ERASMUS UNIVERSITEIT ROTTERDAM

FOREIGN ASSISTANCE AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

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'Volenti nihil difficile'.

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To my mom, grandma and brothers my eternal affection and gratitude. Mimosa, thank you for being there for me.

Abstract

The effectiveness of foreign aid on economic growth is a much debated topic on the field of Development Economics. As such, a huge body of literature is available with the vast majority concluding that aid contributes in increasing growth (Hansen and Tarp, 2000); although some scholars, amongst them Boone (1996), Osaka (2003), and Moyo (2009) hold a different and an opposite view.

Aware of the fact that Sub-Saharan Africa is the poorest region in the world (Chen and Ravallion, 2012), (World Bank, 2012), and that Sub-Saharan Africa is the region which is the biggest beneficiary of aid (Lancaster, 1999), (OECD, 2010); but nevertheless aid in this region seems not to produce the expected results; this paper focuses, firstly, on whether foreign aid through savings and investment could contribute in enhancing economic growth in Sub-Saharan Africa countries. Secondly, diverging from the previous literature, we introduce democracy and corruption (corruption-control) as new control variables that might have an effect on the performance of foreign aid on economic growth in Africa, by questioning whether the impact of foreign aid on growth in Sub-Saharan Africa is a positive function of the environment (democratic and corruption free) where aid is delivered.

Regarding the results, we find evidence which seems to suggest that aid can contribute in increasing economic growth in Africa by impacting positively on savings and investment. Further, the results show a mixed picture in as much as a democratic and a corruption free environment seems to positively determine the performance of foreign aid on economic growth in Sub-Saharan Africa through investment, whereas via savings the results do not appear to offer conclusive evidence one way or the other.

Key words: foreign aid, economic growth, Sub-Saharan Africa.

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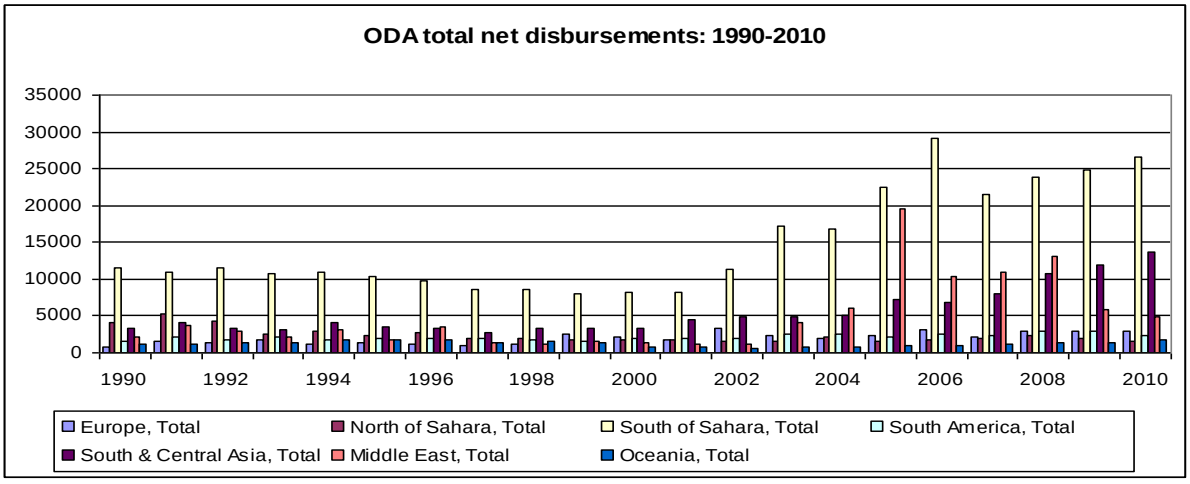
Chapter I: Introduction

Foreign assistance comprises aid from mainly rich developed donors provided to partner poor countries. The underlying assumption is that aid will contribute in increasing economic growth and stimulate development. Because historically Africa's development appear to be dependent on aid (Loxey and Sackey, 2008) this paper is, thus, about foreign assistance and economic growth in Sub-Saharan Africa. That is, I set to find out whether foreign aid can contribute in enhancing economic growth measured as the per capita GDP growth in Sub-Saharan Africa. For after a half century of foreign aid, there seems to be a foreign aid fatigue in donor countries motivated by lack of progress in recipient countries. Moreover, it appears that foreign aid does not produce the expected effects in Sub-Saharan Africa, for if we look, for instance, at the human development index (HDI) we see that the Sub-Saharan Africa indices are the lowest in the world (UNPD, 2011). Furthermore, if we focus on the poverty levels, we see that Sub-Saharan Africa is the poorest region of the world (Chen and Ravallion, 2012)[1], (World Bank, 2012). All of this in spite of the huge inflows of foreign aid that Africa receives.

Figure 1: Official Development Assistance (ODA) total net disbursements by region: 1990-2010

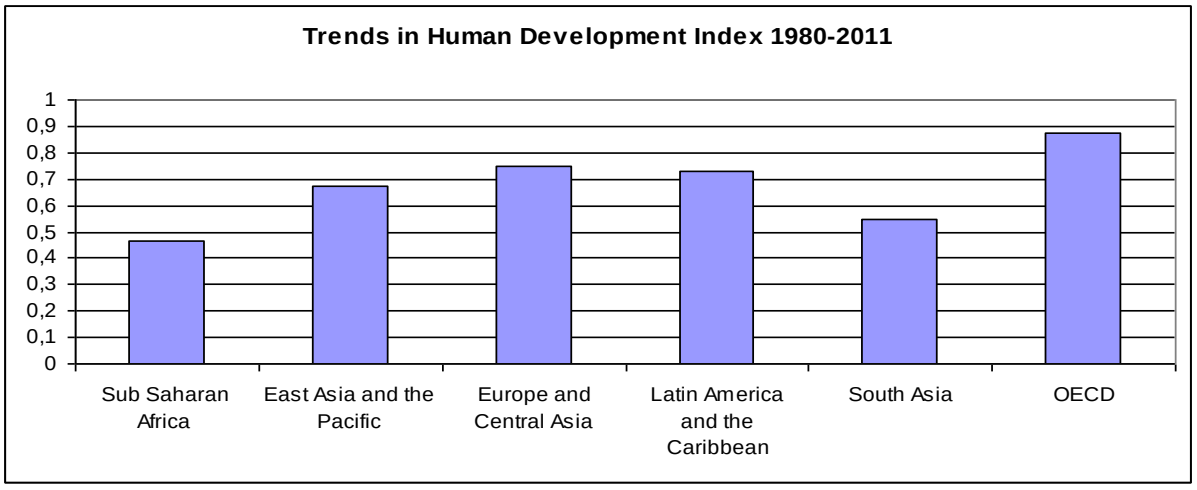


Source: OECD, 2012

[1] See Appendix A for number of people living below $1 per day, by region (1981-2008)

Figure 1 above depicts the distribution of foreign aid around the world, allocated by region from 1990 to 2010. The cream-yellow colored bars depicting aid that goes to Sub-Saharan Africa are the longest in each and every year. This shows that in fact Sub-Saharan Africa amongst all other aid recipients is the largest beneficiary. Hence, given the amount of foreign aid this African sub-region receives compared to its development levels, which for the most part are still largely disappointing (Lancaster, 1999), as figure 2 below depicting the trends in human development index shows; critical voices in donor countries (even in some beneficiary countries), including scholars and politicians, and aid practitioners alike raise questions about the role and the impact of foreign assistance (Levy, 1988). It follows therefore that the effectiveness of aid or, in other words, the impact of foreign aid on economic growth be closely scrutinized. For instance, why foreign aid in Sub-Saharan Africa does not seem to produce the desired effects? Is the service delivery ineffective, the objective ill-defined or the recipient countries bureaucracy (politics, institutions, policies and macroeconomic environment) not appropriate (Bourguignon and Sundberg, 2007)? Could it be the case that the development aid is embezzled and used for purposes other than the intended and right ones; or simply that in fact aid does not spur economic growth (Boone, 1996), (Ovaska, 2003), (Moyo, 2009)?

Figure 2: Trends in Human Development Index (HDI): 1980-2011



Source: UNDP, 2011

In the quest for answers to the serious questions of underdevelopment in Africa, in spite of the aid inflows, one has to recognize that lack of development is multi-causal and complex. But when it comes to aid, several avenues have been explored. Particularly starting from the 1990s new approaches to the development challenge have been put in place. For example, the principle that Africa must take its responsibilities with regard to development, as it became clear to all stakeholders: donors, aid practitioners and African countries themselves that if Africa does not take control of its own 'destiny', nobody else will do (Commission for Africa, 2010). Subsequently, the idea of allowing the poor countries own their development programs became essential with the Poverty Reduction Strategy Papers (PRSP) underlining this strategy (IMF and World Bank, 1999). Furthermore, the significant role of good governance emphasizing in particular the fight against corruption, proper institutions, the promotion of human rights, civil liberties and political freedom in tackling poverty and development issues (Millennium Project, 2005) became one of the main focal points; coupled with the requirement of more coordination among donor countries (Commission for Africa, 2005).

1.1 Social and Scientific Relevance

Focusing into Sub-Saharan Africa, however, it is noticeable that besides the aid inflows the region receives and the disappointing levels of development, which do not match the foreign aid expectations levels or the vast amount of money invested, two other factors dominate the socio-political and economical landscape of the vast majority of the Sub-Saharan Africa countries, namely: i) Lack of democracy and ii) corruption. Both are presumed to have a massive negative impact on the performance of African countries, in general, and development aid, in particular (Dollar and Svensson, 1998), (Akçay, 2006). In fact, democracy is included within those factors, such as economic growth, social progress and care for the environment that constitute the prime engines of development in all countries (the Accra Agenda for Action, 2008). The New Partnership for Africa's Development (NEPAD) states that democracy and good governance are pre-conditions for the development of Africa (Chabal,

2007). The Paris Declaration of Aid Effectiveness (2005) asserts that the effectiveness and the efficiency in the use of development assistance requires from donors and beneficiaries alike to do their utmost in fighting corruption. Yet according to the Economist Intelligence Unit (2011) the Sub-Saharan Africa region in its entirety has no democratic country. More than half of the 44 Sub-Saharan Africa countries reviewed in their reports (25 in 2010 and 23 in 2011) are authoritarian regimes. The average rank of a Sub-Saharan Africa country in 2011 on the Corruption Perception Index is 118, 72 out of 182 countries, with the corresponding average score of 2, 91 (with 0 to 0.9 = highly corrupt and 9 to 10 = very clean), (Transparency International, 2011). Although some academics would argue that the nature of a political regime does not have a significant effect on a country's development levels (Heyden, 2007); the former Soviet Union in the past and the economic rise of China today, being the examples put forward by the proponents of this assumption; key empirical papers in the field of Development Economics such as the one by Burnside and Dollar (2000), and Collier and Dollar (2000), for example, show that aid can enhance economic growth given proper management and sound economic policies. In fact, if anything the results of Burnside and Dollar (2000) seem to indicate that indeed the recipient government's actions are crucial for the success of aid programs. In the same token, however, it is hardly envisageable how a country which is undemocratic, corrupt and not accountable can have proper management, enact and apply good policies. Hence, I shall argue that the rule of law and accountability, that is, democracy and corruption-control are prior to a sound fiscal, monetary environment; and thus essential. Therefore, in this thesis I shall focus on testing two hypotheses. Namely:

HYPOTHESIS (I):

Boosting Sub-Saharan Africa savings and investment with foreign aid will result in an increased economic growth measured as GDP per capita growth.

Secondly, by introducing democracy and corruption-control as new control variables, I will seek to find out whether in Africa undemocratic and corrupt regimes contribute significantly in hampering or hindering the outcomes of aid by for instance not directing aid to the

intended purposes, such as investments in agriculture, health and sanitation, education and infrastructures. In other words, because economic growth in poor countries is largely dependent on their own economic policies (Burnside and Dollar, 2000), I shall therefore argue that the performance of foreign aid is a function of the environment where aid is delivered. Hence, from aid to savings and investment (economic growth), one needs a bridge in between; a transmission mechanism which is, even though not sufficient, but a necessary condition encompassing sound governance, in general, and corruption-control and democracy, in particular. In this way, Sub-Saharan Africa countries that battle corruption and which are democratic shall benefit directly from both democracy and corruption-control. In such context foreign aid will thus result in increased economic growth. In undemocratic and corrupt African countries, however, foreign aid is embezzled by the elites in power and/or dissipated in unproductive government expenditure (Burnside and Dollar, 2000). Therefore, my second hypothesis shall be:

HYPOTHESIS (II):

Democracy and corruption-control in Sub-Saharan Africa ensures that foreign aid is directed into savings and investment. Therefore, in such environment foreign aid accelerates economic growth.

I am perfectly aware of the fact that foreign aid effectiveness is a much debated issue and as a consequence a vast literature on this topic exists. This study, though, by focusing exclusively in the Sub-Saharan Africa region, recognizes that Sub-Saharan Africa has its own and unique specificities regarding its socio-economic orientation compared to other poor countries around the world (Loxley and Sackey, 2008) which merit therefore to be accounted for. The chosen time span: 1990-2010, is intended to capture the results of the new approaches introduced in the field of aid and development since the 1990s. Finally, by introducing specifically democracy and corruption-control as new control variables, this paper seeks to distinguish itself from the previous literature.

The remainder of the thesis is structured as follows: Chapter II shall broach Foreign Aid Effectiveness Literature Review. Chapter III will present the Theoretical Framework and in Chapter IV we will discuss issues related to Data and present the empirical model, followed by the Results of the study. Finally, Chapter V will encompass the conclusion of the paper coupled with recommendations.

Chapter II: Literature Review

There is a vast body of literature on the topic of foreign aid and economic growth. White (1992), Hansen and Tarp (2000), for example, offer good summaries on the topic. For us, however, we shall concentrate primarily on those studies which focus on the interaction of foreign aid with economic policy measures and/or institutional environment, and its impact of economic growth in the recipient countries.

The World Bank's paper Assessing Aid of 1998 came to the conclusion that foreign aid to poor countries impacts positively on economic growth, when the recipient countries governments pursue sound fiscal, monetary and trade policies. The World Bank argued, therefore, that foreign aid should be better targeted to those poor countries which pursue proper economic management. In the same vain, Burnside and Dollar (2000) researching on the relationship between foreign aid, economic policies and GDP growth per capita, studied 56 low income countries, 25 of which where African countries, using cross-country regression analysis. Their study distinguished itself from the broader aid and growth literature by introducing an aid-policy interaction term where policy was represented by an index encompassing inflation, the budget deficit and trade openness. Burnside and Dollar concluded then that aid has a positive effect on economic growth and development in poor countries given quality fiscal, monetary and trade policies. Otherwise, in the presence of poor policies, aid would have no effect. This result by Burnside and Dollar was challenged and questioned by Easterly (2003) who argues that the correlation between foreign aid effectiveness and sound economic policies is much weaker. However, Ali, Isse and Peek

(2009) on their study: The Sensitive Analysis Approach on the Effects of Foreign Aid on Growth corroborates Burnside and Dollar results. Likewise does Lancaster (1999).

Hansen and Tarp (2000) on their paper Policy Arena: Aid Effectiveness Disputed, they re-examined a group of 131 cross-country studies from the last 30 years on the aid-savings, aid-investment, and aid-growth relationship and concluded that aid contributes positively in increasing savings and investment. In addition, overall, there is a positive correlation between foreign aid and growth. Hansen and Tarp, however, failed to find a strong and significant positive relationship between the effectiveness of aid and governance or the quality of policies. The same conclusion was again underlined in their paper Aid and growth regressions of 2001. The absence of a positive correlation between aid and the institutions, aid and policies environment conclusions of Hansen and Tarp do not stand alone. Levine and Renelt (1992) before them reached the same conclusion.

Levy (1988), Hadjimichael et al. (1995) and Gomanee et al. (2005) all studied the relationship between foreign aid and economic growth in Sub-Saharan Africa. Their results showed that aid does increase savings and investments, and therefore contributes positively in growing the economies of the recipient countries. For instance, Victor Levy found that there is a significant indication that one more dollar of aid raised investment by 0.92 dollars with a standard error of 0.278 (Levy, 1988: 19). Likewise, Loxley and Sackey (2008) on Aid effectiveness in Africa examined the effect of foreign aid on growth. They used a panel sample of 40 member countries of the African Union (AU) and estimated fixed-effects growth models. They found that there is a statistically significant positive correlation between foreign aid and economic growth in Africa: through increases in investment, foreign aid increases growth. Oliver Morrissey (2001) evaluated critically the evidence of foreign aid effectiveness by considering the mechanisms through which aid can have an impact on economic growth. Namely: i) the gaps approach based on the Harrod-Domar model and ii) the Neo-classical growth models based on the Solow model. He concluded that foreign aid could have an impact on the growth rates of recipient countries through savings and

investments, with the gaps model allowing for a permanent effect of aid on economic growth whereas the Neo-classical models showing an effect which is assumed to be transitory or temporary. Overall, Morrissey (2001) concluded that foreign aid has a positive impact on increasing the growth rates of poor countries. Clemens, Radelet and Bhavnami (2004) focused on the short impact aid, that is, aid that could affect growth in four years time, including aid for investments in infrastructures and agriculture. They concluded that there is a positive, causal relationship between aid and economic growth. For example, a one dollar increase in aid raises growth by 1.64 dollars.

Peter Boone in his Politics and Effectiveness of Foreign Aid paper of 1996 argued that poverty is not caused by lack of capital, and that it is not optimal for governments in underdeveloped countries to adjust their distortionary policies when they receive foreign assistance. Therefore, foreign aid can neither promote economic growth nor any human development indicator because according to Boone foreign aid finances government consumption rather than investment. He, therefore, implied that aid was directed to the wrong goals. Djankov et al (2006) on their paper: Does Foreign Aid Help?, reacted to the paper by Sachs et al (2004) where Sachs and his co-authors claimed that what developing countries need is a huge financial aid to overcome the poverty trap. Djankov et al, equalized aid to the natural resources curse, which implies that in developing countries there is a negative correlation between natural resources and economic growth. Hence, if the natural resources produce a large revenue flow that can lead to corruption, rent-seeking behavior, and civil wars; a large flow of foreign aid may exactly have comparable effects on developing countries, as for many of these poor countries aid is an important source of revenue. Therefore, they concluded that foreign aid hinders democracy and is counterproductive to economic growth. Along the same line of thinking we find Dambisa Moyo who argued that indeed cutting off the flow of foreign aid would serve better the interests of developing countries, as aid has trapped these countries in a cycle of corruption, absence of robust economic growth and poverty. Ovaska (2003) examined the effectiveness of foreign aid on economic growth over the time period 1975-1998 using data from 86 developing countries.

He concluded that there is a negative relationship between aid and economic growth. Furthermore, Ovaska stated that there is no solid evidence that proper governance in poor countries can alter the main findings of the negative link between foreign aid and growth. Rajan and Subramanian in Aid and growth: What does the cross-country evidence really show? Paper of 2006 used cross-sectional panel data and scrutinized the effects of foreign assistance on economic growth. They concluded that there is little robust evidence to support the claim of a positive or indeed a negative relationship between foreign aid and economic growth in developing countries. Contrary to the findings of Burnside and Dollar (2000), Lancaster (1999) and Ali, Isse and Peek (2009); Rajan and Subramanian (2006) did not find neither any evidence that foreign aid would be effective on a sound economic policies environment nor that some kind of aid works better than others.

Easterly et al (2004) reacted to the results of the 2000 study by Burnside and Dollar by adding new data from 1993 to 1997, that they claimed were not available in the time period of their predecessors and conducted a very simple robustness check. The results showed that Burnside and Dollar (2000) results do not hold. The aid*policy interaction term appears insignificant. Concluding their paper, Easterly et al (2004) pointed out though that they do not assert that aid is ineffective in spurring economic growth, but simply that empirically their results do not offer a decisive conclusion one way or the other. In fact, the results are unclear, undetermined and inconclusive.

Chapter III: Theoretical Framework

In this section, I shall give the scientific foundation of the stand that foreign aid contributes in spurring economic growth in the recipient countries. The core of this statement is contributing which is meant to imply that foreign aid has a mediated or an indirect impact on growth; through the impact that aid has on those factors that, from economic models and empirical studies, have proved that they enhance economic growth. In other words, by positively affecting the determinants of economic growth, such as investment, savings, human capital, measures of political stability, government policies and so on (Barro, 1991), (Easterly and Rebelo, 1993), (Fischer, 1993), (Sala-i-Martin, 1994), foreign aid can ultimately have a positive and significant association with economic growth.

3.1 GDP Accounting Identities, Foreign Aid and Economic Growth

A country's output or GDP can be decomposed in the two fundamental ways concisely described hereafter:

i) Net final sales: $Y = C + I + G + X - Z$ (1)

Where Y = GDP or output, C = final sales of consumption goods, I = final sales of investment goods that enhances the capital stock, G = final sales to government, and X = final sales to the rest of the world (exports). Because part of the national income of a country is used to pay for goods from abroad; imports of the domestic country (Z) is subtracted from national GDP.

ii) Users of income: $Y = C + S + T$ (2)

Where C = consumption, S = savings and T = taxes or net transfers.
The two decompositions of GDP above (1) and (2) are by definition true (Burda and Wyplosz, 2005). Equalizing both of them, yields:

$$C + S + T = C + I + G + X - Z \quad (3)$$

Because consumption (C) is present in both sides of (3), it can be eliminated. And after rearranging, we have the following identity:

$$(S-I) + (T-G) = (X-Z) \quad (4)$$

The key idea that identity (4) conveys is that: if S>I, firms or the private sector of the economy in general is a net saver. Otherwise, if S<I, companies are net borrowers. In the same vain, if T>G implies that the government budget is in order, that is, the government is saving. Meanwhile, if G>T the government issues public debt and it borrows (Burda and Wyplosz, 2005).

The decompositions of GDP outlined above are important because they are able to capture all potential sources that can serve to finance investment in a country. For example, identity (4) tells us that in order to replenish the capital stock of a country, in other words, in order to finance investment a country can resort to private savings (S), government own savings (budget surplus) or (T-G), or indeed savings of foreigners (Z-X). Summarizing the three sources of investment financing available to a country, we get the following identity:

$$I = S + (T-G) + (Z-X) \quad (5)$$

Now, let us assume for reasoning simplicity, that the government budget is in balance so that T=G; and similarly that the current deficit also is balanced, that is Z=X. Then, from identity (5) we see that investment will only depend on saving. That is: investment is equal to savings (I=S).

SUMMARY:

GDP = F(S, I) (6)

Where S=saving rate, I=investment

Hence, S↑ = I ↑ = GDP ↑ (7)

We depart from the widely accepted economic premise that a country's economic growth is a function of its stock of capital or investment and savings (6). Hence, from the final result of the decomposition of GDP which states that investment equals saving (I=S), we shall conclude the following: when the saving rate increases, investment increases. Consequently, economic growth rises (7). We have thus arrived at one of the very first explanations of economic growth which states that: "we save, we invest, we grow" (Burda and Wyplosz, 2005: 52). However, poor countries because they are poor and therefore not able to save and invest, foreign aid directed at strengthening poor countries savings and/or investment can have a positive impact on economic growth (Sachs, 2005).

3.2 Production Function Equations, Foreign Aid and Economic Growth

Consider the following parsimonious production function:

$$Y_t = F(K_t, L_t, H_t, A_t) \quad (8)$$

Where Y= GDP or output, K = physical capital, L = labor force, H = human capital and A = an overall efficiency factor which here shall include both technology, and the quality of governance and /or institutions. Furthermore, t = denotes time. It is essential though to point out that observing the production function (8) above, t or time only enters the production function through its determinants: K, L, H, and A. This implies that GDP or economic growth increases or decreases over time whenever the production input change one way or the other (Romer, 2011). Hence, if we take the natural logarithm of the production function (8), we have:

$$\ln Y_t = \ln K_t + \ln L_t + \ln H_t + \ln A_t \quad (9)$$

Differentiating (9) with regard to time t, yields:

$$\dot{Y}_t = \dot{K}_t + \dot{L}_t + \dot{H}_t + \dot{A}_t \quad (10)$$

Where $\dot{Y}_t$, $\dot{K}_t$, $\dot{L}_t$, $\dot{H}_t$ and $\dot{A}_t$ represent respectively the growth rates of output, capital, labor, human capital and technology[2].

Hence, from equations (8), (9) and (10), we conclude that increases in capital, labor, human capital and productivity will increase economic growth. Therefore, foreign aid by impacting positively on those variables will also have a positive effect on growth itself. This methodology has already proven its value on economic growth studies done by academics and researchers such as Xavier Sala-i-Martin on Cross Sectional Regressions and the Empirics of Economic Growth (1994), who concludes that in the vast majority of empirical studies, investment seems to be the variable that is most significantly correlated with economic growth. In addition, countries with high levels of human capital will grow faster, and that government policies affect growth (Sala-i-Martin, 1994). Robert Barro, researching on the determinants of long-term economic growth concluded that within other factors, investment, initial human capital (school enrolment) and measures of political stability contribute in increasing economic growth (Barro, 1991). Easterly and Rebello (1993) on Fiscal Policy and Economic Growth found that overall government policies and in particular investments in public infrastructures contribute in spurring economic growth. Likewise, Fischer found that macroeconomic factors contribute positively in enhancing growth (Fischer, 1993).

From the above, it is evident that in fact the strategy directed at impacting the determinants of economic growth can work. Therefore, if foreign aid can be targeted to the determinants

of growth, it can ultimately impact on growth itself. Summarizing, one can thus state that the combination of the insights gained from this mediated impact of aid on growth, leads to the identification of a number of mechanisms and ways through which foreign aid is expected to have an effect in spurring economic growth. Namely: i) aid contributes in increasing the availability of investment dedicated to physical and human capital (Gomanee et al, 2005); ii) aid will contribute in augmenting the capacity of importing capital goods and/or technology (Chenery and Strout, 1966); iii) foreign aid does not encompass (in)direct effects that will significantly hamper savings rates or investments (Levy, 1988); iv) foreign aid, through technical assistance of donor countries and non-governmental organizations (NGOs), is associated with technology transfer that can contribute in enhancing capital productivity and ultimately increase endogenous technical changes and improvements that lead to economic growth (Bourguignon and Sundberg, 2007); and finally v) foreign aid will definitely increase economic growth dependent on the quality of governance and institutions (Collier and Dollar, 2001) and only given the quality of macroeconomic policies and institutions of the aid recipient country (Burnside and Dollar, 2000).

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[2] See Advanced Macroeconomics (Romer, 2011: 14): "A key fact about growth rates is that the growth rate of a variable equals the rate of change of its natural log. That is, $(\dot{X}t)/X(t)$ equals $\partial \ln X(t)/\partial t$. To see this, note that since $\ln X$ is a function of X and X is a function of t, we can use the chain rule to write:

$$d \ln X(t) / d t = d \ln X(t)/dX(t) \; dX(t)/dt$$
$$= [1/X(t)] \dot{X}(t) = (\dot{X}t)/X(t)''.$$

3.3 Corruption and Economic Growth

The link between corruption (both in the process of enactment of laws and that in the process of law enforcement) and growth is not as hotly debated as that of Democracy and growth. In fact, there is a broad consensus among the majority of researchers and for that matter civil society at large that corruption has substantial, adverse effects on economic growth (Mauro, 2004), (Drury, A. et al, 2006), (Aidt, T. et al, 2008). For instance: when corrupt officers or civil servants demand high bribes, coupled with an environment where nepotism, theft, misappropriation of resources, lack and/or disregard of the rule of law, property rights and so on, corruption has a deniable negative impact on profitability of investments and thus constitutes a fundamental disincentive for investors (Bardhan, 1997); or simply because corruption implies inefficient and infective governance it leads to poor economic, social and political outcomes (Akcay, 2006). Therefore, in this sub-section, I shall introduce Corruption in the Diamond Overlapping-Generations model and with the aid of simple equations and a diagram show how corruption hinders and lowers economic growth through decreases in capital stock (investment).

By using Logarithmic Utility (θ=1) and Cobb-Douglas Production function, the equation of motion of capital per unit of effective labor in the Diamond model becomes:

$$K_{t+1} = \frac{1}{(1+n)(1+g)} \frac{1}{2+\rho} (1 - \alpha)K_t^{\alpha} \qquad (11)$$

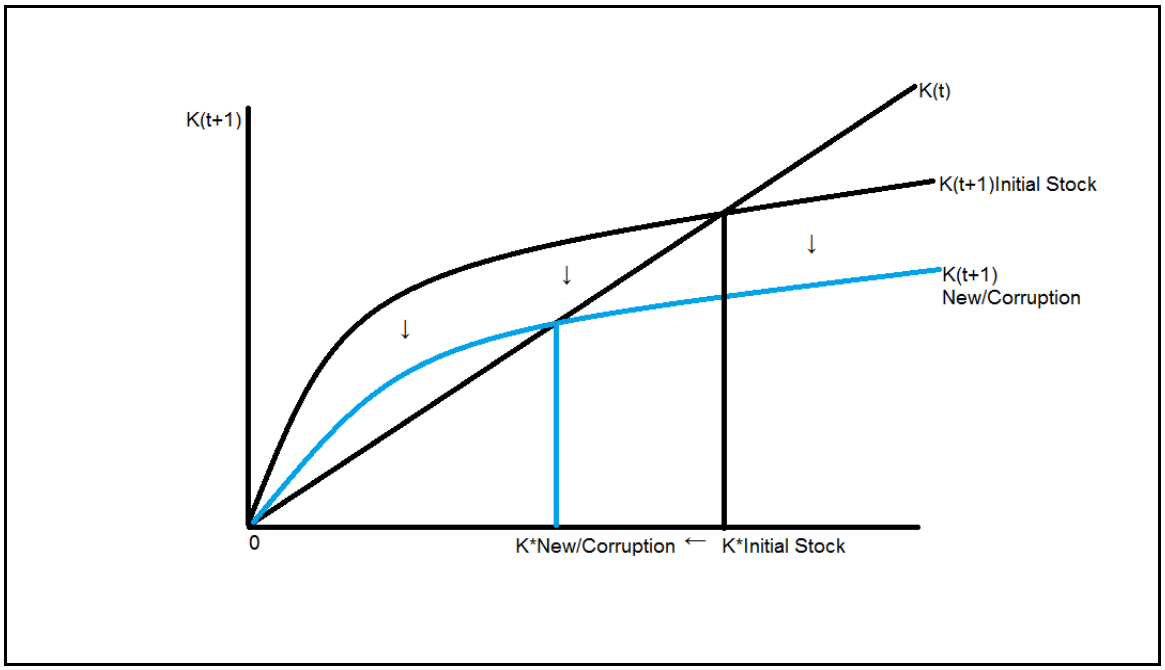
Then, when we introduce Corruption in this economy through equation (12), it yields:

$$K_{t+1} = \frac{(1 - \alpha)}{(2+ \rho)(1+n)(1+g)} ß\, K_t^{\alpha} \qquad (12)$$

Where: ß ≡ Good Governance parameter which entails: ß = (1-b), and

b = Corruption; so that if b↑ = ß ↓ and therefore K_{t+1}↓.

Figure 6: Corruption and bad governance in the economy

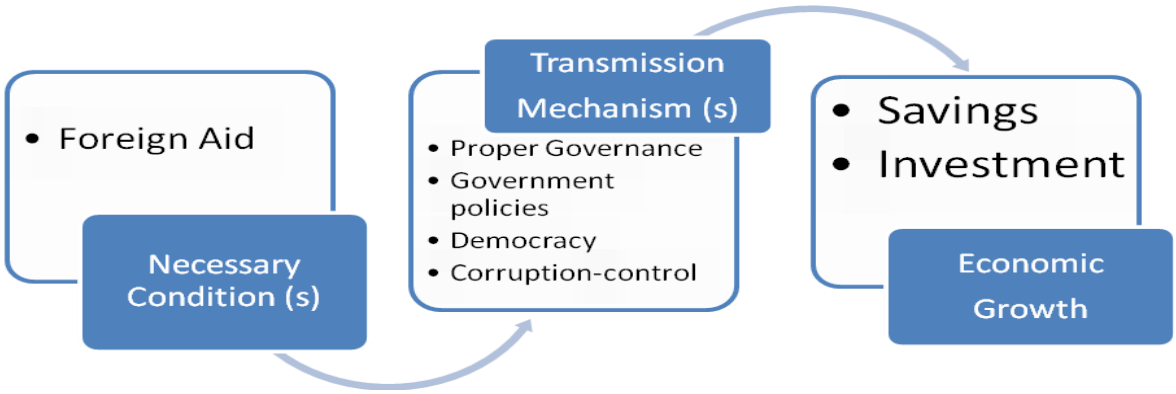


The graph above depicts an economy faced with corruption. The black line represents the initial stock of capital and the blue one is the corruption line. As the graph shows, after the introduction of corruption in this economy, the black line shifts downwards. Therefore, the initial stock of capital decreases from K*initial stock to K*New/corruption. Hence, the reduction in capital stock implies investments shortages which ultimately translate into lower and poor economic growth rates. In this sense, corruption and indeed bad governance at large could be assimilated to a hike in taxes in a Solow setting. Taxes in the Solow model will lower the effective marginal return on capital and therefore weakens the representative household incentives to save. Lower savings then translate into a smaller capital stock and consequently the level of output (growth) with the tax will be lower compared to the level of output without the tax. Hence, corruption decreases economic

growth by impacting as an offsetting force to the efficiencies and productivity increases of physical capital and human capital.

3.4 Aid, Democracy, Corruption-control and Economic Growth

Figure 7: Foreign Aid, Democracy, Corruption-control and Economic Growth. A Stylized Possible Causal Diagram



The diagram above depicts schematically the probable link through which foreign aid, given democracy and corruption-control, which should ensure that aid goes into savings and investment, could have a significant and positive impact on economic growth over time. The starting point here is one of the main assumptions of Development Economics which states that because poor countries are poor they have no means to invest and thus foreign aid is expected to remedy the lack of investment capacity of the recipient countries (Sachs, 2005). Hence, if so, one assumes that foreign aid to poor countries would indeed contribute in increasing the availability of investment directed to physical and human capital (Gomanee et al, 2005). But as the diagram shows, although intuitively one would expect that foreign aid should be directed into savings and investment, in practice this expectation is not straight forward. Sound and proper governance, government policies, in general, democracy and

corruption-control, in our case, constitute a sine qua non condition that should guarantee that in fact aid is channeled into savings and investment. By so doing, those Sub-Saharan Africa countries with proper economic management, sound policies, corruption-control and which are democratic shall thus benefit directly from them. In such environment, therefore, foreign aid should result in increased economic growth. In undemocratic and corrupt countries, however, foreign aid is embezzled by the authorities or the elites in power and/or engaged in other unproductive activities and therefore inefficient (Burnside and Dollar, 2000).

Chapter IV: Data, the Empirical Model and Study Results

This study covers a two decade period, from 1990 to 2010, based on a panel of 48 Sub-Saharan Africa countries (the list of which is found in Appendix B), comprising 1008 observations. Table 1 below depicts the descriptive statistics summary of the most important variables of the study. The entire data, if not referenced otherwise, is from the African Development Indicators (ADI) of the World Bank.

Table 1: Descriptive Statistics Summary (common sample)

	Mean	Median	Standard-Deviation
Aid	0.09	0.07	0.10
GDP	2.28	2.20	5.60
Savings	0.07	0.00	0.23
Investment	0.05	0.02	0.12
Corruption-Control	-0.75	-0.80	0.59
Democracy	-1.09	3.00	20.19

Notes: The negative means of corruption-control and democracy are inherently linked to the data collection and the ranking process of these variables. They range approximately from (-2.5 to 2.5) for corruption-control and (-100 to 100) for democracy (World Bank, 2012). Given that the majority of Sub-Saharan Africa countries are corrupt and undemocratic, they are assigned negative values which consequently result in negative means.

(A) Measures:

(A.1) Dependent variables

In order to test this paper's Hypothesis (I) and (II) (see section 1.1 pages 8 and 9), we shall use three different dependent variables, namely: savings, investment and economic growth. For savings we shall use the ratio of savings defined as the gross national savings including net current transfers (constant 2000 US$) to GDP (constant 2000 US$). Investment shall be the ratio of investment to GDP (constant 2000 US$). The investment variable is defined as the net Balance of Payment (BoP) US$ Foreign Direct Investment (FDI). Economic growth is measured as GDP per capita growth (annual %), (World Bank, 2012).

(A.2) Independent variables

Foreign aid is the ratio of aid measured as total net ODA (Official Development Assistance) received from DAC (Development Assistance Committee) donors to GDP (constant 2000 US$) (World Bank, 2012). In testing Hypothesis (I), that aid can increase economic growth by impacting positively on savings and investment, we expect the aid coefficient to have a statistically significant positive sign.

Democracy variable is measured as the institutionalized democracy (World Bank, 2012). Although we do not concentrate on the main effect of democracy in this paper, it is important to remember that democracy is expected to spur economic growth because it is associated with political and social stability, peace and reduction of uncertainty (Guillaumont et al, 1999), (Gerring, J. et al, 2005) which constitute indispensable conditions for a country to attract investment, use wisely the proceeds of foreign aid and develop. Hence, a positive higher index value for democracy is desirable, so that in gauging the performance of aid in a democratic environment we, therefore, expect the interaction term of aid with democracy to have a coefficient which is positive and statistically significant.

Corruption data should be from the Corruption Perception Index (CPI) of Transparency International. I decline to use the CPI data on this study, however, because it lacks too many observations. In the quest for a reliable substitute, we begun from the consideration that corruption has crucially to do with government effectiveness. In this sense, a less corrupt country will be more effective for example in enacting laws and in fact in its observance and application. A country with a more effective system of governance, thus less corrupt, will be more mindful, accountable and committed in bringing about for example the intended objectives of foreign aid. We are, therefore, confident that the estimate of government effectiveness from the World Bank, which we shall name corruption-control, is a very good substitute for corruption and thus we use it as its proxy. Furthermore, interpreting government consumption as wasteful expending, that is, expending not directed at investment in productive activities (Boone, 1996); and when one conceives inflation as lack of fiscal discipline and poor macroeconomic management, government effectiveness or corruption-control will be sufficient in order to capture the input of those variables in an economic growth-foreign aid regression. Consequently, government consumption and inflation, two control variables that frequently appear in economic growth (GDP) and foreign aid regressions literature need not be specifically included in our regressions as our corruption-control variable (government effectiveness) encompasses them both. This will thus result in a leaner, simpler and more effective regression model.

(Aid*corruption-control) and (Aid*democracy):

The interaction between foreign aid and corruption-control and that between foreign aid and democracy are intended to test the second hypothesis of this paper. Thus, they are both design to capture the performance of aid in Sub-Saharan Africa, given an environment characterized by good and effective governance and therefore negligible levels of corruption that for the (aid*corruption-control) variable; and the performance of aid in a democratic environment for the (aid*democracy) interaction term. Hence, we expect both interaction variables to yield positive and relevant coefficients from the regression results.

(A.3) other controls

The reasoning behind the non inclusion of control variables other than those of our primary interest (savings, investment, democracy and corruption-control) is twofold:

Firstly, drawing from the Development Economics literature, we see that the essence of the aid-growth regressions is that we have a basic growth model coupled with the regressors that are of interest of the researcher in the study (Burnside and Dollar, 2000), (Hans and Tarp, 2001). Alongside that, we have the recognition that in the literature there is no consensus on the theoretical framework to guide empirical word on growth, and existing models to not completely specify the variables that should be held constant while conducting statistical inference on the relationship between growth and the variables of primary interest (Levine and Renelt, 1992). Therefore, we introduced savings and investment as the core of our growth model in order to meet the fundamental requirement of having a growth model in our regressions; mainly based on the broad macroeconomic conclusion drawn earlier in the Theoretical Framework (see section III) that the very first explanation of economic growth is that: 'we save, we invest, we grow' (Burda and Wyplosz, 2005).

Secondly, observing 'modern' growth equations, in particular, we see that there are multiple controls that the researchers' use which are expected to have an impact on economic growth. Take, for example, the in the literature widely publicised work of Robert Barro: Determinants of Economic Growth: A Cross-Country Empirical Study (1996); as growth determinants, Barro includes: democracy index, inflation rate, life expectancy, government consumption, fertility rate, male secondary and higher schooling. Here we acknowledge that because appropriate data from Sub-Saharan Africa on those controls is lacking, we are unable to include all of them. Besides, we could equally argue that the biggest share of those controls used in 'modern' growth regressions is already embedded in our primary controls. Consider, for instance, inflation rate and government consumption. One could argue that the government effectiveness variable which is the proxy of our corruption-control variable

comprises them both (see independent variables paragraph in Chapter IV for more details). In addition, investment provides jobs, education, access to health care and infrastructures development. One understands that in this sense investment is all encompassing. Hence, our investment control can entail literacy rate and life expectancy. For investments can be directed to education and health and sanitation, for example, which have a straight forward impact on literacy rate and life expectancy. This would imply that under the above assumptions, precluding the inclusion of the other controls explicitly in the regression, it should not bias the study results.

4.1 Model Specification and Description

In order to test our hypotheses, we shall make use of the feasible generalized least squares (FGLS or EGLS) estimation methodology. The use of EGLS is justified by the following:

(A) We have, as we pointed out in the data section, a panel data sampling design. This implies that we have repeated observations on the same units (countries) which possess two dimensions: an individual dimension (i) coupled with a time dimension (t). In this paper (i) ranges from 1 to 48, that is the 48 Sub-Saharan Africa countries included in the study, and (t) comprises of course the study's time frame from 1990 to 2010. Therefore, even though panel data offers several advantages such as reduction of collinearity among explanatory variables thus improving the efficiency of the estimates; accounting for a greater degree of heterogeneity that may characterize different cross-sections and identifying changes over time at individual level, for example; the very nature of panel data itself [(i) and (t) dimensions] makes it very hard to assume that different observations on the same individual are independent (Verbeek, 2008). So, there is a source of a potential heteroskedasticity and autocorrelation problem in panel data. In addition, panel data can be incomplete which results in unbalanced data set; (which is the case here with many African countries missing several observations). Using conventional OLS in these circumstances would result in biased standard errors and misleading inferences (Hansen, 2003). Therefore,

to circumvent those problems we can use EGLS. It is important to underline that the EGLS emanates from the generalized least square (GLS) which is a weighted least square estimator. The use of weights means that those observations with the most accurate information about the model parameters will get the highest weights, and the smallest weights are given to the observations with a higher variance; those that provide relatively little information about the ß. Moreover, ''the GLS estimator is simply an OLS estimator in a transformed model that satisfies the Gauss-Markov properties'' (Verbeek, 2008). Hence, although we could estimate our model using OLS with heteroskedasticity-and-autocorrelation-consistent standard errors, in the present case where we have an unbalanced but nonetheless reasonable large panel data set, we chose for EGLS because it offers a reasonably robust solution to the problems of misspecification, and asymptotically EGLS produces estimates which are more efficient than their OLS counterparts due to its smaller standard errors (Verbeek, 2008), (Hansen, 2003).

(B) As for the panel option Period SUR (Seemingly Unrelated Regression), it enables one to correct for both heteroskedasticity and general correlations between residuals in a given cross-section (see Eviews 7 User's Guide). That is exactly the reason why we make use of this option coupled of course with White's heteroskedasticity-consistent covariance matrix for the coefficient standard errors to accommodate the fact that EGLS Period SUR adjustment might just not be completely successful.

(C) The potential endogeneity problem of foreign aid

Although in the vast majority of aid-growth regressions, foreign aid is regarded as exogenous (Hans and Tarp, 2001); the possibility, however, that aid could be in fact endogenous has been a serious concern in recent aid-growth studies (Hans and Tarp, 2001), (Loxley and Sackey, 2008). Take, for instance, the reverse causality or simultaneity bias which may potentially arise because a poor country receives foreign aid given its poverty levels (in this case lower GDP per capita or poor economic growth), and in the same token donor countries

decide to allocate aid to this particular country precisely because it is poor or given its levels of perverty (Verbeek, 2008). In such conditions, applying the OLS would produce unreliable and inconsistent estimates. Hence, to remedy this potential endogeneity problem one of the solutions is to apply the Two-Stage least square estimation with the usage of instruments (Verbeek, 2008). In this paper, however, although we recognize the potential endogeneity problem of aid, we lack good instrument candidates. Consequently, we shall not apply the Two-Stage least square estimation.

(D) The problem of unobservables/fixed-effects

The issue of unobservales, that is, the influence of variables not specifically estimated in our regression but nevertheless could have an impact on the effect we try to measure and therefore may influence the interpretation of the results, is current in cross-section data. One of the solutions to this problem is to estimate the model by using fixed-effects (Siebert and Zubanov, 2009), (Verbeek, 2008). Although we ought to point out that, in general, the fixed-effects methodology responds to unobserved heterogeneity through within transformation (Verbeek, 2008), and that this procedure commands a huge drawback in as much as it eliminates the cross-sectional information, which is the principal strength of the panel data (Barro, 1996). Nonetheless, because we think that it is essential to quell the concerns about the potential unobservables problems, we shall apply the fixed-effects technique. Hence, consider, for instance, the general regression equation below:

Economic growth (i, t) = regression variables (i, t) X regression coefficients + error term (i, t).

Because we deal we cross-country panel data, the error in the above equation which captures all unboservables factors that affect the dependent variable (economic growth) comprises two different terms: I) each and every country specific error (i) and II) ordinary or common error term (i, t). Here, (i) is the index for each particular country and (t) is the time span of the study. Hence, estimating economic growth correctly in this context requires a

separate identification of the error terms. OLS estimator will treat both separate error terms as one which could produce inconsistent estimates. A practical solution to this potential problem is, therefore, to apply the fixed effects estimator which eliminates any time-invariant variables from the model (Verbeek, 2008). The reason behind the difference between OLS and fixed-effects lies on the fact that the effects of a country specific unboservables on economic growth are all, shall we say, caught up by the country specific error term and eliminated by the fixed-effects technique, whereas the OLS methodology does not eliminate the effects of the unobservales as it does not distinguish both constituents of the (total) error term. In moving forward, however, it is crucial to remind ourselves that our main estimation methodology is the feasible generalized least square, and in order to use fixed-effects in combination with EGLS and period SUR we need a balanced panel data set. But due to the limitations of Sub-Saharan Africa data collection we could not manage to escape the problem of unbalanced panel. Hence, even though the statistical software packet we use, Eviews, offers a solution to this problem by structuring and resizing the panel (procedure that would convert the panel from unbalanced into a balanced one) we, nonetheless, could not make use of this technique because of the huge discrepancies in the observations. And applying the structure and resize technique anyway would have resulted in an unusable panel. Therefore, to remedy the short-comings presented by EGLS, unbalanced panel and still use the fixed-effects technique, we had to resort to OLS fixed-effects.

(E) Regression Equations

The regression equations could be written as follows:

(E.1) HYPOTHESIS (I)

First, in seeking to test the assumption of Hypothesis (I) that foreign aid contributes in increasing savings and/or investment; we, firstly, regress savings (dependent variable) on aid (explanatory variable); and secondly, investment (dependent variable) on aid as follows:

Savings (i,t) = $ß_0$ (constant term) + **$ß_1$(aid(i,t))***+ $ß_2$ (investment(i,t)) + error term(i,t)

Investment (i,t) = $ß_0$ (constant term) + **$ß_1$(aid(i,t))*** + $ß_2$ (Savings(i,t)) + error term(i,t)

The coefficient of foreign aid on the equations above should be positive and statistically significant, which will imply that our expectations are met. Afterwards, we use savings and investment as explanatory variables that can explain economic growth which is the dependent variable as follows:

Economic Growth (i,t) = $ß_0$ (constant term) + **$ß_1$ (savings(i,t))*** + $ß_2$ **(investment(i,t))*** + error term(i,t)

The model above, thus, regresses economic growth on savings and investment. The individual coefficients of the explanatory variables, like in all other multiple regression models, represent marginal effects. That is:

$ðE[Yi|Xi] / ðXi_k = ß_k$.

Hence, $ß_k$ will measure the expected change in Y(t) (dependent variable) whenever Xi_k (an individual regressor) changes with one unit. But all the other independent variables remain constant or in other words to not change. This property is known as the ceteris paribus condition (Verbeek, 2008). This for the above model means that the effect of savings on economic growth is measured and/or evaluated given the presence of the other explanatory variable: investment; and vice-versa. We test the impact of each particular (singular) variable, for instance savings in our model, with a t-statistic test (Verbeek, 2008), (Moore, D. et al, 2003) through the following hypotheses:

H_0: $ß_1 = 0$

H_a: $ß_1 > 0$

The alternative hypothesis (Ha) could have been two-sided. That is, $ß_1 \neq 0$, implying that the impact of savings on economic growth could be either positive or negative. But because we expect that savings should increase economic growth (see reasons why and transmission mechanisms on the Theoretical Framework Chapter III), we formulate the alternative hypothesis as one-sided ($ß_1>0$). We proceed likewise when testing the individual impact of investment on economic growth; and for this matter the effect of any other singular right-hand side variables in a multiple regression analysis. The impact or significance of all explanatory variables together, for example savings and investment on growth is assessed by an F-test (Verbeek, 2008), (Moore, D. et al, 2003) as follows:

H_0: $ß_1 = ß_2 = 0$

H_a: H_0 is not true or at least $ß_1 \neq 0$ or ß2 ≠ 0.

(E.2) HYPOTHESIS (II)

We start by noting that the empirical workings of the assessment of the impact of the right-hand side variables on the dependent variable are absolutely equal to those described above with regard to Hypothesis (I). Furthermore, we will assess whether democracy and corruption-control would in fact ensure that foreign aid be channelled into savings and investment and in such environment foreign aid contribute in spurring economic growth as follows:

Savings(i,t) = $ß_0$(constant term) + $ß_1$(aid(i,t)) + $ß_2$(investment(i,t)) + $ß_3$(corruption-control(i,t) + **$ß_4$(aid*corruption-control(i,t))*** + $ß_5$(democracy(i,t) + **$ß_6$(aid*democracy(i,t))*** + error term(i,t)

Investment(i,t) = $ß_0$(constant term) + $ß_1$(aid(i,t)) + $ß_2$(savings(i,t)) + $ß_3$(corruption-control(i,t) + **$ß_4$(aid*corruption-control(i,t))*** $ß_5$(democracy(i,t) + **$ß_6$(aid*democracy(i,t))*** + error term(i,t).

The coefficients of the highlighted variables (*) are the core of our focus. That is, the interaction variables of aid with democracy and aid with corruption-control constitute our

primary interest, and so we expect that their coefficients should be positive and statistically significant. Regarding the interpretation of the statistical significance of the study variables, we proceed as follows: we check the P-value or probability of each variable. Because we have a specification of a null hypothesis, which is the hypothesis under test, we establish a reasonable significance level (α), usually 1%, 5% or 10% and then compare the calculated P-value from the regression result with the chosen or established significance value. If the P-value is greater than the significance level (α), [P-Value > α], we do not reject the null hypothesis. Otherwise, we reject it. Overall, low P-values will lead to the rejection of the null hypothesis (Moore, D. et al, 2003), (Verbeek, 2008), (Field, 2005).

4.2 Study Results

Table 2: Correlations matrix

	GDP	Aid	Savings	Investment
GDP	1.00	-0.05	-0.10	0.09
Aid	-0.05	1.00	0.07	0.05
Savings	-0.10	0.07	1.00	0.01
Investment	0.09	0.05	0.01	1.00

Table 1 depicts a simple exploratory partial correlation matrix of economic growth (GDP), foreign aid, savings and investment. It is intended to give an indication of the strength (high or low) and direction (positive, negative or none) of the linear relationship between the variables. The results show that all variables are weakly correlated with economic growth. In addition, where investment has a positive correlation with GDP, the correlation between aid with GDP and that between savings with GDP is negative. This implies that investment and economic growth will move in the same direction (which is desirable) whereas savings, aid and growth move in opposite directions (which is undesirable). Given, however, that these partial correlation results are only explanatory, we will not stress these particular relationships of these variables any further. We shall in turn concentrate on the full regression results which we present and discuss hereafter.

4.2.1 Regression Results

Table 3: EGLS regression results

Regression Results	Model(1) R^2=0.006 N=963	Model(2) R^2=0.010 N=963	Model(3) R^2=0.030 N=961	Model(4) R^2=0.060 N=530	Model(5) R^2=0.19 N=538
Dependent Variable	**Savings**	**Investment**	**Economic Growth**	**Economic Growth**	**Investment**
Aid	**0.034*** ** (0.012504)	**0.032*** ** (0.012491)	--------	**-2.34** ** (1.081696)	0.096* (0.056835)
Savings	----------	-0.002** (0.001094)	**-1.87*** ** (0.720508)	-1.86** (0.732097)	0.005 (0.003890)
Investment	0.002 (0.005034)	----------	**2.71** ** (1.250335)	2.72** (0.0258)	----------
Corruptionctrl	---------	----------	----------	---------	0.02*** (0.005421)
Aid*Corruptionctrl	---------	----------	----------	---------	**-0.03** (0.062563)
Democracy	---------	---------	----------	---------	-0.0003*** (0.000106)
Aid*Democracy	---------	----------	----------	---------	**0.002** (0.000665)
Regression Results	Model(6) R^2=0.033 N=550	Model(7) R^2=0.038 N=941	Model(8) R^2=0.09 N=538	Model(9) R^2=0.07 N=550	Model(10) R^2=0.033 N=941
Dependent Variable	**Investment**	**Investment**	**Savings**	**Savings**	**Savings**
Aid	0.14*** (0.051797)	0.06*** (0.014350)	-0.044 (0.043755)	-0.008 (0.031959)	0.05*** (0.020335)
Savings	0.00097 (0.004631)	-0.004*** (0.000947)	--------	--------	--------
Investment	----------	---------	0.0004 (0.002175)	-0.005*** (0.001455)	0.001 (0.0005648)
Corruptionctrl	0.014*** (0.004855)	---------	0.05*** (0.009034)	0.04*** (0.008012)	--------
Aid*Corruptionctrl	**0.06** (0.043132)	---------	**-0.008** (0.034055)	**0.0004** (0.023022)	--------
Democracy	---------	2.33E-05 (2.51E-05)	0.0002** (8.93E-05)	----------	0.0002*** (6.26E-05)
Aid*Democracy	---------	**0.0008*** ** (0.000169)	**-0.0003** (0.000298)	----------	**0.0005*** ** (0.000234)

Note: *, ** and *** show statistically significance at the 10%, 5% and 1% levels respectively. The values between parentheses are the standard deviations.

Table 4: OLS fixed-effects results

Regression Results	Model(1) R^2=0.24 N=963	Model(2) R^2=0.18 N=963	Model(3) R^2=0.22 N=961	Model(4) R^2=0.22 N=961	Model(5) R^2=0.20 N=538
Dependent Variable	**Savings**	**Investment**	**Economic Growth**	**Economic Growth**	**Investment**
Aid	**0.80** (0.729110)	**0.12*** (0.066279)	---------	**3.97** (5.046008)	0.010 (0.160249)
Savings	--------	-0.004 (0.005869)	**-3.75*** (2.154913)	-3.93* (2.169493)	-0.002 (0.010884)
Investment	-0.04 (0.050621)	--------	**-1.08** (2.407342)	-1.33 (2.257237)	--------
Corruptionctrl	---------	----------	----------	---------	0.087*** (0.028663)
Aid*Corruptionctrl	---------	----------	----------	---------	**-0.096** (0.115665)
Democracy	---------	---------	----------	---------	-0.003** (0.000309)
Aid*Democracy	---------	----------	----------	---------	**0.003***** (0.001126)
Regression Results	Model(6) R^2=0.20 N=550	Model(7) R^2=0.18 N=941	Model(8) R^2=0.36 N=538	Model(9) R^2=0.36 N=550	Model(10) R^2=0.25 N=941
Dependent Variable	**Investment**	**Investment**	**Savings**	**Savings**	**Savings**
Aid	0.39** (0.209771)	0.21*** (0.062432)	-1.02 (0.977917)	-0.60 (0.755548)	1.11 (0.966269)
Savings	-0.0006 (0.009554)	-0.008 (0.006729)	--------	--------	--------
Investment	--------	--------	-0.006 (0.029623)	-0.002 (0.027598)	-0.07 (0.071582)
Corruptionctrl	0.06** (0.024909)	--------	0.013 (0.062027)	-0.009 (0.054122)	--------
Aid*Corruptionctrl	**0.19** (0.120136)	--------	**-0.83** (0.714662)	**-0.43** (0.506201)	--------
Democracy	---------	-0.0003** (0.000140)	0.0002 (0.000351)	--------	-0.0008 (0.000997)
Aid*Democracy	---------	**0.003***** (0.000821)	**0.004** (0.002574)	--------	**0.0097** (0.008714)

Note: *, ** and *** show statistically significance at the 10%, 5% and 1% levels respectively. The values between parentheses are the standard deviations.

4.2.2 Regression Analyses

(A) Hypothesis (I)

In model (1), we regress savings on foreign aid and investment whilst in model (2) we regress investment on aid and savings. These models are designed to capture the argument we made in the Introduction and on the Theoretical Framework sections that foreign aid directed into savings and investment of the recipient countries in Sub-Saharan Africa can contribute in spurring economic growth (Chenery and Strout, 1996), (Sachs, 2005). In order words, both models seek to establish whether Hypothesis (I) receives support from the empirical data. The results of both models, in the EGLS specification, show that foreign aid has the intuitive and the expected coefficients: (0.034) and (0.032) for model (1) and (2) respectively; and that both are significant at 1% significance level. These results suggest that in this particular setting we have statistical indication that foreign aid could increase savings and investment in Sub-Saharan Africa countries and thus accelerate economic growth. The fixed-effects results show that aid can equally contribute in increasing investment: a one unit increase in foreign aid increases investment by 0.12 units. Because both variables are measured in thousand, this implies that for every $1000 increase in foreign aid towards Africa, an extra 12% increase in growth is obtained. Regarding savings, however, the result is somehow counter-intuitive. In theory, we expect that foreign aid would increase savings and, in fact, that is the assumption we made. But, although the aid coefficient is positive (0.80), this result is not statistically significant at any reasonable significance level (the aid P-value is 0.27), hence irrelevant. Model (3) which regresses directly economic growth on savings and investment shows equally counter-intuitive results. In the EGLS specification, the investment coefficient is positive and statistically significant whereas savings is negative. In the fixed-effects both savings and investment have negative and statistically significant coefficients. The pertinent question regarding these counter-intuitive findings, therefore, is why do we get such results when based on economic theory savings and investment should increase growth? The correlation matrix table 2 could shed some insight into this issue. The

table shows that the partial correlation between economic growth (GDP) and savings is weak and negative (r = -0.10) and that between growth and investment, although positive, is equally weak and fragile (r = 0.09). These weak correlations suggest that from this particular data we used there is not a reliable independent statistical relationship between the variables of our interest. This fact could be due to the well known African problem of missing observations; remember that our panel data set is unbalanced. Hence, the above could in part explain the lack of statistical significance shown by savings and investment in explaining growth in model (3), fixed-effects, and savings in the EGLS specification. Furthermore, the discrepancy in the magnitude and/or the statistical significance of the coefficients between both specifications (EGLS versus Fixed-effects) is not surprising. This expected heterogeneity is based on the fact that the EGLS and, in fact, the simple OLS models are expected to bundle together each country's specific error term and the total regression error term (see section 4.1 paragraph (D): the problem of unobservables/fixed-effects, page 25). In other words, the EGLS and the OLS models are set to pick up the fact that only those countries with high unobservables (perhaps those countries with relatively good and honest civil servants, good infrastructures, proper economic management, sound policies, well educated population/work force and the like) could relatively better ensure that foreign aid is well allocated. That is, directed into savings and investment and therefore increase economic growth. The fixed-effects, however, are expected to sweep aside the influence of those unobservables and that is precisely the reason why it is expected that its coefficients should be smaller and at times not statistically significant as it is the case in models (1), (2) and (3).

Summarizing, with regard to Hypothesis (I) that boosting savings and investment with foreign aid would increase growth in Sub-Saharan Africa; notwithstanding model (3) results, the empirical evidence from model (1) and model (2), EGLS specification, and the fixed-effects model (2), seems in essence to be in line with the macroeconomic theory which states that when countries save and invest, they grow (Burda and Wyplosz, 2005). In addition, it is important to note that the findings of both models (1) and (2) can be viewed as consistent and reliable for they have considerable support in the literature. For example,

Victor Levy on Aid and Growth in Sub-Saharan Africa: The Recent Experience (1988) found that foreign aid is positively and significantly correlated with investment and economic growth. Likewise, more recently, Gomanee, Girma and Morrissey (2005) studying specifically the mechanisms through which foreign aid could positively affect economic growth in Sub-Saharan Africa, found that investment is the transmission channel par excellence. In the same token, Ghura and Hadjimichael (1996), investigating empirically the determinants of per capita economic growth in Sub-Saharan Africa in the period 1981-92 found that an increase in investment has a relatively large positive effect on economic growth.

(B) Hypothesis (II)

In essence the foundation of Hypothesis (II) is the argument we made that the performance of foreign aid is a function of the environment where aid is delivered[3]. This premise does, however, imply the requirement to include interaction term variables among the regressors. Following shortly below, therefore, I will present a concise discussion on interactions terms before discussing their respective regression results.

(B.1) The interactions terms: (aid*democracy) and (aid*corruption-control)

Table 5: Covariance matrix

	Aid	Corruption-control	Democracy
Aid	0.01	-0.01	-0.32
Corruption-control	-0.01	0.35	3.63
Democracy	-0.32	3.63	406.80

[3] See section 1.1: Social and Scientific Relevance pages 9 and 10; and section 3.4: Aid, Democracy, Corruption-control and Economic Growth, page 22.

The covariance matrix table above shows that aid and democracy and aid and corruption-control are related to each other. This can be interpreted as an indication that the way in which foreign aid, democracy and indeed corruption-control affect economic growth merits further discussion. Hence, due to the fact that we used these three variables as controls in our regressions, it would imply that the effect of foreign aid might be dependent upon the value of democracy and corruption-control. The simplest way to account for such situations, where the effect of one predictor may depend up on the value of another predictor, in a regression is to include an interaction term (Moore, D. et al, 2003). We constructed and included, therefore, the interaction terms (aid*democracy) and (aid*corruption-control) in our regressions. Both are designed to capture the effects of foreign aid in an environment which is democratic and battles corruption.

The results show that starting from model (5) where we regress investment, among other predictors, on the interaction terms (aid*democracy) and (aid*corruption-control), ceteris paribus, that investment is positively and significantly explained by the interaction term (aid*democracy). A one unit increase in (aid*democracy) is expected to rise investment by 0.002 points. This result suggests that a democratic environment can influence the performance of foreign aid on investment and thus on economic growth. In other words, delivering foreign aid in a Sub-Saharan Africa country which is democratic could have a positive impact on growth. Regarding (aid*corruption-control) interaction term, however, its coefficient is negative, and with a P-value of (0.63) this result is not statistically significant at any acceptable significance level, therefore irrelevant. Model (8) which is similar to model (5) but then with savings as a dependent variable, shows results that seem to indicate that both (aid*democracy) and (aid*corruption-control) are not relevant in explaining savings. Given, however, that in model (5) as well as in model (8) we lumped together both interaction terms, we still have the alternative choice of running two apart regressions: one with (aid*corruption-control) and the other with (aid*democracy). This was done with models (6) and (7) for investment as dependent variable and models (9) and (10) for savings.

These individual models equally serve the purpose of firstly testing the overall accuracy of the estimates and the validity of the results by removing some of the regressors from the full model (5) for investment and model (8) for savings. Secondly, rule out the possibility of multicollinearity between corruption-control and democracy and indeed their respective interaction terms with aid (Moore, D. et al, 2003). Finally, it is important to mention that in similar cases with at least one quantitative or factorial independent variable it is the interactions between variables that are the most interesting as they can produce effects that could not be predicted from looking at the effects of either aid, democracy or corruption-control alone; and that sometimes main effects can produce misleading results (Field, 2005). Following the above procedure, we found for the EGLS specification that starting with investment; both interaction terms show positive and statistically significant coefficients. In model (6), (aid*corruption-control): (0.014) and in model (7), (aid*democracy): (0.0008). These results seem thus to indicate that delivering foreign aid in a less corrupt and democratic environments in Sub-Saharan Africa could enhance economic growth. Turning now to model (9) and (10) with savings as dependent variable, we see that (aid*corruption-control) although positive (0.0004), it remains irrelevant. Whereas the other interaction term (aid*democracy) becomes positive (0.0005) and statistically significant at a 5% significance level (P-Value: 0.02). In the fixed-effects specification, only the (aid*democracy) interaction term, model (7), is positive and statistically significant. These findings do suggest that the EGLS results which are positive and significant might again be bundling together a country's specific error term with the total regression error term. Therefore, caution is required in interpreting these results. Hence, while the positive and statistically significant EGLS interaction coefficients could be interpreted as indicating that aid could increase economic growth in a non-corrupt and democratic environment; in the same token, however, the fixed-effects results coupled with the tiny magnitude of the EGLS coefficients are plausible to be interpreted as suggesting that the possible aid effects, given by its interaction with corruption-control and democracy, are limited and possibly negligible. Summarizing, therefore, with regard to Hypothesis (II), one can say that given that the interaction terms with savings[4] as dependent variable produced mixed results: a positive but

not statistically significant coefficient for (aid*corruption-control) and (aid*democracy) with a positive and statistical significant coefficient, nonetheless tiny in magnitude; coupled with the fact that investment[5] has the expected results for both (aid*corruption-control) and (aid*democracy), cautiously the conclusion can be drawn that in Sub-Saharan Africa countries the environment in which foreign aid is delivered can be a relevant factor on whether foreign aid through savings and investment can have a positive impact in spurring economic growth. Even though, one should equally recognise and underline, that giving the magnitude of some coefficients the foreign aid effect on growth might be fragile and/or limited and not as decisive as one would have preferred. Furthermore, we ought to recognise that neither a democratic governance system nor corruption-control can be achieved over night. Time is a necessary requirement. This implies that we need to take into account the time dimension of both democracy and corruption-control. In fact, if we take the majority of the present Western democracies, we shall see that many of them have taken centuries of institutions building to get where they are presently democracy and corruption-control wise. Hence, in this context, it is essential to consider how both democracy and corruption-control have been evolving over time in Sub-Saharan Africa (in our study period at least).

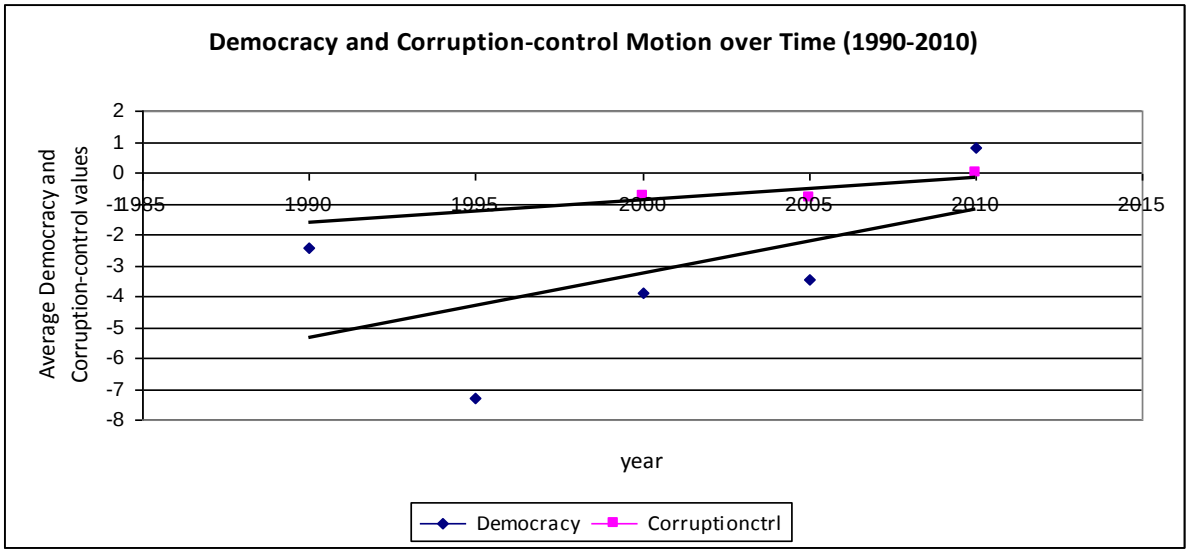
[4]

EGLS	Coefficient	P-value	FIXED-EFFECTS	Coefficient	P-value
(aid*corruption-control)	(0.0004)	(0.98)	(aid*corruption-control)	(-0.43)	(0.40)
(aid*democracy)	(0.0005)	(0.02)	(aid*democracy)	(0.0097)	(0.26)

[5]

EGLS	Coefficient	P-value	FIXED-EFFECTS	Coefficient	P-value
(aid*corruption-control)	(0.06)	(0.13)	(aid*corruption-control)	(0.19)	(0.11)
(aid*democracy)	(0.0008)	(0.0000)	(aid*democracy)	(0.0008)	(0.0011)

Figure 8: Evolution of Democracy and Corruption-control over time



Source: African Development Indicators (World Bank, 2012).

Figure 8 depicts average democracy and corruption-control of Sub-Saharan Africa based on all countries in our study panel for the selected years: 1990, 1995, 2000, 2005 and 2010. The figure shows that democracy and corruption-control have been evolving upwards. In fact, the trend line on both variables displays a positive increase, although one should be guarded in taking these trend lines at face value. However, focusing exclusively on the fact that democracy and corruption-control seem to be evolving positively over time, this would suggest that if both trends materialize, this could imply that as countries improve their democratic governance systems and fight corruption they can become more efficient and effective in whatever endeavour they embark on. Consequently, regarding foreign aid, in particular, a more democratic governance system with institutions which are less prone to corruption should be instrumental in enhancing the performance of foreign aid in Africa.

(C) Robustness Checks and Regression Results Validity

To confirm the results robustness it is usual to undertake sensitivity tests which encompass investigating the results found to alternative definitions of key variables of the regression

equation (Siebert and Zubanov, 2009), (Papps, Bryson and Gomez, 2010). Hence, because democracy entails strong institutions, accountability, checks and balances between at least the three centres of power in a democratic system of governance (executive, legislative and judicial powers); and corruption-control in its essence measures the observance of law, I shall use the rule of law as a proxy for both democracy and corruption-control.

Table 6: Results of Regression Analyses with alternative definitions for democracy and corruption-control explaining economic growth (GDP) in Sub-Saharan Africa

Regression Models	Model(1) R^2=0.07 N=555	Model(2) R^2=0.04 N=551
Dependent variable	**Savings**	**Investment**
Aid	-0.07** (0.027246)	0.16*** (0.051763)
Savings	---------	0.0003 (0.004501)
Investment	-0.007*** (0.001768)	----------
Rule of Law	0.04*** (0.006761)	0.02*** (0.005094)
Aid*Rule of Law	-0.04** (0.015953)	0.07** (0.031743)

Note: *, ** and *** show statistically significance at the 10%, 5% and 1% levels respectively. The values between parentheses are the standard deviations.

Table 5 reports the results for the alternative definitions of democracy and corruption-control. In both models we focus on the coefficient of the interaction term (aid*rule-of-law). In model (1), we see that although its coefficient is statistically significant, its sign is counter-intuitive. Model (2), however, shows that, ceteris paribus, the interaction term (aid*rule-of-law) is positive and statistically significant. This implies that foreign aid could promote economic growth in an environment characterized by democracy and corruption-control. Hence, as it was already the case in the main results where we had a mixed picture concerning the environment in which foreign aid is delivered and its impact on economic growth; because table 5 results suggest the same, we can conclude that overall our main

regression findings can be considered to be robust to the use of different measures for democracy and corruption-control.

(C.1) Regression Results Validity

In principle, the regression model, which is the basis for inference, imposes four (4) main conditions which the regression results should meet in order to be considered valid and robust. Those conditions are: I) the data should be a simple random sample of the population; II) the sample data should show a roughly linear pattern in a scatter plot; III) homoskedasticity or the constant variance principle, that is, the regression residuals should be roughly uniform (no curved pattern) and IV) Normal distribution (Moore, D. et al, 2003).

Figure 9: Study regression residuals

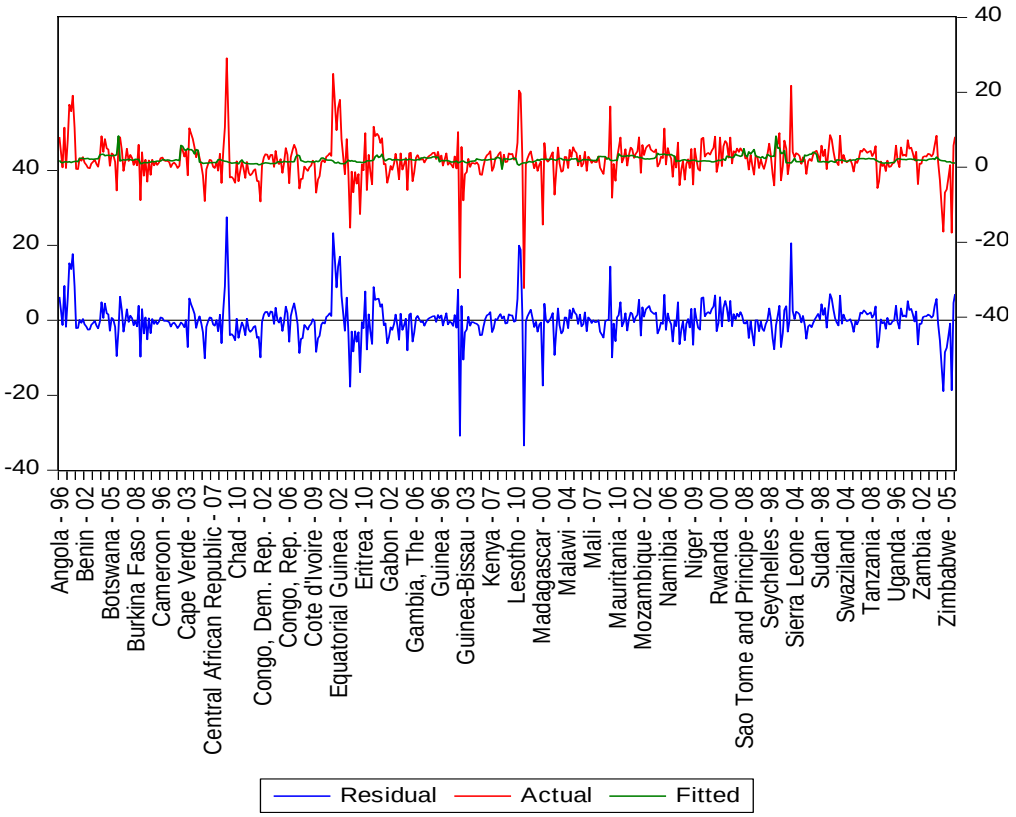


Figure 9 depicts the regressions residuals. As we can see, the residuals have small values, which is an indication that the model fits well the sample data. Apart from a few observations corresponding to the Central African Republic, Guinea, Mali, Lesotho and Zimbabwe where one detects the presence of some outliers on the residuals patterns (remember that we used an unbalanced panel data set), overall the observations are fairly random and evenly distributed across the horizontal axis of the plot. This smooth pattern is an indication that, in one hand, the assumptions of linearity and homoskedasticity of the residuals are met. In the other hand, although we recognized the presence of a few outliers in the data, the plot shows that the variance across the residuals is not increasing which indicates the absence of heteroskedasticity which is expected, in fact, as we did control for it by using period SUR in combination with White's heteroskedasticity-consistent standard errors. Hence, we can conclude that the results are fairly valid and robust.

Chapter V: Conclusion and Recommendations

This paper examined 48 Sub-Saharan Africa countries in a time period covering the years 1990 up to 2010. The main purpose of the paper was twofold: firstly, to find empirical evidence whether boosting savings and investment in Sub-Saharan Africa with foreign aid would increase economic growth (Hypothesis (I)); and secondly, whether democracy and corruption-control in Sub-Saharan Africa would ensure that foreign aid is channeled into savings and investment and in such environment aid increase economic growth (Hypothesis (II)). With regard to Hypothesis (I), we could cautiously conclude that, in line with previous literature, we found empirical support for the hypothesis, in as much as model (1) and model (2) showed foreign aid with the expected positive and statistically significant coefficients. As for Hypothesis (II), we conclude that the evidence from our results is mixed. The environment in which foreign aid is delivered seem to be relevant in spurring growth in Sub-Saharan Africa through investment, as both interaction terms (aid*corruption-control) and (aid*democracy) have the expected positive and statistically significant coefficients; but via savings, however, the results are not so clear. The interaction term (aid*corruption-control)

is negative and statistically irrelevant whereas the (aid*democracy) variable is, as expected, positive and statistically sound (see model (9) and model (10) respectively). Therefore, overall, our findings can be summarized in two main guidelines as follows: Firstly, from the perspective of donor countries, foreign aid to Sub-Saharan Africa countries is relevant as aid can be instrumental in contributing to enhance economic growth through savings and investment. Secondly, because there is some evidence which suggests that the environment in which foreign is delivered is important, Sub-Saharan Africa countries should embrace democracy and fight corruption.

Finally, given that we had to work with an unbalanced panel due to the incompleteness of observations concerning multiple African countries, this paper regression results should be taken with caution, as issues related to data can bias the results one way or the other. However, further research on this topic with better data would be interesting.

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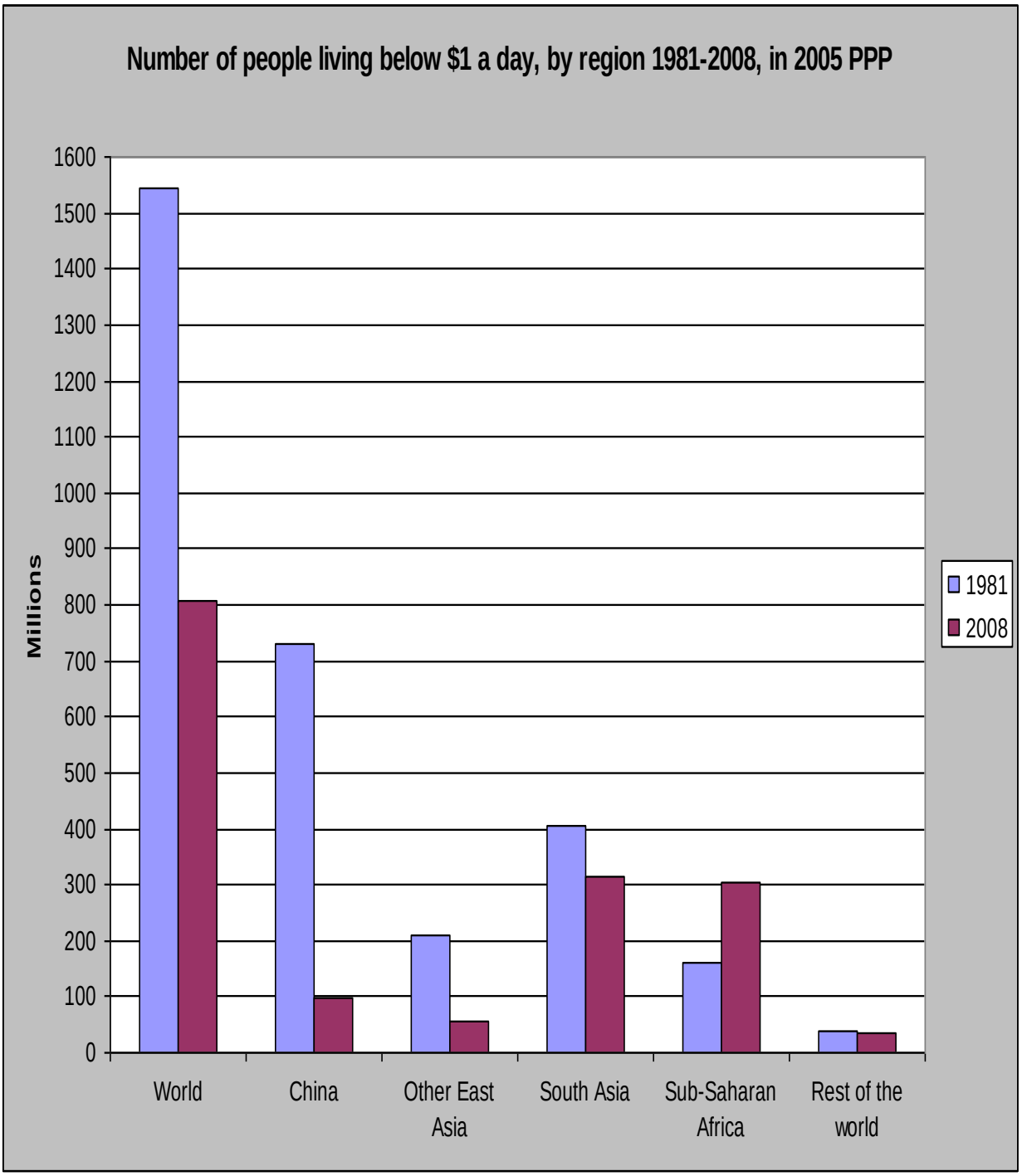
Appendix A



Source: Chen and Ravallion (World Bank, 2012)

Appendix B

Table 7: List of the studied Sub-Saharan Africa countries

List of Sub-Saharan Africa Countries			
1	Angola	25	Madagascar
2	Benin	26	Malawi
3	Botswana	27	Mali
4	Burundi	28	Mauritania
5	Cameroon	29	Mauritius
6	Cape Verde	30	Mozambique
7	Central African Republic	31	Namibia
8	Chad	32	Niger
9	Comoros	33	Nigeria
10	Congo (RDC)	34	Rwanda
11	Congo (Republic of)	35	Sao Tome & Principe
12	Cote d'Ivoire	36	Senegal
13	Djibouti	37	Seychelles
14	Equatorial Guinea	38	Sierra Leone
15	Eritrea	39	Somali
16	Ethiopia	40	South Africa
17	Gabon	41	Sudan
18	Gambia	42	South Sudan
19	Ghana	43	Swaziland
20	Guinea	44	Tanzania
21	Guinea-Bissau	45	Togo
22	Kenya	46	Uganda
23	Lesotho	47	Zambia
24	Liberia	48	Zimbabwe

Source: World Bank , 2012.