production function across countries. The main findings from initial studies that use the panel method is that the estimated rates of conditional convergence turns out to be higher than in the case of single cross-sectional estimation [Islam [1995], Caselli, Esquivel and Lefort [1996]].

An alternative, time series approach to testing convergence has been proposed and used in the empirical literature by authors such as Bernard and Durlauf [1996], Quah [1992], Lee, Pesaran and Smith [1997] and Aubyn [1999]. This approach focuses on the long-run behaviour of differences in per capita output across countries. The model implies that these differences are transitory, such that long-run forecasts of the difference between any pair of countries converge to zero as the forecast horizon increases.

Therefore, convergence follows that output differences between two economies cannot contain unit roots or time trends, and also that output levels in two economies must be cointegrated[87] [Bernard and Durlauf, 1996].

Interestingly, whereas the results in most cross-sectional studies confirm convergence [Baumol [1986], Dowrick and Nguyen [1989], Barro and Sala-i-Martin [1991, 1992], Barro [1991], Mankiw, Romer and Weil [1992], Caselli, Esquivel and Lefort [1996]], most of the convergence studies based on time series tests have generally rejected convergence[88] [Quah [1992], Bernard [1992], Bernard and Durlauf [1995]].

Beginning with Azariadis and Drazen [1990], a different class of models have proposed the existence of multiple locally stable steady states in per capita output. According to these models, cross-country growth behaviour is typically non-linear and exhibits multiple regimes. However, countries associated with the same steady state do obey a common linear regression [Durlauf and Johnson, 1995]. These, according to the school of thought, render conventional convergence tests unreliable.

[87] If convergence holds between all pairs, then convergence holds for all.

[88] Bernard and Durlauf [1995] tested for a single unit root process driving output across the OECD economies. Quah on the other hand, tested for the presence of common stochastic trends in a large cross-section of aggregate economies. This is done by subtracting per capita output of US from the per capita output of every economy under study, and then testing for unit roots in the series obtained.

Bernard and Durlauf [1993] explained that,

"…. *a linear regression applied to data generated by economies converging to multiple steady states can produce a negative initial income coefficient. Intuitively, the initial income coefficient in the mispecified linear model inherits the convergence exhibited among countries associated with a common steady state in the correctly specified multiple regime growth process*" [p.18].

Durlauf and Johnson [1995] studied the multiple steady-state argument in cross country growth and found that countries do not obey a common linear model. Moreover, even for the countries that were found to obey a common linear model, some subsets of countries had very different production functions.

This finding implies that the other empirical studies that estimate linear models to show convergence are unreliable, since the model used for such studies is mispecified. Franses and Hobijn [1995] made similar findings that high and low income economies do not converge to one another, even though they converge to different limits.

Other empirical studies such as Bianchi [1997], Jones [1997], and Quah [1993, 1994, 1996, 1997], provide another revealing methodology in the literature. Based on the entire cross-section distribution, the approach studies the distribution dynamics represented by a law of motion for the

stochastic process such as $\{\phi_t : t \geq 0\}$, where ϕ is the probability associated with some cross-section distribution F_t at a particular time period.

Hence, if such probability exhibits tendencies towards a point mass, then one can conclude that there is convergence towards equality or otherwise. Indeed, the methodology is less straightforward and technical. Nevertheless, it represents the depth of effort in the empirical literature at understanding long-run growth dynamics.

Finally, studies such as Lucas [2000], Tamura [1996] employ a simulation model of world income dynamics, based on technology diffusion to study and predict convergence in income distribution across all regions of the world. Similarly, Taylor and Rada [2003] set up simulations from 1998 to 2030, of per capita income ratios for nine regions of the world - Africa, China, Middle East, South Asia, East Asia, Latin America, Tigers, Former USSR, and Eastern Europe.

In place of some "mythical" aggregate production function, the authors used a standard, sources of growth equation based on identities from the national income and product accounts. Among the growth factors considered in their

simulation model are - effect of industrialisation, effect of human capital accumulation, wage shares in GDP, capital accumulation, capital productivity, labour force growth, retardation effect, resource constraints, etc.

The projections in the simulation model reveal that poor regions are likely to converge relatively [developing regions versus the OECD], since the ratio of GDP per capita has an upward slope for all the regions.

However, the model also showed that absolute income gaps in comparison to the OECD, also increase sharply. The authors conclude therefore that,

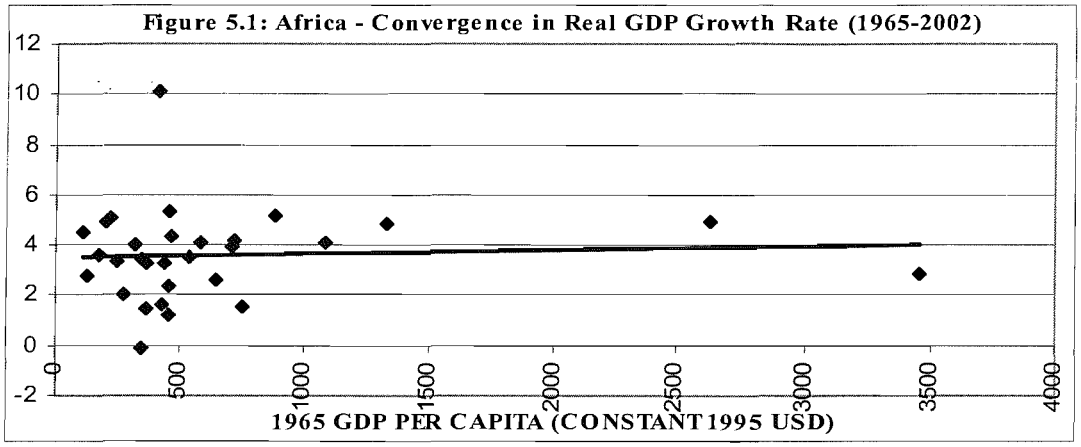
"…. at least in the medium term, the prophesy by Lucas [2000] *about all countries being equally rich and growing looks well off the mark".*

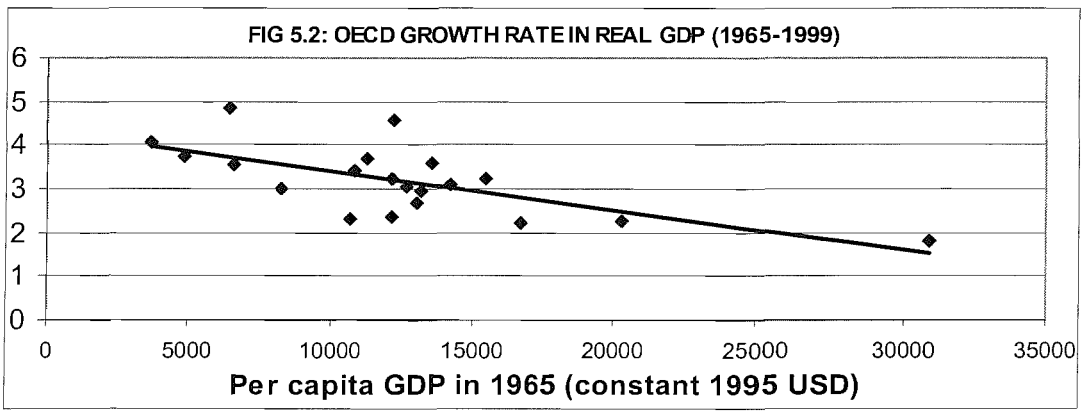
From the foregoing, it is clear that evidence of economic convergence remains inconclusive even in the wider empirical literature. The methodologies used appear to matter for the findings, and these vary widely. Our paper is based on the dynamic panel approach as proposed in CEL [1996] and BHT [2001] as outlined in section 3. The next section presents the empirical framework for this paper.

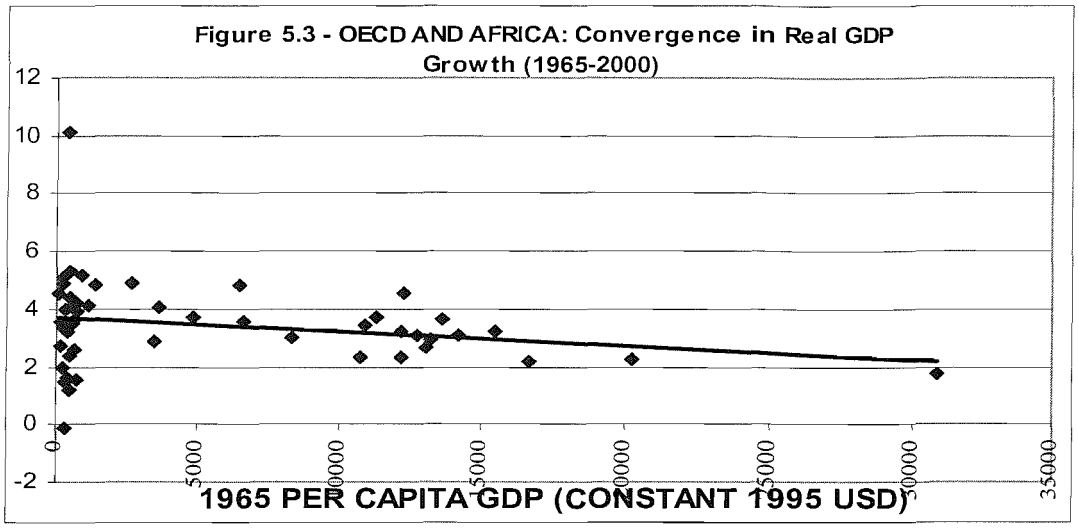
5.4 Empirical Analysis

5.4.0 Absolute Convergence

Critics of the neoclassical growth theory often refer to the failure of per capita output to equalise across first and third world economies, and also the apparent failure of growth rates in less developed countries to exceed those of advanced industrialised countries. These are often taken as evidence that there is no tendency for poorer economies to catch up to the richer ones. Of course it is evident in the graphs below:







that average growth rates among our sample of African countries [in Figure 5.1] over the 1965-1999 period have not been markedly different [except for Botswana's 10.1 percent growth over the period] from growth in OECD countries [in Figure 5.2] over the same period. Besides, whereas average growth rates among OECD countries show a tendency to converge, in the case of African countries, there is no such clear tendency. The trend in Figure 5.3 suggests there could be some element of catching up. However, the puzzle is why the gap in per capita incomes between Africa and the OECD countries remains just as wide as it was in 1965. Given our sample of OECD and African countries, Table 5.2 below shows the changes:

Table 5.2: Change in per capita incomes (1965-1999) - OECD and Africa

CONSTANT 1995 USD	OECD	AFRICA
Average per capita income (1999)	27,226.5	1061.617
Average per capita income (1965)	12,454.325	650.699
Change over the period	2.19	1.64
Average real GDP growth rate (%)	3.6	3.2

that have occurred between 1965 and 1999. Indeed the OECD sample grew on the average by 3.6 percent compared to the African average of 3.2 percent. No wonder, OECD per capita incomes increased by more than two fold whereas African average per capita incomes increased by about sixty percent [Fig 4 in appendix 3 presents the distribution of per capita incomes among our panel of countries over the study period][89], thereby widening the absolute gap in per capita incomes even further.

5.4.1 Conditional Convergence

It is quite apparent from Figure 5.1 that absolute convergence is unlikely to hold for our sample of African countries[90]. Indeed this is confirmed econometrically, as the coefficient of initial income in a regression on the

[89] The highest per capita income countries are Algeria, Botswana, Gabon, Mauritius, Tunisia, and South Africa. Mauritius recorded the highest per capita income of over $12,000.

[90] The concept of - convergence does not hold either. The dispersion of income distribution across the sub-region has been widening (see Fig. ??? in Appendix 4c), as depicted by the linear trend in the plot of the coefficient of variation across our study period.

growth rate of log per capita incomes suggest a positive effect that is insignificant. We therefore proceed to test for conditional convergence. Our estimation model for testing conditional convergence is based on both the restricted and unrestricted form of equation [5.8] and [5.9]. Thus the behaviour of a country's growth rate around the steady state could be expressed as [see appendix 5]:

$$InY_{i,t} - InY_{i,t-\tau} = -(1-e^{-\lambda\tau})InY_{i,t-\tau} + (1-e^{-\lambda\tau})\frac{\alpha}{1-\alpha}In(s) - (1-e^{-\lambda\tau})\frac{\alpha}{1-\alpha}In(n+g+d) + \eta_i + \varepsilon_{i,t}$$

[5.9]

where $\lambda = (n+g+d)(1-\alpha)$;

$$InY_{i,t} - InY_{i,t-\tau} = -(1-e^{-\lambda\tau})InY_{i,t-\tau} + (1-e^{-\lambda\tau})\frac{\alpha}{1-\alpha-\beta}In(s^k) + (1-e^{-\lambda\tau})\frac{\alpha}{1-\alpha-\beta} In(s^h) + (1-e^{-\lambda t})\frac{\beta}{1-\alpha-\beta}In(n+g+d) + \eta_i + \varepsilon_{i,t}$$

[5.10]

where $\lambda = (n+g+d)(1-\alpha-\beta)$.

Tables 5.3 and 5.4 present results of our test of the conditional convergence hypothesis [textbook Solow and augmented Solow] based on different methodologies. Table 5.5 and 5.6 [see appendix] present results for the two GMM estimators based on further augmentation of our model using selected macroeconomic variables. Table 5.7 [see appendix] compares our results with the existing literature.

Table 5.3: Conditional Convergence in the Solow Model (Unrestricted)

	Pooled		Fixed Effects		GMM (diff)	
	a	**b**	**a**	**b**	**a**	**b**
Constant	-0.0901 (0.07)**	-0.046 (0.35)	0.2905 (0.005)**	0.5342 (0.00)**	0.304 (0.01)**	0.0026 (0.632)
Initial Income	0.0142 (0.199)	0.0074 (0.54)	0.0487 (0.019)**	-0.126 (0.00)**	-0.152 (0.10)*	-0.192 (0.05)**
Savings	0.0131 (0.00)**	0.061 (0.00)**	0.0487 (0.019)	0.0540 (0.00)**	0.099 (0.001)**	0.103 (0.001)**
Population	0.0133 (0.00)**	-0.07 (0.00)**	-0.1185 (0.119)	-0.0772 (0.162)	-0.163 (0.000)**	-0.178 (0.00)**
Literacy Rate	------	0.065 (0.97)	-------	-0.0506 (0.383)	------	0.081 (0.793)
Implied λ	xxxxxx	xxxxx	1.61%	2.67%	3.29%	4.26%

a *denotes the textbook Solow model.*
b *denotes the human capital augmented Solow model.*

Table 5.4: Conditional Convergence in the Solow Model (Restricted)

	Pooled		Fixed Effects		GMM (diff)	
	a	**b**	**a**	**b**	**a**	**b**
Constant	2.189 (0.156)	-0.1099 (0.336)	0.2353 (0.039)**	0.7228 (0.002)**	-0.0780 (0.766)	-0.0038 (0.842)
Initial Income (lny_o)	0.697 (0.056)**	-0.0502 (0.370)	-0.0721 (0.020)**	-0.1936 (0.001)**	-0.1254 (0.082)*	-0.1902 (0.096)*
$ln(s) - ln(n+g+\delta)$	0.0118 (0.183)	0.1447 (0.005)**	0.0552 (0.007)*	0.0929 (0.156)	0.1089 (0.00)**	0.1482 (0.092)*
$ln(h) - ln(n+g+\delta)$	------	-0.0175 (0.794)	------	-0.0629 (0.250)	------	0.0935 (0.724)
Implied λ		1.03%	1.49%	4.30%	2.68%	4.22%
Implied α			43.5%		46.5%	

a *denotes the textbook Solow model.*
b *denotes the human capital augmented Solow model.*

For the purpose of comparison with existing studies, and illustrating the arguments in CEL, we present alternative results for the least squares and fixed effects estimation methods, in addition to our GMM estimates. In the case of the GMM estimates, we first discuss results for the differences estimator, and then subsequently compare to results for the systems estimator [Table 5.6 in appendix].

The result for the unrestricted textbook Solow model shows that there is a clear tendency toward convergence both in the fixed effects and GMM methods. The pooled estimation results suggest no convergence at all, as the coefficient of initial income is positive and insignificant. This difference could therefore be accounted for by the presence of omitted variable bias and also endogeneity bias as discussed in section 4.

The results for the fixed effects method also shows that population growth has an insignificant effect on the transitional dynamics of growth in Africa. However, correcting for endogeneity bias in the GMM model indicates that population growth indeed has a significant and negative effect on growth. Of course, this confirms findings in earlier studies such as CEL [1996] and BHT [2001], albeit for a different sample of countries. The speed of convergence also shows that correcting for endogeneity bias changes the speed of convergence from 1.61% to 3.29%.

For the case of the augmented Solow model, the effects of initial income, savings and population growth remain largely the same as in the textbook case. However, the literacy rate

does not show a significant effect in any of the alternative methods.

We also used the variable 'secondary school enrolment' as a measure of human capital accumulation. However, the estimated effect on growth was negative, which suggested that school enrolment in Africa could be measuring the effect of government consumption through the provision of infrastructure, textbooks, and salaries for teachers. This is why we rather reported results for the literacy rate, which we believe to be a more appropriate measure of human capital accumulation.

We notice that the augmented Solow model increases the speed of convergence from 1.61% to 2.67% for the fixed effects estimation, and from 3.29% to 4.26% for the GMM [differences] estimation. In terms of distance from the steady state, our preferred GMM estimation results for the Solow model shows that countries cover half the distance to the steady state between 16years and 21 years.

Our results for the restricted Solow model are not very different from the unrestricted case even though the speed of convergence in the textbook Solow case using the GMM [differences] estimation is a bit higher than in the

unrestricted case. According to Table 5.6 [column 1 and 2], the GMM "systems" estimator yields coefficients that are different in magnitude, but are equivalent in terms of significance. The speed of convergence significantly reduces with the systems estimator.

Whereas the "differences" estimator suggests a rate of convergence of 3.29 percent and 4.26 percent respectively for the textbook and augmented Solow models, the "systems" estimator suggests 1.62 percent and 2.5 percent respectively. Indeed BHT [2001] made similar findings when they applied the "systems" estimator to the same dataset used by CEL [1996]. BHT found that the speed of convergence using the "systems" estimator was between 2 percent and 4 percent, compared to 12.8 percent obtained using the "differences" estimator.

We also calculated the capital share in output for the restricted model [Table 5.7]. The fixed effects estimates show that the capital share in output is 43.5 percent while the GMM estimates show 46.5 percent. Of course these are more than the 33 percent assumed for the textbook Solow model to hold. This justifies therefore, the need for augmenting the textbook Solow model in order to explain the transitional dynamics of growth in Sub-Saharan Africa.

Hence in addition to human capital augmentation, we consider the role of macroeconomic variables [Fischer [1993], Kormendi and Meguire [1985]] in the next section. Our particular interest is on variables such as government consumption, excessive money growth, inflation, openness, foreign direct investment, poverty and financial development.

5.4.2 Macroeconomic Variables and Long Run Growth

The inclusion of macroeconomic as well as socio-economic variables has no doubt yielded further insights into the growth process in Africa. We considered variables such as government consumption, excessive money growth, and inflation that have not been explored in the recent growth literature on Africa. In addition, we also included other variables like openness, foreign direct investment, and financial development that have been explored in studies such as Temple [1998] and Saviddes [1995]. We therefore used these variables to augment the Solow model.

The results [Table 5.5 and Table 5.6 on p.143 and p.144] show that government consumption, inflation, poverty and excessive money growth have negative effects on growth. The effect of government consumption is believed to work through

distortionary tax-financed government purchases, while inflation creates uncertainty [Barro, 1980] that affects the ability of economic agents to extract information from relative prices, thus leading to inefficient resource allocation, and hence lower growth.

We further used the infant mortality rate to proxy poverty, that leads to a cycle of lower savings and capital accumulation, hence lower growth in per capita incomes, and hence poverty over again. We used the M2GDP ratio to proxy excessive money growth in these countries. Earlier studies made use of monetary aggregates such as the M1 or M2 as a ratio of GDP to proxy financial development. However, as argued in De Gregorio and Guidotti (1995), such indicators may provide a poor proxy for financial development, since they are rather related to the ability of financial systems to provide transactions services, better than the ability of financial intermediaries to channel funds from savers to borrowers.

Also, in much of Sub-Saharan African countries in particular, money is often used as a store of value in the absence of other, more attractive alternatives, which could give the erroneous impression that high monetary aggregates imply a high demand for a financial asset. As a result,

studies such as Gelb (1989) and King and Levine (1993) made use of M3, which is also called liquid liabilities. But although using liquid liabilities could overcome the shortcomings of using narrower definitions of money, they may still be influenced by factors other than financial depth, since M3 still includes M1.

For this reason, Neal (1988) subtracted M1 form M2, whereas King and Levine (1992) subtracted M1 from M3. Indeed, others such as De Gregorio and Guidotti (1995) used the ratio of domestic credit to the private sector to GDP as proxy for the degree of financial intermediation. However due to data problems, we subtract M1 from M2 and use the residual as a proportion of GDP, as our indicator of financial development. Thus we rather interpret increases in the M2GDP ratio as excessive money expansion (monetization), which probably feeds into higher inflation rates.

Our results also show that openness, financial development, and foreign direct investment have a positive effect on growth in Africa. The effect of openness confirms the earlier findings in Sachs and Warner [1997], Temple [1998] and Savvides [1995], that trade is beneficial for growth in Africa. The effect of foreign direct investment is also striking. The results show that despite the relatively

insignificant levels of foreign direct investment flows to Africa, yet their marginal effect is beneficial for the region's growth.

The literature on foreign direct investment suggests that it can have either a positive effect or negative effect on growth. The positive effect arises through productivity gains that are expected to occur through technology spillovers and the introduction of new methods as well as processes that could be learnt, and used to modernize the national economy, hence growth. On the other hand, the negative effects could arise due to unfair competition if multinationals use their technological and scale advantages over domestic firms to extend their monopolistic power into the domestic market. In that case, foreign direct invest would crowd-out domestic investment. Our results thus agree with the findings in Agosin and Mayer (2000) who reported that there was crowding-in[91] of domestic investment in Africa. The same was found for Asia, but not for Latin America.

[91] The term 'crowding in' is used when the presence of foreign direct investment stimulates new downstream and upstream investments that would not have taken place in their absence. Similarly, 'crowding out' occurs when foreign direct investment displaces domestic investment.

Hence, higher flows of foreign direct investment could help spur growth in the region. Therefore, governments in the region can at best pursue policies that create an attractive environment for foreign direct investment flows to the region. Such policies include; promoting the rule of law, reducing bureaucracy and corruption, improving on institutions and infrastructure, and enhancing general social and economic stability.

We therefore proxied financial development by the ratio of quasi-liquid liabilities to GDP [(M2-M1)/GDP] as already discussed. Even though such a ratio is evidently low, yet the marginal effect on growth is positive and significant.

This result apparently lends support to efforts at reforming the financial sector in these countries, under the various programs funded by the IMF and World Bank. Indeed the literature has long recognised that financial development brings about improved financial intermediation and allocation of financial resources that leads to enhanced efficiency in investment, and growth.

In order to check for robustness of our results, we considered several alternative specifications so as to isolate potential collinearity effects and interactions

among the explanatory variables [Table 5.5 and 5.6]. Our results largely confirm robustness.

Finally, we closely compared the estimates in Table 5.6 [based on the systems estimator] with the earlier estimates in Table 5.5 [based on the differences estimator). The striking finding is that the magnitudes of the estimates are reduced in most of the specifications based on the systems estimator, and the convergence rate falls to between 1.2 percent and 2.5 percent.

Such findings were also encountered by BHT [2001] as earlier explained. Nonetheless, our findings for the macroeconomic variables based on the 'differences' estimator remain largely unchanged even under the systems estimation. The next section presents a summary and conclusion of our paper.

5.5 Conclusion

This study was focussed on long run growth and in particular, the issue of club convergence as well as the effect of macroeconomic variables on growth in Sub-Saharan Africa. The issue of club convergence has come into the limelight in recent times, as some researchers refer to the overwhelming evidence of convergence in the OECD as proof of

the fact that the Neoclassical [Solow] predictions about cross-country growth still has empirical relevance. That, countries having similar production and structural characteristics experience club convergence.

In view of the perceived lack of robustness in growth regressions [McGrattan and Schmitz, 1998], our paper uses the dynamic panel GMM framework that has been shown to adequately address the two main sources of bias in growth regressions - omitted variable bias due to correlated country-specific effects, and also the issue of endogeneity among the right-hand side variables.

We found evidence of conditional convergence among Sub-Saharan African countries, but absolute convergence is absent. Similar findings were made by recent empirical studies as shown in Table 5.7, including Easterly and Levine [1997] who reported a non-linear conditional convergence. In this light we do not find support for club convergence as has been found for the OECD by other studies.

Apparently due to the correction for omitted variable and endogeneity bias, our estimate for the speed of convergence is higher than the 2 percent generally referred to in the empirical literature. Our speed of convergence ranges

between 3.2 percent and 4.7 percent based on estimates from the dynamic panel GMM [differences] estimator. However, when the methodology suggested by BHT [2001] based on the systems estimator was applied, the convergence rate fell to a range of 1.6% and 2.5%. Indeed, similar findings were made in BHT [2001] even based on the earlier dataset of CEL [1996].

Thus we conclude that countries probably conditionally converge, but at a rate of between 1.6% and 4.7%. Further, we considered the effect of macroeconomic variables on growth in Sub-Saharan Africa. This exercise sought to make up for the perceived inability of the Solow model to adequately explain growth, as found in several studies.

Our dynamic panel GMM estimates suggest that countries that are more open are likely to experience higher growth. Moreover, even though foreign direct investment flows to Africa has been very small compared to other developing regions, yet there is evidence that FDI flows have a beneficial marginal effect on growth in Africa.

On the contrary, variables such as distortionary government consumption, inflation, poverty and excessive money growth are found to retard growth in Africa. The results for excessive money growth in particular, have implications for

the recent apparent shift in emphasis to medium-term poverty reduction and growth promoting policies. We argue that economic stabilisation remains key, and can only be a worthy platform and complement for medium-term growth-promoting and poverty reduction policies.

Appendix 5A

Assume a Solow model with a Cobb-Douglas production function and labor-augmenting technological progress:

$Y(t) = K(t)^{\alpha}[A(t)L(t)]^{1-\alpha}, \qquad 0 < \alpha < 1$

where Y is output, K is capital, L is labour, and A is the level of technology. Labour and capital are assumed to grow exogenously:

$L(t) = L(0)e^{nt}$

$A(t) = A(0)e^{gt}$

If we let $k = K/AL$, and $y = Y/AL$, then the reduced form of the production function is:

$$y = \left[\frac{Y}{AL}\right] = \left[\frac{K^{\alpha}(AL)^{1-\alpha}}{AL}\right] = k^{\alpha}$$

Suppose that s is the savings rate and δ is the depreciation rate. Then the evolution of k is given by:

$$\dot{k}(t) = sy(t) - (n + g + \delta)k(t)$$
$$= sk(t)^{\alpha} - (n + g + \delta)k(t)$$

Therefore k converges to a steady-state value k^* such that:

$sk^{*\alpha} = (n + g + \delta)k^*$. Hence,

$$k^* = \left[\frac{s}{n + g + \delta}\right]^{\frac{1}{1-\alpha}}$$

We can substitute the above into the production function; take logs to obtain steady state income per capita:

$$y^* = \frac{Y}{AL} = k^{*\alpha},$$

$$\frac{Y}{L} = Ak^{\alpha},$$

$$\frac{Y}{L} = A\left[\frac{s}{n+g+\delta}\right]^{\frac{\alpha}{1-\alpha}}$$

$$In\left(\frac{Y}{L}\right) = InA + \left[\frac{\alpha}{1-\alpha} Ins - \frac{\alpha}{1-\alpha} In(n+g+\delta)\right]$$

$$In\left(\frac{Y}{L}\right) = InA(0) + gt + \frac{\alpha}{1-\alpha} In(s) - \frac{\alpha}{1-\alpha} In(n+g+\delta)$$

Consider the value of output per worker at a particular time to be $y(t)$. Approximating around the steady state, the speed of convergence can be expressed as:

$$\frac{dIn(y(t))}{dt} = \lambda\left[In(y^{*}) - In(y(t))\right]$$

where, $\lambda = (n+g+\delta)(1-\alpha)$

This leads to:

$$In(y(t)) = (1-e^{-\lambda t})In(y^{*}) + e^{-\lambda t} In(y(0))$$

where $y(0)$ is output per worker at some initial date. Finally, subtract $y(0)$ from both sides and subtitute for $\boldsymbol{y^{*}}$ yields the textbook Solow model:

$$In(y(t)) - In(y(0)) = (1-e^{-\lambda t})In(y^{*}) - (1-e^{-\lambda t})In(y(0))$$

$$In(y(t)) - In(y(0)) = (1-e^{-\lambda t})\frac{\alpha}{1-\alpha} Ins - (1-e^{-\lambda t})\frac{\alpha}{1-\alpha} In(n+g+\delta) - (1-e^{-\lambda t})In(y(0))$$ T

he augmented Solow model yields;

$$In(y(t)) - In(y(0)) = (1-e^{-\lambda t})\frac{\alpha}{1-\alpha-\beta} Ins - (1-e^{-\lambda t})\frac{\alpha+\beta}{1-\alpha-\beta} In(n+g+\delta) +$$

$$(1-e^{-\lambda t})\left(\frac{\beta}{1-\alpha-\beta}\right) In(h) - (1-e^{-\lambda t})In(y(0))$$

APPENDIX 5B

Given that $y_{i,t} - y_{i,t-1} = \beta(y_{i,t-1} - y_{i,t-2}) + (e_{i,t} - e_{i,t-1})$, the vector of transformed error terms is therefore: $\Delta\varepsilon_i = \begin{bmatrix} \varepsilon_{i,2} - \varepsilon_{i,1} \\ \ldots\ldots \\ \varepsilon_{i,T} - \varepsilon_{i,T-1} \end{bmatrix}$.

The associated matrix of instruments is:

$$Z_i = \begin{bmatrix} y_{i1} & 0 & \ldots & 0 \\ 0 & [y_{i1}, y_{i2}] & & 0 \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & [y_{i1}, y_{i2}, \ldots, y_{i,(T-2)}] \end{bmatrix}$$

Hence the set of all moment conditions can be written concisely as $E\left[Z_i'\Delta\varepsilon_i\right] = 0$. (note that these are *1+2+3+4+...+(T-1)* moment conditions.). To derive the GMM estimator, rewrite the set of moment conditions as:

$E\{Z_i'(\Delta y_i - \beta\Delta y_{i,-1})\} = 0$. Since the number of moment conditions will typically exceed the number of unknown coefficients, β can be estimated by minimizing a quadratic expression in terms of the corresponding sample moments:

$\min\left[\frac{1}{N}\sum_{i=1}^{N} Z_i'(\Delta y_i - \beta\Delta y_{i,-1})\right]' W_N \left[\frac{1}{N}\sum_{i=1}^{N} Z_i'(\Delta y_i - \beta\Delta y_{i,-1})\right]$, where W_N is a symmetric positive definite weighting matrix. Differentiating the above expression and solving for β gives the GMM estimator:

$$\hat{\beta}_{GMM} = \left(\left(\sum_{i=1}^{N} \Delta y_{i,-1}' Z_i\right) W_N \left(\sum_{i=1}^{N} Z_i' \Delta y_{i,-1}\right)\right)^{-1} \times \left(\sum_{i=1}^{N} \Delta y_{i,-1}' Z_i\right) W_N \left(\sum_{i=1}^{N} Z_i' \Delta y_i\right)$$

Clearly, a decision has to be made about the choice of weighting matrix. This would result in either one-step estimation or two-step estimation [see Verbeek, 2000p.331]. In general however, the optimal weighting matrix is determined as:

$$W_N^{opt} = \left(\frac{1}{N} \sum_{i=1}^{N} Z_i' G Z_i \right)^{-1}, \text{ where } G = \begin{pmatrix} 2 & -1 & 0 & \dots \\ -1 & 2 & \ddots & 0 \\ 0 & \ddots & \ddots & -1 \\ \vdots & 0 & -1 & 2 \end{pmatrix}$$

The case of dynamic models with other exogenous explanatory variables is just a straightforward extension of the above. Assume a predetermined regressor x_{it} correlated with the individual effect is added to the model above:

$$y_{it} = x_{it}'\gamma + \beta y_{i,t-1} + \alpha_i + \varepsilon_{it},$$

$$E(x_{it} v_{is}) = 0 \quad \text{for} \quad s \geq t$$

$$\neq 0 \text{otherwise}$$

$$E(x_{it} \eta_i) \neq 0$$

The instrument matrix can then be written as,

$$Z_i = \begin{bmatrix} [y_{i1}, x_{i1}, x_{i2}] & 0 & \dots & 0 \\ 0 & [y_{i1}, y_{i2}, x_{i1}, x_{i2}, x_{i3}] & & 0 \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & [y_{i1}, y_{i2}, \dots, y_{i,T-2}, x_{i1}, x_{i2}, \dots x_{i(T-1)}] \end{bmatrix}$$

The first-differenced GMM estimator has been found to have poor finite sample properties in terms of bias and imprecision. In particular, this occurs when the lagged levels of the series are weakly correlated with subsequent first-differences[92]. Hence the instruments available for the first-differenced equations are weak [Blundell and Bond, 1998]. Blundell and Bond have shown that the first-differenced GMM estimator could be subject to a large downward bias. This is particularly severe when the time period being considered for each unit is small.

For example, in most cross-country growth regressions that test convergence, the time period is reduced to a small

[92] For example, when the series are highly persistent

number of τ-period averages. Also, it is known that variables such as output are highly persistent series. As a result, Blundell and Bond [1998] have suggested a system GMM estimator that simply considers lagged differences as instruments for an additional levels equation. These are stacked as follows:

$$Z_i^{++} = \begin{bmatrix} Z_i & 0 & \dots & 0 \\ 0 & \Delta y_{i2} & 0 & 0 \\ \vdots & \vdots & \Delta y_{i3} & 0 \\ 0 & 0 & 0 & \Delta y_{i,(T-1)} \end{bmatrix}$$

SAMPLE COUNTRIES

Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroun, Central African Republic, Chad, Congo (Zaire), Congo (Republic of), Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea, Cote d'Ivoire, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Zambia, Zimbabwe, Sudan.

APPENDIX 5C

Table 5.5: DYNAMIC PANEL GMM (DIFFERENCES) ESTIMATION - DEPENDENT VARIABLE $(Iny_{i,t} - Iny_{i,t-\tau})$

Variable	SPECIFICATION						
	1	2	3	4	5	6	7
Initial Income	-0.152(0.10)*	-0.192 (0.01)**	-0.21(0.00)**	-0.196(0.00)**	-0.167(0.02)**	-0.200(0.01)**	-0.165(0.05)**
Savings	0.099(0.001)**	0.103 (0.001)**	0.189(0.00)**	0.187(0.01)**	0.189(0.01)**	0.192(0.00)**	0.194(0.072)*
Population Growth	-0.163(0.000)**	-0.178 (0.00)**	-0.17 (0.00)**	-0.17 (0.00)**	-0.167(0.00)**	0.149(0.00)**	-0.101(0.05)**
Literacy Rate	------	0.081 (0.80)	0.149(0.884)	0.129(0.700)	0.019(0.571)	-0.179(0.876)	0.183(0.886)
Openness	------	------	0.147 (0.08)*	0.152(0.09)*	0.053(0.09)*	0.144(0.257)	0.155(0.07)*
Govt. Consumption	------	------	------	------	-0.083(0.10)*	-0.127(0.068)*	-0.165(0.11)
M2GDP	------	------	------	-0.297(0.06)*	-0.128(0.02)**	-0.122(0.04)**	-0.259(0.00)**
Life Expectancy	------	------	------	------	------	-0.226(0.19)	-0.202(0.120)
Financial Devt.	------	------	------	------	------	------	0.282(0.00)**
FDI	------	------	------	------	------	------	0.153(0.00)**
Infant Mortality	------	------	------	------	-----	-0.196(0.02)**	-0.199(0.06)**
Inflation Rate	------	------	------	------	------	------	-0.164(0.05)**
Implied Convergence	**3.3%**	**4.26%**	**4.71%**	**4.36%**	**3.65%**	**4.46%**	**3.61%**
Wald (Joint)	25.86(0.00)**	24.89(0.00)**	31.9 (0.00)**	34.3(0.00)**	31.1(0.00)**	39.10(0.00)**	67.38(0.00)**
Sargan Test	14.28(0.354)	16.75(0.211)	16.87 (0.21)	16.8(0.21)	16.87(0.21)	19.83(0.100)	10.46(0.656)
AR (1)	-3.40(0.001)**	-2.83 (0.005)**	-2.84 (0.00)**	-2.78(0.01)**	-2.59(0.01)**	-2.712(0.00)**	-2.21(0.027)**
AR (2)	-0.588 (0.556)	-0.092 (0.927)	-0.113 (0.91)	-0.095(0.92)	0.022(0.98)	0.061(0.952)	0.3855(0.700)

****All variables are in logs. ** denotes significant at 5%. * denotes significance at 10%*
****Probabilities are in parenthesis. The constants in the regressions have not been reported.*

Table 5.6: Dynamic Panel GMM (systems) estimation - dependent variable $(Iny_{i,t} - Iny_{i,t-\tau})$

VARIABLE	SPECIFICATION						
	1	2	3	4	5	6	7
Initial Income	-0.118(0.059)**	-0.078 (0.09)*	-0.06(0.02)**	-0.058(0.09)*	-0.071(0.112)	-0.051(0.074)*	-0.19(0.05)**
Savings	0.194 (0.000)**	0.189(0.00)**	0.078(0.00)**	0.164(0.00)**	0.085 (0.052)**	0.047 (0.002)**	0.045 (0.08)*
Population Growth	-0.179(0.008)**	-0.169(0.0)**	-0.13(0.01)**	-0.10(0.01)**	-0.054 (0.096)*	-0.164(0.024)**	-0.17(0.03)**
Literacy Rate	------	0.207 (0.119)	------	------	------	-0.067(0.850)	-0.156(0.863)
Openness	------	------			------	0.210 (0.023)**	0.212(0.04)**
Govt. Consumption	------	------	-0.23(0.04)**		------	-0.151(0.076)**	-0.153(0.08)*
M2GDP	------	------	------	-0.085(0.07)*	------	-0.156(0.077)**	-0.156(0.07)*
Life Expectancy	------	------	------	------	-0.032 (0.068)*	------	-0.054(0.792)
Financial Devt.	------	------	------	------	0.036 (0.096)*	0.179 (0.049)**	0.177(0.05)**
FDI	------	------	------	------	0.182 (0.001)**	0.152 (0.018)**	0.151(0.02)**
Infant Mortality	------	------	------	------	-0.155 (0.469)	------	0.055 (0.930)
Inflation Rate	------	------	------	------	-0.171(0.047)**	-0.015(0.047)**	-0.16(0.05)**
Implied Convergence	**2.5%**	**1.62%**	**1.24%**	**1.2%**	**1.47%**	**1.1%**	**2.1%**
Wald (Joint)	17.57 (0.001)**	20.88(0.00)**	20.75(0.00)**	23.74(0.00)**	43.48 (0.000)**	40.20 (0.000)**	33.88(0.00)**
Sargan Test	26.66 (0.271)	48.83 (0.129)	53.69 (0.333)	89.14(0.496)	99.81 (0.000)**	266.9 (0.122)	265.6(0.762)
AR (1)	-3.74 (0.000)**	-3.3(0.001)**	-3.99(0.00)**	-3.96 (0.00)**	-2.29 (0.022)**	-2.318(0.020)**	-2.32(0.02)**
AR (2)	-0.739 (0.460)	-0.083 (0.933)	-0.343 (0.73)	-0.357 (0.721)	0.1333 (0.894)	0.099 (0.921)	0.121 (0.904)

****All variables are in logs. ** denotes significant at 5%. * denotes significant at 10%*

****Probabilities are in parenthesis. The constants in the regressions have not been reported.*

Table 5.7: Comparison with recent studies on the growth process in Africa

	Sachs & Warner (1997)	Easterly & Levine (1997)	Temple (1998)	Ghura & H.Michael (1996)	Savvides (1995)	This Paper
	Cross-Section	*SUR*	*Cross-Section*	*Feasible GLS*	*Fixed Effects Panel*	*Dynamic Panel GM*
Initial Income	-	+	-	-	-	-
Initial Income Squared	-	-				
Savings	+			+	+	+
Population Growth			+	-	-	-
Literacy Rate						xxx
School Enrolment		+	+	+	xxx	
Life Expectancy	+		+	+		xxx
Government Consumptn					-	-
Infrastructure		+	+			
Black Market Premium		-	-			
Fiscal Deficit/Surplus		+	+	-		
Socio/Political Instability		-	-	-	-	
Openness	+		+		+	+
Geography	-		+			
Climate				-		
Natural Res. Abundance	-		-			
Institutional Quality	+		+	+		
Inflation				-	xxx	-
Financial Development		+	+		+	+
Dummy for Africa	+	-	-			
Foreign Direct Invest.						+
Poverty						-
M2GDP						-
Neighbourhood Effects	-	-				
Terms of Trade				+		xxx
Real Effective Exch. Rate				-	xxx	
Ethnic Fractionalisation	-		-			

- denotes a negative effect on growth
+ denotes a positive effect on growth
***xxx** denotes a non-significant effect on growth*

Fig 5.4: GDP PER CAPITA (1960, 1999)

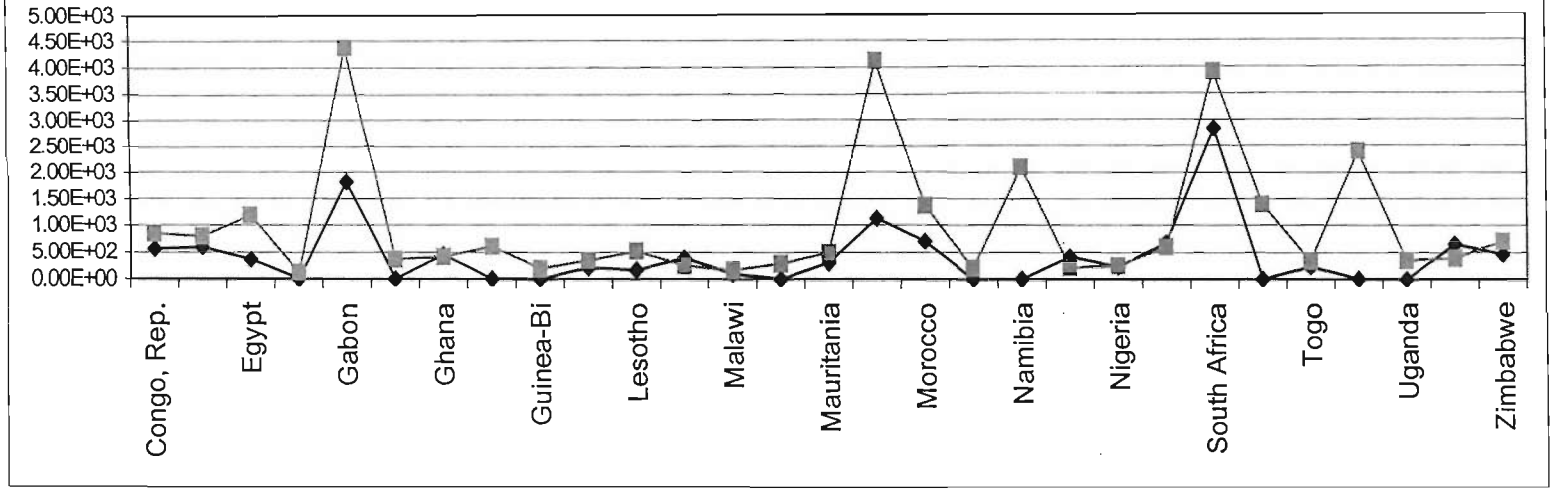


Fig 5.5: Sub-Sahara Africa: Per Capita GDP (constant 1995 USD)

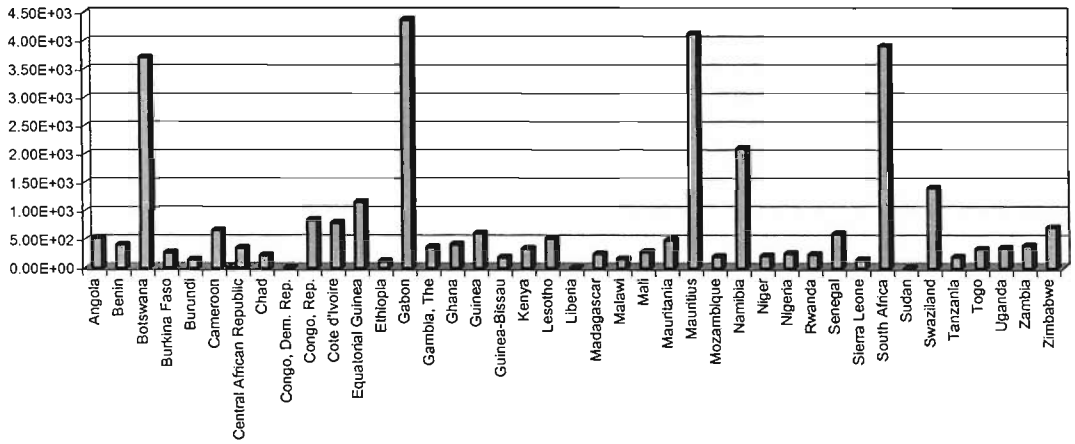


Fig 5.6: Average Annual Growth Rates in Sub-Sahara Africa (1985-1999)

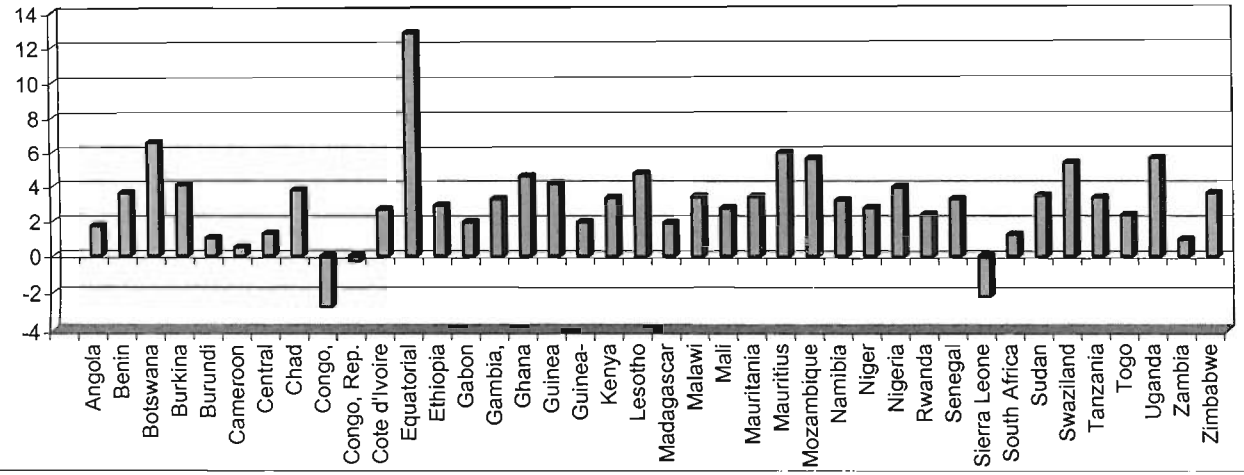
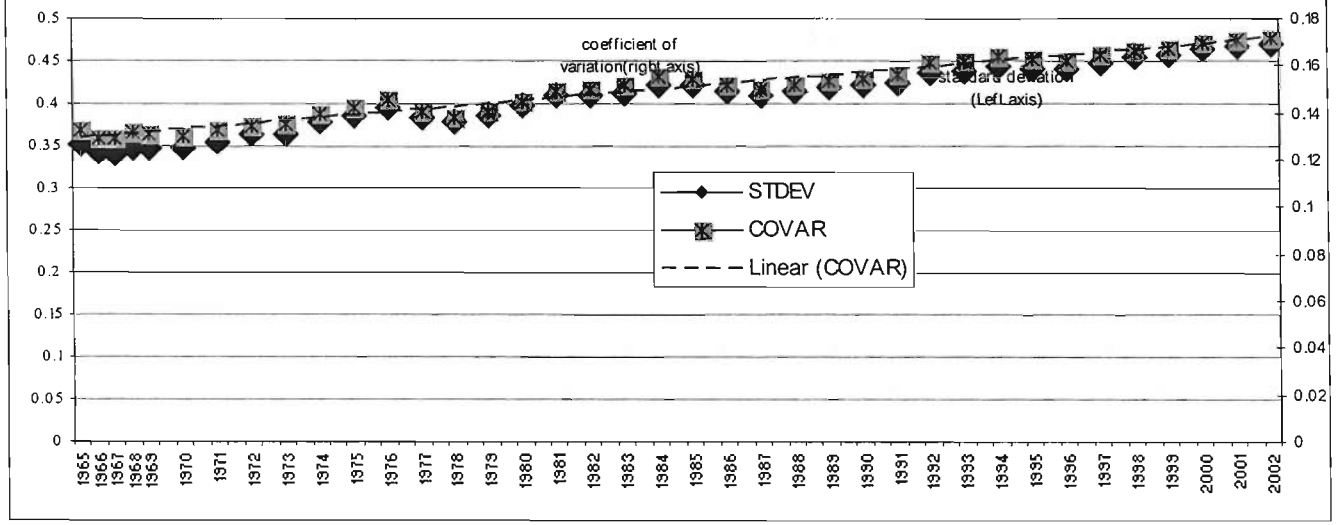


Figure 5.7: Africa - Dispersion of Incomes Per Capita (1965-2002)



CHAPTER 6

Summary of Thesis, Discussion and Policy Recommendations

6.0 Summary

This thesis presents three essays on aspects of economic stabilisation and long run growth dynamics in Sub-Saharan Africa over the last two decades. The first essay evaluated the macroeconomic effects of IMF stabilisation programs in a panel of seven non-oil exporting Sub-Saharan African countries - Ghana, Zambia, Uganda, Zimbabwe, Kenya, Malawi, and Ethiopia. We make use of the Generalised Evaluation Estimator [Goldstein et al, 1986; Khan, 1990] and we correct for selection bias as well as potential endogeneity biases that have hardly been addressed in the empirical literature.

Focussing on the growth rate of GDP, current account, and inflation - we found that IMF stabilisation programs have effect on all three variables with a one-year lag, while the rate of inflation responds in the year of implementation.

The second essay evaluated the role of nominal shocks in the dynamics of the current account of the balance of payments in a typical small open economy. Such issues have been

brought to the fore of research in recent times by developments particularly in New-Keynesian Macroeconomics and also the New Open Economy Macroeconomics literature. Indeed, the theoretical literature on the dynamics of the current account particularly in a typical developing country context remains at best murky.

In a recent theoretical contribution by Lane [2001a], it is demonstrated that nominal shocks can have real effects both in the short run and long run. However, such results indeed depend on the extent of price and wage stickiness. In the context of developing countries, there remains controversy about whether prices and wages are more or less sticky or not sticky at all. Thus it is an empirical issue as to whether nominal shocks can have real effects in the short and long run as proposed in the contribution by Lane [2001a].

The essence of it all is that such evidence might contribute to the policy debate about the use of monetary policy within IMF stabilisation programs. For example, in a recent development policy seminar at the World Bank, a former Finance Minister of Ghana - Dr. Kwesi Botswey called upon the IMF to modify its policy framework such that countries that have a good track record of implementation can have

more room to use monetary policy for the achievement of other macroeconomic goals (such as output stabilisation). The question therefore is whether unanticipated monetary policy actions can have persistent real effects, or in other words be used for the achievement of real objectives even to the long run.

We therefore examine the evidence for six Sub-Saharan Africa countries. We made use of structural vector autoregression methods, and we applied the Blanchard and Quah [1989] decomposition to identify the structural innovations in each case. We found that there are indeed differential responses of the current account to nominal shocks across the countries. Whereas some countries show a J-curve phenomenon (contrary to the view that this might not be observed), others experienced a temporary improvement in the current account following a positive nominal shock. Secondly, nominal shocks explain a very significant proportion of forecast error variance decomposition of the current account in three of the six countries studied.

These findings are largely consistent with the theoretical contribution in Lane [2001a]. Hence the implication is that stabilisation policy in these countries must incorporate the particularities of each country, and also - rather than

assuming one strand of theory, current account models must incorporate the possibility of differential reactions of the current account to macroeconomic shocks.

The third essay focused exclusively on long run growth dynamics in Sub-Saharan Africa - exploring the club convergence hypothesis and also the effect of macroeconomic policies on the transitional dynamics of long run growth. We made use of the empirical approach pioneered by Caselli, Esquivel and Lefort [1996] and also the modifications suggested in Bond, Hoefler and Temple [2002]. We found that Sub-Saharan Africa is not an example of a convergence club. Rather, countries conditionally converge to their own steady states. The speed of convergence is rather slow - ranging between 1.6 percent and 4.7 percent.

The meaning of this slow speed of convergence is that the relative growth differences and increasing heterogeneity in economic conditions observed in the sub-region is evidently due to the fact that countries have markedly different steady states. Thus, the obvious way that growth stagnant countries in the sub-region can take off, does not only depend on variables that will move the economy from one steady state to another [such as higher savings and investment coupled with a fall in population growth rates],

but also on variables such as technology and industrialisation that can ensure sustained higher long run growth. In terms of economic policy, we found that countries that are more open, have more developed financial systems, and are attractive to foreign direct investment are likely to grow faster. On the contrary, countries, which suffer from higher levels of distortionary government consumption, inflation, poverty and excessive money growth (monetization), are likely to grow much less.

6.1 Discussion and Policy Recommendations

Indeed, explaining the economic mirage in Africa during the second half of the 20th century continues to attract empirical interest, in spite of the large literature that has already accumulated. For a region that held so much promise to slide into little or no long run growth coupled with economic misery for more than 50 years, is indeed an important matter.

In this sub-section, we provide a discussion about the measures that might help to restore sustained growth and a general improvement in socio-economic conditions across the sub-region. Our analysis shows that macroeconomic stability remains a key factor for growth in the sub-region. Hence countries have to remain on their program tracks and

intensify implementation of such programs as most of them have with the Bretton Woods institutions[93]. Indeed in order to help countries complete agreed policy programs, the Bretton Woods institutions also need to incorporate more flexibility in program design. For example, quantitative as well as structural performance criteria need to be set at lower frequencies in order to enhance compliance and program completion (see Bird, 2002a).

Apart from macroeconomic instability, one other noticeable feature of the region is that, private FDI flows are woefully below (see table 1.1) flows[94] to other developing regions such as Latin America and Asia. Therefore, once domestic saving and investment is remarkably low, it is no surprise that capital accumulation hence growth, is not as significant as it is in Latin America and Asia.

According to Neoclassical theory, we should have witnessed increased private capital flows to regions such as Sub-Saharan Africa where a higher marginal product to capital is expected to exist. But this has not been observed. Some schools of thought attribute this puzzle to the high level

[93] We do not suggest that these programs do not have inherent weaknesses. We take note of the concerns raised widely about the need for streamlined programs that will address local concerns better. Moreover the new growth-oriented and poverty-targeted programs should help to restore macroeconomic stability and growth.

[94] Indeed FDI flows to Africa on aggregate has been rising steadily despite a relapse in 1997 and 2000. The highest FDI flows to the region was recorded in 1998 as it reached an all time high of about 4.2 percent of aggregate GDP. These however remain significantly lower than similar flows to Asia and Latin America.

of political and social instability in the region (Bird, 2000).

However, recent debate has drawn attention to the fact that FDI flows to the mining and oil sectors in Sub-Saharan Africa have increased significantly over the last two decades, and is concentrated in the rather unstable regions such as Mozambique, Angola, Sudan, Sierra Leone, and the Democratic Republic of Congo. This irony suggests that the political risk perception may not explain it all.

One explanation of this irony is that the mining and oil sectors appear to provide a high return that is able to outweigh the political risk, and hence the attraction of foreign investment. If this is true, then one can expect that if other high return yielding sectors can be found in the Sub-region to justify the political risk premium, then FDI flows could respond accordingly.

Clearly, this brings back the current argument about what can be done to boost agricultural production and export in developing countries such as Sub-Sahara Africa. If such countries can increase productivity in the agricultural sector as well as process more of their primary products for export (a clear area where they have comparative advantage

and could be more competitive) then one can perceive the potential for good export business in that sector.

We propose that the reason why this has not happened can be partly attributed to the structure of world trade[95] . The argument is that, export subsidies in developed countries coupled with the existence of tariff escalation involving the primary products exported from developing countries (e.g. cocoa, coffee etc.) have made their exports uncompetitive and thus rendered any profit margins unattractive. If this is valid, then one would expect that a swift implementation of the recent trade agreements such as the Doha agreement could help to create more attractive investment opportunities in regions such as Sub-Saharan Africa, thereby boosting FDI flows and hence growth.

Yet still, some are of the view that if indeed such renewed flows took place, we may experience a sudden increase in flows that could be equally destabilising as happened in Latin America in the early 1990s. The lack of absorptive capacity (i.e. undeveloped banking systems and the lack of capacity for economic policy to manage such large flows) has

[95] Indeed we recognise the importance of policy and institutional reform such as fighting corruption, lower corporate tax rates and more incentives for small and starting businesses, legal reforms, macroeconomic and social stability, and improvements in general infrastructure etc. in attracting FDI flows to the region. However, we consider the fact that countries in the region that have attracted a large chunk of the recent surge in FDI flows happen to be those that have among the worst in terms of the conventional bottlenecks to FDI flows. This therefore suggests that investor appetite to the region is also driven by other factors.

often been cited. However, as argued by Jeffrey Sachs, this constraint need not be binding to the long term. Things could be managed in such a way so as to prevent any such shocks due to sudden capital flow reversals.

In terms of recent policy frameworks, the programs that are in place currently have the potential to transform countries in the Sub-region considerably. In particular, as discussed in the first chapter, the Millenium Development Goals (MDG), the Highly Indebted Poor Country Initiative (HIPC), the Poverty Reduction and Growth Facility (PRGF) and the New Partnership for Africa's Development (NEPAD) initiative - all have what it takes to help restore long run growth and a sustained improvement in economic conditions in the Sub-Region.

Clearly, the HIPC initiative is helping to free up domestic resources which are being used to increase social spending. Secondly, the PRGF papers (PRSPs) do have all the strategies and programs to ensure growth and development. However, the level of financing available for the latter is woefully too little. As such programs have to be scaled according to the level of financing available. This needs to be addressed. The IMF needs to intensify its catalytic role to help

galvanise international resources in order to achieve full implementation of the measures outlined in the PRSPs.

Indeed some have referred to the corruption problem in much of Sub-Sahara Africa. But considering the arrangements in place where the Fund and World Bank staff are directly involved in periodic reviews of implementation, and the fact that public expenditure management is being restructured as part of the PRSPs, the corruption problem can be contained.

Also, the NEPAD initiative is laudable as for the first time; African countries are fostering cooperation for their mutual benefit. This is long overdue considering the fact that the region has long remained polarised along colonial lines. Moreover, the Peer Review Mechanism represents a bold step to have an early warning system in order to prevent domestic pressures that culminate in violence and civil wars. This is indeed a novel step. But the financing constraint is ever present in the NEPAD initiative also.

Most of the cross-regional infrastructural projects that are to be carried out in the Sub-region have still not seen the light of day, four years into the birth of the NEPAD initiative. If these projects (energy, roads and highways, etc.) could be implemented early enough, this could speed up

the much expected South-South cooperation in terms of trade and investment, and hence ensure sustained growth in the region.

In light of the analyses in this thesis and our foregoing discussion, we make the following policy recommendations:

(a) IMF stabilisation programs are found to have significant lagged effects. However, in order for such gains to be sustained, there is the need to incorporate more flexibility in program frameworks. For example, the call for more flexibility in the use of quantitative monetary targets cannot be over-emphasised. In the case of countries that have shown consistent commitment to program implementation, the periodic targets can be set at lower frequency [for example, half-yearly and/or yearly benchmarks] so that the Central Bank can use monetary policy for other macroeconomic goals to the extent that price stability is not sacrificed.

(b) The findings about the effects of nominal shocks imply that unanticipated monetary policy actions can have persistent real effects, the extent depending on the particular country. This lends further

support to the first recommendation above that, monetary policy actions can be used to stabilise other real variables to the extent that price stability is not sacrificed. Therefore, in designing stabilisation policy programs, every effort must be made to understand the circumstances of each country [such as the patterns of response to various macroeconomic shocks] in order to enhance the effectiveness of such programs.

(c) The relative difference in per-capita income growth across Sub-Saharan Africa is attributable to the fact that countries converge to different steady states. Hence the need for increased savings and capital accumulation is just as important as technological development, in order to ensure sustained high growth rates in the region.

(d) Our study confirmed that openness has a positive effect on long run growth rates across the sub-region. Hence, policymakers must rather intensify efforts to ease restrictions on international trade, and also boost their exports sector so that the external sector is able to contribute directly to output growth. In addition, efforts must be

intensified to create a receptive environment for foreign direct investment. This requires enhanced economic infrastructure, improved legal systems, consistent policies and frameworks to reduce corruption, investor-friendly laws, developed financial systems, and general macroeconomic and social stability.

(e) Anecdotal evidence suggests that the level of FDI flows to the Sub-region could be attributed to the structure of trade tariffs faced by these countries on their exports. For example, tariff escalation means that it is more profitable to keep exporting raw cocoa and coffee etc. than processed chocolates, coffee drinks etc. Hence countries in the Sub-Region need to intensify their efforts in trade negotiations as well as designing strategic trade policies. The developed countries must also be urged to eliminate export subsidies which together with the elimination of tariff escalation could help the competitiveness of developing country exports.

(f) The present framework under the HIPC/PRGF holds a lot of promise for the Sub-Region. Particularly, under the PRGF, the financing available to the

intended programs is far too little. There needs to be increased financing for such social programs such as spending on health and education that help to reduce extreme poverty. This could in turn help to tackle other structural issues such as the population problem.

(g) The NEPAD initiative is a good one, as it uniquely seeks to promote cooperation among African countries. It is a fact that trade among African countries represents a small proportion of their aggregate trade levels. Hence such cooperation must be enhanced by increasing financing available for the intended projects especially in energy and transport. The related 'Peer Review Mechanism' also needs to be supported, since it is designed to serve as an early warning system about the break out violence and instability

(h) The new initiative for Africa launched by the British Prime Minister, Tony Blair in February 2004 brings a renewed interest in Africa. Dubbed, the 'Commission for Africa' the program aims to generate new ideas and action for a strong and prosperous Africa, using the British Presidencies of the G8 and

the European Union as a platform. Indeed, the Commission also aims to support the best of existing programs in Africa, in particular the New Partnership for African Development (NEPAD) and the African Union (AU). One only hopes that this does not turn out to be a nine-day wonder. There needs to be sustained efforts that will help for example in implementing the Doha Round agreement, and this is a clear example where the British government can bring pressure to bear on the other industrialised countries, in order to facilitate the efforts by developing countries to develop their exports sector.

APPENDIX 6A

PANEL DATA ESTIMATION AND GROWTH REGRESSIONS

1. Panel Data Estimation

A panel data set is one that follows a given sample of individuals over time, and thus provides multiple observations on each individual in the sample. As pointed out in Hsiao [2003] p.3, panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data sets. For example, panel data usually give the researcher a large number of data points, increasing the degrees of freedom and reducing the collinearity among explanatory variables - hence improving the efficiency of econometric estimates.

Panel data also allows the researcher to construct and test more complicated behavioural models and also addresses the problem of omitted variables that are correlated with explanatory variables. Notwithstanding the above advantages, panel data estimation tends to be more computationally complex, and several potential biases have to be corrected for. Nevertheless, panel data estimation has proved to be a useful tool for researchers and the approach has been assuming increasing applicability over the years.

2. Estimation Methods

The estimation of panel data sets has evolved over different approaches. In the earliest stage, four different approaches were being applied. Suppose we have N groups of observations covering T periods. If T is large enough, then in order to obtain the average effect of some exogenous variables on a dependent variable, one could run separate regressions for each group and then average the coefficients over groups. Alternatively, one could run pooled regressions by combining data sets, and then use dummies to derive different coefficients for different groups.

Thirdly, pure time-series estimation could be carried out by averaging data over different groups. Finally, as used by many earlier researchers, the data could be averaged over time before it is estimated as a cross-sectional method.

Clearly, all the above approaches suffer from severe econometric shortcomings. For example, there is significant loss of information by averaging out data in the third and fourth approaches. Also the first and third approaches require an adequately long time dimension for each unit, which is unlikely to be available in typical panel data sets. Even more significant is the problem of unobserved heterogeneity due to omitted variables, and also possible

endogeneity problems that arise in typical research work. Attempts have therefore been made since, to address the above estimation problems through appropriate transformations. These are discussed below.

2.1 Transformations

Consider the unrestricted model:

$$y_{it} = \alpha_i + \beta' x_{it} + u_{it}, \qquad i = 1,2....,N; t = 1,...,T ....$$

(A5.1)

where α_i stands for the unobserved individual specific effect while i is the individual or unit and T is the time series dimension. Notice that α_i is time invariant, and hence tends to introduce severe biases in the estimations. The first transformation method that can eliminate this bias is through first-differencing. Hence, equation (A5.1) is transformed into:

$$y_{it} - y_{i,t-1} = \beta'(x_{it} - x_{i,t-1}) + (u_{it} - u_{i,t-1}) ... \qquad \text{(A5.2)}$$

A second transformation method is to use the within-group transformation, whereby the time average of each group is deducted as:

$$y_{it} - \bar{y}_i = \beta'(x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i) \quad .... \qquad \text{(A5.3)}$$

where $\bar{y}_i = \frac{1}{T_i}\sum_{s=1}^{T} y_{is}; \bar{x}_i = \frac{1}{T}\sum_{s=1}^{T} x_{is}; \bar{u}_i = \frac{1}{T_i}\sum_{s=1}^{T} u_{is}$ are time means.

A third method of transformation is based on taking orthogonal deviations:

$$y_{it}^{o}=\left[y_{it}-\frac{1}{T_i-t}\sum_{s=t+1}^{T_i-1}y_{is}\right]\left\{\frac{T_i-t}{T_i-t+1}\right\}^{1/2},t=1,...,T_i-2 \quad ... \quad (A5.4)$$

$$x_{it}^{o}=\left[x_{it}-\frac{1}{T_i-t}\sum_{s=t+1}^{T_i-1}x_{is}\right]\left\{\frac{T_i-t}{T_i-t+1}\right\}^{1/2},t=1,...,T_i-2 \quad ... \quad (A5.5)$$

$$u_{it}^{o}=\left[u_{it}-\frac{1}{T_i-t}\sum_{s=t+1}^{T_i-1}u_{is}\right]\left\{\frac{T_i-t}{T_i-t+1}\right\}^{1/2},t=1,...,T_i-2 \quad ... \quad (A5.6)$$

Thus, the orthogonal transformation expresses each observation as the deviation from the average of future observations in the sample for the same unit, and weighs each deviation to standardize the variance. Indeed the three transformations are equivalent and should lead to the same estimator.

In actual empirical work, the estimators used generally depend on whether the model being estimated is static or dynamic. These are next reviewed in some detail.

2.2 Static Panel

2.2.1 Least Squares Dummy Variable (LSDV) Estimator

Again, assume the typical fixed effects static panel data model in equation (1) below:

$$y_{it} = \alpha_i + \beta' x_{it} + u_{it}, \qquad i = 1,2....,N; t = 1,...,T$$

Let α_i be represented by $N-1$ dummy variables d_{ij}, that takes 1 if $i=j$ and 0 otherwise. Hence we have:

$$y_{it} = \sum_{j=1}^{N} \alpha_i d_{ij} + \beta' x_{it} + u_{it} \quad ... \qquad \text{(A5.7)}$$

This model is thus estimated by the LSDV estimator. Indeed this suffers from loss of degrees of freedom, since we are estimating $N-1$ extra parameters. Thus a better estimator will concentrate on estimating the β vector and save on degrees of freedom. This is exactly what the next estimator, the within-groups estimator does.

2.2.2 Fixed-Effects (Within-Groups) Estimator

As already seen, taking deviations from individual means will get rid of the unobserved heterogeneity α_i thereby saving on the number of parameters to be estimated. This estimator is unbiased if all explanatory variables are independent of the error term.

$$y_{it} - \bar{y}_i = \beta'(x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i) ... \qquad \text{(A5.8)}$$

The fixed-effects estimator is therefore obtained as:

$$\hat{\beta}_{FE} = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)(x_{it} - \bar{x}_i)' \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)(y_{it} - \bar{y}_i) \quad \ldots \qquad (A5.9)$$

$$= \beta + \left(\sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)(x_{it} - \bar{x}_i)' \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)(u_{it} - \bar{u}_i)$$

= β, under the assumption that $E\left([x_{it} - \bar{x}_i]u_{it}\right) = 0$

Hence, if the explanatory variables are strictly exogenous, the fixed-effects estimator is unbiased. Notice however that, the within estimator is good at explaining the extent to which y_{it} differs from $\bar{y}_i$ but not why $\bar{y}_i$ is different from $\bar{y}_j$. This leads us to the 'between' estimator that addresses this shortcoming.

2.2.3 Between Groups Estimator

The 'between' estimator as the name implies, exploits the 'between' dimension of the panel data. It simply involves a regression of the individual averages of the dependent variable on individual averages of the explanatory variables. Using the model in equation 1, the individual means of each variable leads to:

$$\bar{y}_i = \alpha_i + \beta' \bar{x}_i + \bar{u}_i \quad , \qquad i = 1, \ldots\ldots, N \quad \ldots$$

(A5.10)

Hence the estimator for β :

$$\hat{\beta}_B = \left(\sum_{i=1}^{N} (\bar{x}_i - \bar{x})(\bar{x}_i - \bar{x})' \right)^{-1} \sum_{i=1}^{N} (\bar{x}_i - \bar{x})(\bar{y}_i - \bar{y}) \quad \text{... . .}$$

(A5.11)

is unbiased under the assumption that

$$E\left((\bar{x}_i - \bar{x})\alpha_i\right) = 0 \quad \text{and} \quad E\left((\bar{x}_i - \bar{x})u_i\right) = 0$$

This again implies that the between estimator will be unbiased if the explanatory variables are strictly exogenous and uncorrelated with α_i. There is however a loss of information since the number of observations reduces to *N*.

2.2.4 Random Effects Estimator

The random effects estimator is based on the case where α_i is uncorrelated with the explanatory variables. That is, $\text{cov}(x_{ij}, \alpha_i) = 0$, for $t = 1,2,...T; i = 1,2,...N$.

One would have thought that if α_i is uncorrelated with the explanatory variables, then the β vector could be consistently estimated by using a single cross section approach or running a pooled OLS. However, these will not be correct. To see why, assume we had the model:

$$y_{it} = \beta_0 + \alpha_i + \beta' x_{it} + u_{it},$$

(A5.12)

Define a composite error term as $v_{it} = \alpha_i + u_i$. Hence equation (12) becomes,

$$y_{it} = \beta_0 + \beta' x_{it} + v_{it} \qquad \text{(A5.13)}$$

Because α_i is in the composite error in each time period, the v_{it} are serially correlated across time. In fact, under the random effects assumptions,

$$Corr(v_{it}, v_{is}) = \frac{\sigma_\alpha^2}{\sigma_\alpha^2 + \sigma_u^2}, t \neq s,$$

This (necessarily) positive serial correlation in the error term can be substantial: because the usual pooled OLS standard errors ignore this correlation, they will be incorrect, as will the usual test statistics. Therefore, the generalised least squares approach can be used to solve the serial correlation problem. However, this requires a large *N* and a small *T* for the procedure to have good properties. This requires a GLS transformation that eliminates serial correlation in the errors.

Define $\lambda = 1 - \left[\frac{\sigma_u^2}{\sigma_u^2 + T\sigma_\alpha^2} \right]^{1/2}$ which is between zero and one. Then, the transformed equation turns out to be:

$$y_{it} - \lambda \bar{y}_i = \beta_0 (1-\lambda) + \alpha_i (1-\lambda) + \beta' (x_{it} - \lambda \bar{x}_i) + (v_{it} - \lambda \bar{v}_i) \qquad \text{(A5.14)}$$

The above equation shows that whereas the fixed effects estimator subtracts the time averages from the corresponding

variable, the random effects transformation subtracts a fraction of that time average, where the fraction depends on σ_u^2, σ_α^2, and the number of time periods, T. The GLS estimator is simply the pooled OLS estimator of equation (14). However, the parameter λ is never known in practice, but has to be estimated based on pooled OLS or fixed effects. The random effects estimator uses an estimate of λ to compute the β vector. Thus, under the random effects assumption, the estimator is consistent (not unbiased) and asymptotically normally distributed as N gets large with fixed T.

In actual empirical work, one has to determine whether the fixed effects estimator or the random effects estimator is more efficient. This is usually done by a Hausman (1978) specification test, which compares an estimator that is known to be consistent (fixed-effects) with an estimator that is efficient (random-effects). Under the null hypothesis, there should be no systematic difference between the coefficients of the efficient estimator and the consistent estimator.

In a dynamic setting however, all the foregoing estimators yield biased results in small samples due to the presence of omitted variables or endogeneity biases. In particular, when

the lagged dependent variable is included as one of the explanatory variables, the assumption of strict exogeneity of the explanatory variables becomes no longer tenable. In that case, one needs to use dynamic panel data methods such as described below.

2.3 Dynamic Panel Methods

The properties of various estimators in dynamic panel models are well discussed in Sevestre and Trognon (1996). Essentially, it is shown that all the estimators discussed in static panel models yield inconsistent estimates where T is fixed. As such those estimators are inappropriate for the estimation of dynamic panel models in empirical work. The following example demonstrates the sources of bias when an OLS estimator is applied to a dynamic panel data set:

$$y_{it} = x_{it}\beta + \varepsilon_{it} \qquad \text{(A5.15)}$$

Under the Gauss-Markov assumptions, OLS has minimum variance in the class of linear unbiased estimators (MVLUE), which implies the following two conditions:

a. $V(\varepsilon / x) = V(\varepsilon) = \sigma^2 I$ (A5.16)

b. $E(\varepsilon / x) = E(\varepsilon) = 0$ (A5.17)

These conditions imply that the conditional distribution of the errors given the matrix of explanatory variables has

zero means, constant variance and zero covariances. We shall however see that both conditions could be violated in estimating a dynamic panel model.

The presence of heterogeneity and auto-correlation renders the first condition no longer tenable. For example, heterogeneity arises if different error terms do not have identical variances, and hence the diagonal elements of the covariance matrix are not identical. This is indeed the case in panel data sets where individual units have different variances.

On the other hand, the fact that panel data sets are repeated observations on the same units makes autocorrelation a default problem. Hence the second condition might not hold and so OLS looses the MVLUE property when applied to dynamic panel data estimation. Also, Nerlove (2002) p.83-87 demonstrates the inconsistency of the fixed effects estimators in a dynamic panel model.

It is clear therefore that appropriate estimators must be used for dynamic panel estimations[96]. Two of such estimators

[96] Nerlove (2002)p.274-301 uses a cross-country study of economic growth to illustrate the properties of alternative estimators of dynamic panel models. The author finds that, "...biases in the estimate of the coefficient of the lagged dependent variable are transmitted to the estimates of other coefficients in the model , making inferences about the determinants of growth problematic unless appropriate econometric methods are used".

- Anderson-Hsiao (1981) IV estimator, and the class of GMM estimators are discussed below.

2.3.1 Anderson-Hsaio IV estimator

Assume we have a dynamic panel model such as:

$$y_{it} = \gamma y_{i,t-1} + \beta' x_{it} + v_{it}, \qquad i = 1, \ldots, N$$

(A5.18)

$$t = 1, \ldots, T$$

where $|\gamma| < 1, v_{it} = \alpha_i + u_{it}, x_{it}$ is a vector of controls and α_i is a vector of individual-specific effects.

Taking first differences of the above,

$$y_{it} - y_{i,t-1} = \gamma(y_{i,t-1} - y_{i,t-2}) + \beta'(x_{it} - x_{i,t-1}) + u_{it} - u_{i,t-1},$$

for $t = 2, \ldots, T$.

Clearly, $y_{i,t-2}$ or $(y_{i,t-2} - y_{i,t-3})$ are correlated with $(y_{i,t-1} - y_{i,t-2})$ but are not correlated with $(u_{it} - u_{i,t-1})$. Hence any of them can be used as an instrument for $(y_{i,t-1} - y_{i,t-2})$ and then estimate consistently γ and β by the instrumental variable method. Hence, both:

$$\begin{pmatrix} \gamma_{iv} \\ \beta_{iv} \end{pmatrix} = \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} (y_{i,t-1} - y_{i,t-2})(y_{i,t-2} - y_{i,t-3}) & (y_{i,t-2} - y_{i,t-3})(x_{it} - x_{i,t-1})' \\ (x_{it} - x_{i,t-1})(y_{i,t-2} - y_{i,t-3}) & (x_{it} - x_{i,t-1})(x_{it} - x_{i,t-1})' \end{pmatrix} \right]^{-1}$$

$$\times \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} y_{i,t-2} - y_{i,t-3} \\ x_{it} - x_{i,t-1} \end{pmatrix} (y_{it} - y_{i,t-1}) \right]$$

and

$$\begin{pmatrix}\gamma_{iv}\\ \beta_{iv}\end{pmatrix}=\left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}y_{i,t-2}(y_{i,t-1}-y_{i,t-2}) & y_{i,t-2}(x_{i,t}-x_{i,t-1})'\\ (x_{i,t}-x_{i,t-1})y_{i,t-2} & (x_{i,t}-x_{i,t-1})(x_{i,t}-x_{i,t-1})'\end{pmatrix}\right]^{-1}$$
$$\times\left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}y_{i,t-2}\\ x_{it}-x_{i,t-1}\end{pmatrix}(y_{i,t}-y_{i,t-1})\right]$$

will yield identical estimates that are consistent. Anderson-Hsaio consider the additional case where the model includes a time-invariant variable such as sex, religion, etc. That case calls for an additional step where the estimated γ and β are substituted in the expression below:

Let the time invariant variable be represented by Z. Then, substitute the estimated β and γ into the equation:

$\bar{y}_i-\gamma\bar{y}_{i,-1}-\beta'\bar{x}_i=\rho'z_i+\alpha_i+\bar{u}_i$, $i = 1,\ldots..,N$

The coefficient of ρ is obtained by OLS.

2.3.2 Dynamic Panel GMM Estimators

Initially, assume the dynamic panel model $y_{it}=\beta y_{it-1}+\alpha_i+e_{it}$

Taking first-differences,

$y_{i,t}-y_{i,t-1}=\beta(y_{i,t-1}-y_{i,t-2})+(e_{i,t}-e_{i,t-1})$,

Hence, the vector of transformed error terms is therefore:

$$\Delta\varepsilon_i=\begin{bmatrix}\varepsilon_{i,2}-\varepsilon_{i,1}\\ .....\\ \varepsilon_{i,T}-\varepsilon_{i,T-1}\end{bmatrix}.$$

The associated matrix of instruments is:

$$Z_i = \begin{bmatrix} y_{i1} & 0 & \cdots & 0 \\ 0 & [y_{i1}, y_{i2}] & & 0 \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & [y_{i1}, y_{i2}, \ldots, y_{i,(T-2)}] \end{bmatrix}$$

Hence the set of all moment conditions can be written concisely as $E\left[Z_i'\Delta\varepsilon_i\right]=0$. (note that these are *1+2+3+4+...+(T-1)* moment conditions.). To derive the GMM estimator, rewrite the set of moment conditions as:

$E\{Z_i'(\Delta y_i - \beta\Delta y_{i,-1})]=0$. Since the number of moment conditions will typically exceed the number of unknown coefficients, β can be estimated by minimizing a quadratic expression in terms of the corresponding sample moments:

$$\min\left[\frac{1}{N}\sum_{i=1}^{N} Z_i'(\Delta y_i - \beta\Delta y_{i,-1})\right]' W_N \left[\frac{1}{N}\sum_{i=1}^{N} Z_i'(\Delta y_i - \beta\Delta y_{i,-1})\right],$$

where W_N is a symmetric positive definite weighting matrix. Differentiating the above expression and solving for β gives the GMM estimator:

$$\hat{\beta}_{GMM} = \left(\left(\sum_{i=1}^{N}\Delta y_{i,-1}' Z_i\right) W_N \left(\sum_{i=1}^{N} Z_i'\Delta y_{i,-1}\right)\right)^{-1} \times \left(\sum_{i=1}^{N}\Delta y_{i,-1}' Z_i\right) W_N \left(\sum_{i=1}^{N} Z_i'\Delta y_i\right)$$

Clearly, a decision has to be made about the choice of weighting matrix. This would result in either one-step estimation or two-step estimation (see Verbeek, 2000p.331). In general however, the optimal weighting matrix is determined as:

$$W_N^{opt} = \left(\frac{1}{N} \sum_{i=1}^{N} Z_i' G Z_i \right)^{-1}, \text{ where } G = \begin{pmatrix} 2 & -1 & 0 & \dots \\ -1 & 2 & \ddots & 0 \\ 0 & \ddots & \ddots & -1 \\ \vdots & 0 & -1 & 2 \end{pmatrix}$$

The case of dynamic models with other exogenous explanatory variables is just a straightforward extension of the above. Assume a predetermined regressor x_{it} correlated with the individual effect is added to the model above:

$$y_{it} = x_{it}'\gamma + \beta y_{i,t-1} + \alpha_i + \varepsilon_{it},$$

$$E(x_{it} v_{is}) = 0 \text{ for } s \geq t$$

$$\neq 0 \text{otherwise}$$

$$E(x_{it} \eta_i) \neq 0$$

The instrument matrix can then be written as,

$$Z_i = \begin{bmatrix} [y_{i1}, x_{i1}, x_{i2}] & 0 & \dots & 0 \\ 0 & [y_{i1}, y_{i2}, x_{i1}, x_{i2}, x_{i3}] & & 0 \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & [y_{i1}, y_{i2}, \dots, y_{i,T-2}, x_{i1}, x_{i2}, \dots x_{i(T-1)}] \end{bmatrix}$$

The first-differenced GMM estimator has been found to have poor finite sample properties in terms of bias and imprecision. In particular, this occurs when the lagged levels of the series are weakly correlated with subsequent first-differences[97]. Hence the instruments available for the first-differenced equations are weak (Blundell and Bond, 1998). Blundell and Bond have shown that the first-differenced GMM estimator could be subject to a large downward bias.

This is particularly severe when the time period being considered for each unit is small. For example, in most

[97] For example, when the series are highly persistent

cross-country growth regressions that test convergence, the time period is reduced to a small number of τ-period averages. Also, it is known that variables such as output are highly persistent series. As a result, Blundell and Bond (1998) have suggested a system GMM estimator that simply considers lagged differences as instruments for an additional levels equation. These are stacked as follows:

$$Z_i^{++} = \begin{bmatrix} Z_i & 0 & \dots & 0 \\ 0 & \Delta y_{i2} & 0 & 0 \\ \vdots & \vdots & \Delta y_{i3} & 0 \\ 0 & 0 & 0 & \Delta y_{i,(T-1)} \end{bmatrix}$$

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