AID EFFECTIVENESS: ILLUMINATING THE MACROECONOMIC EFFECT OF AID-GROWTH NEXUS IN GHANA (1965-2007)

By

Philip Banahene Thompson

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Supervisor: Dr. Achim Kemmerling (Associate Professor)

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ABSTRACT

After more than three decades of development assistance, Ghana and other SSA countries wallow in Poverty. Ghana has had her real per capita GDP growth stagnate or decline since 1960. The obvious question remains: Why does this trend persist despite increased aid flows and structural adjustment lending in Ghana likewise many SSA countries? Could this be a question of aid ineffectiveness?

Using Ghana as a test case this thesis contributes to the aid-growth debate by investigating whether aid has worked in Ghana? Of interest to the study is the realisation that past studies have failed to pay much attention to single case macro-level studies which the paper argues is more relevant than cross-section pooled regressions which have dominated the focus of the debate thus far. Different countries experience with aid makes single case analysis more imperative.

Given this empirical gap and perceived methodological limitations of aggregated studies to an issue which is more of a time series phenomenon; the paper offers a nuanced analysis of aid-growth nexus in Ghana and captures key transmission variables using the technique of co-integration. In effect we investigate whether aid has worked in Ghana.

The study found that contrary to the aid critiques, aid has a positive impact on Ghana's growth. The question therefore is not 'whether aid works' but how can we make aid work better.

DEDICATION

To God: In Him lies My Strength & My Hope
To Family & Well Wishers: Lies the Secret to My Strength

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ACRONYMS/ABBREVIATIONS

ACF	:	Autocorrelation Function
ADF	:	Augmented Dickey Fuller
ERP	:	Economic Recovery Programme
GDP	:	Gross Domestic Product
HIPC	:	Highly Indebted Poor Countries
ICOR	:	Incremental Capital Output Ratio
MDRI	:	Multi-Donor Debt Relief Initiative
NEPAD	:	New Partnership for African Development
ODA	:	Official Development Assistance
PP	:	Phillips Peron
PRSP	:	Poverty Reduction Strategy Paper
SSA	:	Sub-Saharan Africa
US	:	United States
WAIFEM	:	West African Institute for Finance and Economic research
WB	:	World Bank
WDI	:	World Development Indicators
WDR	:	World Development Report

CITATION NOTE

Referencing at the end of a paragraph should be taken as the source of all information within that paragraph except otherwise indicated. The referencing style is Turabian Bibliograpgy

CHAPTER 1: INTRODUCTION

1.1 Is Aid effective: An On-Going Debate?

Since the concept of aid was institutionalized in the post-war era, the economic justification has been that without it the Poor-South would not grow adequately to catch up with the developed North (Carlsson et al. 1994: 1, Chakravarti 2005: 5). Foreign aid/ODA thus provides the needed resources for growth and poverty reduction. As benign as it seems, the extent to which such goal has been met remains debatable. This has led to an ideological divides: the traditional pro-aid/orthodox and the anti-aid/critical heterodox views.

The orthodox view advocates aid on the premise that it complements domestic resources, eases pressure on foreign exchange, enhances capacity utilization and existing technology, all of which expectedly contributes to economic growth (Chenery and Strout 1966, Cassen and Associate 1994). The heterodox divide however argues aid rather displaces domestic resources, worsens income inequality, dampens exports and often times sustain corrupt governments (Bauer 1965 cited in Quazi 2005, Moyo 2009).Why the fuss?

Hansen and Tarp (2000) and other commissioned studies like the Cassen and Associates (1994), note that the aid debate has been approached from several methodological and ideological perspectives spanning micro-macro perspectives to qualitative and quantitative approaches with different emphasis and conceptual anchorage (cf. Arjan de Haan 2009: 18-20, Hansen and Tarp 2000).

It therefore stands to reason that context matters. The lack of consensus can therefore be attributed to such expressed-concerns which do not make the debate less relevant.

Cassen and Associates (1994:16) takes a more focused stand on this and argue that experience of aid varies enormously across countries and thus a blanket criticism associated with pooled-regressions may not be convincing enough. At the end single case studies is preferable (*ibid.)*. This paper contributes to the debate with a single case-study.

1.2 Scope & Justification

Whereas the paper not evocative of resolving conflict in the literature recounted, we focus on one key empirical issue – use of single case time series phenomenon to estimate the macroeconomic effect of aid on growth in Ghana. To expatiate on this strand, the paper asserts that by accentuating single case analysis and paying attention to empirical issues such as the time series properties of the data the conclusions from macroeconomic aid effectiveness studies which have thus far been elusive (see Mallik 2008:251) can be enhanced. Many of the celebrated papers have used cross-country pooled-regressions at the expense of single case analysis. Indeed, Lloyd *et al. (*2001) in their paper on aid and private consumption justify the need for single case analysis instead of cross country regressions for better insights. This position had earlier been emphasized by the commissioned study of Cassen and Associates (1994: 30-21) on aid effectiveness and re-affirmed by (Riddell 2007:224) which cautions against aggregated statistical studies on aid which mainly employs pooled panel-regressions.

This study notes the concerns of cross country regressions which approximates cross-sectional-phenomenon to what is apparently a time series phenomenon and its implications. What is more, weaknesses in accounting for the transmission mechanisms also have implications on research findings - a situation which makes the paper's contribution to the debate imperative.

Findings from this study would therefore bridge an important gap in literature.

1.3 Problem Statement & Case Selection: Bringing the Debate Home

Mahbub ul Haq – the co-creator of the Human Development Index – maintains that "any aid is better than no aid", a philosophy the West seems to have operated on for decades (Krueger et al. 1989: 81). This puzzles if one considers the troubling statistics given by Easterly who asserts that the West has spent more than $2.3 trillion over the last five decades on foreign aid yet to little avail (Easterly, 2006, p. 4). Notably, total aid flows from 'North' to 'South' exceed $150 billion annually of which a third enters Africa (Arjan de Haan 2009: 5).

Moyo (2009) focusing on Africa rebuts aid-effectiveness and argues does not work. She advocates a change in the status quo as the only way to revitalize Africans growth. Moyo notes: aid flows to Africa alone from the North is in excess of $1 trillion and yet Africa still suffers from poverty (Moyo 2009: 35). Moyo denounces aid by espousing its negative effect on exports, aid-dependency, micro-macro paradox[1], absorption bottlenecks (inflation, fungibility, Dutch Disease…) and corruption (Moyo 2009).

Counter-reaction to Moyo's criticism came not from Researchers alone but politicians alike. Among them include the former Ghanaian President J.A. Kufour [2]. This signals Ghana's potential as a test case for SSA. Indeed, Ghana was selected among high aid-recipients in SSA based on scientific case selection criteria. *A question holds: can the selected-Ghanaian case vindicate the likes of 'Moyo or Mahbub ul Haq'?*

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[1] The Micro-Macro Paradox as used by Moyo points to the apparent disjoint between short term impact and lack of long term aid-effect. Here Aid may be detrimental in the Long-term contrary to the short term positive-effect. The earlier usage by Mosley (1987) referred to contradiction in micro-successful and macro-failure aid-impacts studies.

[2] In the *Financial Times*, 7 May 2009, http://www.paulkagame.com/blog4.php; Former Ghanaian President John Kufuor maintains Moyo does not speak for Africa and that aid works (*NRC Handelsblad International,* 2 December 2009)

Observably, macroeconomic studies suggest that the more the foreign aid, the more aid-dependent most beneficiary economies have become with its attendant negative consequence. However, one can not base a judgment on such observation to cast doubt on aid-impact without exhausting all the empirical issues.

In sync with the aid debate, Burnside and Dollar (1997, 2000) injects another dimension to the debate, that aid is only effective under good policy environment. Equally important ex-post studies such as Hansen and Tarp (2000, 2001) and Easterly (2003) have all failed to confirm the impact of good policy environment […], whereas the former holds a positive view, the latter subscribes to the contrary but notably they all converge to the same conclusion- that policy's impact on aid is insignificant .

As puzzling as these conflicting findings are, the Burnside and Dollar studies have widely informed aid policy especially on issues of conditionality and selectivity in Africa (which also partially informs the case selection). The extent to which this dimension impacts the debate is worth internalizing.

1.4 How Different Is This Study?

Despite the strengths in cross-country regressions, they still suffer from proper *treatment* of country specific effects, heterogeneity and joint effect of endogeneity which all have implications on aid effectiveness results. These have been expressed by Hansen and Tarp (2001) and Cassen and Associates (1991). Although a comprehensive survey of aid effectiveness literature is not feasible now, such concerns support the inherent limitations embedded in macro-economic aid-studies which are well alluded to […]. This provides added scope for further research.

This paper takes such opening together with the need for single case time series analysis as a point of departure from similar cross-country studies to investigate whether aid has worked in Ghana (see setting on case justification).

1.4 Research Question & Objectives

In line with orthodoxy and for conceptual issues this paper asserts that if aid increases per capita GDP then it is effective or otherwise. Thus the paper revisits the aid debate by answering one key question: What has been the impact of aid in Ghana?

The objective of the research was therefore to examine this question using time series and co-integration analysis to estimate whether aid has worked in Ghana as an indication for aid effectiveness in the sub-region. To meet this objective, the paper addressed these key sub-objectives:

i. What are the trends in growth indicators in Ghana in relation to aid flows? Why is Ghana an ideal case for aid effectiveness in SSA?

ii. Is there a Short-Run and Long-Run relationship between aid and growth in Ghana?

iii. What is the overall effect of aid on growth in Ghana?

iv. What has been the relative efficacy of aid and trade within the period?

1.5 Research Outline

The remainder of the thesis is structured as follows: Chapter two provides the underlying theoretical and empirical literature on aid and growth. Chapter three serves to justify the case selection and critically reviews economic performance in Ghana including its ODA trends since sixties. Chapter four reviews the Methodology employed. Chapter five presents the results and discussions of the empirical estimation and finally chapter six summarizes the findings and conclusions.

Chapter 2: LITERATURE REVIEW

2.1 Introduction

In this section the theoretical and empirical literature on aid and economic growth is reviewed aimed at framing the appropriate research design and empirical specification for the study.

2.2 Theoretical Review

I set out first to review growth theories and proceed to the theoretical strands underpinning the aid-growth nexus within this framework and the possible transmission mechanisms. A brief empirical account is given to inform the model specification.

2.2.1 Growth Theories

Economic growth was central to classical political economy from Adam Smith to David Ricardo, and then in the critique of it by Karl Max, which was later undermined under 'marginalism' -the so called 'marginal revolution' (Salvadori 2003). Its revival remains the focus of attention of development discourse since the seventies. Early thinkers like Roy Harrod, J.M Keynes, Robert Solow and Nicholas Kaldor's contribution to growth theories is marked (Salvadori 2003: xi, emphasis in original). Typical neoclassical growth theories include the Solow and Harrod-Domar growth models. I review variants of these growth theories through the lens of aid-growth nexus.

In the Harrod-Domar model, conditioned on the Leontief-style production function, savings constraint is envisaged with an assumption of excess supply of labour (Hansen and Tarp 2000, 2003). In this model of savings constraint, aid serves to *fill a gap*, providing the requisite resources to poor countries with low savings capabilities.

Savings is channelled via Investment which increases the proportion of physical capital that is invested[3]. Thus capital accumulation remains the key to economic growth (Mankiw 2003). However such growth was conditional on the *quality of investment* capital (Easterly 2003). Indeed at the heart of the neoclassical theory was the 'incremental-capital-output ratio (ICOR)' which ranged around 2 to 5; where a high ICOR was often taken as a measure of *poor quality of Investment* (Easterly 2003:31).

Notably, in the neoclassical Solow model where savings, depreciation and population are key growth determinant, savings have level effect whiles population – affecting capital formation-has both level and growth effect. *Population* was viewed as the main source of technological progress (Ray, 1998) which affects the capital stock. What is unique about the Solow model is the existence of the *steady state level of per capita GDP*[4] to which developing countries can converge due to the assumption of *diminishing returns to scale*. Aid was to facilitate this convergence. Solow model posits that increasing savings or investment rates through for example foreign aid only raises the steady state level. Thus a high savings rate yields a high steady-state level of output. Growth results through *population and productivity growth* linked with shift from one steady-state to another. The higher the rate of population growth, the lower the level of output per worker – i.e. growth comes with improved efficiency (Y/L)[5] and increased investment which is achieved through technological progress (Deepak and Myint 1998: 73, Mankiw 2003).

[3] *Ibid.*
[4] Here, Investment equals depreciation
[5] Solow model: output (Y)=f(Labour(L),Capital(K))

Aid seen in this lens impacts investment and improves factor productivity through technological progress. This theory in particular informed first and second generation aid-growth study in particular where savings and investment were key intervening variables. How technological progress evolves is however not explained well by this model. In turn growth is determined exogenously (Mankiw 2003).

A critical view to neoclassical growth models arose through the lens of the new growth theory which 'endogenises' technology into a model of growth (cf. Salvadori 2003**)**. It seeks to explain, how technological progress which determines growth, comes about. In the new growth theory there are no diminishing returns to capital and no *steady state* level as the old theory espouses. "Growth does not slow as capital builds-up, growth rate is however contingent on the investment quality determined by the *ICOR" (*Easterly 2003). Thus aid impact on growth is through quality of investment. H*uman capita*l rather than physical capital plays a key role. In effect knowledge (human capital) which is endogenously determined and not subject to diminishing return is the source of growth. (Cortright 2001: 2). The new growth theory informs the shift from *resource-based economy to a knowledge-based economy.* Seen from this angle aid plays a facilitating role in the terrain of capital formation and technological progress.

2.2.2 Other Growth Determinants

Within the above theoretical framework empirical evidence has thus far proven that capital accumulation (both physical and human capital) is the key growth-determinant. However, evidence also abounds outside this sphere that support long-run growth namely; trade, institutions, openness, and geographical characteristics which need to be considered.

Rodrik et al. 2004:2-3, for example notes:

> "Growth theory has traditionally focused on physical and human capital accumulation, and, in its endogenous growth variant, on technology change. But accumulation and technological change are best proximate causes of economic growth. [...] economic-integration, geography, and institutions-allow us to organize our thought on the "deeper" determinants of economic growth"
>
> (Rodrik et al. 2003:2-3)

It is worth mentioning that the theoretical vigour of these allied factors often remains contentious. Example, Sachs and Warmer (1995) emphasis on openness and its growth link has been criticised by Rodriguez and Rodrik (2000) for being highly correlated with other indicators such as governance and institutional quality.

2.2.3 Aid and Economic Growth

Having touched on other growth determinants we reinforce the old and new growth theories within the aid-growth framework for greater analytical depth. Easterly (2003) and others contend that the empirical literature on the aid-growth nexus is challenged by the lack of clear cut theoretical model by which aid influences growth. Such development has had implications on empirical specification of the aid-growth relationships. The 'two-gap model of Chenery and Strout (1966) remains the benchmark model dominating the aid-growth specifications despite development in the growth models' (Gomanee et al. 2002: 2).

Interestingly, Chenery and Strout (1996) was inspired by 'Rostow's one-size-fits-all' model developed in the 1960s (Browne 2006: 25). This model implies that, increase in investment stock due to aid-financed would cause a "take-off via the intermediate stages of development into a self-sustained growth stage" (*ibid*.)

However, the analytical anchor of the two-gap model still identifies with Harrod-Domar model that assumes only saving constraint on growth (Hansen and Tarp, 2003). This has been the fundamental concept underlying earlier generation studies.

Easterly (2003:30) explains the two-gap model as follows: first gap is between the amount of Investment necessary to achieve a target-growth and the available domestic savings, while the second gap is between import-requirements for a given level of production and foreign exchange earnings. The theory assumes that poor countries lack adequate resources needed to finance investment and imports of capital goods and technology. Export growth is also important, as it generates the foreign exchange to finance imports. "*At any point in time one gap is binding and foreign aid serves to fill the gap"* (cf., Browne 2006: 24, Easterly 2003:30, Hansen and Tarp 2000).

The 'two gap-model' however invokes challenges as a consequence. First foreign aid will impact growth differently depending on which gap is binding. Second, while aid-savings interaction is positive when *savings* are binding, this will not be the case when *trade* is binding (Hansen and Tarp 2003). It is partially on this account that aid-critics for example during the *Monterrey consensus* in 2002 advocated for more trade and not more aid for developing countries.

In the two-*gap model* the 'quality of investment' matters. Aid might finance additional consumption instead of investment and pose *absorptive capacity* and growth challenges. With a *binding trade gap* there is likely to be a direct effect of aid on growth that by-passes Harrod-Domar aid –savings- investment - growth chain (Hansen and Tarp 2000).

Further, the gap model implies that the level of growth depends on the Investment Share of GDP, adjusted, for the 'Investment quality' (Easterly 2003).

This in turn has been the focus of second generation studies which departs from the first generation studies in that it considers domestic *as well as foreign sources of capital accumulation* (Aid) as separate explanatory variables in a behavioural estimation (Hansen and Tarp 2001: 8). The sum of investment was taken as the sum of domestic savings and foreign aid. Easterly (2003) summarily discuss the link as follows:

$$g = (I/Y)/\mu$$

$$I/Y = A/Y + S/Y$$

Where '*I*' is required investment, '*Y*' is output, '*g*' is targeted GDP growth, '*A*' is aid, and '*S*' is domestic saving. μ is the ICOR with values discussed in preceding session. It is simply the proportion of the Investment to the targeted-growth rate treated as constant (ibid.). Further, the 'financing gap' approach of aid assumes a stable linear relationship investment-growth relationship conditional over the short to medium run (Easterly 2003:31). This emanates from the 'Leontief-style production function' where capital and labour are fixed per unit of output[6].There is therefore no substitution effect between the two inputs. This view has not reconciled well with other neoclassical models like the Solow model.

However (*Easter 2003*) notes that further theoretical attempts have been made to i.) dispel such claim of a constant *ICOR, and* ii.) doubts as to whether the link between investment and growth is linear. There have also been 'doubts that variations in *ICOR* necessarily represent the *investment quality (ibid)*. This alternative expression is justified under the new growth theory.

[6] *Ibid.*

Conditioning growth on more inputs beside physical capital such as technology, human capital, social capital and institutional design, the new growth theory serves to provide the alternative. This development has informed current generation studies such as Burnside and Dollar (1997:2000). Here the *ICOR* is likely to change with these interactive inputs; dislodging any stable linear link between Investment and growth neither does 'ICOR measure the quality of investment' (Easterly 2003:32). The key to growth is therefore knowledge-driven technological progress (Cortright 2001).

The evolution on how aid capital, impacts growth via the intervening variables of *aid via savings-investment to growth* or *aid via investment to growth* and the endogenous transmission such as *aid policy growth* is well alluded to in Cassen and Associate (1994), Hansen and Tarp (2000) and Gomanee (2002) studies.

Thus far I have accounted for savings (domestic and foreign (aid)), Investment and other endogenous growth variables such as human capital, key variables in the aid-growth model. I proceed to the empirics after which I account for factors that inform aid effectiveness.

2.4 Empirical Literature

An insight into the empirics of aid-growth nexus is necessary to provide an acute lens with which one can put the theory in perspective. In view of the focus of the paper, we concentrate on the macroeconomic discourse at the expense of the broader debate which encompasses the qualitative aspect as well.

Notably, much of the research on aid effectiveness has focussed on large group of developing countries producing contrasting results. Such studies have found positive or negative effect depending on country groupings, methodology and time period chosen (Cassen 1994:16).

Since the results are varied and would be impossible to capture the growth processes in simple analytical framework, we summarily siphon the underlying lessons from key studies for this review and subsequent estimation.

Hansen and Tarp (2000), provide a well informed macroeconomic survey of the literature on aid effectiveness capturing key intervening variables. In their submission which this study finds quite useful on both empirical and methodological grounds, an attempt is made to consider the three generations of empirical works on aid effectiveness. They discuss the analytical underpinnings of each generation's work and give encyclopaedic survey of work in each which informed their estimating model. Their conclusion is rather positive, that aid improves economic performance against a rather subtle conclusion by other studies like Chakravarti (2005:42).

Chakravarti (2005) concluded that any possible link between aid and growth might be weak however ample evidence also suggests such *impact varies from country to country and from one region to the next*, due to regional and country specific effects. This remains poorly controlled for *(ibid)*. The findings emphasise the importance of *good policy environment* for aid to be effective. This is akin to current generation studies revitalised by Burnside and Dollar (1997, 2000).

In the Burnside and Dollar (1997, 2000) a policy variable in the aid-growth estimation was allowed for which had significant impact on their submission. Hansen and Tarp (2000) and Easterly et al. (2003) are two critics of the theoretical vigour of the Burnside-Dollar study. Despite that they all agree to the importance of economic policy; that good economic policies and high institutional quality have independent and positive effect on growth, they note that the impact of aid is not contingent on policy. Thus such studies vary in their conclusions on aid effectiveness.

Burnside and Dollar (1997, 2000), claims that aid is only effective under good policy environment. Hansen and Tarp (2001) offered a re-examination of the Burnside-Dollar study by applying the same empirical IV estimation using different instruments in panel estimation as with the others. Drawing on the old and new growth theories in a wider macroeconomic context, they found that there is *favourable aid growth link* even in less favourable policy environment. The same conclusion about policy environment was reached by the Easterly studies-which also used same procedure by different instruments - but *found aid to be ineffective*. The conflicting conclusions from these cross country-regressions prove the results to be sensitive to choice of instruments and sampling. The jury is out. The question of aid effectiveness remains an empirical discourse.

We reconcile earlier empirical works with findings of current studies. Linking the key submission of the classical work of Cassen and Associate (1994:21), the facts remain that different study comes to different conclusions based on methodology. Aid explains varying proportions of growth, and its quantitative impact on growth rates *appears* to be weak but consistent with historical experience and theoretical expectations. There are sizeable regional differences, hinting at different country experience. This support the view for interest in single case country analysis (Cassen and Associate 1994)

Earlier generation studies on aid and savings have shown a strong negative relationship albeit the underlying reasons have not been properly explained. However other studies found a positive relationship once *consumption aid* was accounted for. Cassen and Associate (1994) further notes that few studies account for the transmission mechanism, predominantly the indirect effect of aid via investment - what is captured under second generation study. However one finds a weak but positive effect.

The Cassen and Associate (1994) Studies notes that these aid-growth studies assumed a theoretical context where growth is subject to three types of constraints: *absorptive capacity, savings and foreign exchange*, which is explicitly in line with our discussed two-gap model. The study notes that these findings are more attuned with cross country regressions which may be at odds with individual country experiences and thus advocate for such single case studies to allay some of the misconceptions of aid-growth impact[7]. I recount few of these studies within the framework of time series analysis since it captures the underlying premise of the study.

Dhakal et al. (1996: quoted in Mallik 2008) using bi-variate Granger causality tests involving four Asian and four African countries failed to find any causal relationship between foreign aid and economic growth in any of the countries studied. Levy (1998) however found aid to be positively and significantly correlated with investment and economic growth in Africa.

Upolo and Mbaku (1994: quoted in Mallik 2008) assessed the impact of aid on growth in Cameroon 1970-1990 using timer series analysis from 1970-19990. They found that the *per capita gross domestic product, savings rate and aid* are co-integrated and aid has a positive long run effect. Contrary, Nyoni (1998: quoted in Mallik, 2008) found positive long run effects of aid on equilibrium real exchange rate during 1967-1993; suggestive of a negative effect of aid on growth via the appreciation of exchange rate (Dutch Disease Syndrome).

Quazi (2005) investigating the impact of aid–growth and aid-fiscal link in Bangladesh - one of the low income countries in the World - used time series co-integration analysis and applied a neoclassical growth model and finds that aid has marginal effect on, GDP growth but when grants are controlled for - loans had significant impact on growth whiles grant does not.

[7] See Riddell 2007:224-225

Mallik (2008), using time series analysis to account time series properties and individual country dynamics subjected six poorest African countries to cointegration-test and found a long run relationship between *per-capita real GDP, aid as a percentage of GDP, investment as a percentage of GDP and Openness*. However, he found the long run effect of aid on growth for most of these countries to be negative i.e. possible evidence of the micro-macro paradox.

The conclusions from the single case studies have also not been consistent suggesting that aid may work differently depending on country specific effects justifying the need for country-specific considerations.

2.4 Constraints to Aid Effectiveness

Predictability and Volatility are all constraining factors to aid-growth nexus. We however, briefly review the general ones from orthodox view point.

2.4.1 Aid Taxes and Fungibility

There is varying concerns of differing effect of aid on public finances of aid-recipient economies. Aid money intended to boost investment expenditure due to savings gap may be used to expand consumption expenditure instead (cf. Boone 1996).

There is also concern that aid displaces tax revenue- high expectation of aid flows has been shown to cause recipient governments reducing commitments to raise taxes or compensate for small domestic tax base (Riddell 2007:226, Quazi 2005). As a consequence, government fiscal behavior represents an important channel through which aid flows can influence growth since it affect economies saving rate (cf. Khan and Hoshino 1992).

There is concern that aid may be rendered ineffective when recipient governments switch money away from targeted sectors by donors to other consumption or capital expenditure priorities making aid *fungible*. Thus 'fungibility' underlines the tendency for recipient-governments to re-order the overall spending priorities and finance a range of non-developmental projects and programmes (*ibid*). The fungibility model has many lapses including underlying premises that aid really finances consumption and not investment and that it complements rather than retard growth as it expands investment frontier and raises productivity (Cassen and Associate 1994:17-18)

2.4.2 Aid and Exchange Rate

The tendency for aid to adversely put upward pressure on real exchange rate of the recipient's currency to appreciate i.e. the Dutch Disease phenomenon is a topical issue in aid effectiveness debate.

It occurs when aid funds are used to enhance spending on domestic output, requiring production to be switched away from exports to import substitutes. The appreciated real exchange rate kills the relative competitiveness of the economy, limiting export expansion and reducing the potential for further wealth-generation especially in a floating exchange rate regime. In a fixed exchange rate regime, however, the impact may be via inflation.

Admittedly, the dynamics may be different in different exchange rate regimes, however the results are the same; the demise of the export sector and the negative impact on growth (cf. Moyo 2009:62-63, Riddell 2007:227).

2.4.3 Aid and Absorptive Capacity

Countries with low-financial depth do not have the requisite system to absorb aid flows (Moyo 2009). Macroeconomic studies have found the existence of the *aid-laffer curve* [8] i.e. the existence of diminishing returns to aid flow symbolising decreasing efficiency. This suggest existence of a critical point where aid becomes ineffective-termed the Absorptive Capacity Threshold. Even though the exact point is not known, it has been suggested that the consequences may be more detrimental if there is absorptive constraints.

Moyo (2009) evidently posit that weak recipient economies manytimes have to contend with managing surplus aid at a greater cost [9]. Leaving it unattended would be consequential (Dutch Disease, Inflationary Pressures…). The cost of preventing these negative consequences can also be weighing on these already vulnerable economies.

Riddell (2007:228) further contend that such scenario may even stimulate the aid already provided to be used less efficiently.

2.5. Conclusion

In this chapter a theoretical lens of aid-growth nexus has been presented. Discussions of generations of empirical studies have been given. Notably, aid impacts growth through intervening variables which have received varied attention within past generation. On account of the above review, we found evidence of gap in the literature of aid-growth nexus which has thus far led to conflicting conclusions.

[8] Cf. Lensik and White; Are there Negative Returns to Aid? A report to Swedish Ministry of Foreign Affairs
[9] The argument is that it cost money to mop up the excess liquidity and the unused funds accrue interest. Indeed the latter assertion may not be applicable in a grant situation

More emphasis has been given to cross-country studies and the time series phenomenon has been neglected. At the end the conclusion has been one of an empirical issue.

Although the session presented various growth theories within the aid-growth lens; it offers no magic pill for rapid economic growth. It, however, provides the analytical and intellectual lens within this sphere of study.

Chapter 3: THE SETTING

3.1 Introduction

This chapter offers a descriptive analysis of the case within the aid-growth framework and justification of case-selection for the sub-region. Results from this chapter thus inform the empirical estimation to capture key dynamics in aid effectiveness. More importantly analysis of trends in ODA flows in Ghana-the case, is given and its relation to the sub-region is elucidated where necessary for enhanced insights. Key macroeconomic growth indicators are given in assessment of economic performance. The chapter therefore meets sub-objective one.

3.2 Why Ghana: Progress on Good Governance?

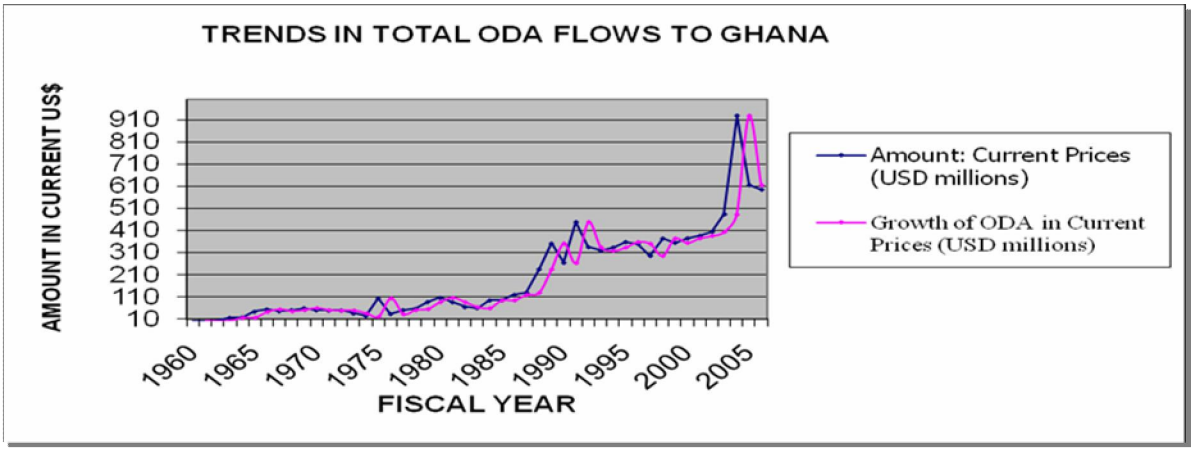
As deciphered from the theoretical discourse, the place of policy/good governance in aid-growth debate has taken a heightened turn especially after the publication of the Burnside and Dollar (1997) report. Thus given good governance as fundamental to aid-effectiveness,[10] championed by the World Bank and with Ghana's pioneering role in driving such agenda in Africa - being the first African country to subject itself for peer review under the NEPAD Governance African Programme [11] - Ghana qualifies as an ideal case for aid effectiveness and good approximation for most low income SSA countries[12].

[10] See Burnside and Dollar (1987)
[11] See (http://www.aprm-international.org/)
[12] *There is caution in using Ghana as a true representative case. SSA has diverse political and policy terrain and experience of aid varies enormously across which is an underlying assumption of the paper. It therefore only serves to approximate*

Aid Flows & Governance:

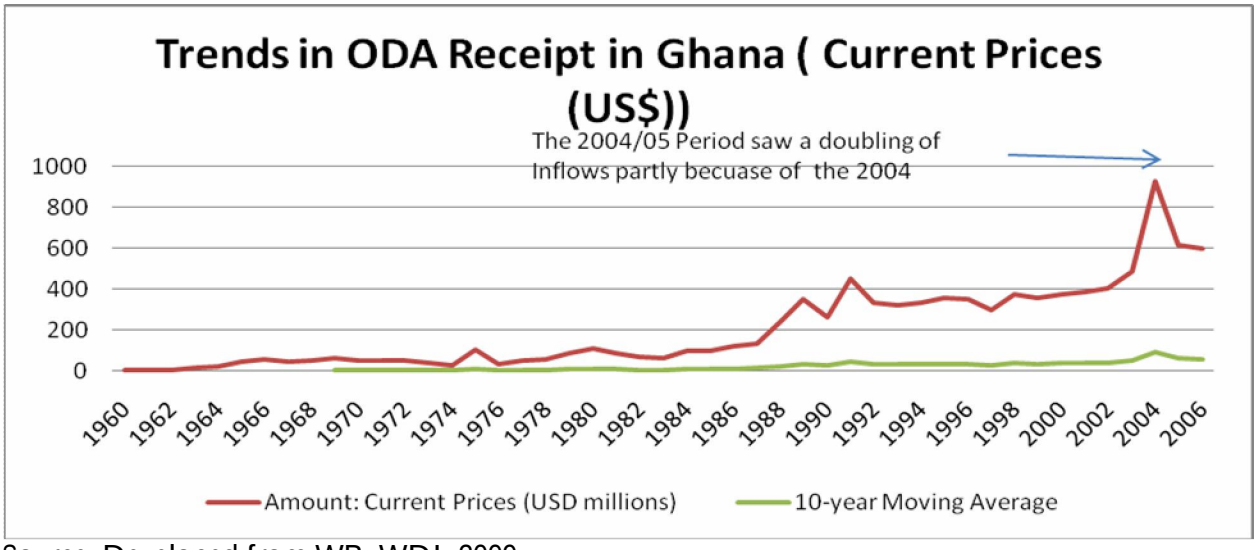
Ghana by African measure is heavily aided. Her lead role in growth and governance commitment in Africa[13] has endeared her to the international donors receiving almost US$1.0 billion in aid annually[14] and recently was host to the 2008 High Level Forum on Aid Effectiveness after the landmark 2005 Paris Declaration (see figures 1 & 2 for ODA Trends).

Figure 1.Trends in ODA flow-Current and Growth Rate (US$ Million)



Source: Constructed from WB, WDI, 2009

Figure 2.10-year Moving Average & Trends in ODA flows in Ghana Current US$'m



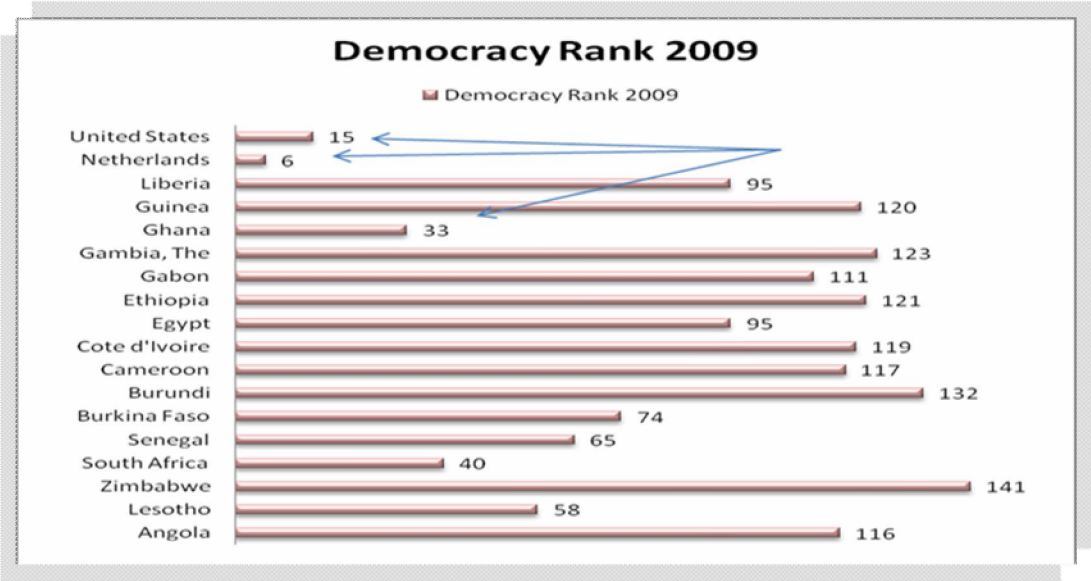
Source: Developed from WB, WDI, 2009

[13] see John Toye, 1991

[14] See BBC Report (http://news.bbc.co.uk/go/pr/fr/-/2/hi/business/5071320.stm) accessed 15th May, 2010: 22.05hr

Indeed, Ghana is praised as a stable democracy with significant progress in governance reforms since early 2000. In 2006 the World Bank and International Finance Corporation (IFC) ranked Ghana among the top ten global reformers (WDR 2006). Within the past few years; Ghana has been ranked as *free* by Freedom House, in critical areas such as political rights and press freedom which bears on economic freedom. Ghana's political landscape therefore offers a relatively high level of demand, for external assistance. Indeed in June, 2009 the US President paid an official visit to announce the USA's commitment to increase assistance to Ghana in view of its commitment to good governance. Figures 3 and 4 developed from the 'Freedom-House' database support Ghana's recent democratic credentials which the World Bank and other aid agencies deem important for aid effectiveness and on which aid selectivity has evolved.

Figure 3.Governance Indicator (Case Justification) - Democracy Rank 2009

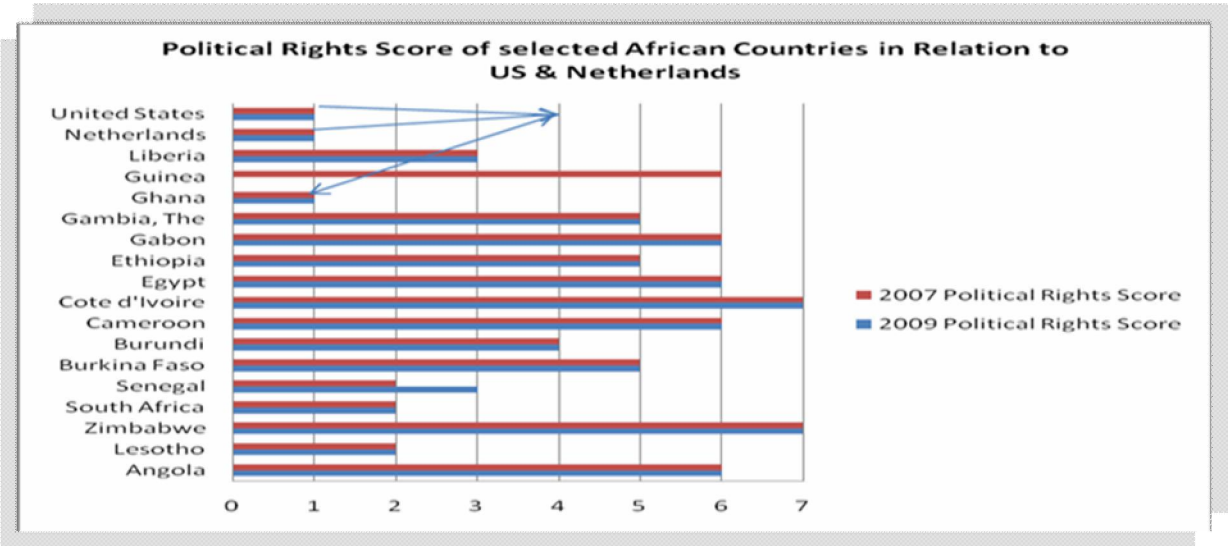


Source: Authors Construct Using 2009 Democracy Rankings by Freedom House[15]

[15] See (http://www.worldaudit.org/polrights.htm; accessed 14/12/09)

It can be seen that Ghana has the best democracy rankings in Africa followed by South Africa in both figures and thus the selection of Ghana is justified on condition of good governance.

Figure 4.Governance-Political Rights Score of selected African Economies



Source: Authors Construct From 2007 & 2009 Freedom House Annual Surveys Rankings[16]

3.3 Economic Structure and ODA Trends

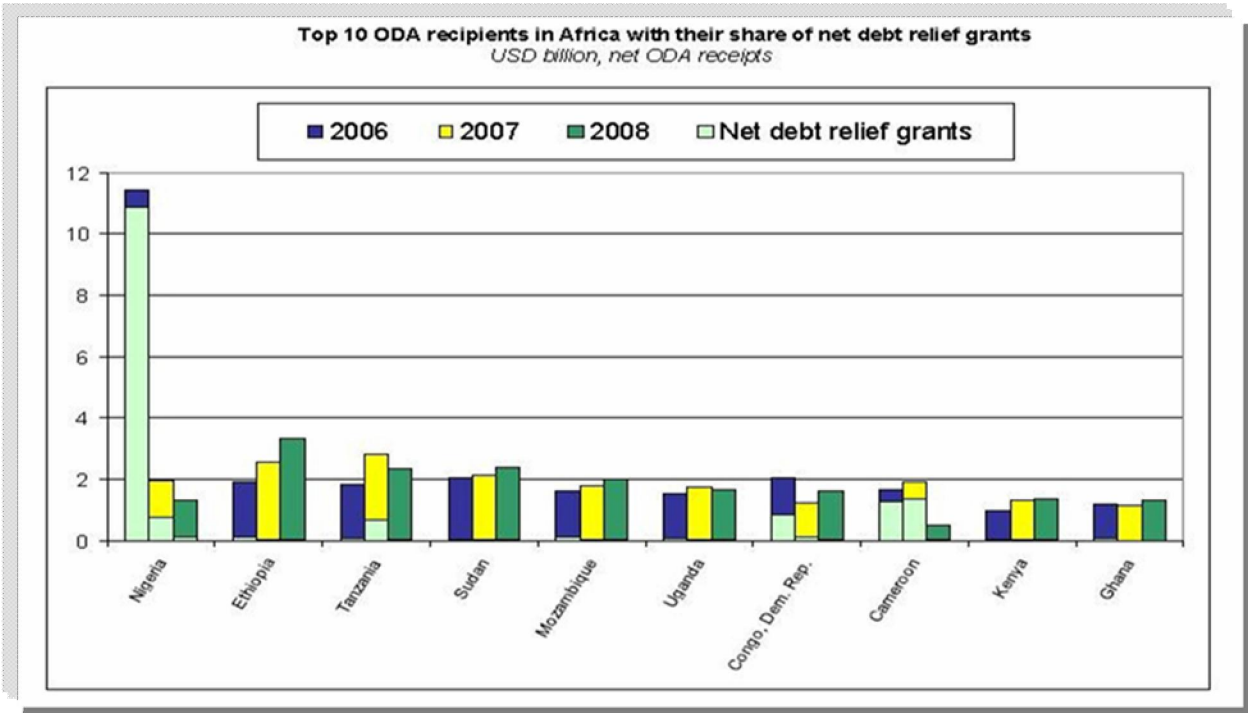
Ghana happens to be the second largest producer of Cocoa and Gold after Cote D'Ivoire and South Africa respectively. Yet majority of her population still lives below the poverty line of 1.25$ a day estimated around 28% by 2006 WB Report; down from 51% a decade earlier due to commitment to good governance[17]. The economy is predominantly agro-based with over 60% of its labour force engaged in Agriculture which accounts for more than a third of its GDP[18].

[16] See (http://www.worldaudit.org/polrights.htm) accessed 14/12/09:12.4 GMT, Freedom House Scale: 1-7; 1=Most Free, 7=Least Free.
[17] Ministry of Finance, Ghana
[18] CIA World Fact Book, 2010

These two commodities and individual remittances constitute the major sources of its foreign exchange[19]. Due to a less diversified economy and the *primary* nature of its major export commodities, the economy is heavily affected by the performance of commodity prices in the world market.

Compared to the poorest countries in West Africa however, Ghana's per capita output is almost twice as much the average[20].Despite this trend Ghana's economy is heavily dependent on foreign aid and has been among the top ten aid recipients in Africa (see figure 5 & 6).

Figure 5.Top ten ODA recipients in African 2006-2008

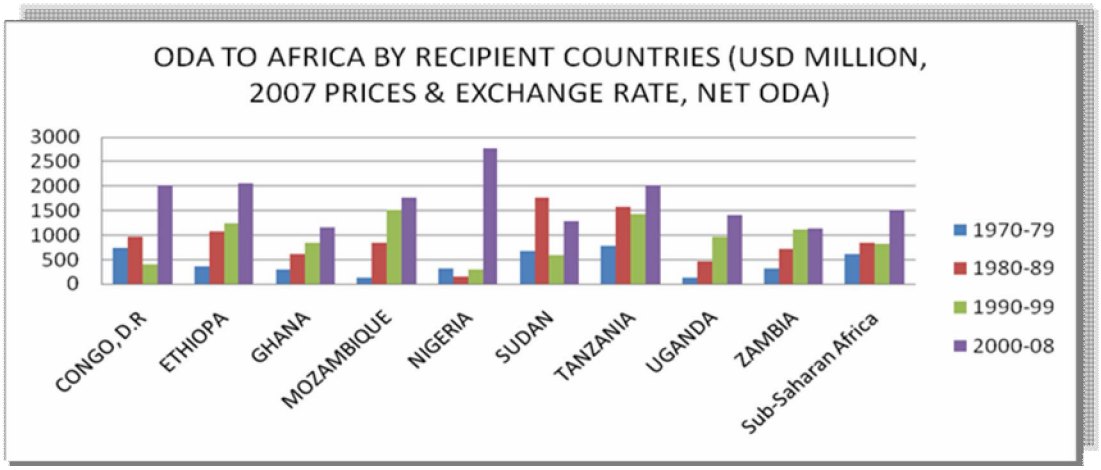


Source: OECD database, 2009.

[19] *Ibid.*
[20] *Ibid.*

Figure 6 is even more telling since it shows that since Ghana's independence, Ghana has consistently enjoyed high aid inflows in relation to others within the region. Even though it is not the highest among the top groups, it has the highest governance rankings which also make it the ideal choice for the study. (cf. Polity rankings/Appendix A)

Figure 6.Highest Aid recipient countries since 1970 (10-year averages)



Source: Authors Construction from OECD stat. 2009

Ghana accessed the 'Paris Club' for debt relief under HIPC initiative in 2002 and benefited from the MDRI that took effect in 2006. Ghana had about $4.2 billion of its $6.0 billion debt written off (Ryan 2006: emphasis in original). Yet the poverty level is still high and it may take some time for these positive gestures to reflect on poverty levels due to time response lags.

3.3.2 Reform & Growth Experience

Historically, the growth trends have been one of unevenness. "It may seem harsh to say so, but, just as Ghana pioneered political independence [...] in the 1960s, so also has she pioneered a set of self-destructive economic policies[…]' (Toye 1991: 151).

It is mind boggling to note that Ghana had similar economic base like Malaysia in the 60s at the time when they all had their independence. Whereas Malaysia is now economic giant, Ghana has stagnated or declined in growth over the period. Ghana's status as a middle income country in the 1960 dissipated into low-income country in the 1970s due to bad governance and economic mismanagement.

Between 1970 and the 1983 ERP, real GDP at market prices fell by about 11% (worse was the per capita income). This persisted until the 1985 post ERP (Lloyd et al. 2001; Toye 1991: 166). Ghana's economic malaise compelled her to opt for the World Bank Structural Adjustment in 1983 (ERP) - which established some level of economic stability by the mid 80s. Indeed, Ghana managed to raise her real per-capita income by some 12% by 1987 (Toye 1991: 166). It is believed that aid flows which increased during the adjustment period contributed to the growth recovery. This gives an added scope for empirical test.

Under the Good governance of the 90s Ghana adopted the PRSP under the Growth and Poverty Reduction framework. The thematic areas include: macroeconomic stability and good governance. Ghana's commitment to these targets has enabled her to overcome most of the current growth challenges that bedeviled the sub-region posing a record growth of 7.2% in 2008 in the height of the financial crises[21]. However this came at a cost as her deficit skyrocketed to over 14% of GDP at the same time[22]. Analysts have partially attributed the high deficit spending to unmet commitments and perverse effect of aid.

[21] Adopted from Ghana Statistical service

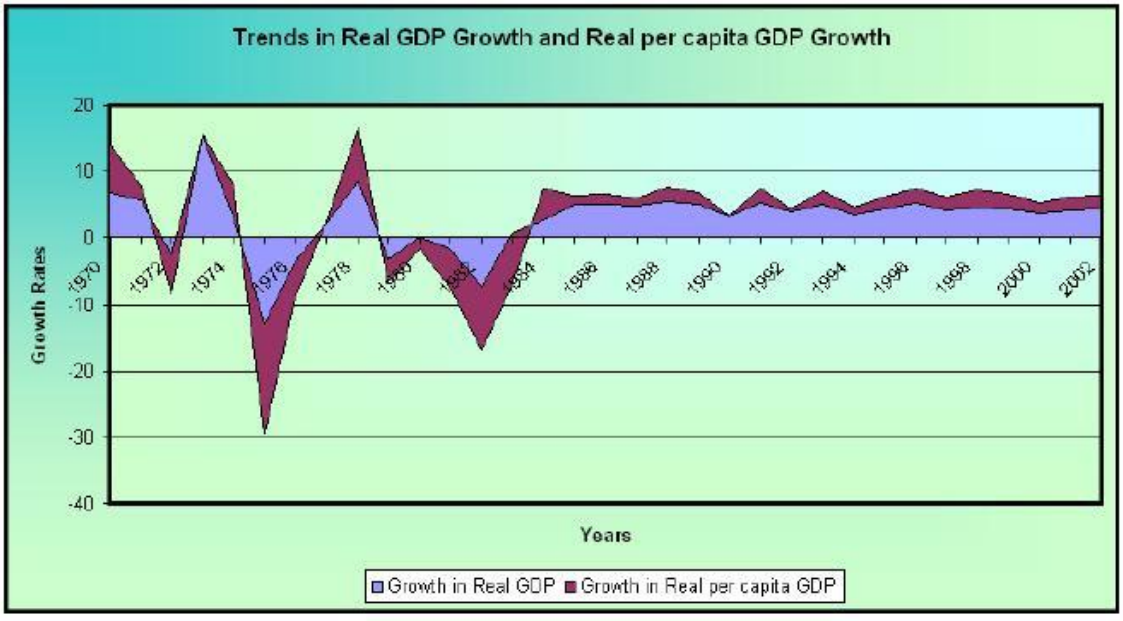
[22] See the 2009 World Bank Country Report on Ghana

Suffice to say the last four decades have been turbulent for SSA countries in terms of both economic growth and stability. Many of the countries did not only suffer the world wide growth slow-down in the mid 70s at the height of the oil crises, but also had several years of negative growth in the subsequent period of mild global recovery.

Toward the end of the 1980's, some SSA countries began slight recovery due to structural reform, although the future of this recovery is still shaky (Toye et al. 1991).

The growth record of Ghana within this sphere has been one of unevenness when the post-reform period of 1983 is compared to the earlier period. With a reasonably high GDP growth in the 1950s and early 1960s, the Ghanaian economy began to experience a slow down in GDP growth in 1964. Growth was turbulent during much of the time after the overthrow of the first regime of the 60s and only began to stabilize after 1984. As seen from *figure 7/8*, the 1966, 1972, 1975-1976, 1979, 1980-1983 periods; the growth rates were negative.

Figure 7. Trends in Real GDP Growth and Real per capita GDP Growth of Ghana



Source: Ayeetey and Fosu, 2004

Figure 8 Annual GDP growth Rates at Constant Prices (Ghana)

Source: IMF, database

Notably, the years of negative growth were generally associated with changes in government through illegitimate means which led to policy discontinuity. This extols good governance as fundamental factor to growth.

In effect there are reasons to believe that aid has played an important role in Ghana's historical growth which is akin to the sub-region, both by injecting funds and 'encouraging' policy reforms. 'Donors have played a major role in both shaping the adjustment program and financing the attendant costs' (Leechor 1994: 172).

Given this historical account, it is appropriate that our study of growth in Ghana concentrates on the contributions of aid and other growth determinants such as trade. Our concern is with aid contribution on growth in Ghana accounting for the transmission of export/import, investment and government policy such as consumption.

This is in line with the recent literature on the relationship between aid and per capita growth, which focuses on transmission chains (e.g. Gomanee 2002)

3.4 Conclusion

The chapter has justified Ghana as a good case for aid effectiveness in SSA and signals how aid may have contributed to Ghana's historical growth. It thus meets sub-objective one. Policy played a key role in Ghana's selection among SSA-countries. Further selection criteria are outlined in the next chapter.

Although it is difficult to generalise from such results due to each countries experience with aid - another premise for which I undertake a country- based analyse instead of cross country – a careful selection such as the one offered here has the potential of exuding policies which can be replicated in other regimes when governance and other factors are accounted-for supporting the need for Ghana as a representative case within the sub-region.

CHAPTER 4: METHODOLOGY

4.1 Introduction

In this chapter I present the methodology employed for the research, encompassing design, data sampling and analytical technique.

4.2 Hypothesis

Although we implicitly test a number of hypotheses in our estimation I do not pursue a key hypothesis but rather put forward a research question. The reason being that from my literature review it's noted that the issue whether aid is effective or not is one of empirical question. However from the previous –chapter, *a priori*, one expect aid impact to be positive in Ghana.

4.3 Conceptual Framework

Past trends inform current trends (*the naive model*) and thus I capitalised on the theoretical literature for this design.

Empirically, I note that many aid-growth studies have failed to *account* for the aid-growth transmission link and key empirical issues recounted in the theoretical review such as the treatment of savings/investment, imports, Government Consumption and Policy into aid-growth analysis. In Gomanee *et al*. (2002), they accounted for the transmission mechanism via the technique of generated regressors or instrumental variables and lagging in their panel analysis. In similar vein I pursue government fiscal behaviour as highlighted by current generation studies such as Burnside and Dollar (2000) and with key variables from earlier generation studies such as the two gap-models, I establish the potential linkages between aid and growth (figure 9). This may be done by lagging and proper model-specification to mitigate endogeneity and

autocorrelation a consideration under time-series models. However, I use co-integration analysis which has added advantage over generated regressors as it by-passes the problem of heterogeneity and non-normality concerns associated with cross-country regressions and the issue of endogeneity. Co-integration implicitly assumes that all variables are endogenous (cf. Mallik 2008)

Thus the paper strategise by considering carefully the variables that serve this aid-growth link. On account of theory and using the naive model I arrived at the variables recounted in figure 9.

This conceptual design is an important consideration in the aid-growth nexus which serves to provide the intellectual lens through which one can account for the transmission mechanisms of investment, trade (import-exports) and fiscal behavior. Within this framework I do not pursue the government policy *as the key focus* of the analysis like the third generation studies do; since its transmission link within the aid-growth nexus is poorly understood and the pioneering work of Burnside and Dollar (1997) for the policy-variable has been disputed by equally important studies. However since policy environment forms an important consideration in selecting my case, I choose variables close in spirit to the ones used in the current generation studies such as Burnside-Dollar studies including government consumption; captured under the fiscal behavior like Inflation.

Figure 9. Transmission Flow from Aid to Growth

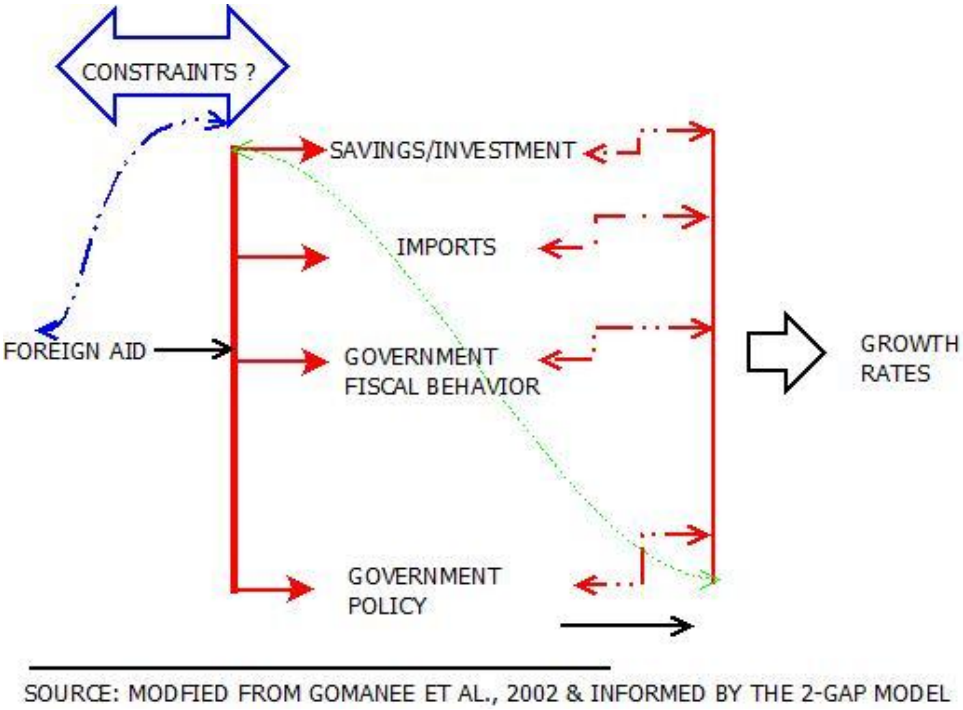


Figure 9 shows the aid growth transmission with Investment being the most important link. I posit that conditional on the productivity of Investment, Aid may finance investment and increase growth. Hansen and Tarp (2001) and Lensink and Morrissey (2000) further to this theory provide empirical support for the proposition that aid affect growth through investment. Poor countries in SSA like Ghana would need to import goods and intermediate inputs, but their export revenues are often not adequate to meet such imports and thus aid may provide the needed foreign exchange to acquire such input and technology (see gap model).

Hence, the economic technique applied was to determine if aid determines the transmission variable through simple correlation and 'instrumenting'. Having established that, I enter the variables into the base model for the co-integration estimation to analyze the long-and short run estimates of aid and growth if co-integration is confirmed.

4.4 Data and Sampling Technique

The study employed mainly secondary-data on annual time series macroeconomic variables. The choices of variables are described after the empirical model and covers time series period from 1965-2007[23] (Appendix 2).

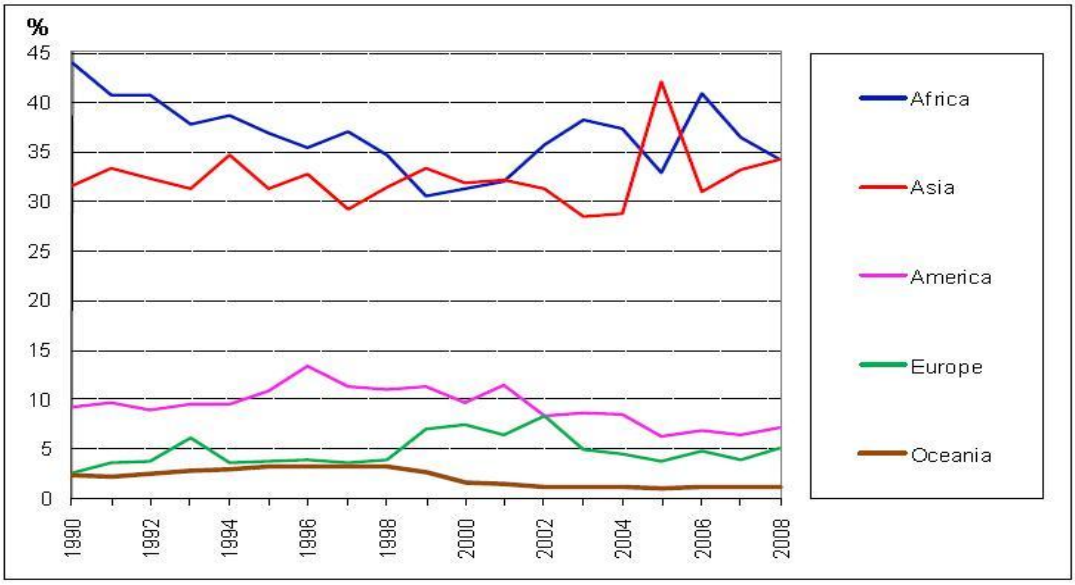
The study used Purposive Sampling technique to narrow the sampling-frame to only low income aid recipient countries. We then subjected the selected samples to key criteria recounted below to ensure that we have required distributional properties to minimize noises in the error term to priorities the use of OLS estimating technique within the time frame allowed. Although alternative techniques were employed mainly autoregressive distributed lags (ADL) in the form of polynomial distributed lags (PDL) the desired model was chosen based on the minimum Akaika Criterion (AIC) which prioritized OLS.

Sampling frame of Africa is ideal for aid effectiveness study because it constitutes the largest share of total ODA over the years (see figure 9). It is comprised of 50 countries with different income categories distributed as Low income countries (30), low middle income country (10), upper middle income country (7), and High income country (1) (For details see World Bank WDI, 2009).

Distributional properties e.g. treatment of outliers and heteroskedasticity are key empirical issues with OLS estimation on panel and thus we were mindful in incorporating that assumption in our selection procedure. *Others have use VAR when co-integration is not confirmed to model in levels since it by-passes such issues.*

[23] Period where all relevant data were available

Figure 10.Percentage Share of Total ODA flows



Source: OECD, database, 2009: statistics by Region

Further selection criteria were the following:

(i) *Country must be in a low income category where aid inflows are high.*
(ii) *Country must belong to one of the regional blocs, SADC, COMESA or ECOWAS and has a coastal mass to enable us estimate effectively gains from trade*
(iii) *Country must satisfy Data availability for all the selected variables; and*
(iv) *Finally, country must satisfied commitment to good governance.*

The criteria led to the selection of Ghana as an ideal sample among SSA especially on account of its high governance score and data availability (fig 3/4).

*It should be noted that the use of co-integration makes most of these concerns less of an issue such as endogeneity which we account for empirically.

4.5 Analytical Framework

4.5.1 Objective one _ ....*Was* addressed using descriptive analysis involving the use of graphs and document analysis? The main thrust was to establish a justification for Ghana as a good-case and explore the role of aid in its growth trajectories.

4.5.2 Objectives two and three_

...*Were analyzed* empirically by conducting a co-integration analysis to establish whether there is a long-run effect of aid on growth and thus an ECM was advocated. On account of the literature reviewed we note that many single case studies have employed time-series analysis for aid – growth nexus which captures the time phenomenon. Our model employs most of the variables in previous studies accounting for the transmission mechanism. We apply time series- co-integration method as chartered in figure 11 below to estimate the long-and short-run representation of aid.

4.5.2.1 Co-integration?

Given that the main thrust of econometric theory, prior to development of co-integration, was developed within a stationary framework, it is deemed necessary to test the stationarity condition of the time series variables which might contain time trends rendering them non-stationary. If variables contain unit roots (non-stationary), without appropriate remedy, the problem of spurious regression manifests. Here, the results obtained would suggest statistically significant relationships between the covariates when in fact it only reflects contemporaneous correlations rather than meaningful causal relations (cf. Gujarati, 2004).

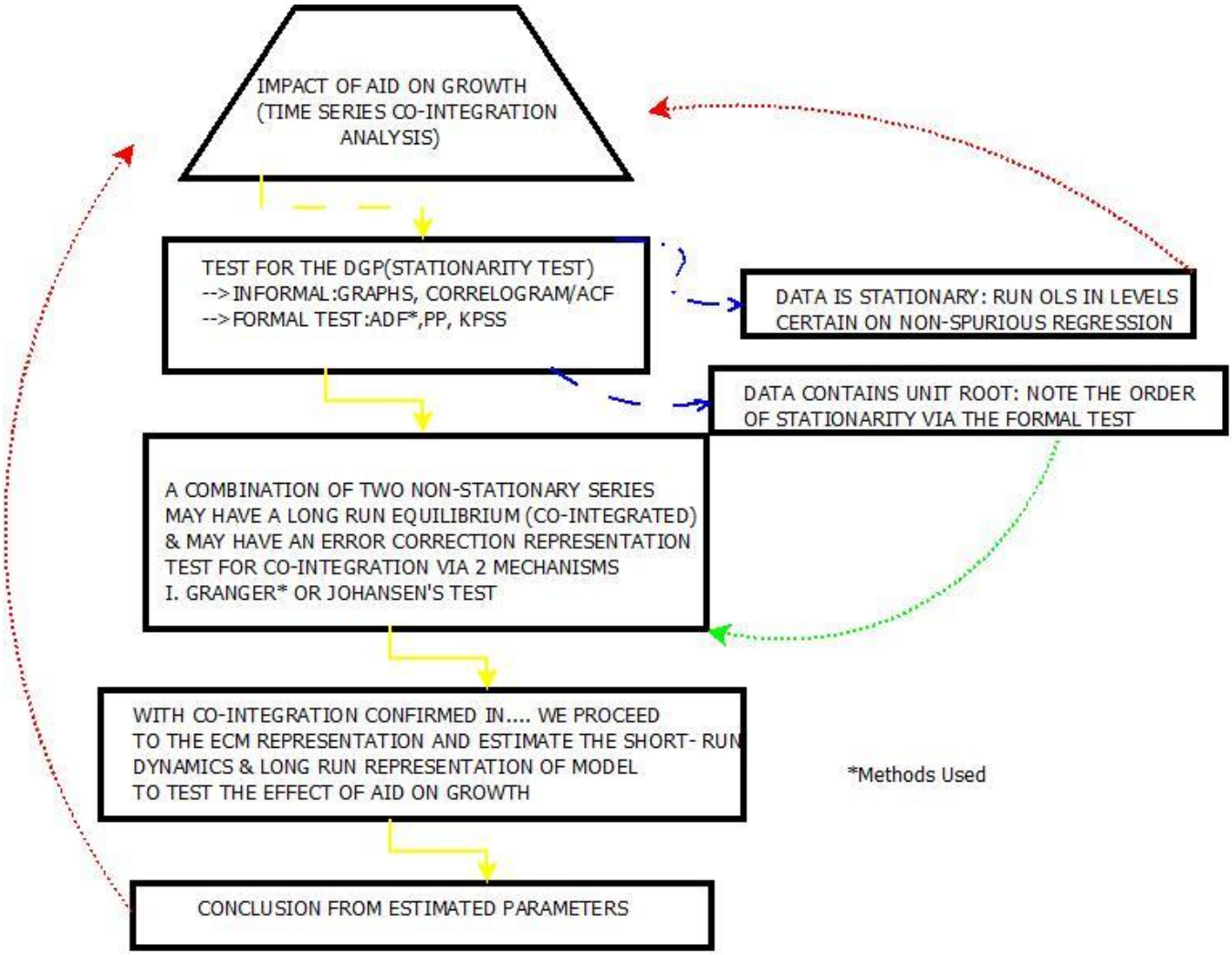
In dealing with stationarity problems, at the simplest level some simply ignored the issue of non-stationarity, resulting in the literature on spurious regression, culminating in the Box-Jenkins approach to modeling, which only used stationary variables (Gujarati, 2004). In turn the reaction to this approach was that important information could be lost by pre-filtering the data to render it stationary and that the long run properties of the data were being ignored.

This reaction developed into the error correction modeling (ECM) approach. This approach uses a mixture of stationary and non-stationary variables in the same equation that gives insight to the long run properties of the data.

There is therefore a close link between co-integration and error correction models (ECMs). This linkage is given by the Granger representation theorem. According to this theorem, two or more integrated time series that are co-integrated have an error correction representation and two or more time series that are error correcting are co-integrated (Granger ,1997). Thus the ECMs provide the framework for an equilibrating relationship to be established involving both the short and long run behaviour of the integrated time series. Cointegration thus makes regressions involving variables stationary by differencing once making *i(1)* variables potentially meaningful. The two most commonly employed procedures for detecting cointegration are the single equation regression techniques of Engle and Granger approach and the full system approach of Johansen and Johansen and Juselius procedure (cf. Gujarati, 2004).

We use the Engle and Granger approach although unlike the Johansen's procedure, it fails to identify the number of co-integrating vectors in the model which is less a concern to us since it does not affect the final results. Granger's approach despite this weakness has found wide appeal due to its applicability especially when few vectors are involved.

Figure 11.Flow of Empirical Analysis



Source: Authors Construct

4.5.3. Objective Four_

On the relative efficacy of aid and trade policies, beta- statistical test on the base model was done to estimate such policies impact, aid and trade, *proxied* by aid (Aidc) vector and trade variable (openness) respectively.

The size of the policies impact-aid and trade is estimated by the summed beta coefficients estimated statistically as:

$$beta_i = b_i S_{xi} / S_y \quad \text{----------} \quad \text{(eqn.1)}^{24}$$

Where b_i is the value of the coefficient, S_{xi} is its corresponding standard error and S_y is the standard error of the regression. The larger the beta coefficient of the policy variable (aid/trade), the stronger is its efficacy on the dependent variable, growth.

4.4 Empirical Model

Aid-growth nexus is presented as follows:

$$f(\ln RGDPC_t, \ln AidY_{t-1}, \ln Iy_{t-1}, \ln Open_t, \ln RDDPworker_t) = 0$$

Specifically

$$\mathbf{Ln\ RGDPC_t = a_1 + b_1 \ln AidY_{t-1} + b_2} \ln Iy_{t-1} + b_3 \ln Openk_t + b_4 CPI_t + b_5 \ln RGDPworker_t + V_t + U_t \quad \text{----------} \quad (2)$$

Where[25],

ln $RDGPC_t$ = Natural log of real GDP per capita at time t(US$) as proxy for growth
ln $AidY_{t-1}$ = Natural Log of ODA per capita share of GDI, allowed for response lag at time t
ln Iy_{t-1} = natural log of Invetment share of real GDP per capita at 2005 constant price at time t, with a response lag
ln $Openk_t$ = natural log of Openness at 2005 constant prices (exports plus imports as % of GDP) at time t
ln $RGDPworker_t$ = Natural log of Output per worker as proxy of labour force participation rate
ln CPI_t = Natural log of CPI per capita as proxy for government fiscal policy.
V_t = Vectors of other variables

[24] Applied by WAIFEM, to estimate the relative efficacy of Monetary and Fiscal Policy for partner countries, 2005
[25] For data and sources see Appendix 2

Choice of Variable

A cursory analysis of equation 2 suggest that the key variables from our theoretical review are captured as *labour productivity variable, domestic savings - we use Investment share of Output to represent total capital when considered together with Aid as component of foreign capital*. In *effect total capital is savings/Investment and Foreign Aid*. Other vectors including openness/trade share of GDP, CPI/Inflation to capture government fiscal behaviour as inflation correlates directly with consumption. We have included V_t to capture other growth determinants to allow for alternative model specifications. We capture these variables under real terms (see appendix 2 for sources).

Many growth models especially in the second generation modelling where investment played the key transmission variable example Mosley et al (1987), have captured variants of this model in their specifications. More importantly the current generation studies such as Gomanee et al. (2002) and Hansen and Tarp (2000) have all expanded on these variants to capture these dynamics especially on aspect of the government behaviour.

Further Justification:

Found on Cobb-Douglas type production function the model can be extended to include foreign capital as follows:

$$\mathbf{Y = AK^aF^bL^g} \text{ ---------- (3)}$$

Where,

Y = GDP; K = domestic capital; F = foreign capital; L = labour force; and A = productivity/technological progress. A log transformation and differentiating with respect to time [...], our function is re-specified into the following growth accounting equation:

$$\mathbf{\Delta Y = A + a\Delta K + b\Delta F + g\Delta L} \text{ ---------- (4)}$$

Where, Δ denotes growth rate. Although growth of domestic capital (ΔK), foreign capital (ΔF), and labour force per worker (ΔL/y) are simply captured in the model by Investment share of GDP (savings), Aid (AidY), and labor force (RGDPworker), it is difficult to capture the technological progress as noted from theory, since it is determined by myriad of factors-considering the new growth theory- which expands the scope by endogenising technological progress.

We capture the productivity vector through series of variables but in Ghana since the structural adjustment (ERP) era - openness has been a productivity improving factor and thus captures such dynamics. Others have used secondary school enrolment.

It is worth stretching that in the old growth theory, the technological progress (TP) is exogenously determined as discussed. Thus in such modelling the TP was calculated by subtracting the estimated coefficient of the regressors (x_{it}) from the estimated regressand (Y_hat)

4.5 Detailed Accounts of Co-Integration

We follow the following procedure in our estimation on the long- and short-Run effect of the model (see appendix 5). This gives the test for unit root and key empirical issues of the Granger approach to co-integration.

3.6 Conclusion:

We have established the basis for choosing our methods and the concepts behind our empirical strategy. The data has also been discussed. Account of statistical test is given in appendix 3. Estimation follows.

CHAPTER 5: Empirical Results & Discussion

5.1 Introduction

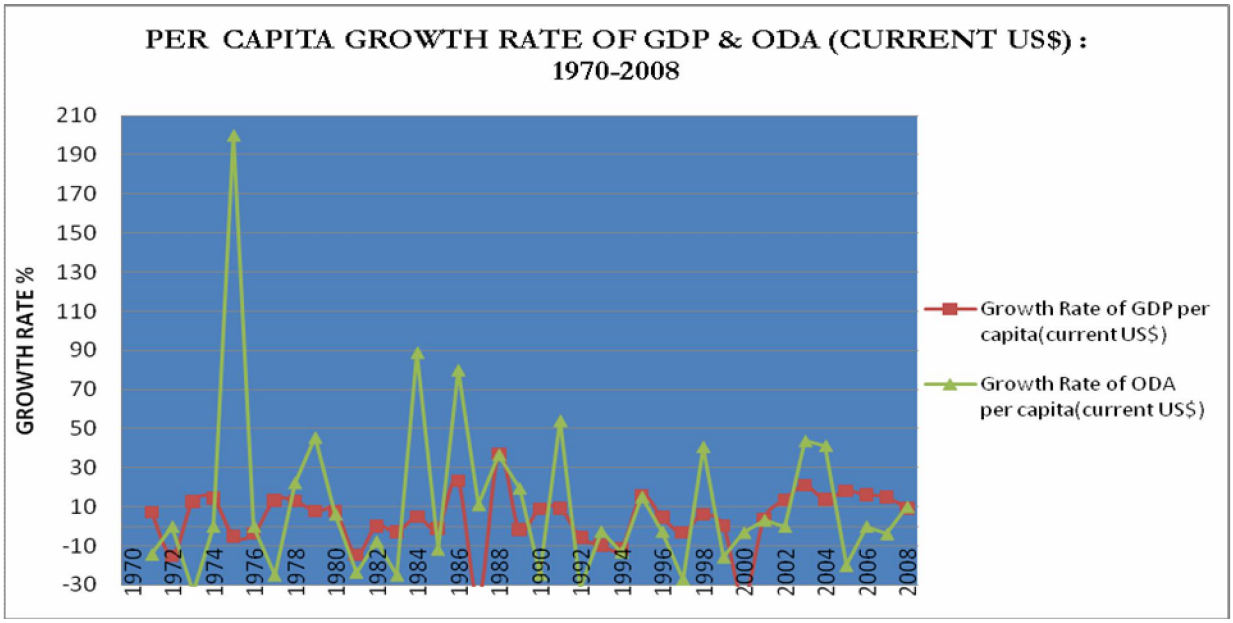
This chapter presents the results and a discussion of the findings aimed at meeting the remaining sub-objectives. Thus after this session we should be able to answered the main research question. We start first by presenting a descriptive analysis of trends of ODA flows in relation to Ghana's growth. We then proceed to estimate the regression results.

The main statistical package employed is Eviews 4 and Stata 10 versions (see appendix2: data).

5.2 Descriptive Analysis Trend

The trend of Aid flows in Ghana as seen in figure 12 is analysed based on their growth rates version which give a true picture of the situation. We note that per capita growth rate move much in the same direction with growth of ODA per capita. This was the observation from the 'settings' session; an indication that aid has a positive effect on growth in Ghana. However it can be proven satisfactorily by accounting for share-effects of other growth determinants.

Figure 12. Trends of ODA/Capita & GDP/Capita (1970-2007)



Source: Authors Construct from WB, WDI database, 2010

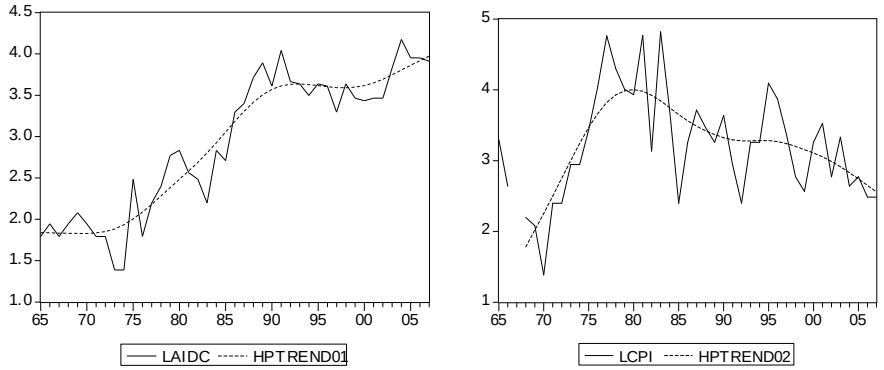
The fact that the rate of growth of ODA per capita is significantly higher than the per capita growth rate is puzzling. This calls for a quantitative estimate to investigate further this observed-dynamics. We therefore on such premise proceed to estimate the macroeconomic effect of such trend by accounting for shares of other key growth determinants using OLS co-integration analysis.

5.3 Regression Results

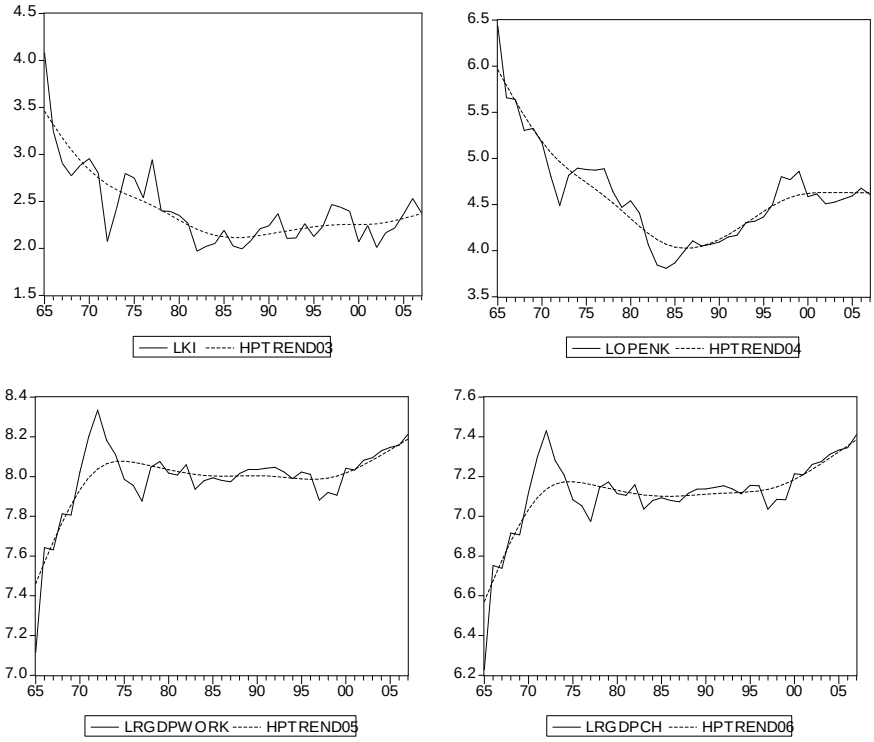
5.3.1 Unit Root Test Results

A visual observation of logs of our data series (using Hodrik-Prescott filter)[26] for smoothing even suggest that some of the data series are trendy, less (LCPI (Inflation), rgdpwork (Labour), Aidc (Aid) and openness (lopennk)) variables which looks stationary. Other informal tests like the ACF or correlogram came to the same conclusion as the lags slowly tapered off. We therefore confirm with a formal ADF test before we move to analyze the co-integrating vectors i.e. if unit root is confirmed in the variables.

Figure 13.Trends of Regression Variables Using Hodrik-Prescott filter



[26] All data log transformed. The percentage shares were transformed as follows log (1+var (%)). For the chosen transformation see appendix 2C for the ladders.



We therefore proceed to a more formal test to confirm the unit root properties of the variables using ADF test mindful of its low power properties *(Note: there is current trend towards the use of Dickey Fuller Generalised least squares (DF-GLS) which performs generalised least squares regression on all variables on account of autocorrelation).*

The result of the unit root test using the ADF test is summarized in table 1. Remarkably the result seem to confirm the conclusion from the informal graph test: *the Growth (lrgdpc), Investment (lnki), Openness (lnopennk) and Labour (lrgdpwork)* variables are all stationary at Levels i.e. integrated of order zero *(i (0))* whiles the Aid *(LAidc*) and Inflation variable *(LCPI)* contains unit root.

Table 1 .Results of ADF Unit Root Test

Variable	Order of integration	Test Statistic (t-calculated)	Remarks*
Lgdpc (Growth)	i(0)	-5.878	Level Stationary
Aidc (Aid)	i(1)	-9.248	Difference stationary
Ki (Investment)	i(0)	-5.231	Level stationary
Openk(Openness)	1(0)	-4.550	Level stationary
lCPIpca(Inflation)	i(1)	-8.834	Difference stationary
rgdpwork(Labour)	I(0)	-6.511	Level stationary

Source: Authors Computation

**As noted the i (0) had their statistic greater than the critical values at 5% level in absolute terms and thus we rejected the null of a unit root*

** Markinnon critical value for rejection of a unit root (General→Specific Method)*

5.3.3 Co-integration Test

As outlined in the methodology chapter, we opted for the Engle and Granger two step approach instead of Johansen's procedure which has wider appeal due to its ability to identify more than one co-integrating vectors. Since we have only two non-stationary series the approach of Engel and Granger is in order.

To avoid spurious regression we first run our empirical model at levels from where we generated the residual from the regression. We then tested for the stationary properties of the residual using ADF. The deciding factor was a confirmation of co-integration in at least one of the vectors provided the residual tested was stationary/integrated of order zero *(i(0)).*

However as indicated in *table 2 below* the residual generated from the level regression tested for unit root was not significant; as the test statistic could not reject the null hypothesis of a unit root((i.e. -2.598 is less than the 5% critical value of (-3.34) not -2.958?)[27]. Co-integration is only confirmed when a linear combination of two *i (1)* variables produces i (0).

[27] Stata reports critical values using Mckinon but the acceptable values are the Engel and Granger as we adopt that approach: which are 1% -3.9 5%, -3.34, 10% -3.04 (credit. Prof Arjun Badi, ISS, Netherlands)

The conclusion from this exercise is that we have been unable to confirm the presence of a long run relationship between our time series model therefore, we can go ahead and run the regression in levels certain of non-spuriousness.

Since we run the regression in levels, we account for endogeneity and the dynamic properties of the non-stationary variables by lagging. This is also in order so as to account for "inside lags". Policies respond with time lags (see Quazi, 2005)[28].

Table 2.Cointegration Regression

```
      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  5,    36) =  774.48
       Model |  1.50413035     5  .300826071           Prob > F      =  0.0000
    Residual |   .01398327    36  .000388424           R-squared     =  0.9908
-------------+------------------------------           Adj R-squared =  0.9895
       Total |  1.51811362    41  .037027162           Root MSE      =  .01971

------------------------------------------------------------------------------
    lnrgdpch |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnaidc |   .0329727   .0045188     7.30   0.000     .0238081    .0421372
       lnki  |  -.0531871   .0205326    -2.59   0.014    -.0948291   -.0115451
     lnopenk |   .0807537   .0146546     5.51   0.000     .0510327    .1104747
      logCPI |   .0001802   .0046407     0.04   0.969    -.0092317     .009592
  lnrgdpwork |   1.048105   .0256028    40.94   0.000     .9961799     1.10003
       _cons |  -1.601384   .2441243    -6.56   0.000    -2.096491   -1.106277
------------------------------


. predict U_hat, resid
(1 missing value generated)

. dfuller U_hat

Dickey-Fuller test for unit root                  Number of obs   =        40

                              ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -2.598            -3.648            -2.958            -2.612
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0934----------------------------------------
```

Source: Authors Estimation

[28] Note: This is not suggestive of using IV regression since is better to use OLS than use a weak instrument.

5.4 Effect of Aid on Growth

Since we could not establish any long run relationship between aid and growth and thus unable to estimate an error correction model (ECM) or short run model we estimate our base model using ordinary least squares. One of the underlying assumptions underlying the error term under Gauv Markov rule is that the sample should be selected is large enough to render the error term white noise. A key problem however with time series OLS estimation of this nature is the issue of serial correlation and multicollinearity. We therefore try to mitigate such effect by lagging which has been used by many researches such as in the Hansen and Tarp (2000) in one of their variant models.

Table 3.OLS Result: Uncounted for Heteroskedasticity

Dependent Variable: LOGGDPCH
Method: Least Squares
Date: 06/04/10 Time: 18:05
Sample(adjusted): 1966 2007
Included observations: 41
Excluded observations: 1 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.670819	0.283681	-5.889790	0.0000
LAIDC(-1)	0.032325	0.004964	6.511444	0.0000
LNKI(-1)	-0.020963	0.013507	-1.552010	0.1297
LOGOPENK	0.059803	0.013135	4.552981	0.0001
LNCPIPCA	4.43E-05	0.005119	0.008658	0.9931
LNRGDPWORK	1.059421	0.031724	33.39530	0.0000

R-squared	0.976825	Mean dependent var	7.143790
Adjusted R-squared	0.973514	S.D. dependent var	0.132321
S.E. of regression	0.021534	Akaike info criterion	-4.703870
Sum squared resid	0.016231	Schwarz criterion	-4.453103
Log likelihood	102.4293	F-statistic	295.0510
Durbin-Watson stat	0.547422	Prob(F-statistic)	0.000000

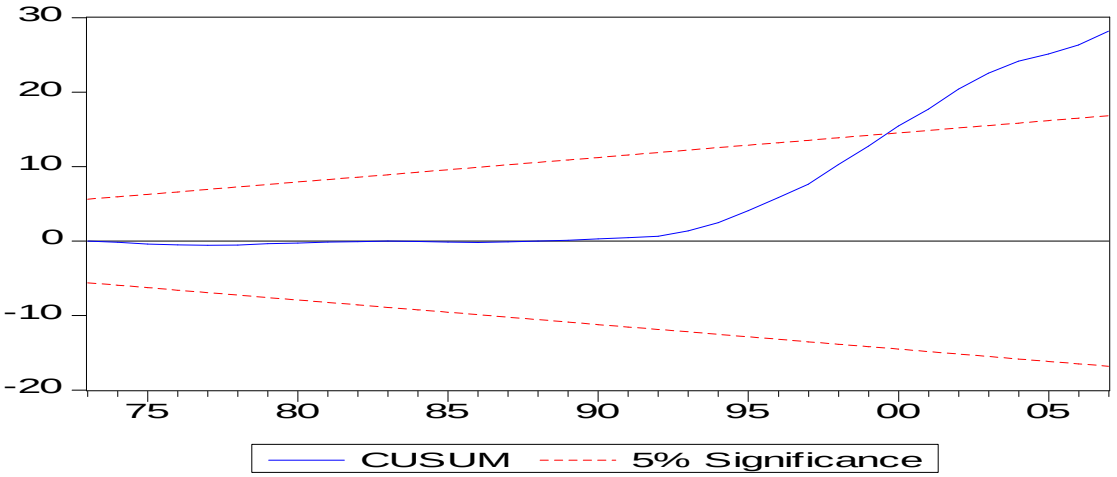
White Heteroskedasticity Test:

F-statistic	1.259711	Probability	0.296065
Obs*R-squared	12.12480	Probability	0.276791

The D-W statistic of 0.547 suggests that the model contains positive autocorrelation which we confirmed with the CUSUM estimates (see figure 14). This shows that the parameters of our model are highly unstable and therefore we proceed to correct for heteroskedasticity with robust estimates.

The result is indicated in table 4.

Figure 14. CUSUM Recursive Plot (Proof of Model Instability)



**Note: Model Unstable since parameters extend the 5% critical bound*

Table 4.Base Model Corrected for Heteroskedasticity

```
Linear regression                                       Number of obs =      41
                                                        F(  5,    35) =  487.93
                                                        Prob > F      =  0.0000
                                                        R-squared     =  0.9767
                                                        Root MSE      =  .02158

------------------------------------------------------------------------------
             |               Robust
    Ln(gdpc) |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Lag(lnKi)|   -.021787   .0130871    -1.66   0.105    -.0483551    .0047811
   Ln(Labour)|   1.059026   .0258139    41.03   0.000     1.006621    1.111431
    Ln(openk)|   .0592542   .0136756     4.33   0.000     .0314913    .0870171
     Ln(CPI) |   .0000635   .0043728     0.01   0.988    -.0088138    .0089408

LagLn(Aidc)| |   .0324208   .0051536     6.29   0.000     .0219583    .0428832
       _cons |  -1.661367   .2541743    -6.54   0.000    -2.177368   -1.145366
------------------------------------------------------------------------------
```

Source: Authors Computation

5.41. Interpretation of Base Regression

The result from this robust OLS estimate has shown our key variables to be significant as indicated by their t-static and p-values. Confirming a priori, Aid effect has been positive on growth in Ghana whereas its transmission-(Investment) has had opposite effect but statistically insignificant. A simple correlation between aid and Investment in Ghana (see appendix7) also

showed a negative effect. This might imply existence of fungibility, dissipation of tax effort effect or more generally increase in consumption investment as aid increases which impacts negatively on growth. We however do not pursue the reasons due to insignificant coefficient.

We also note in particular that a unit change in previous years real ODA flows per capita *(i.e. aid lagged I year)* increases growth per capita in Ghana by about 3.2%. This is quite intriguing especially considering the many arguments against aid.

Further, we note that Openness (imports plus exports over GDP) has had more impact than Aid. The estimates suggest that a unit increase in the level of trade-liberalization or openness in Ghana increases Growth rate of GDP per capita by about 6%. This extols the call for increased assistance on trade and not aid; a call well expressed by informed-civil societies in Monterrey, Mexico during the 2002 forum on financing for development. The Accra High Level forum on Aid effectiveness, 2008 also hinted on *same.* The constant term is negatively signed and significant.

To confirm the relative efficacy of aid and trade we carried out a beta coefficient statistic on the base model which confirms that Policies on Aid has had less impact on growth than policies on Trade (see table 5)

Table 5.Relative Efficacy of Aid and Trade Policy Relative

TRADE POLICY PROXIED BY OPENNESS		*AID POLICY PROXIED by ODA FLOWS PER CAPITA*	
SE OF REGRESSION 0.021			
coefficient	S.E of aid variable	coefficient	S.E of trade variable
.0592542	.0051536	.0324208	.0051536
Beta sum	0.141	Beta sum	0.077
IMPACT MORE THAN AID POLICY		*IMPACT LESS THAN TRADE*	

Source: Author's Computation

Overall our model explains about 98% of the variations in Growth in Ghana i.e. has high predictive power and our coefficients are jointly significant as expressed by the F-Statistic.

5.4.1 Robust Checks: Alternative Specifications

To confirm the consistency of our results that aid increases growth in Ghana, we carried out 2-stage test (2SLS) and OLS where we instrumented the investment with vectors of explanatory variables including the lagged Aid. This is close in spirit to recent third generation regressions but we could not vouch for the validity of such instruments by using the Hausman test and a confirmation of endogeneity with the Wu-Hausman test where a test on the generated residuals were carried out (not reported). The estimate of the OLS came out better than the IV model and therefore we stuck to our base estimation using the OLS (see table 6). Indeed the standard errors and predictive powers of the models were all superior to the *IV's.*

Table 6.Regression results Using OLS and IV estimations

VARIABLES	(1)OLS	(2) IV regression
	Log Real GDP per Capita	Log real GDP per capita
Lag1.lnki(Investment)	-0.0218 (0.0131)	-0.247** (0.0943)
Lnrgdpwork(Lab. Productivity)	1.059*** (0.0258)	0.995***(0.0892)
Lnopenk (Openness)	0.0593***(0.0137)	0.188***(0.0689)
LnCPI(Inflation)	6.35e-05(0.00437)	
Lag1.lnaidc (Aid Per Capita)	0.0324***(0.00515)	
Constant	-1.661***(0.254)	-1.093(0.736)
Observations	41	41
R-squared	0.977	0.811
*** p<0.01, ** p<0.05, * p<0.1		
Robust standard errors in parentheses		

Source: Authors Calculation

From the alternative specification we note that 98% of the variations in the model is explained by the regression. Indeed except the inflation and Investment variables all the regressors are significant with positively signed coefficients except the constant term; which suggest that by keeping all else constant growth will suffer by 166%.

CHAPTER 6: CONCLUSION

6.1. Summary of Findings

The study had one fundamental aim, to investigate the macroeconomic impact of aid on growth in Ghana to contribute to the broader aid-growth debate. Although the study was of the view that choosing a case that would be used as a basis for generalization has weak economic base - as each countries experience with aid makes single case analysis more imperative than a blanket conclusion regarding the efficacy of aid - I alleged that a carefully selected case has the potential of exuding results which when other factors are well controlled for can inform policy discourse. The study partially set-off to achieve this objective; using Ghana as a test case.

On the premise that the broader aid effectiveness debate has fundamental flaw - giving less attention to single case analysis and not considering the time series properties of macroeconomic data - I used that as my point of entry into the aid debate by capitalising on the time series properties of annual macroeconomic data for Ghana. I employed the technique of co-integration under time series analysis for the exercise. I set-off to answer four key sub-questions with a view to achieving the main objective of the effectiveness of aid.

On the first objective, an underlying argument was to justify the selection of Ghana as a representative case in SSA and proceed to investigate the role of aid in relation to Ghana's economic performance. The result was positive as Ghana's position within the sub-region in terms of governance and contribution to reform made it one of the top aid recipients. *The argument of its economic trajectory seems to suggest that aid had had a significant impact on its growth path especially after its structural adjustment reforms.*

Ghana's growth record vindicated the need for good governance for economic growth as it was found that the periods when it recorded negative growths coincided with overthrow of government by illegitimate means. This gave the impetus for more nuanced analysis into the underlying growth-trends.

Having reviewed the various theoretical strands of the aid-growth empirical literature, I settled on time series Granger Co-integration analysis as ideal lens to investigate the Long and Short run effects of aid on growth. On review of literature the study noted that the transmission of aid-growth nexus was a fundamental concern and thus first sought to establish a base for the transmission. This was done by simple correlation and theoretical account based on which key variables were dropped for their weak association with growth. The treatment of aid and Investment was imperative in our analysis. Thus the key intervening variables were certified before entering the model for the co-integration test. The study also suspected high evidence of multicollinearity of aid with investment which was treated with lagging effect.

On account of the estimation however the study could not justify the need for co-integration as *most of the variables were level stationary and their combination could not result in a long-run relationship.* Thus there were no Short and Long run effects of aid on growth. This result suggests that the micro-macro paradox as differently argued by Moyo (2009)-first used by Mosley (1987) - could not be established by this analysis. However I argue that such a concern can not be brushed off as that was not the central focus of the thesis and I might have missed certain key dynamics.

Having established the basis for estimating our base model in levels (meeting objective two of no co-integration/ECM representation) we proceeded further and opted for simple OLS in my estimation against other models like *VAR* for degree of freedom concerns.

I conducted series of robust checks including statistical test such as CUSUM stability test and heteroskedasticity test on my base model to ensure the consistency and reliability of my estimates. Remarkably, the results confirmed *a priori* established under the case setting which portrayed aid impact to be positive. The result indicated that a unit change in per capita Aid-flows increases GDP per capita by some level of 3.2 % which seems to be at variants with the critics. Its key transmission variable-investment seems to be negatively and weakly linked with growth but we could not justify this assertion based on insignificant coefficients. The model was well formulated explaining over 97% of the variations in growth.

Overall our results confirm that Aid works in Ghana. To find grounds with the critics, the study suggests that the aid-argument could be framed in a different way and emphasis in view of other policies like Trade which was more efficacious than aid explaining some 6% of growth. It would make more intellectual sense to argue for balanced policies such as trade with aid. This study therefore supports a more liberalised and less protective trade regime.

In effect a balanced growth is advocated where aid goes in hand with trade. If indeed poverty reduction is the driving goal of aid, then this finding is telling - We should not neglect aid but more importantly we should pay more attention to other key growth supporting regimes like Trade. Issues like technological progress are also important in this nexus as our *proxied*-productivity variable was positive and significant.

In conclusion aid growth nexus is well illuminating in Ghana and for that matter the sub-region. It stands to argue that if aid is the pathway [...] then *Aid indeed works*. But the extent of its effectiveness depends on varieties of factors such as the governance framework [...] which the study could not delve much into for known constraints.

In effect the study is suggestive that the low growth rates or negative growth record in Africa goes beyond the excuse of aid ineffectiveness as the study proves otherwise.

"At Worse a scapegoat must be found!!"

6.5 Limitation & Suggestion for Future research

The limitation of the study was due to paucity of data and time. The soundness of time series analysis lies in part to the number of data points employed. We used 42 data point series (1965-2007) which has implications on our result findings especially when time series is at stake and where the loss of degrees of freedom due to lag effects is dire. Future research would be a plus when more data points are available to see the consistency and replicability of the results. In effect we could not establish co-integration/long run effects. However future research could explore an empirical gap such as the use of DF_GLS and Johansens test as alternative estimation. In effect, significant advances within this empirical sphere of single case macroeconomic time series analysis warrant improvement in data quality, understanding and availability. Thus there is still more room to improve and enhance our understanding in the aid-growth nexus before the final jury is out.

For now is only a thumbs up for pro-aiders'!

End Note:

……So that is is it at the end is not about the Pro-Aiders: the Sachs, Hansens and Tarps or the anti-aiders: the Moyo's and the Easterly's neither can we say is about the Agnostics: the Burnside, Dollar and Riddells…At the end it is all about a laudable intellectual exercise. The aid debate is no way an intellectual exercise in illusion as the tendency seems to be shifting with plethora of conclusions….At the end it all serves to make the debate even better:

Courtesy:
Philip Banahene Thompson, 2008-2010 Erasmus MundusMapp, R
I am responsible for this intellectual classification

----------Word count----13,006/+ footnote 13,359----------

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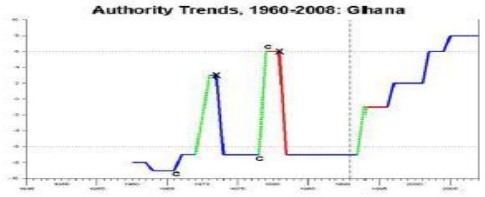
APPENDIX

Appendix1: Ghana Polity (Governance Indicator)

Polity IV Country Report 2008: Ghana

Score:	2007	2008	Change
Polity:	8	8	0
Democ:	8	8	0
Autoc:	0	0	0
Durable:		7	
Tentative:		No	



SCODE	GHA	CCODE	452	Date of Report	31 December 2009

Polity IV Component Variables

XRREG	XRCOMP	XROPEN	XCONST	PARREG	PARCOMP
3	3	4	6	2	4

Date of Most Recent Polity Transition (3 or more point change)

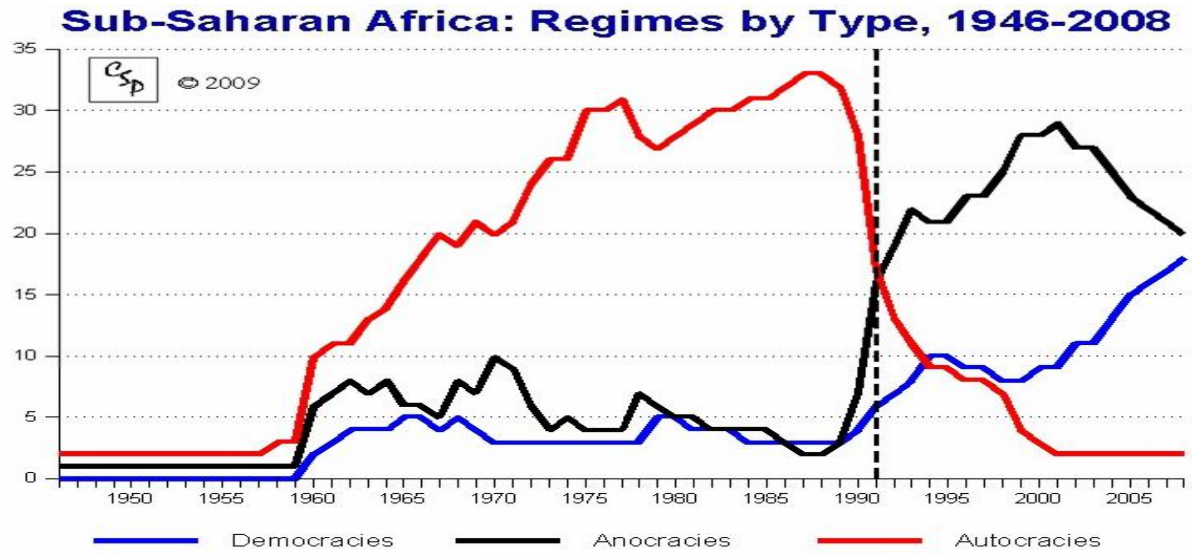
End Date	8 December 1996	Begin Date	8 December 1996

Polity Fragmentation: No

Constitution	1992
Executive(s)	President John Evans Atta Mills (NDC); directly elected 7 and 28 December 2008, 47.9% and 50.2%
Legislature	Unicameral: Parliament (230 seats; directly elected; most recent elections, 7 December 2008) New Patriotic Party (NPP): 107 National Democratic Congress (NDC): 114 Other parties: 3 Non-partisans: 4
Judiciary	Supreme Court

Source: The Polity IV Project. (The report gives Ghana high rankings relative to the other sub-regions)

Note: Rankings (-10 Autocracy, +10 democracy, Polity=Dem-Autocracy)



Appendix 2: Data Exposition

2A. Raw Data Used In the Analysis

year	TsYper	CPIpca	rgdpl	rgdpch	openk	ki	kg	ppp	PIV	Dstxj	Aidc	AidYi	mGDP	CgY	LABwker*
1965	44.0	26.0	527.7	507.0	622.6	58.3	36.9	0.0	-7.0	0.0	6.0	2.0	27.0	57.0	1229.7
1966	34.0	13.0	868.6	856.2	285.2	24.6	18.8	0.0	-7.0	0.0	7.0	3.0	20.0	-13.0	2083.645
1967	37.0	-8.0	848.8	844.4	280.1	17.3	18.9	0.0	-7.0	0.0	6.0	3.0	20.0	1.0	2061.868
1968	41.0	8.0	1016.0	1008.3	199.9	15.0	16.8	0.0	-88.0	0.0	7.0	4.0	21.0	10.0	2470.546
1969	40.0	7.0	1006.3	998.9	204.4	16.9	15.6	0.0	3.0	0.0	8.0	4.0	20.0	-5.0	2455.971
1970	44.0	3.0	1249.8	1236.0	174.8	18.2	15.5	0.0	3.0	0.0	7.0	3.0	23.0	20.0	3049.298
1971	36.0	10.0	1493.5	1479.4	121.2	15.5	11.5	0.0	-7.0	0.0	6.0	2.0	20.0	-9.0	3649.877
1972	36.0	10.0	1694.0	1687.7	88.0	7.0	10.9	0.0	-7.0	0.0	6.0	3.0	15.0	10.0	4163.67
1973	38.0	18.0	1461.6	1451.5	122.5	10.2	9.8	0.0	-7.0	0.0	4.0	2.0	16.0	-20.0	3580.807
1974	40.0	18.0	1365.1	1350.7	132.4	15.4	12.6	0.0	-7.0	0.0	4.0	1.0	22.0	23.0	3332.125
1975	38.0	30.0	1201.8	1191.3	130.5	14.6	14.1	0.0	-7.0	0.0	12.0	4.0	18.0	1.0	2938.753
1976	32.0	56.0	1164.3	1156.4	129.5	11.6	14.5	0.0	-7.0	0.0	6.0	2.0	16.0	2.0	2852.543
1977	22.0	116.0	1076.6	1067.8	131.7	18.0	19.8	0.0	-88.0	0.0	9.0	3.0	12.0	29.0	2634.008
1978	18.0	73.0	1272.9	1267.4	102.3	10.0	19.4	0.0	6.0	0.0	11.0	3.0	10.0	18.0	3126.311
1979	22.0	54.0	1311.1	1303.2	86.3	9.9	15.3	0.0	6.0	0.0	16.0	4.0	11.0	-18.0	3214.538
1980	18.0	50.0	1234.9	1229.8	92.7	9.5	20.4	0.0	-7.0	0.0	17.0	4.0	9.0	28.0	3033.574
1981	10.0	117.0	1220.1	1218.5	81.0	8.6	23.6	0.0	-7.0	0.0	13.0	3.0	5.0	16.0	3002.555
1982	6.0	22.0	1286.8	1285.6	57.0	6.2	19.5	0.0	-7.0	0.0	12.0	3.0	3.0	-11.0	3164.031
1983	12.0	123.0	1138.9	1137.5	45.6	6.5	20.3	0.0	-7.0	1.0	9.0	3.0	6.0	-2.0	2795.282
1984	19.0	40.0	1189.4	1186.8	44.1	6.8	16.0	0.0	-7.0	1.0	17.0	5.0	11.0	-13.0	2919.051
1985	24.0	10.0	1205.6	1203.4	46.8	8.0	17.6	0.0	-7.0	1.0	15.0	4.0	14.0	15.0	2961.797
1986	37.0	25.0	1189.9	1188.0	53.0	6.6	19.6	0.0	-7.0	1.0	27.0	6.0	20.0	15.0	2924.542
1987	46.0	40.0	1181.6	1179.6	59.7	6.3	19.9	0.0	-7.0	1.0	30.0	8.0	26.0	3.0	2903.497
1988	42.0	31.0	1232.6	1230.2	56.4	7.0	18.6	0.0	-7.0	1.0	41.0	11.0	24.0	0.0	3026.431
1989	41.0	25.0	1259.6	1257.2	57.4	8.1	18.6	0.0	-7.0	1.0	49.0	14.0	24.0	5.0	3089.303
1990	43.0	37.0	1261.2	1258.5	58.9	8.4	18.1	0.0	-88.0	1.0	37.0	10.0	26.0	1.0	3087.124
1991	42.0	18.0	1272.2	1268.3	62.3	9.7	18.2	0.0	-1.0	1.0	57.0	14.0	26.0	4.0	3108.074
1992	46.0	10.0	1279.4	1278.4	63.5	7.2	21.1	0.0	-1.0	1.0	39.0	10.0	29.0	20.0	3124.034
1993	57.0	25.0	1259.3	1258.7	73.1	7.2	23.9	0.0	-1.0	1.0	38.0	11.0	36.0	15.0	3052.871
1994	62.0	25.0	1228.9	1228.0	74.0	8.6	24.5	0.0	-1.0	1.0	33.0	10.0	37.0	-4.0	2950.261
1995	57.0	59.0	1282.8	1282.2	77.6	7.4	23.1	0.0	2.0	1.0	38.0	10.0	33.0	-10.0	3049.777
1996	72.0	47.0	1280.3	1279.3	88.8	8.3	22.9	0.1	2.0	1.0	37.0	10.0	40.0	7.0	3014.54
1997	85.0	28.0	1137.8	1136.2	120.7	10.8	25.6	0.1	2.0	1.0	27.0	7.0	53.0	2.0	2647.836
1998	81.0	15.0	1196.1	1194.5	116.8	10.4	28.4	0.1	2.0	1.0	38.0	10.0	47.0	19.0	2751.938
1999	82.0	12.0	1192.5	1192.0	127.9	10.0	27.0	0.1	2.0	1.0	32.0	8.0	50.0	-3.0	2714.671
2000	116.0	25.0	1358.4	1359.1	97.0	6.9	26.6	0.1	6.0	1.0	31.0	12.0	67.0	15.0	3109.503
2001	110.0	33.0	1352.0	1351.2	99.9	8.4	26.8	0.1	6.0	1.0	32.0	12.0	65.0	2.0	3081.288
2002	97.0	15.0	1422.2	1423.6	89.7	6.5	23.8	0.2	6.0	1.0	32.0	11.0	55.0	-4.0	3236.194
2003	97.0	27.0	1443.6	1443.9	91.4	7.7	24.5	0.2	8.0	1.0	46.0	13.0	57.0	7.0	3276.98
2004	100.0	13.0	1499.3	1499.4	94.6	8.2	26.8	0.2	8.0	1.0	65.0	16.0	60.0	0.0	3392.79
2005	98.0	15.0	1530.1	1530.1	97.7	9.7	14.3	0.3	8.0	1.0	52.0	11.0	62.0	-35.0	3452.043
2006	105.0	11.0	1549.4	1549.4	106.4	11.6	13.4	0.3	8.0	1.0	52.0	9.0	65.0	-8.0	3490.3
2007	107.0	11.0	1653.3	1652.2	99.5	9.8	18.3	0.3	8.0	1.0	50.0	8.0	67.0	10.0	3685.607

Notes: TsYper: Trade share of GDP (%): Obtained from WB, WDI, 2010
CPIpca: Inflation, CPI (%annual): Obtained from WB, WDI, 2010
Aidc: ODA per capita (pc) in current US$: Obtained from WB, WDI, 2010
Aidi: ODA as percentage of GNI in current US$: Obtained from WB, WDI, 2010
mGDP: Import share of GDP (%):Obtained from WB, WDI, 2010
CgY: government Consumption share of GDP (%)

Source if: *Pennworld Tables (New 6.3)*
Rgdpl: Real GDP per capita (2005 Constant Prices: Laspeyres), derived from growth rates; c, g, i
Rgdpch: Real GDP per capita (2005 Constant Prices: Chain series)
Ki: Investment Share of Real GDP per capita (RGDPL), @ constant 2005 prices
XRAT: Exchange Rate---PPP: Purchasing Power Parity over GDP
Openk: Openness in Constant Prices
Kg : Government Share of Real GDP per capita

Others: PIV (Political Indicator) Polity IV (-10AUT, +10 DEM, PIV=DEM-AUC: -88 score for transition), source: Polity IV database
Dstxj: Dummy for structural adjustment, 0 pre-adjustment, 1 ex post

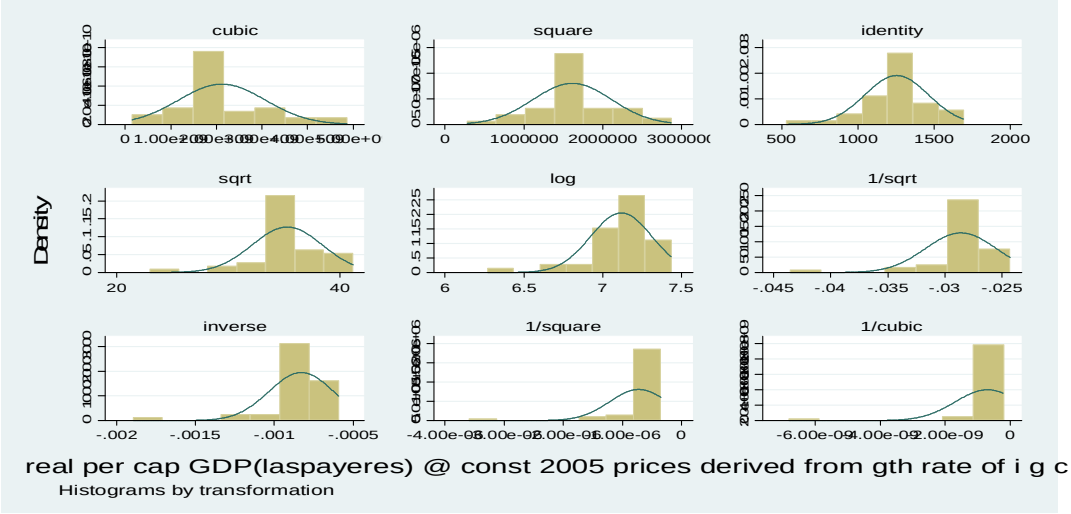
2B. Description and Storage

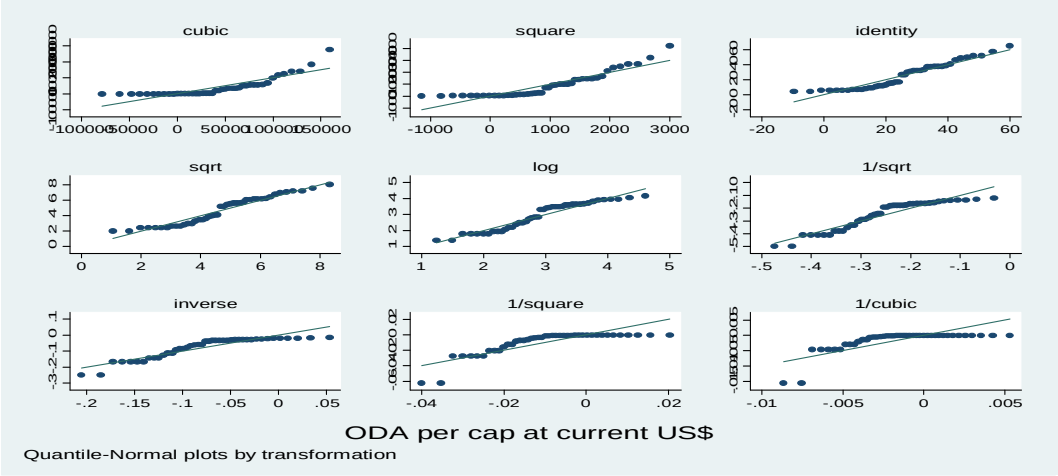
```
Contains data  from C:\Users\philip\Desktop\THLdta
obs:    43
vars:   33                          4 Jun 2010 12:19
size:   4,816 (99.9% of memory free)

              storage  display    value
variable name  type   format     label      variable label

year           int    %8.0g
tsyper         int    %8.0g               Trade share of GDP%
cpipca         int    %8.0g               CPI per annum%
rgdpl          float  %9.0g               real per cap GDP(laspayeres) @ const 2005 prices derived      from
               gth       rate
               of i g c
rgdpch         float  %9.0g               real per cap gdp at 2005 const prices chain series
openk          float  %9.0g               Openness in Constant Prices
ki             float  %9.0g               Investment Share of Real GDP per capita (RGDPL)
kg             float  %9.0g               Government Share of Real GDP per capita (RGDPL)
ppp            float  %9.0g               Purchasing Power Parity over GDP
piv            byte   %8.0g               PIV
dstxj          byte   %8.0g               Dummy of stxl adjustmt
aidc           byte   %8.0g               ODA per cap at current US$
aidyi          byte   %8.0g               ODA per cap as percent of GNI
mgdp           byte   %8.0g               import share of GDP%
cgy            byte   %8.0g               Govt Cons exp as share of GDP
xrat           float  %9.0g               exchange rate
lntsyper               float  %9.0g
lncpipca               float  %9.0g
logCPI         float  %9.0g
lnrgdpl        float  %9.0g
lnrgdpch               float  %9.0g
lnopenk                float  %9.0g
lnki           float  %9.0g
lnkg           float  %9.0g
lnppp          float  %9.0g
lnPIV          float  %9.0g
lnaidc         float  %9.0g
lnaidyi        float  %9.0g
lnmgdp                 float  %9.0g
lncgy          float  %9.0g
lnxrat         float  %9.0g
rgdpwork               float  %9.0g               output per worker as Labour Force Part Rate
lnrgdpwork             float  %9.0g
```

```
Summary statistics of Key Variables
sum lnrgdpch lnki lnaidc lnrgdpwork logCPI
```

Variable	Obs	Mean	Std. Dev.	Min	Max
lnrgdpch	43	7.113085	.198906	6.228511	7.431122
lnki	43	2.414814	.4085414	1.974081	4.082609
lnaidc	43	2.923429	.8441338	1.386294	4.174387
lnrgdpwork	43	7.990152	.1899225	7.114526	8.334152
logCPI	42	3.20799	.7626584	1.386294	4.820282

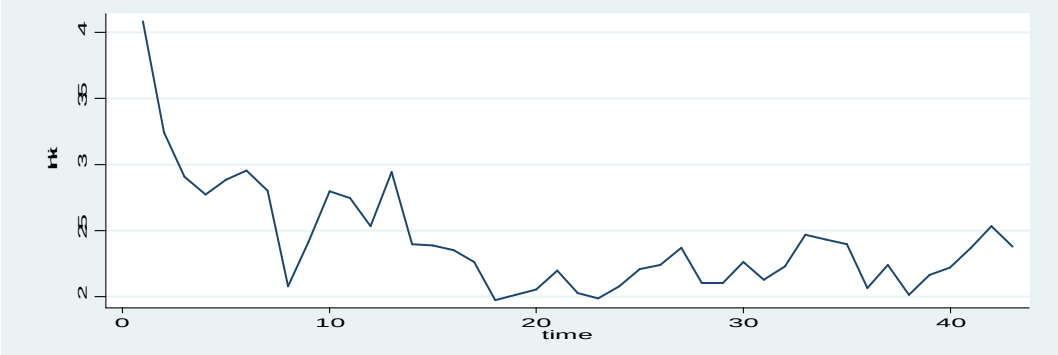
2C. Choice of Transformation





Note: We graphed each data series to ensure that we used the transformation that gave the best distribution: log chosen

Just Example Log transformed (Inv)



Appendix 3: Applied Statistical Tests

i. Student t-test

The test statistics is given by

$$t_{calculated} = coefficient(b_j - 0)/standard\ error\ of\ the\ coefficients\ (s.e\ (b_j))$$

Where t_{cal} represent calculated students t, at a specified probability level for the individual variables in equations (3.9) and (3.10). The sample statistic t_{cal} is tested at a 5% level of significance. If $t_{cal} > t^*_{crit}$ from the students t table the null hypothesis ($\beta, \delta = 0$) is rejected in favour of the alternative hypothesis ($\beta, \delta ? 0$) i.e the variables are significantly different from zero.

iii. The F-Test

The F-test is used to test for the joint significance of the explanatory variables in the estimated regression model. The null hypothesis states that the coefficients are the same and equal to zero whereas the alternative hypothesis states that at least one of the coefficients of the policy variables is significantly different from zero.

The test statistic: $F_{cal} = (ESS/K-1)/(RSS/N-K)$

Where: RSS: regression sum of squares

ESS : error sum of squares;
N : sample size; and
K : number of explanatory variables.

If the F calculated (F_{cal}) is greater than F critical (F_{crit}) value from the F-distribution table at an appropriate degree of freedom, then the null hypothesis is rejected in favour of the alternative and one concludes that the coefficients of the explanatory variable are significantly different from zero and that the explanatory variables jointly explain the variation in the dependent variable.

iv. Coefficient of Determination, R^2

The coefficient of determination determines the goodness of fit of the regression. It is used to measure the proportion of variation in cocoa output that is explained by the regression. It is given by the ratio of explained variation in the dependent variable to the sum of squares of total variation in the independent variable. The R^2 is adjusted for the degrees of freedom that may be lost.

v. CUSUM Test

The CUSUM test is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines.

The CUSUM test is based on the statistic;

$$\omega_t = \sum_{r=k+1}^{t} \omega_r / s_t \qquad t=k+1,\ldots,T$$

ω (Recursive residual) is given by the equation

$$\omega_t = y_t - x'_t b_{t-1} \Big/ (1 + x'_t (X'_{t-1} X'_{t-1})^{-1} x_t)^{1/2}$$

Where ω is the recursive residual and s is the standard error of the regression fitted to all T sample points. If the b vector remains constant from period to period, $E[\omega_t] = 0$, but if β changes, ω_t will tend to diverge from the zero mean value line. The significance of any departure from the zero line is assessed by reference to a pair of 5% significance lines, the distance between which increases with time, t. Movement of ω_t outside the critical lines is suggestive of coefficient instability.

vi. **Normality Test (Jarque-Bera)**

Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. The statistic is computed as;

$$JB = N-K/6\ (S^2+1/4(K-3)^2)$$

where S is the skewness, K is the kurtosis, and k represents the number of estimated coefficients used to create the series. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as χ^2 with 2 degrees of freedom. The reported Probability is the probability that a Jarque - Bera statistic exceeds (in absolute value) the observed value under the null—a small probability value leads to the rejection of the null hypothesis of a normal distribution.

vii. **White's Heteroskedasticity Test**

This is a test for heteroskedasticity in the residuals from a least squares regression (White, 1980). Ordinary least squares estimates are consistent in the presence of heteroskedasticity, but the conventional computed standard errors are no longer valid. If evidence of heteroskedasticity is found then either the robust standard errors option is chosen to correct the standard errors or the heteroskedasticity is modeled to obtain more efficient estimates using weighted least squares.

White's test is a test of the null hypothesis of no heteroskedasticity against heteroskedasticity of some unknown general form. The test statistic is computed by an auxiliary regression, where we regress the squared residuals on all possible

Appendix 4: Test for Stationarity & Engel Granger Method

There are various methods for testing for the stationarity condition of data; but by far the most widely used is the Dickey Fuller (DF) / Augmented Dickey Fuller (ADF) test. Others include the Phillips Peron Test. This test (ADF) involves running the regression of the form;

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \qquad (5)$$

where Y_t is the variable of interest and Y_{t-1} is the period lag of the variable. The lag lengthm is selected large enough to render the residual ε_t white noise. The null hypothesis is that the time series has a unit root ($H_0 : \delta = 0$) and the alternative hypothesis is that the series is trend stationary ($H_1 : \delta < 0$). If δ is significantly different from zero the null hypothesis is rejected, suggesting that the process is trend-stationary. Where the null hypothesis is not rejected, we test for a second order unit root. This involves estimating the regression:

$$\Delta^2 Y_t = c + \delta \Delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta^{i+1} Y_{t-i} + \varepsilon_t \qquad (6)$$

and testing the null hypothesis that corresponds to $\delta = 0$. Where the null hypothesis is rejected, the presence of a first order unit root is established. However, DF/ADF tests are associated with poor power and size properties, particularly in small samples (Gujarati, 2004). Thus, an inability to reject the null hypothesis does not necessarily mean the presence of a unit root. It could be a case of insufficient information in the data to reject the null. In other words, not all series for which we cannot reject the unit root hypothesis is necessarily non-stationary.

In the light of this problem, the DF/ADF test can be supplemented by some informa methods. One is simple plots of the variables, and two is correlograms of the variables. I a variable is stationary, we expect the autocorrelation coefficient (ACFs) at various lag to hover around zero or to fall quickly to zero from lag one. For non-stationary processes, on the other hand, the autocorrelation coefficient at the first lag start very close to one and decline very slowly thereafter (Guharati, 2004)

The Single Equation Case

According to the Engel and Granger (1987) methodology, if two time series y_t and x_t are both integrated of order *d*, i.e. I(*d*), then in general any linear combination of the two series will also be *I(d)*, unless there exists a vector β, such that the disturbance term from the regression ($\varepsilon_t = y_t - \hat{\beta} x_t$) is of a lower order of integration, *I(d-b)*, where *b>0*. When this is the case, Engel and Granger (1987) define y_t and x_t as cointegrated of the order (*d,b*). Thus, if y_t and x_t are both *I(1)* and ε_t is *I(0)*, the two series is integrated of order *CI(1,1)*.

In testing for cointegration in the single equation model (assuming 2 variables), the Engle-Granger procedure requires estimating the static model:

$y_t = \beta x_t + \varepsilon_t$. (7)

Testing the null hypothesis that y_t and x_t are not cointegrated involves directly testing whether ε_t is *I(1)* against the alternative that it is *I(0)*. The usual test methodology is by the augmented Dickey-fuller (ADF) test that has been previously discussed in this section above.

However, estimating the static long run model is fraught with limitations. These include its:

(1) Low power – that is the higher likelihood of under rejecting the null hypothesis of no cointegration when it is false; and

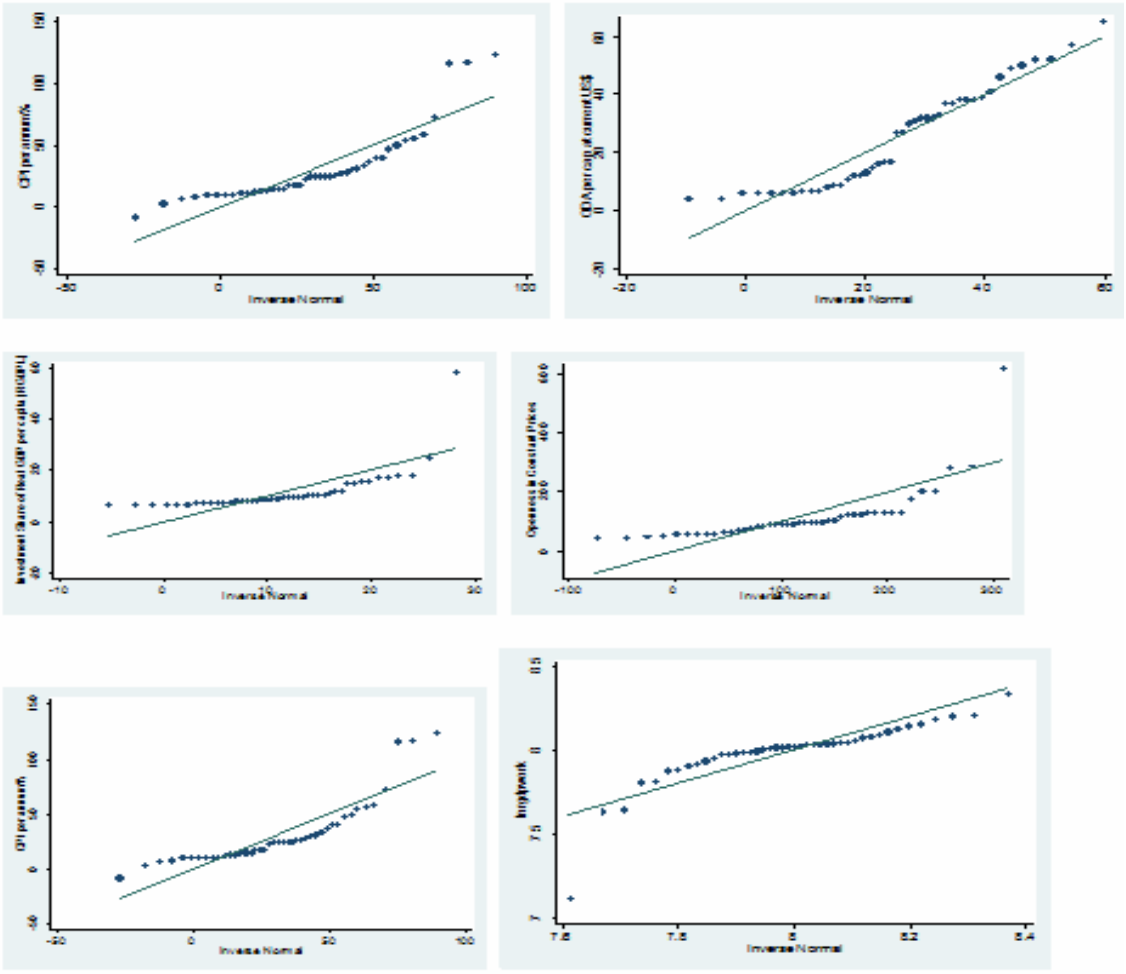
(2) invalid *t*-tests about the significance of the parameters.

To overcome these limitations, a dynamic process (that includes lags of both the dependent and independent variables) can be estimated. However, where the number of variables *n* is more than two, the likelihood of there being more than one cointegrating vector makes the single equation approach inefficient. Assuming that there exist one cointegrating vector when there is more than one leads to inefficiency in the sense that only a linear combination of the vectors is estimated. This is overcome with Johansen procedure. Secondly, even when there is truly one cointegrating vector, estimating a single equation is potentially inefficient because it does not lead to the smallest variance against alternative approaches except when all the right hand side variables in the cointegrating vector are weakly exogenous which is assumed here.

Estimating the short run dynamic model

Assuming it is valid to estimate the long run relationship and test for cointegration via the Engle-Granger method, the second stage of the procedure involves estimating *the Error correction Model* (ECM), using the estimates of the disequilibrium ($\hat{\varepsilon}_t$) to obtain information on the speed of adjustment to equilibrium. The Hendry-type 'general to specific' procedure was used used to reduce the ECM to its parsimonious form.

Graphical Method 5: In Quest for Co-Integration Vectors



Distributional properties:

Appendix 6: ADF Test

```
. egen time= fill (1,2)
. sort time
. tsset time
        time variable:  time, 1 to 43
                delta:  1 unit

ADF TEST RESULTS
------------------------------------------------------------------------------ ORDER OF INTEGRATION
    1)  Variable : GDP. dfuller lnrgdpch

Dickey-Fuller test for unit root                   Number of obs   =        42

                     ------ Interpolated Dickey-Fuller ------
         Test         1% Critical       5% Critical      10% Critical
       Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)     -5.878            -3.634           -2.952           -2.610
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
------------------------------------------------------------------------------ GDP i(0)

    2)  Aid  dfuller lnaidc (Aid)

Dickey-Fuller test for unit root                   Number of obs   =        42
                     ------ Interpolated Dickey-Fuller ------
         Test         1% Critical       5% Critical      10% Critical
       Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)     -1.335            -3.634           -2.952           -2.610
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6130
. dfuller d.lnaidc, trend
Dickey-Fuller test for unit root                   Number of obs   =        41
                     ------ Interpolated Dickey-Fuller ------
         Test         1% Critical       5% Critical      10% Critical
       Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)     -9.129            -4.233           -3.536           -3.202
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
. dfuller d.lnaidc
Dickey-Fuller test for unit root                   Number of obs   =        41
                     ------ Interpolated Dickey-Fuller ------
         Test         1% Critical       5% Critical      10% Critical
       Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)     -9.248            -3.641           -2.955           -2.611
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
    • Conclusin: Aid is I (1)
------------------------------------------------------------------------------Aid i(1)
```

4. Openness . dfuller lnopenk

Dickey-Fuller test for unit root Number of obs = 42

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-4.550	-3.634	-2.952	-2.610

MacKinnon approximate p-value for Z(t) = 0.0002

. *opennes is also i(0)

---------- *Openness I(0)*

5. INFLATION . dfuller logCPI

Dickey-Fuller test for unit root Number of obs = 40

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-3.180	-3.648	-2.958	-2.612

MacKinnon approximate p-value for Z(t) = 0.0212

. dfuller dlogCPI, trend

Dickey-Fuller test for unit root Number of obs = 38

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-8.834	-4.260	-3.548	-3.209

MacKinnon approximate p-value for Z(t) = 0.0000

. *CPI is i(1)

----------CPI *i(1)*

. dfuller lnrgdpwork

Dickey-Fuller test for unit root Number of obs = 42

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-6.511	-3.634	-2.952	-2.610

MacKinnon approximate p-value for Z(t) = 0.0000

Labour i(0)

---------- Labour *i(0)*

. dfuller lnki

Dickey-Fuller test for unit root Number of obs = 42

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-5.231	-3.634	-2.952	-2.610

MacKinnon approximate p-value for Z(t) = 0.0000

---------- Inv i (0)

Appendix 7: Treatment of Investment -Aid in Growth Equations

SIMPLE CORRELATION

```
corr lnaidc lnmgdp lncpipca lncgy lnki
(obs=28)

             |   lnaidc   lnmgdp lncpipca    lncgy     lnki
-------------+------------------------------------------------
      lnaidc |   1.0000
      lnmgdp |   0.5826   1.0000
    lncpipca |  -0.0016  -0.3670   1.0000
       lncgy |  -0.4351  -0.3051  -0.0596   1.0000
        lnki |  -0.6030  -0.1344  -0.0545   0.3936   1.0000
```

Inv and Aid have negative correlation in Ghana which reflected in the overall equation. Here we instrument aid on investment.

Note Inv(Ki) And Aid Are linked And care should be taken in using both in regression growth equations.Below shows A consequence: This clarifys that Aid impacts growth indirectly.

One way of correcting may be through lagging effect to mitigate....

```
Linear regression                               Number of obs =      10
                                                F(  0,     0) =       .
                                                Prob > F      =       .
                                                R-squared     =  1.0000
                                                Root MSE      =       0

------------------------------------------------------------------------------
             |               Robust
    lnrgdpch |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnmgdp |  -.9268928          .        .       .            .           .
      lnaidc |  -.5885036          .        .       .            .           .
       lnPIV |   .1076938          .        .       .            .           .
        lnki |  -.1624069          .        .       .            .           .
      logCPI |   -.236572          .        .       .            .           .
  lnrgdpwork |   1.452492          .        .       .            .           .
      lnxrat |    .097015          .        .       .            .           .
       lncgy |  -.0379879          .        .       .            .           .
       dstxj |   1.288425          .        .       .            .           .
       _cons |   1.254497          .        .       .            .           .
------------------------------------------------------------------------------

. reg lnrgdpch lnmgdp  lnaidc lnPIV  logCPI lnrgdpwork lnxrat lncgy dstxj,robust

Linear regression                               Number of obs =      10
                                                F(  8,     1) = 4997.86
                                                Prob > F      =  0.0109
                                                R-squared     =  0.9998
                                                Root MSE      =  .00504

------------------------------------------------------------------------------
             |               Robust
    lnrgdpch |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnmgdp |  -.2262615   .0935952    -2.42   0.250    -1.415502    .9629787
      lnaidc |  -.1344868   .0562942    -2.39   0.252    -.8497728    .5807992
       lnPIV |   .0421336    .034867     1.21   0.440     -.400894    .4851611
      logCPI |  -.0570433   .0220245    -2.59   0.235    -.3368907    .2228041
  lnrgdpwork |    1.08748   .0495581    21.94   0.029     .4577837    1.717175
      lnxrat |   .0312938   .0151005     2.07   0.286    -.1605759    .2231636
       lncgy |  -.0058268   .0032407    -1.80   0.323    -.0470038    .0353502
       dstxj |   .3141792   .2535977     1.24   0.432    -2.908085    3.536443
       _cons |  -.2850594   .3006126    -0.95   0.517    -4.104704    3.534586
------------------------------------------------------------------------------
```