

Foreign Aid and Economic Growth in Sub-Saharan Africa

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ABSTRACT

Since the end of the Second World War, developing countries have been the recipient of significant amounts of foreign aid, provided mainly with the aim of easing poverty and promoting economic growth and development. Sub-Saharan Africa, a region of forty-eight countries with a combined population of over nine hundred million as of 2013, has consistently been one of the largest recipients of foreign aid. For example, in 2012, the region received a share of over twenty five per cent of total world aid. As such, the effectiveness of aid in Sub-Saharan Africa is of particular interest to researchers and both donor and recipient countries alike. The main objective of this study is to empirically examine the impact of foreign aid on this region over the period 1970 to 2012, through fixed effect panel data analysis. A sample of twenty-five Sub-Saharan African countries is considered in the study. The findings of the study indicate that aid has a significant positive long-term impact on per capita GDP growth over the period under consideration. This significant positive effect of aid is not subject to diminishing marginal returns, nor is conditional on the level of freedom in the country. Furthermore, upon sectoral decomposition of aid commitments, certain sectors are identified as having a more significant impact on growth over the sub-period 1995 to 2012. Aid designated for social infrastructure, in particular education and health, and general budget support has a positive, significant impact on growth. Given the shorter time frame, these results are not as robust as those for the 1970 to 2012 period, but nonetheless provide a unique insight into the effect of sector-earmarked aid on growth in Sub-Saharan Africa, as well as guidance for aid allocation policy-makers.

Key Words: foreign aid, growth, sectoral aid, Sub-Saharan Africa

JEL: F35, N27, O55

1. INTRODUCTION

1.1 Background

Foreign aid, or Official Development Assistance (ODA), is defined by the Development Assistance Committee (DAC) as “government aid designed to promote the economic development and welfare of developing countries” (OECD, 2014). One measure of the effectiveness of ODA is economic growth, which has been confirmed by numerous empirical studies to be a necessary requirement for the achievement of sustained economic development and poverty reduction (Dollar and Kraay, 2002). Although the necessity of economic growth is undisputed, the idea that foreign aid is needed to promote growth in developing countries remains highly controversial (Snowdon, 2009).

The relationship between foreign aid receipts and economic growth has been the subject of countless studies since the 1950s, following the success of the Marshall Plan, whereby in 1948 US foreign aid significantly contributed to the rebuilding of war-torn Europe. Initial findings were optimistic (Papanek, 1972); however, subsequent studies reached conflicting conclusions, with several notable cross-country studies finding that aid, in fact, had a negative impact on growth (Griffin and Enos, 1970; Easterly, 1999). Currently, the common view is that, on average, aid is effective, although there is still much debate. Many researchers argue that aid is conditional on certain factors, and a large portion of the current literature is dedicated to finding the environment in which aid is most effective. Others disagree, finding that a “good” policy environment is not necessary for the achievement of aid-induced economic growth.

At present, the debate over the aid-growth relationship is particularly relevant to Sub-Saharan Africa (henceforth, SSA) for a number of reasons. Most notably, the principal objective of the United Nation’s Millennium Development Goals, to reduce poverty to half of the 1990 level by 2015, is probably not going to be met in SSA despite substantial aid flows (Addison et al, 2005). In addition, there are increasing signs of donor fatigue as a result of the global financial crisis and growing concern for government debt levels (OECD, 2012), which threaten to further stagnate economic development in the region.

Research into the effect of aid in SSA benefits both donors and recipients, as findings can improve understanding of how different types of aid work, which types have the greatest impact, and the environment in which aid is most effective. Outcomes of such research can

facilitate the design and implementation of policies that are capable of improving aid effectiveness further, as well as enhance the capacity of aid-recipient countries to use aid effectively. In addition, findings in support of the effectiveness of aid can help overcome donor fatigue and renew interest in the cause.

1.2 Objectives and Significance

The primary objective of this paper is to estimate the aid-growth relationship in SSA. The study will use panel data from twenty-five Sub-Saharan African countries over the period 1970 to 2012. A standard growth model, consistent with much of the cross-country growth literature, will be estimated to determine the effect, if any, of aid, in whole and disaggregated form. This paper will contribute to the SSA area of the aid-effectiveness literature, which has in the past found that aid generally has a positive, albeit small, impact on growth in the region. In addition, the impact of sector-disaggregated aid on growth over the sub-period 1995 to 2012 will be considered. Although the literature regarding the impact of disaggregated aid is growing, to the best of the author's knowledge, the impact of aid commitments by purpose has not been studied in the context of SSA, thus this paper aims to fill this gap in the literature.

This study finds that foreign aid has a positive significant impact on growth and that the effect is lagged by approximately twelve years. In addition, aid in the form of grants is found to be more effective than loans. Analysis of the sub-period 1995 to 2012 finds that aid has a lagged effect of approximately nine years, which is dependent on the sector to which aid is allocated and whether aid takes the form of grants or loans. These findings are particularly applicable to policymakers who allocate aid with the aim of maximizing the impact on economic growth and development. This emphasises the importance of the purpose for which aid is donated, rather than the aid recipient environment, which has dominated the aid allocation debate for some time.

1.3 Paper Structure

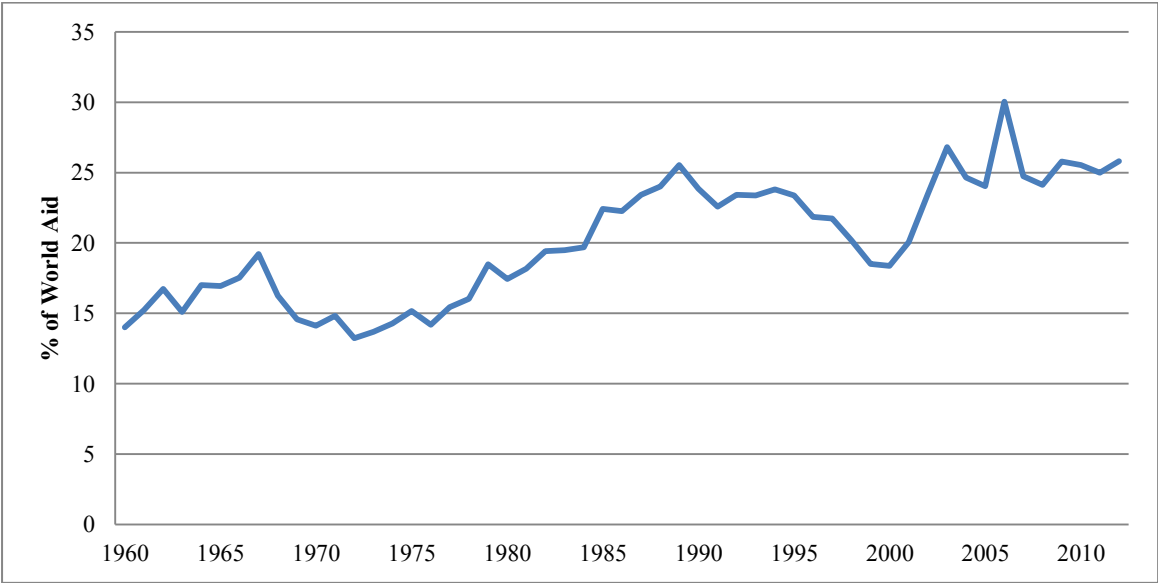
The remainder of this paper is structured as follows. Section 2 provides an overview of SSA's experience with foreign aid and economic growth. Section 3 outlines the empirical analysis of aid and growth in SSA. Finally, limitations to the study, concluding remarks and suggestions for future research are presented in Section 4.

**2. FOREIGN AID AND ECONOMIC GROWTH IN
SUB-SAHARAN AFRICA: AN OVERVIEW**

2.1 Trends in Foreign Aid and Economic Growth

SSA has been a major recipient of foreign aid since 1960. Aid disbursements to the region continued to grow throughout the 1960s, 70s and 80s, until a major decline in multilateral and bilateral aid disbursements in the mid 1990s. Concerningly, this decline in aid was not due wholly to an overall contraction in world aid donations, but also to the tendency for donors to allocate away from Africa, in favour of East Europe and East Asia, regions with much higher living standards (Addison et al, 2005). This sharp decline in aid from approximately 1995 to 2000 can be clearly seen in Figure 3.1. Fortunately, aid allocation to the region has since improved. Allocation peaked in 2006, when SSA received over thirty percent of world aid. Most recently in 2012, SSA received a twenty-five percent share.

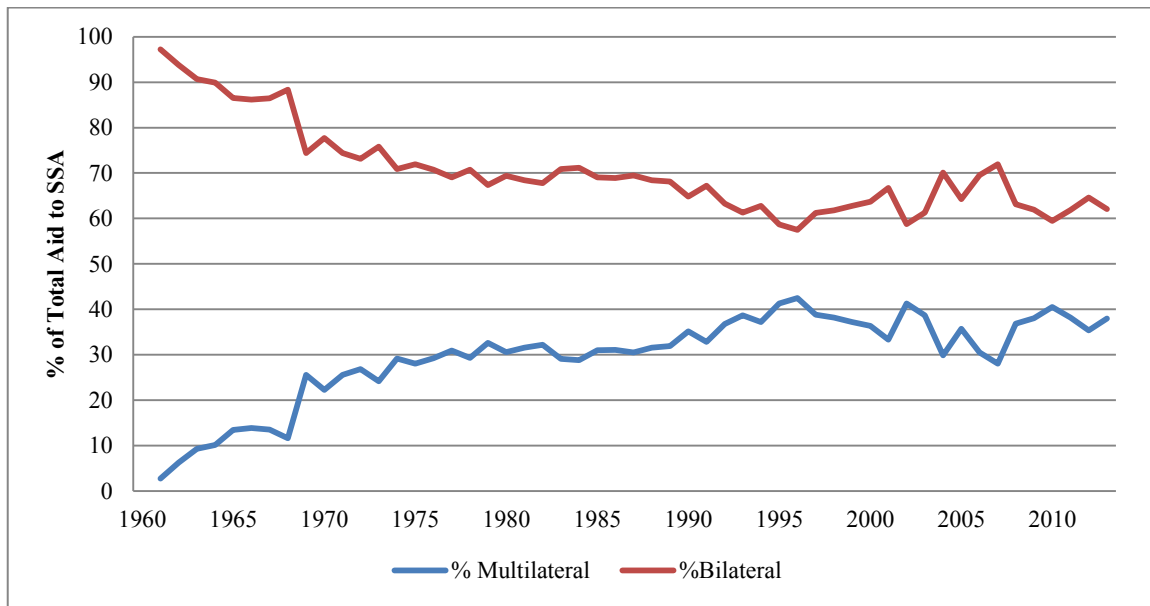
Figure 2.1 Percentage of World Aid to SSA, 1960-2012



Source: Derived by Author from OECD DAC2a data

The composition of aid to SSA has also undergone significant change. In 1960, aid to the region stemmed almost entirely from bilateral donors. Since then, the share of multilateral aid has continually increased, from around thirty percent throughout the 1970s and 80s, to approximately forty percent in 2012. The change in composition can be seen in Figure 3.2 below.

Figure 2.2 Multilateral and Bilateral Aid to SSA, 1960-2012



Source: Derived by Author from OECD DAC2a data

A more detailed view of the changing donor composition is presented in Table 3.1. DAC donors have consistently accounted for the largest proportion of aid, at around sixty percent each decade. France and the United States are the largest individual donors, each supplying around twelve percent of aid from 1970 to 2012, with France’s share falling and the United States’ share rising over the period. Other significant donors are the United Kingdom and Germany, who each supplied approximately six percent of all aid to SSA. In total, these four donors account for around thirty-six percent of aid donations from 1970 to 2012. The biggest change in terms of donor composition comes from non-DAC donors. From 1970 to 1979 they supplied ten percent of total aid, largely from Saudi Arabia and the UAE. However, from 2000 to 2012 non-DAC donors accounted for less than one percent of all aid. In terms of multilateral aid, the largest donors are the IDA and EU institutions, who respectively provided eleven and ten percent of aid over the forty year period.

Table 2.1 Aid to SSA by Donor as a Percentage of Total Aid

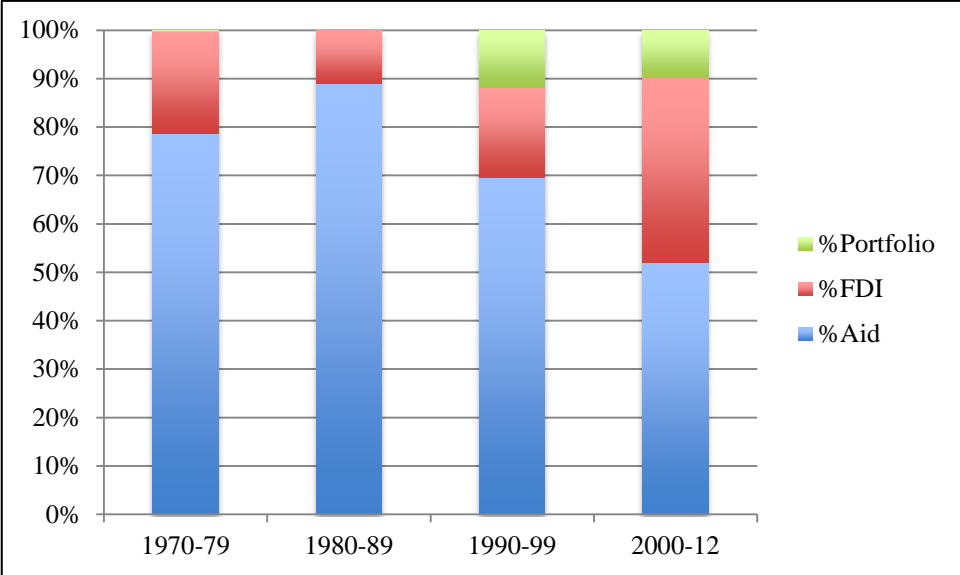
Donor	1970-79	1980-89	1990-99	2000-12	1970-2012
Bilateral, Total	71.40	68.58	61.63	64.14	64.49
DAC Countries, Total	60.76	63.21	60.82	63.47	62.71
Belgium	4.95	2.27	1.34	1.99	2.01
Canada	4.24	3.10	1.89	2.59	2.57
Denmark	1.68	1.67	2.23	1.96	1.97
France	16.96	14.33	15.45	8.82	11.47
Germany	8.21	7.44	7.16	5.37	6.19
Italy	0.57	5.82	3.03	1.52	2.43
Japan	1.89	4.59	6.03	3.91	4.41
Netherlands	3.20	3.75	3.47	3.37	3.44
Norway	1.59	2.08	2.22	2.05	2.08
Sweden	3.86	3.26	2.89	2.28	2.63
United Kingdom	5.36	3.99	3.96	7.74	6.24
United States	6.85	7.99	6.13	15.94	12.17
Other DAC	1.4	2.92	5.02	5.93	5.1
Non-DAC Countries, Total	10.65	5.36	0.81	0.67	1.78
Saudi Arabia	4.80	3.07	0.20	0.04	0.70
United Arab Emirates	3.02	0.61	0.09	0.22	0.37
Other Non-DAC	2.83	1.68	0.52	0.41	0.71
Multilateral, Total	28.60	31.42	38.37	35.86	35.51
African Development Fund	0.44	2.21	3.45	3.56	3.21
EU Institutions	9.95	8.43	10.81	10.59	10.32
IDA	6.30	9.78	12.92	11.58	11.41
IMF (Concessional Trust Funds)	0	0.84	2.35	1.61	1.61
Global Fund	0	0	0	2.68	1.57
Other Multilateral	11.91	10.16	8.84	5.84	7.39

Source: Calculated by Author from OECD DAC2a data

ODA has consistently accounted for a significant proportion of total foreign inflows to SSA. Figure 3.3 shows how the proportion of total inflows accounted for by aid, FDI and portfolio investment has evolved by decade. From 1970 to 1979, aid accounted for just less than eighty percent of all inflows. Over the next ten years, aid represented an even greater proportion of inflows, almost ninety percent. FDI and portfolio investment increased in the 1990s, which saw the share of foreign aid fall to about seventy percent. Investment continued to rise in the millennium, with the total inflows from 2000 to 2012 shared almost evenly between portfolio

and foreign direct investment, and aid. Although these figures indicate that Africa’s aid dependency has fallen, aid continues to be a significant source of finance to the region and is unlikely to be replaced by foreign investment any time soon.

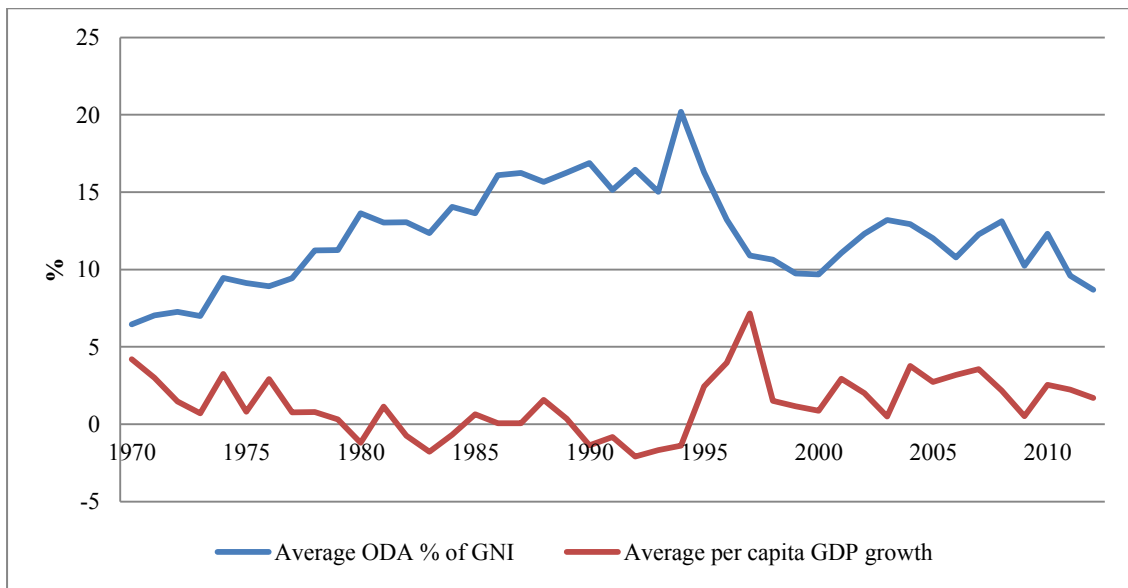
Figure 2.3 Composition of Foreign Inflows to SSA by Decade



Source: Derived by Author from WB WDI data

The most common way to measure the amount of aid a country receives is to take the ratio of aid to national income. Figure 3.4 depicts the change in the average ratio of ODA to GNI as well as the change in per capita GDP growth from 1970 to 2012. The average aid to GDP ratio for Sub-Saharan African countries has varied significantly since 1970, growing from seven percent in 1971, to twenty percent in 1994, before falling to below ten percent in 1999. The 2012 average ratio was just below nine percent. Average per capita GDP growth in the region has also fluctuated, varying between a trough value of negative two percent (1992) and a peak of seven percent (1997). On a basic level, if aid were to increase economic growth, the path of growth would be expected to follow a similar path to aid ratios, possibly lagged by a number of years. Until around 1993, growth and aid ratios tend to move in opposite directions. However, post the peak aid ratio in 1995, growth does significantly increase until its peak in 1997 and subsequently decline along with aid. A continued pattern of correlation between aid and growth could be argued from 1998 to 2012.

Figure 2.4 Average Per Capita Growth and Aid Ratios in SSA, 1970-2012



Source: Derived by Author from WD WDI data

Table 3.2 presents average aid to GDP ratios and average per capita growth rates by decade for each of the twenty-five SSA countries included in the sample for empirical analysis. There is a wide variation of aid ratios over the course of the study. Gambia had the highest aid ratio in the first and second decade at twenty-one percent and thirty-two percent, respectively. Rwanda had an average aid to GDP ratio of thirty-two percent in the 1990s, the highest of the decade. In the 2000s, Sierra Leone has the highest ratio at twenty-three percent, followed by Rwanda and Malawi at just under twenty percent. Countries that have consistently received high amounts of aid are Central African Republic, Gambia, Lesotho, Malawi, Mali, Niger, Rwanda, Tanzania and Zambia, with an aid to GDP ratio greater than ten percent in three of the four decades. South Africa has received the least aid over the period, receiving no aid for the first two decades, and a small amount, less than one percent of GDP, for the subsequent decades.

Average growth appears to have improved over the four decades. In the 1970s, twelve countries recorded growth of less than one percent. Growth was weakest in the 1980s with twenty countries experiencing growth below one percent. There was a small improvement in the 1990s with sixteen countries recording low growth. From 2000 to 2010, eight countries recorded poor growth, and seventeen countries had growth over one percent. Only five countries, Benin, Botswana, Lesotho, Mauritius and Swaziland, have achieved positive average growth in every decade.

Table 2.2 Average Aid/GDP ratio and Average Growth by Country and Decade

Country	1971-1980		1981-1990		1991-2000		2001-2010	
	Growth	Aid	Growth	Aid	Growth	Aid	Growth	Aid
Benin	0.22	6.5	0.33	9.5	1.15	12	0.70	9.26
Botswana	11.08	13	7.36	7.5	2.45	2	2.76	1.47
Cameroon	3.86	4	0.51	2.5	-1.33	5	0.71	5.10
Central African Republic	-0.85	10.5	-1.31	15	-0.97	13	2.62	9.18
Congo Republic	-2.21	2.2	-1.85	5.5	-8.24	3	1.80	17.45
Democratic Republic of Congo	3.48	6.5	2.22	5	-1.22	8	1.86	5.51
Gambia	1.86	21.5	-0.56	32	0.32	8	0.69	11.22
Ghana	-1.75	3	-0.77	6.5	1.70	10	3.19	8.95
Kenya	4.27	4	0.35	8.5	-1.00	7	1.41	4.26
Lesotho	5.49	18	1.77	29	2.29	13	3.14	8.13
Madagascar	-1.78	3.5	-2.15	9	-1.33	12	-0.25	11.96
Malawi	2.90	9.5	-1.90	17.5	1.85	26	0.06	19.89
Mali	2.47	12.5	-0.86	20.5	1.48	17	2.78	12.65
Mauritius	5.24	1.5	5.08	3.5	4.15	1	2.99	0.71
Niger	-1.17	9	-2.67	14	-1.63	15.5	0.83	13.86
Rwanda	2.29	13	-1.32	10.5	1.20	30.5	5.22	19.89
Senegal	-0.95	6.5	-0.37	12.5	0.34	11	1.32	8.52
Sierra Leone	0.01	3.5	-1.41	9	-2.55	20	3.22	23.10
South Africa	1.12	0	-0.91	0	-0.41	0.5	2.06	0.34
Swaziland	3.19	7	5.58	6	0.82	3	1.12	1.82
Tanzania	0.61	6	-0.31	12	0.12	14.5	4.02	12.76
Togo	1.81	8	-2.15	13	0.03	10	-0.44	6.46
Uganda	-4.21	2.5	0.38	7.5	3.14	15.5	3.90	13.45
Zambia	-1.87	4	-1.84	12.5	-1.74	25.5	2.82	13.80
Zimbabwe	-0.11	0.5	0.77	3.5	0.10	5.5	-4.79	6.32

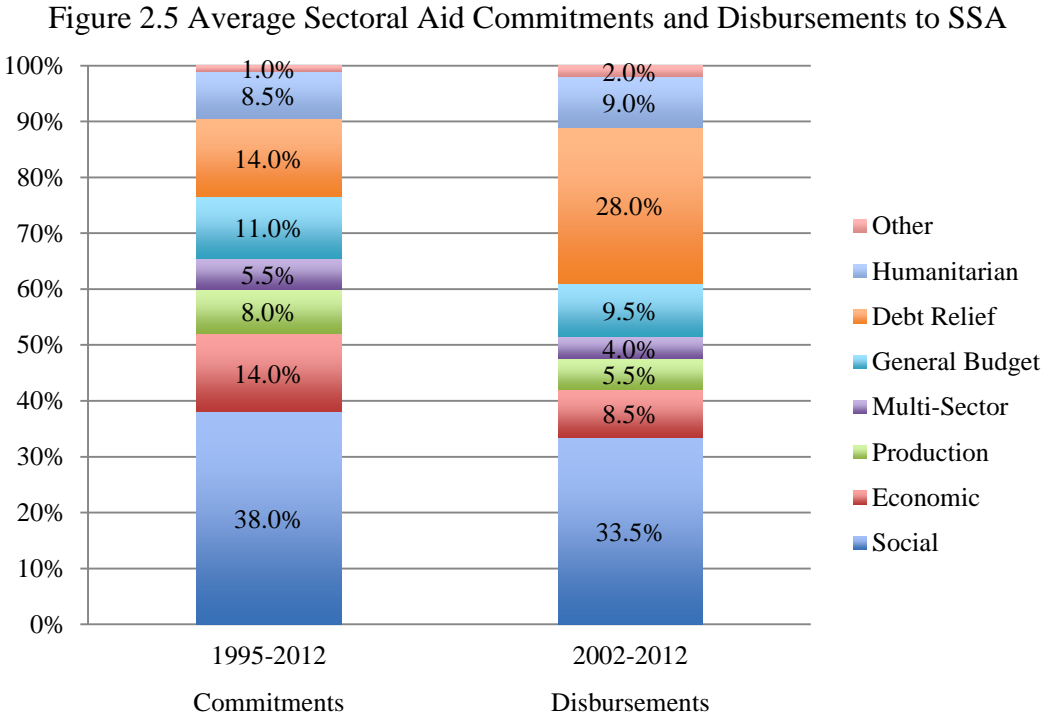
Source: Calculated by Author from WB WDI data

2.2 Trends in Sectoral Aid

Data on sectoral aid commitments to SSA is available from 1995 onwards. The breakdown of aid committed to each sector is shown in Figure 3.5. On average, the majority of aid, thirty-eight percent, is committed to social infrastructure and services, which comprises education, health, population policy and reproductive health, water supply and sanitation, and government and civil society. Aid for the purpose of debt-relief and economic infrastructure and services were the next largest sectors, each receiving an average of fourteen percent of

total aid commitments from 1995 to 2012. The next largest recipient sector is general aid, which comprises general government budget support, food aid and food security, and imports support. Production sectors include agriculture, forestry, fishing, industry, mining, construction, trade policies and tourism, and account for eight percent of total commitments, as does humanitarian aid. Six percent of aid was committed to multisector, which comprises general environment protection, urban development, rural development, and research.

Data on sectoral disbursements to SSA is only available from 2002 onwards. The proportion of aid disbursed to each sector from 2002 to 2012 is shown in the right-hand column in figure 3.5. Composition of average commitments for the comparable period is very similar to the 1995 to 2012 period. Thus, the major difference between commitments and disbursements appears to be the proportion of aid allocated to debt relief. Only fourteen percent of aid was committed to debt-relief, while twenty eight percent was disbursed for that purpose. A slightly larger proportion was disbursed to humanitarian aid than originally committed. Social sector aid received around five percent less aid than committed, and each other sector around two percent less.



Source: Calculated by Author from OECD CRS data

2.3 Empirical Aid-Growth Relationship

Barro (1991) was the first to identify the region of African developing countries as having a significantly different empirical growth equation to other developing regions. Since then, an Africa dummy included in growth regressions, including aid-growth regressions, has continually been found negative and significant¹. The explanation for this result remains highly controversial (Snowdon, 2009).

Collier and Gunning (1999) consider several possible intrinsic and policy-dependent explanations for Africa's slow growth, including adverse external influences and conditions, terms of trade volatility, poor policies, unfavourable demographic factors, geographical constraints, political instability, ethnic tensions, and a lack of physical and social infrastructure. They note that it is not possible to determine through regression analysis whether slow growth is due to unobserved geography or unobserved microeconomic policies since they are not well proxied for in the literature. Sachs et al (2004) argue that low agricultural productivity, heavy disease burdens, and adverse geopolitics are the cause of persistent low growth in SSA.

The SSA aid-growth literature attempts to account for a number of these observable factors in their growth regressions. Several empirical analyses estimate the effect of aid on growth in Sub-Saharan Africa and Africa. The majority of studies find that aid has a positive and significant, albeit small, impact on growth in SSA². Good governance (Armah and Nelson, 2008) and social cohesion (Baliamoune-Lutz, 2012) are identified as factors that enhance the effectiveness of aid in the region.

¹ See, for example, Barro and Lee (1993), Easterly and Levine (1997) and Jerven (2011).

² See Levy (1988); Gyimah-Brempong (1992); Hadjimichael et al (1995) Goumanee, Girma & Morrissey (2005); Armah and Nelson (2008); Loxley and Sackey (2008); Ndambendia and Njoupouognigni (2010) and Balde (2011).

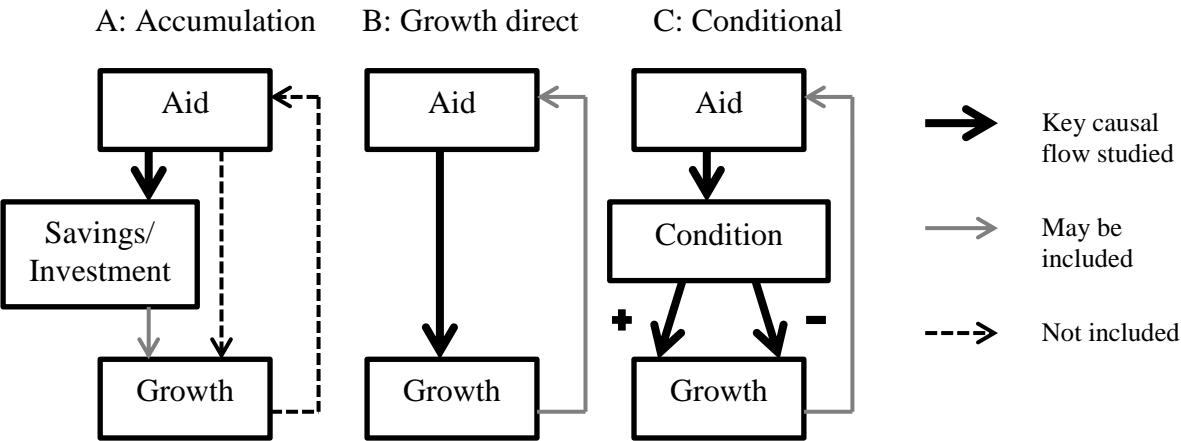
3. FOREIGN AID AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA: AN EMPIRICAL ANALYSIS

3.1 Methodology Framework

The empirical analysis of aid and growth in this study has two objectives; firstly, to estimate the long-term impact of aid on growth in SSA over the period 1970 to 2012, and secondly, to estimate the impact of sectoral aid on growth in SSA over the sub-period 1995 to 2012.

The three general types of growth relationships investigated in the vast aid effectiveness literature are depicted in Figure 2.2. The impact of aid on savings or investment, and the impact of savings and investment on growth, was estimated in the first series of aid studies, as shown in “A”. The second model, “B”, estimates the direct impact of aid on growth, and was characteristic of the second generation of literature. The likely endogeneity of aid and growth was accounted for in the third generation of literature, as was the possibility of the conditional effectiveness of aid, depicted in structure “C”. This study explores the aid-growth relationship in SSA through estimation of variants of models “B” and “C”.

Figure 3.1 Causal Structure of the Aid-Growth Model



Source: Created by Author from Figure 1, Doucouliagos and Paldam (2008: 4).

Throughout the analysis, a panel data model with fixed country and period effects is employed³. The importance of the use of country effects to account for individual country heterogeneity has been recognised throughout the third generation literature (Hansen and Tarp, 2001). While the countries in the sample share a number of attributes as a function of their geographical location in SSA, others, such as colonial history, political regime and

³ The Hausman specification test indicated that fixed effects rather than random effects is the more appropriate estimator.

religious affiliations, are country specific and cannot be accounted for in the regression model. Failure to account for this heterogeneity would bias the results, regardless of the sample size. Period effects are included to account for time factors that relate to the world business cycle and similarly affect all countries across a single time period.

The endogeneity of aid is now widely recognized in the aid effectiveness literature (Islam, 1995; Rajan and Subramanian, 2005; Baliaoune-Lutz, 2012). The issue is one of reverse causality, stemming from the donor aid allocation process (Moreira, 2005). Foreign aid is often donated on the basis of level of income, with poorer countries tending to be the largest aid recipients. The negative relationship between per capita income and aid is well established empirically⁴. In addition, foreign aid may be donated to countries with lower levels of growth, with the aim of improving growth in that country, or alternatively, to countries achieving higher levels of growth, on the basis that they have a proven track record and a greater perceived potential to use aid effectively (Rajan and Subramanian, 2005). To avoid serious bias in estimation, this endogeneity needs to be accounted for in regression analysis. The use of lagged aid instead of current aid is a common way to overcome this issue, and is particularly effective since aid is unlikely to have an immediate impact on growth⁵. This is the method employed throughout this analysis⁶. Furthermore, each variable measured as a ratio of current GDP is lagged by one period to eliminate any endogeneity with the dependent variable, per capita GDP growth.

The endogeneity of macroeconomic variables is another issue that has been raised in the literature (Boone, 1996; Hansen and Tarp, 2001; Rajan and Subramanian, 2005). While not as widely dealt with as the endogeneity of aid and growth, there is the possibility that other explanatory variables in the growth regression, such as policy indicators, may be endogenously related to aid. To account for this endogeneity, many studies use a vector of instruments for aid. This approach is challenging, however, due to the difficulty of finding exogenous instrumental variables. The usefulness of macroeconomic indicators as instruments has been discussed extensively throughout the growth literature, with several researchers pointing to persistent correlations between macroeconomic policy indicators and country

⁴ See, for example, Trumbull and Wall (1994) and Alesina and Dollar (2000).

⁵ See Hadjimichael et al (1995) or Hansen and Tarp (2001), for example.

⁶ The Generalised Method of Moments estimator, which effectively addresses the issue of endogeneity, is not required in this study since endogeneity is eliminated by the use of lagged variables.

specific factors that render them not strictly exogenous and therefore inappropriate instruments⁷.

3.2 Long-Term Impact of Aid on Growth

This first stage of the empirical analysis seeks to estimate the long-term effect of aid on economic growth in SSA from 1970 to 2012. The analysis, which accounts for endogeneity and includes policy and institutional variables, contributes to the third-generation of the Sub-Saharan African aid-growth literature.

3.2.1 Model Specification

The growth model is estimated as follows:

$$Y_{it} = \alpha_0 + \alpha_n N_{it} + \alpha_x X_{it} + \alpha_p P_{it} + \varepsilon_{it}$$

where Y_{it} is per capita GDP growth of the i th country for period t , N_{it} is a vector of variables of interest, X_{it} is a vector of variables traditionally included in the growth equation, and P_{it} is a vector of variables derived from the new growth theory.

The variables of interest (N_{it}) are aid, aid squared and an aid-freedom interaction variable. The traditional variables (X_{it}) are FDI, GDI, government consumption, and imports (all as a percentage of GDP), as well as initial GDP per capita for the period, and the population growth rate. Included in P_{it} are freedom, conflict, initial life expectancy, exports and interest repayments on external debt. Both exports and interest repayments are percentage ratios of GDP.

3.2.2 Description of Data and Variables

The estimation uses unbalanced panel data for a cross-section of twenty-five SSA countries. Where available, the data spans 1970 to 2012 and is divided into eleven 4-year averages. This approach, which is consistent with the literature, captures the development of trends rather than the occurrence of cycles, and ensures results are comparable to previous empirical aid studies⁸. Further details on the countries included in the sample and the availability of data are provided in Appendix 1, as well as variable definitions and sources. Variable descriptive statistics and a correlation matrix are provided in Appendix 2.

⁷See, for example, Easterly and Levine (1997) and Temple (1998).

⁸Most aid-growth studies use either four or five year averages. See for example, Gomanee et al. (2005) and Loxley and Sackey (2008).

The dependent variable used in this study is per capita GDP growth. This is consistent with most current aid studies, which use per capita growth in order to account for population growth and measure the real annual increase in GDP. Some studies use the Penn World Table (PWT) PPP adjusted growth rates instead of nominal growth rates, however, Guillaumont et al (1999) test both and obtain similar results for either measurement. Therefore, the choice of dependent variable should not significantly impact the results.

A key variable in any growth equation is initial per capita GDP, which is included to control for convergence and initial country conditions⁹. This variable is particularly important when considering a sample of developing countries, since it is likely that countries at different levels of economic development have different capacities to utilize resources in order to generate economic growth (Gyimah-Brempong, 1992). The variable takes the value of GDP per capita (in constant US dollars) in the year prior to the beginning of the period.

Population growth serves as a proxy for the growth rate of the labour force and is expected to have a negative or insignificant effect on growth.

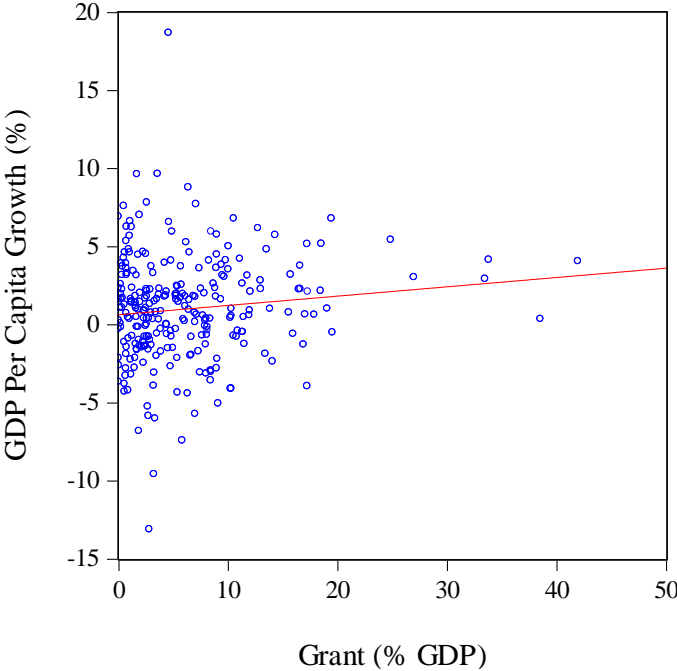
Several policy and institutional variables are included to improve the explanatory power of the model. The level of conflict is included to account for economic contraction experienced during periods of conflict due to the disruption of the normal functioning of a country. The freedom variable is an inverse ranking based on the level of civil liberties and political rights in a country, and is expected to be negatively related to growth. Imports and exports are proxy measures for trade openness, which is generally positively related to economic growth. Imports are also one of the transmission mechanisms for aid in the gap model of growth, whereby aid can increase the capacity of a recipient country to import capital goods necessary for investment. Interest repayments on external debt could plausibly have either a negative or positive impact on growth. If the repayment is for an existing debt, which is not financing current investment, the variable may have no effect on growth. A negative impact may be observed if existing productive spending is reduced as a result of repayments. Alternatively, an increase in interest repayments may be the result of an increase in borrowing financed investment, which could raise the productive capacity of the economy and increase economic growth.

Various measures of aid from a number of data sources are used to test the effect of aid on growth. Details of these aid measures can be found in Appendix 3. The total aid measure

⁹ See, for example, Moreira (2005) or Rajan and Subramanian (2005).

used in this study is net ODA. Grants, the portion of ODA for which there is no repayment requirement, are expected to have a larger impact on growth than net ODA. Data on aid by donor, and multilateral and bilateral aid flows are available from the OECD DAC2a database and were used to compile various measures of aid, each expected to have a different impact on growth. Given the results of previous studies, it is expected that aid will have a positive albeit, small, impact on growth¹⁰.

Figure 3.1 Scatterplot of Growth and Grants



Source: Calculated by Author.

Figure 4.1, a scatterplot of the dependent variable, per capita GDP growth, and the key variable of interest, grants as a percentage of GDP, shows a slight positive relationship between the two variables. There does not visibly appear to be any major outliers that are likely to be driving the observable positive trend.

3.2.3 Empirical Results

Table 4.1 presents the results obtained from the regression of growth against grants and a number of traditional control variables that are characteristic of the first and second-generation literature. FDI, GDI, government consumption and imports are all transmission mechanisms in the gap model of growth, however none of the variables are significant in the

¹⁰ See Levy (1988); Gyimah-Brempong (1992); Hadjimichael et al (1995) Goumanee, Girma & Morrissey (2005); Armah and Nelson (2008); Loxley and Sackey (2008); Ndambendia and Njoupouognigni (2010) and Balde (2011).

regressions. This could be due to the lag structure employed; these variables may have an immediate, rather than a delayed, impact on growth.

Aid is tested at different lags to examine the time it takes for aid to impact growth. Using the least squares dummy variable (LSDV) method, grants lagged by one period, grant (-1), is found to be negative and insignificant. Grant (-2) is positive and significant when regressed independently, however, when grant (-2) and grant (-3) are regressed simultaneously only grant (-3) is significant. Grant (-3) is positive and highly significant for both ordinary least squares (OLS) and least squares dummy variable (LSDV) regressions. The logarithm of initial GDP is found to be negative, as predicted, and highly significant in all LSDV regressions.

Additional control variables, derived from new growth theory and third generation aid literature, are introduced to the model in Table 4.2. The adjusted R^2 value of the model increases by approximately 0.05, confirming the improved explanatory power of the extended model. While the coefficient on grant (-3) remains positive, its significance and size is reduced. This observation emphasises the importance of the inclusion of policy and institutional variables to ensure the effect of aid is not overestimated as a result of omitted variable bias. Population growth becomes a significant factor, and is negative, as expected. Freedom is consistently negative and highly significant, indicating that a lower level of freedom, which equates to a higher freedom score, negatively impacts growth. Interest repayments as a percentage of GDP are positive and intermittently significant, possibly indicating that debt is financing productive, growth-creating investment. The logarithm of initial life expectancy is generally found to be positive and statistically significant.

The aid-growth relationship over the sub-period 1982 to 1997 is tested in regression 2. Over this period, grant (-3) has a highly significant, much larger, positive effect. In addition, imports and exports were significant at the 5% level. Imports had a positive effect, suggesting that imports were used to increase the productive capacity of the economy. Exports had a negative impact on growth, possibly due to a reduction in dependency on foreign currency, and an increase in production of domestic goods, which contributes to growth. Over the sub-period 1998 to 2012, only grants (-2) were significant, with a relatively large, positive coefficient. The relatively smaller impact of grant (-3) in the overall regression, 1982 to 2012, is explained by the differing impact of grants observed over each sub-period.

The non-linearity and conditionality of aid are tested in regressions 4 and 5 in Table 4.2 and Table A3.1. Aid squared is found to be insignificant in both regressions, indicating that the

effect of aid on growth is predominately linear and that there are not diminishing returns to aid. This is consistent with Armah and Nelson (2008) who also find no evidence of a non-linear relationship between aid and growth in SSA. The conditionality of aid is tested through interacting aid with freedom. The interaction term is found to be insignificant, suggesting that the effectiveness of aid in SSA is not conditional upon the level of freedom in the recipient country.

Fixed country and period effects from regressions 2 to 4 in Table 4.2 are presented in Table A3.1, Appendix 3. From 1982 to 1989 and 2006 to 2012, the residual time period effect is positive. Only six countries in the sample, Botswana, Cameroon, Congo Republic, Mauritius, South Africa and Swaziland, had a positive residual effect on growth in all three periods examined. The remaining countries had an overall negative effect on growth, although eight countries had a positive impact on growth in one of the two sub-periods.

Table A3.1, in Appendix 3, presents the results of the regression of total aid, ODA, on growth. The model follows the same basic formula, with ODA, which includes grants, loans and technical assistance grants, tested as the aid variable rather than grants alone. The coefficient on ODA is consistently around half the size than the coefficient on grants for the equivalent regression, indicating that loans and technical assistance grants are less effective than grants at accelerating growth.

Table A3.2 tests the impact of multilateral and bilateral aid. Bilateral grants only affected growth significantly over the period 1982 to 1997, while bilateral ODA had no impact. Multilateral grants and ODA impacted growth positively and significantly from 1998 to 2012. There appears to be a shift in effectiveness of bilateral grants in 1982 to 1997, to multilateral grants in 1998 to 2012. Bilateral ODA (-2) and (-3) had no effect on growth over across any time period, while multilateral ODA (-3) positively and significantly (at the 10% level) impacted growth in all three time periods. Although multilateral aid appears have a greater impact on growth than bilateral aid, given the relatively large share of total aid that bilateral aid represents and the many donors it comprises, there is not a strong argument that bilateral aid is ineffective at promoting growth. Further disaggregation of bilateral aid would be necessary to determine whether aid from certain donors is more effective than others.

Bilateral aid was further disaggregated through the estimation of development and non-developmental aid. Bilateral aid flows from a number of development friendly countries, as proposed in Minoiu and Reddy (2010), were pooled to form development aid, while the

residual bilateral aid flows formed non-developmental aid. No meaningful difference between the effects of the two types of aid could be established. As such, the results of the regression of three versions of development and non-developmental aid upon growth are not reported in this paper.

The adjusted R^2 values, which range from 0.441 to 0.518, and significant f-statistics, indicate that the overall model is very robust. Table A2.1 presents a sensitivity analysis, which demonstrates the robustness of the aid-growth relationship to changes in specification. Grants are regressed independently as well as jointly at various lags to ensure that the model is not suffering from multicollinearity bias. The best-fit model, regression 3, which was used as the base model for further linear and conditional analysis, has highest R^2 value, f-statistic and log likelihood. Regression 7 tests a dynamic model with the inclusion of the lagged dependent variable, growth (-1), which is found to be insignificant. The Durbin-Watson statistic, which consistently has a value very close to 2, indicates that there is little to no serial correlation of residuals, further verification of the robustness of the model.

Table 3.2 Aid-Growth Regressions with Traditional Growth Variables, 1970-2012

	(1) 1974-2012	(2) 1978-2012	(3) 1982-2012	(4) 1982-2012	(5) 1982-2012
Grant (-1)	0.004 (0.061)				
Grant (-2)		0.082** (0.038)		0.054 (0.042)	0.047 (0.044)
Grant (-3)			0.156*** (0.051)	0.138*** (0.047)	0.133*** (0.039)
FDI (-1)	0.049 (0.058)	0.037 (0.056)	0.032 (0.058)	0.028 (0.058)	0.115 (0.065)
GDI (-1)	0.011 (0.032)	0.023 (0.034)	-0.001 (0.037)	-0.002 (0.037)	0.013 (0.038)
Govt Cons (-1)	-0.015 (0.042)	-0.006 (0.043)	0.020 (0.044)	0.019 (0.045)	-0.076* (0.042)
Imports (-1)	0.010 (0.025)	-0.007 (0.024)	0.004 (0.026)	-0.002 (0.027)	0.014 (0.012)
Pop Growth	0.000 (0.299)	0.008 (0.274)	-0.040 (0.260)	-0.045 (0.266)	-0.384* (0.208)
Log Initial GDP	-4.560*** (1.078)	-4.999*** (1.162)	-5.830*** (1.506)	-5.608*** (1.538)	0.170 (0.119)
Intercept	29.561*** (6.992)	32.298*** (7.600)	37.040*** (9.812)	35.731*** (10.002)	
Periods included	10	9	8	8	8
Countries included	25	25	25	25	25
Method	LSDV	LSDV	LSDV	LSDV	OLS
Observations	227	214	193	193	193
Adjusted R ²	0.328	0.364	0.390	0.390	0.116
Log Likelihood	-515.940	-482.137	-428.051	-427.383	-481.562
F-Statistic	3.756***	4.124***	4.232***	4.153***	
DW Statistic	1.858	1.930	1.966	1.994	1.601

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table 3.3 Aid-Growth Regressions with New-Growth Variables, 1970-2012

	(1) 1982- 2012	(2) 1982- 1997	(3) 1998- 2012	(4) 1982- 2012	(5) 1982- 2012	(6) 1982- 2012	(7) 1982- 2012
Grant (-2)	0.038 (0.047)	-0.293* (0.174)	0.148** (0.058)				
Grant (-3)	0.098* (0.052)	0.943*** (0.287)	0.075 (0.050)	0.104* (0.057)	0.229* (0.118)	0.074 (0.128)	0.169*** (0.039)
Grant (-3) Squared					-0.004 (0.003)		
Grant (-3) *Freedom						0.020 (0.079)	
FDI (-1)	0.085 (0.061)	-0.051 (0.179)	0.026 (0.107)	0.088 (0.061)	0.088 (0.062)	0.088 (0.061)	0.097 (0.064)
GDI (-1)	-0.056 (0.042)	-0.105 (0.074)	-0.098 (0.081)	-0.056 (0.042)	-0.061 (0.042)	-0.055 (0.044)	-0.002 (0.036)
Govt Cons (-1)	-0.010 (0.055)	0.034 (0.096)	-0.235* (0.134)	-0.007 (0.054)	-0.001 (0.055)	-0.008 (0.055)	-0.085 (0.041)
Imports (-1)	0.019 (0.038)	0.129** (0.058)	0.020 (0.072)	0.023 (0.037)	0.020 (0.038)	0.023 (0.037)	0.019 (0.013)
Pop Growth	-0.513* (0.303)	-0.922** (0.395)	0.604 (0.524)	-0.544* (0.296)	-0.531* (0.289)	-0.534 (0.307)	-0.085 (0.266)
Log Initial GDP	-5.349*** (1.599)	-2.762 (2.954)	-5.059 (3.092)	-5.496*** (1.558)	-5.291*** (1.562)	-5.519*** (1.585)	0.183 (0.404)
Int Repay (-1)	0.318 (0.200)	-0.201 (0.410)	0.620 (0.060)	0.331* (0.199)	0.379* (0.202)	0.330 (0.199)	-0.298 (0.153)
Exports (-1)	-0.042 (0.034)	-0.181** (0.089)	-0.042 (0.060)	-0.041 (0.034)	-0.042 (0.035)	-0.040 (0.035)	0.014 (0.019)
Conflict	-0.881 (0.600)	-0.498 (0.709)	-1.904 *(1.032)	-0.953 (0.589)	-0.942 (0.591)	-0.937 (0.603)	0.285 (0.466)
Freedom	-1.432*** (0.497)	-1.174** (0.510)	-2.175** (1.014)	-1.375*** (0.476)	-1.369*** (0.476)	-1.468** (0.631)	-1.272 (0.310)
Log Life Exp	5.506* (3.009)	5.069 (5.254)	15.529** (6.670)	6.229** (2.784)	6.078** (2.764)	6.177** (2.812)	0.227 (0.227)
Intercept	16.812 (14.963)	1.858 (26.814)	-22.948 (35.172)	14.841 (14.709)	13.754 (14.479)	15.301 (15.127)	
Method	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	OLS
Periods	8	4	4	8	8	8	8
Countries	25	24	25	25	25	25	25
Observations	193	94	99	193	193	193	193
Adjusted R ²	0.443	0.518	0.477	0.445	0.446	0.441	0.209
Log Likelihood	-415.516	-190.074	-177.862	-415.845	-414.966	-415.805	-468.685
F-Statistic	4.467***	3.568***	3.236***	4.574***	4.511***	4.443	
Durbin Watson	2.068	2.403	2.158	2.033	2.012	2.034	1.826

Robust White heteroskedastic consistent standard errors are reported in parentheses.
***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

3.3 Impact of Sectoral Aid on Growth

This section of the empirical analysis contributes to the disaggregated aid-growth literature, which examines the impact of different types of aid on growth¹¹. The importance of disaggregation of aid to avoid aggregation bias has long been recognized in the literature, however empirical application has only occurred more recently. This study employs recently available data to estimate the impact of earmarked sectoral aid, aid allocated for a specific purpose, on growth in SSA over the sub-period 1995 to 2012.

3.3.1 Model Specification

The model follows the same formula as previously, the only difference being the modification of a selection of variables. As seen before, the relationship between aid and growth is estimated by the following equation:

$$Y_{it} = \alpha_0 + \alpha_n N_{it} + \alpha_x X_{it} + \alpha_p P_{it} + \varepsilon_{it}$$

where Y_{it} is per capita GDP growth of the i th country for period t , N_{it} is a vector of variables of interest, X_{it} is a vector of variables traditionally included in the growth equation, and P_{it} is a vector of variables derived from the new growth theory.

The variables of interest are aid commitments, which are divided into seven sectors by intended purpose, with each overall sector further disaggregated into various components. The vector of traditional growth variables remains unchanged. Inflation is included in addition to previous variables in P_{it} , along with an indicator of governance, in place of the level of freedom.

3.3.2 Description of Data and Variables

Data on sectoral aid from the OECD Creditor Reporting System (CRS) is used to test the impact of sector specific aid on growth. Sector allocable aid is divided into four sectors: social, economic, production and multisector. The remaining portion of aid is classified as general aid, debt relief, humanitarian aid, and unallocated aid. A detailed breakdown of all sectors and their components is available in Appendix 1 under the heading, Sectoral Aid Definitions.

Since aid is not homogeneous, it is likely that the effectiveness of aid in promoting economic

¹¹ See Clemens et al (2004), Rajan and Subramanian (2005), Heady (2008), and Minoiu and Reddy (2010) for examples of studies that employ disaggregated aid variables.

growth will depend upon the type of aid received (Gyimah-Brempong, 1992). In this study, it is expected that the impact of aid will depend upon its objective. Aid intended to finance investment, like economic and production aid, is expected to impact growth immediately. Aid to finance welfare and human capital requirements, such as social infrastructure aid, is likely to increase growth over the longer term. Humanitarian aid, which includes emergency disaster relief, often increases during periods of low or negative economic growth. As such, it is unlikely to increase economic growth in the short run, although it may have a positive effect on growth over the longer term. The effect of general aid, which is a form of untied aid, depends on the absorptive capacity of the recipient country. Aid for debt relief could potentially affect growth positively if a lower debt burden frees up funds for investment purposes.

Data on inflation becomes available for SSA during the 1990s from the World Bank World Development Indicators, and is expected to have a negative impact on growth.

World Bank Worldwide Governance Indicators (WGI) are available from 1996 and provide an annual score for a range of indicators of governance, which include political stability as well as control of corruption, voice and accountability, rule of law, government effectiveness, and regulatory effectiveness. Of all the indicators, political stability had the largest impact on growth, thus was selected for inclusion in the final model. Two other indicators, control of corruption and voice and accountability, also had a significant impact on growth, although are not included in any regressions due to a high level of correlation with political stability. An overall score of governance based on the WGI is also tested for comparative purposes.

3.3.3 Empirical Results

Throughout the sectoral regression analysis, two types of aid measures, grants and ODA, are tested and presented side by side. In preliminary analysis, three lags of the aid variable were tested, -1, -2, and -3, however only the third lag is presented since sectoral aid had the greatest significance at this lag. As such, the regressions estimate the impact of sectoral aid, lagged by approximately nine years, on economic growth.

Table 4.3 shows the results of the overall sectoral regressions. Both political stability and overall governance have a large, positive effect on growth, significant at the 1% level. Initial GDP continues to have a negative, although much larger effect on growth, and, again, population growth has a negative effect, which is significant at the 10% level. Inflation was

insignificant, and had a very small, negative coefficient, which rounded to zero, as presented in the table.

Social infrastructure grants and ODA are significant and positive at the 5% level. General grants and ODA also have a significant positive effect on growth in three periods time. Multisector grants had a negative effect on growth, significant at the 10% level. Unallocated ODA had a significant negative impact on growth, while unallocated grants were insignificant. Aid for economic infrastructure, production, debt relief, and humanitarian purposes were insignificant.

In order to determine if specific components within each sector of aid are responsible for the overall sector effect, further disaggregated sector regressions were performed. The results of these regressions are presented in Tables A3.5 to A3.9, Appendix 3.

Within social sector aid, aid for education consistently has a significant effect on growth. The effect is positive and somewhat larger for grants than ODA. This finding is consistent with studies that find the stock of human capital and level of investment in education to be positively associated with growth¹². Another study by Asiedu and Nandwa (2007) finds that only certain components of education aid positively impact growth, while aggregate education aid is insignificant. They use a sample of developing countries not limited to SSA, which may explain the different effect of overall education. ODA for the health sector is found to have a large positive effect on growth, significant at the 5% level, while health grants are insignificant. ODA for government is significant at the 10% and 5% level when political stability and the overall governance score, respectively, is included as the governance indicator.

When economic aid is disaggregated into its overall components, none of the five sectors impact growth significantly. The sectors are somewhat broad, however, and further disaggregation of the components of those sectors may be needed to determine whether any particular component of economic aid has a significant impact on growth.

Although the overall effect of production aid is insignificant, when analysing the components, tourism has a very large, highly significant, positive effect on growth, which is around the same size for both grants and ODA. Industry aid, which comprises aid to industry, mining and construction, has a positive effect on growth. The effect is more robust when ODA is used as the aid measure, rather than grants.

¹² See McMahon (1998) and Keller (2006), for example.

There are two components of multisector aid, environment and other. Grants for the environment have a positive significant effect, while other multisector grants have a negative significant effect when political stability is employed as the governance indicator. Other multisector ODA, however, has a positive, significant effect on growth. This suggests that multisector loans are more effective than grants when allocated to “other”. Grants to environment, however, seem to be more effective than loans.

General aid comprises general budget support, food aid, capital import support and commodity import support. General budget support ODA has a positive, highly significant effect on growth, while grants for the same purpose are insignificant.

The adjusted R^2 values for these regressions, which are relatively high, ranging from 0.496 to 0.858, and the significant f-statistics, indicate that the model has strong explanatory power. However, the model is less robust than previously, since the Durbin-Watson statistic is above 2 for every regression, indicating the presence of serial correlation in the residuals. This is not surprising given the time period under consideration is relatively short, particularly once aid is lagged three periods. Another weakness is that this study uses data on sectoral aid commitments rather than disbursements, since data on sectoral aid disbursements is only available from 2002. While the overall volume of aid disbursed and committed appears to be the same, there are some significant differences between them, most notably the much larger volume of aid disbursed to debt relief than committed. Furthermore, Asiedu and Nandwa (2007) note that commitments are typically disbursed over a period of several years, thus reducing the accuracy of the estimated timing of the impact of aid.

Table 3.4 Sectoral Aid Regressions, 1995-2012

	(1) Aid=Grants	(2) Aid=ODA	(3) Aid=Grants	(4) Aid=ODA
Social Aid (-3)	0.914** (0.411)	0.828** (0.313)	0.670 (0.402)	0.612* (0.352)
Economic Aid (-3)	0.571 (0.765)	-0.421 (0.335)	0.762 (0.746)	-0.326 (0.337)
Production Aid (-3)	0.590 (1.103)	-0.178 (0.624)	0.422 (1.045)	0.018 (0.545)
Multisector Aid (-3)	-3.099* (1.688)	0.661 (0.625)	-3.000* (1.606)	0.459 (0.632)
General Aid (-3)	0.751* (0.417)	0.532*** (0.188)	0.769* (0.423)	0.579** (0.224)
Debt Relief Aid (-3)	0.188 (0.177)	0.049 (0.094)	0.055 (0.163)	-0.068 (0.112)
Humanitarian Aid (-3)	-0.052 (0.443)	0.320 (0.265)	0.245 (0.384)	0.522* (0.261)
Unallocated Aid (-3)	-4.311 (7.798)	-3.504** (1.656)	-3.195 (7.671)	-3.506** (1.422)
FDI (-1)	-0.078 (0.121)	-0.107 (0.085)	-0.001 (0.115)	-0.026 (0.082)
GDI (-1)	0.094 (0.158)	0.050 (0.095)	0.036 (0.140)	-0.004 (0.094)
Imports (-1)	-0.036 (0.100)	0.032 (0.068)	-0.003 (0.085)	0.050 (0.069)
Govt Cons (-1)	-0.262 (0.257)	-0.077 (0.150)	-0.138 (0.220)	-0.024 (0.158)
Log Initial GDP	-16.033** (6.851)	-15.519*** (5.103)	-14.476** (6.078)	-14.452*** (4.168)
Population Growth	-4.441* (2.436)	-3.996* (2.158)	-3.586 (2.176)	-3.476* (1.923)
Interest Repay (-1)	-1.187 (1.042)	-0.693 (0.672)	-0.691 (0.951)	-0.271 (0.602)
Exports (-1)	-0.093 (0.133)	-0.122 (0.096)	-0.042 (0.124)	-0.060 (0.094)
Conflict	1.099 (1.742)	0.549 (1.154)	0.893 (1.488)	0.431 (0.968)
Log Life Exp	12.208 (22.176)	10.313 (21.138)	4.729 (19.803)	4.718 (21.011)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Political Stability	2.322** (1.056)	2.313*** (0.750)		
Governance			1.325*** (0.369)	1.243*** (0.373)
Intercept	73.892 (72.660)	72.223 (75.405)	90.626 (61.494)	86.555 (70.429)
Method	LSDV	LSDV	LSDV	LSDV
Periods Included	3	3	3	3
Countries Included	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.610	0.761	0.653	0.786
Log likelihood	-96.721	-78.928	-92.466	-74.909
F-statistic	3.452***	5.975***	3.948***	6.736***
Durbin-Watson	2.609	3.135	2.623	3.185

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

4. CONCLUDING REMARKS

4.1 Summary and Policy Implications

The aim of this study was to determine the effect of different types of aid on growth in Sub-Saharan Africa. Using data from 1970 to 2012 in a panel model with fixed country and period effects, aid is found to have a lagged effect on growth, with the optimum lag being three periods, or twelve years. Aid in the form of grants is found to have a larger impact on growth than ODA, which includes loans and technical assistance in addition to grants. A one percent increase in the grant to GDP ratio contributes 0.104 percentage points per capita GDP growth in twelve years time. Comparatively, a one percent increase in the ODA to GDP ratio contributes 0.063 percentage points to growth. The results are consistent with previous studies, which find that aid has a small, positive effect on growth in SSA¹³. In addition, the finding that grants have a larger impact on growth than ODA is supported by the literature (Clemens et al, 2004; Loxley and Sackey, 2008). Policymakers should consider allocating a greater proportion of aid in the form of grants rather than loans, given that grants have a greater impact on growth. Furthermore, Quartey (2005) recommends that aid measures be designed to reduce the debt burden of recipients so that aid inflows are not used for debt servicing purposes. Countries in SSA, in particular, do not need increased debt obligations, given a large proportion already face an unsustainable debt burden, and are classified as a Heavily Indebted Poor Country by the IMF and World Bank.

A number of important growth-promoting factors in SSA are emphasised throughout the regression analysis. The initial value of per capita income is highly significant in nearly every regression, and negative, confirming the convergence theory in which countries with lower levels of income experience more rapid growth. A lower level of conflict and higher level of personal freedom positively impact growth. Political stability is highly significant and positively impacts growth, as does the overall quality of governance. A higher initial life expectancy, which is an indicator of the overall health or quality of the workforce, has a positive significant effect on growth.

The heterogeneous nature of aid was considered throughout this paper. The relative effectiveness of aid through disaggregation by donor was estimated over the period 1970 to 2012. Multilateral aid in relation to bilateral aid, as well as bilateral development aid in

¹³ See Levy (1988); Gyimah-Brempong (1992); Hadjimichael et al (1995) Goumanee, Girma & Morrissey (2005); Armah and Nelson (2008); Loxley and Sackey (2008); Ndambendia and Njoupouognigni (2010) and Balde (2011).

relation to bilateral non-developmental aid were considered, however no meaningful difference between the impacts of the two types of aid was uncovered.

The second stage of analysis shifted from disaggregation of aid by donor, to disaggregation by purpose, which has the potential to significantly guide aid allocation policy. The impact of each aggregate sector of aid on growth, as well as the components within those, was estimated for the sub-period 1995 to 2012. Each overall sector was found to affect growth differently, as was the type of aid, whether it was in the form of grants or loans. Both loans and grants for education have a large, significant effect on growth, with a one percent increase in the aid to GDP ratio resulting in an increase in growth of between 1.737 to 2.106 percentage points. ODA for the health sector also has a positive, significant impact on growth. Aid for tourism and industry, both components of the production sector, and grants for the environment, have a large, positive effect on growth. The positive effect of general budget aid suggests that untied aid, aid that is not allocated conditionally for a specific purpose, is effective at promoting growth. This finding supports the results of Miquel-Florensa (2007), who finds that untied aid and tied aid do not have different effects on growth, thus challenging the view that untied aid is highly fungible relative to tied aid.

The applicability of results to policymakers is much improved in this study in comparison to previous studies of sector allocated aid. Clemens et al (2004) and Minoiu and Reddy (2010) aggregate sector-specific aid data into new, broader measures of aid, namely short-impact and long-impact aid, and development and non-developmental aid. While these studies demonstrate the effectiveness of aid, they do little to help policy makers decide where to allocate aid in order to maximize growth. This study has highlighted several sectors in which aid positively and significantly impacts growth. Policy-makers should consider allocating future aid to these sectors in order to accelerate growth and eventually reduce poverty in Sub-Saharan African countries.

4.2 Limitations and Suggestions for Future Research

Given the limited period of data available, only the effect of sectoral aid from 1995 to 2004 on growth in 2004 to 2012 has been estimated. The shorter time frame has resulted in increased serial correlation, which may bias the results. In future, estimation with Newey-West standard errors, which are consistent in the presence of serial correlation and heteroskedasticity, should be employed.

Given that the OECD CRS database classifies aid into a total of 246 purposes, more detailed analysis of sector-specific data is possible. This would give further guidance to aid allocation policymakers as sectors found to be insignificant in this analysis may have components within them that significantly impact growth.

Further empirical analysis of the impact of sectoral aid on growth when sectoral aid disbursement data is available for a longer period of time would be beneficial. A comparison to the results obtained using commitments would also be useful to assess the relevance of both the results obtained in this study, as well as the results of other studies that use aid commitment data.

APPENDIX 1 DEFINITIONS AND SOURCES OF DATA

Sample of 25 SSA Countries

Code	Country	Data availability
BEN	Benin	
BWE	Botswana	1975 – 2012
CMR	Cameroon	
CAF	Central African Republic	
COG	Congo Republic	
ZAR	Congo Democratic Republic	1978 – 2012
GMB	Gambia	
GHA	Ghana	
KEN	Kenya	
LSO	Lesotho	1977 – 2012
MDG	Madagascar	
MWI	Malawi	
MLI	Mali	
MUS	Mauritius	1974 – 2012
NER	Niger	
RWA	Rwanda	
SEN	Senegal	
SLE	Sierra Leone	1980 – 2012
ZAF	South Africa	
SWZ	Swaziland	
TZN	Tanzania	1990 – 2012
TGO	Togo	
UGA	Uganda	1982 – 2012
ZMB	Zambia	
ZWE	Zimbabwe	1974 – 2012

*All data available from 1970-2012 unless otherwise specified.

Variables Included in 1970-2012 Regressions

Variable	Definition	Source*
Growth	Per capita GDP growth	
Aid	Net aid as a percentage of GDP	
Initial GDP	GDP per capita (measured in constant USD) as of year prior to the period.	
FDI	Net foreign direct investment inflows as a percentage of GDP	
GDI	Gross domestic investment as a percentage of GDP	
Govt Cons	Government consumption as a percentage of GDP	
Imports	Imports as a percentage of GDP	
Exports	Exports as a percentage of GDP	
Life Exp	Initial life expectancy for the growth period	
Pop Growth	Population growth rate	
Int Repay	Total interest repayments on external debt as a percentage of GDP	
Freedom	Index of combined political rights and civil liberties: 2 = Not Free; 1 = Partly Free; 0 = Free.	Freedom House
Conflict	Level of conflict: 0 = no conflict; 1 = minor conflict, 25-999 battle-related deaths in a given year; 2 = war, at least 1000 battle-related deaths in a given year.	UCDP/PRIO Armed Conflict Dataset

*Source of data is World Bank World Development Indicators unless otherwise specified

Additional variables included in 1995-2012 regressions

Variable	Definition	Source
Inflation	Annual percentage change in price level.	WB WDI
Political Stability	Captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Score for each country ranges from -2.5 to 2.5.	WB WGI
Governance	Aggregate score for WGI.	WB WGI

Definitions of Aid

Type of aid	Definition	Data Source
ODA	Net ODA consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants provided to DAC approved recipients with the promotion of economic development as its main objective.	WB WDI
Grants	Transfers made in cash, goods or services for which no repayment is required. Excludes technical assistance grants.	WB WDI
Multilateral	Aid given by a multilateral organization whose membership is made up of member governments, who collectively govern the organization and are its primary source of funds.	OECD DAC2a
Bilateral	Aid given by a government directly to the government of another country.	OECD DAC2a
Commitments	Total commitments per year comprise new undertakings entered in the year in question (regardless of when disbursements are expected) and additions to agreements made in earlier years.	OECD CRS
Disbursements	A disbursement is the placement of resources at the disposal of a recipient country or agency, or in the case of internal development-related expenditures, the outlay of funds by the official sector. It can take several years to disburse a commitment.	OECD CRS

Sectoral Aid Definitions

Sector Name	Description
Social	Social Infrastructure and Services
Education	Education
Health	Health
Population	Population policies and reproductive health
Water	Water and sanitation
Government	Government and civil society; conflict prevention and resolution, peace and security.
Other	Other social infrastructure and services.
Economic	Economic Infrastructure and Services
Transport	Transport and Storage
Communication	Communications
Energy	Energy Generation and Supply
Banking	Banking and Financial Services
Business	Business and Other Services

Production	Production Sectors
Agriculture	Agriculture, Forestry and Fishing
Industry	Industry, Mining, Construction.
Trade	Trade Policy and Regulations and Trade-Related Adjustment
Tourism	Tourism
Multisector	Multisector/Cross-cutting
Environment	General Environmental Protection.
Other	Includes urban and rural development, non-agricultural alternative development, multisector education, and scientific research.
General	Commodity Aid and General Programme Assistance
General Budget Support	Unearmarked contributions to the government budget; support for the implementation of macroeconomic reforms; general programme assistance.
Food aid	Developmental food aid; food security assistance.
Capital import support	Import support for capital goods and services; lines of credit.
Commodity import support	Import support for commodities, general goods and services and oil.
Debt Relief	Action Relating to Debt
	Includes debt forgiveness, relief of multilateral debt, rescheduling and refinancing, debt for development swap, other debt swap, debt buy-back
Humanitarian	Humanitarian Aid
	Includes emergency response; reconstruction relief and rehabilitation; disaster Prevention and preparedness.
Unallocated	Sector Unallocated/Unspecified
	Includes promotion of development awareness as well as other unspecified or sector unallocable aid.

Source: OECD Creditor Reporting System (CRS) Aid Activities database

APPENDIX 2 SUMMARY STATISTICS

Table A2.1 Descriptive Statistics, 1970-2012

	Mean	Median	Max	Min	Std Dev	Obs
Per Capita GDP Growth (%)	1.02	0.98	18.69	-13.10	3.36	267
Grants (% GDP)	6.07	4.34	41.95	0	6.32	270
ODA (% GDP)	9.83	8.94	48.55	0	7.62	270
Multilateral Grants (% GDP)	2.73	1.59	31.78	0	3.62	270
Multilateral ODA (% GDP)	3.86	3.09	18.72	0	3.44	270
Bilateral Grants (% GDP)	5.58	4.54	30.23	0	4.61	270
Bilateral ODA (% GDP)	5.96	5.15	31.58	0	4.61	270
FDI (% GDP)	2.26	1.06	25.24	-5.70	3.61	259
GDI (% GDP)	19.77	18.70	68.28	2.39	9.00	266
Govt Cons (% GDP)	15.05	13.95	36.85	5.82	5.64	265
Imports (% GDP)	40.74	34.85	150.97	8.33	23.53	268
Pop Growth (%)	2.65	2.80	7.90	-4.23	0.97	275
Initial Per Capita GDP (constant USD)	960.30	455.89	5895.70	118.64	1259.56	267
Int Repay (% GDP)	1.26	0.87	7.44	0	1.24	270
Exports (% GDP)	30.15	26.00	92.16	5.92	16.75	268
Conflict	0.17	0	2	0	0.40	275
Freedom	1.22	1	2	0	0.70	275
Life Exp	51.57	51.31	73.27	28.89	7.31	275

Table A2.2 Correlation Matrix, 1970-2012

	Growth	Grants	ODA	FDI	GDI	Govt Cons	Imports	Pop Growth	Initial GDP	Int Repay	Exports	Conflict	Freedom
Grants	0.13												
ODA	0.02	0.80											
FDI	0.30	0.20	0.03										
GDI	0.46	-0.02	-0.03	0.43									
Govt Cons	0.12	-0.12	-0.03	0.20	0.51								
Imports	0.31	0.08	0.12	0.41	0.65	0.54							
Pop Growth	-0.08	0.11	0.15	-0.04	-0.05	-0.06	-0.24						
Initial GDP	0.14	-0.39	-0.49	0.01	0.25	0.25	0.10	-0.33					
Int Repay	-0.16	-0.06	0.18	-0.08	0.07	0.20	0.09	0.11	-0.12				
Exports	0.27	-0.20	-0.28	0.38	0.37	0.38	0.56	-0.16	0.42	0.18			
Conflict	-0.05	0.05	0.01	-0.02	-0.11	-0.16	-0.21	0.03	0.07	-0.13	-0.17		
Freedom	-0.29	0.01	0.09	-0.08	-0.28	-0.27	-0.18	0.11	-0.38	0.12	-0.19	0.08	
Life Exp	0.28	-0.20	-0.34	0.12	0.39	0.13	0.24	0.10	0.40	0.01	0.36	-0.07	-0.41

Note: Cases with missing values for one or both of a pair of variables were excluded from the analysis.

Table A2.3 Descriptive Statistics, 1995-2012

	Mean	Median	Max	Min	Std Dev	Obs
Per Capita GDP Growth (%)	1.69	1.75	16.26	-8.57	2.85	150
Social Grants (% GDP)	3.24	2.63	12.26	0.16	2.71	150
Social ODA (% GDP)	4.04	3.51	12.87	0.18	3.07	150
Economic Grants (% GDP)	0.80	0.42	6.67	0	0.95	150
Economic ODA (% GDP)	1.41	1.33	8.48	0	1.26	150
Production Grants (% GDP)	0.58	0.47	2.73	0	0.53	150
Production ODA (% GDP)	0.93	0.86	3.57	0.01	0.74	150
Multisector Grants (% GDP)	0.46	0.38	1.75	0.01	0.37	150
Multisector ODA (% GDP)	0.60	0.49	3.30	0.01	0.49	150
General Grants (% GDP)	1.12	0.62	7.89	0	1.41	150
General ODA (% GDP)	1.56	1.14	8.46	0	1.66	150
Debt Relief Grants (% GDP)	1.23	0.27	28.98	0	2.93	150
Debt Relief ODA (% GDP)	1.33	0.30	31.43	0	3.17	150
Humanitarian Grants (% GDP)	0.57	0.11	7.59	0	1.29	150
Humanitarian ODA (% GDP)	0.58	0.11	8.70	0	1.33	150
Unallocated Grants (% GDP)	0.07	0.03	1.69	0	0.12	150
Unallocated ODA (% GDP)	0.09	0.04	2.37	0	0.21	150
FDI (% GDP)	3.77	2.30	32.82	-0.23	4.65	149
GDI (% GDP)	19.78	19.38	69.37	2.20	8.38	149
Imports (% GDP)	43.41	37.73	141.22	18.18	22.85	150
Govt Cons (% GDP)	14.44	13.46	37.33	5.95	5.83	150
Initial Per Capita GDP (constant USD)	1081.73	455.35	5895.70	122.72	1482.17	150
Pop Growth (%)	2.48	2.64	9.08	-0.20	1.03	150
Int Repay (% GDP)	0.94	0.71	6.89	0.07	0.90	150
Exports (% GDP)	32.56	27.15	94.03	6.04	17.86	150
Conflict	0.20	0	2	0	0.41	150
Life Exp	52.76	52.94	73.27	35.18	6.95	150
Inflation (%)	187.59	7.03	24411.03	-0.03	2026.63	145
Political Stability	-0.43	-0.29	1.04	-2.83	0.83	150
WGI	-3.17	-3.16	4.84	-12.69	3.59	150

APPENDIX 3 TABLES

Table A3.1 Country and Period Effects

Country	1982-2012	1982-1997	1998-2012
Benin	-2.32	-1.73	-5.58
Botswana	13.00	10.35	17.37
Cameroon	3.05	3.77	2.59
Central African Republic	-2.38	-4.81	0.10
Congo Republic	7.59	8.54	9.31
Congo Democratic Republic	-7.56	-4.23	-8.09
Gambia	-2.99	-2.03	-5.42
Ghana	-1.55	0.13	-3.10
Kenya	-1.07	2.17	-1.29
Lesotho	-1.29	-17.37	8.62
Madagascar	-6.36	-3.47	-10.01
Malawi	-6.32	-0.69	-8.00
Mali	-2.80	-5.85	-4.01
Mauritius	10.20	9.45	8.53
Niger	-4.97	-3.83	-7.03
Rwanda	-1.79	-4.22	-3.71
Senegal	-0.67	-0.96	-2.77
Sierra Leone	-2.64	-2.18	-1.69
South Africa	10.62	7.19	10.89
Swaziland	8.57	7.91	11.98
Tanzania*	-1.88	NA	-2.69
Togo	-2.93	0.49	-4.74
Uganda	-1.37	0.60	-1.37
Zambia	-0.63	1.51	-0.68
Zimbabwe	-1.95	2.02	-0.68

Period	1982-2012	1982-1997	1998-2012
1982-1985	0.08	0.49	
1986-1989	0.20	1.16	
1990-1993	-2.13	-1.58	
1994-1997	-0.07	-0.07	
1998-2001	-0.48		-0.76
2002-2005	-0.13		-0.46
2006-2009	0.84		0.55
2010-2012	1.68		0.68

*Data for Tanzania is not available until 1990, therefore only the effect during the sub-period 1998 to 2012, and the overall period 1982 to 2012, is estimated.

Table A3.2 Sensitivity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Grant (-1)	0.007 (0.067)			0.002 (0.067)		0.002 (0.069)	-0.011 (0.072)
Grant (-2)		0.043 (0.049)		0.043 (0.048)	0.038 (0.047)	0.038 (0.046)	0.030 (0.045)
Grant (-3)			0.104* (0.057)		0.098* (0.052)	0.098* (0.050)	0.093* (0.053)
Growth (-1)							0.084 (0.110)
FDI (-1)	0.094 (0.061)	0.090 (0.060)	0.088 (0.061)	0.090 (0.060)	0.085 (0.061)	0.085 (0.061)	0.078 (0.061)
GDI (-1)	-0.060 (0.042)	-0.060 (0.042)	-0.056 (0.042)	-0.060 (0.042)	-0.056 (0.042)	-0.056 (0.042)	-0.065 (0.043)
Govt Cons (-1)	-0.016 (0.054)	-0.019 (0.055)	-0.007 (0.054)	-0.019 (0.055)	-0.010 (0.055)	-0.010 (0.056)	0.003 (0.052)
Imports (-1)	0.027 (0.039)	0.023 (0.037)	0.023 (0.037)	0.023 (0.040)	0.019 (0.038)	0.019 (0.041)	0.025 (0.042)
Pop Growth	-0.651** (0.308)	-0.602** (0.297)	-0.544* (0.296)	-0.605* (0.320)	-0.513* (0.303)	-0.516 (0.321)	-0.514 (0.325)
Log Initial GDP	-5.051*** (1.512)	-4.897*** (1.520)	-5.496*** (1.558)	-4.889*** (1.556)	-5.349*** (1.599)	-5.340*** (1.630)	-5.605*** (1.590)
Int Repay (-1)	0.300 (0.207)	0.290 (0.197)	0.331* (0.199)	0.289 (0.208)	0.318 (0.200)	0.317 (0.211)	0.303 (0.210)
Exports (-1)	-0.041 (0.034)	-0.043 (0.034)	-0.041 (0.034)	-0.043 (0.034)	-0.042 (0.034)	-0.042 (0.035)	-0.049 (0.035)
Conflict	-0.986 (0.612)	-0.890 (0.606)	-0.953 (0.589)	-0.894 (0.626)	-0.881 (0.600)	-0.886 (0.620)	-0.758 (0.650)
Freedom	-1.268*** (0.475)	-1.328*** (0.493)	-1.375*** (0.476)	-1.330*** (0.497)	-1.432*** (0.497)	-1.434*** (0.502)	-1.317*** (0.488)
Log Life Exp	8.888*** (2.372)	8.002*** (2.646)	6.229** (2.784)	7.992*** (2.670)	5.506* (3.009)	5.498* (3.050)	5.265* (3.069)
Intercept	2.194 (13.597)	4.696 (13.796)	14.841 (14.709)	4.692 (13.841)	16.812 (14.963)	16.801 (14.990)	19.344 (14.685)
Method	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV
Periods	8	8	8	8	8	8	8
Countries	25	25	25	25	25	25	25
Observations	195	195	193.000	195	193	193	193
Adjusted R ²	0.426	0.428	0.445	0.424	0.443	0.439	0.439
Log likelihood	-423.032	-422.637	-415.845	-422.636	-415.516	-415.515	-414.855
F-statistic	4.345***	4.377***	4.574***	4.249***	4.467***	4.338***	4.266***
Durbin-Watson	2.015	2.063	2.033	2.063	2.068	2.069	2.183

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.3 Impact of ODA, 1970-2012

	(1) 1982-2012	(2) 1982-1997	(3) 1998-2012	(4) 1982-2012	(5) 1982-2012	(6) 1982-2012	(7) 1982-2012
ODA (-2)	0.030 (0.032)	-0.108 (0.099)	0.136** (0.055)				
ODA (-3)	0.054 (0.033)	0.412*** (0.144)	0.068** (0.033)	0.063* (0.034)	0.063 (0.094)	0.056 (0.072)	0.085*** (0.028)
ODA (-3) Squared					0.000 (0.002)		
ODA (-3) *Freedom						0.006 (0.045)	
FDI (-1)	0.075 (0.061)	-0.173 (0.177)	0.024 (0.106)	0.077 (0.061)	0.077 (0.062)	0.078 (0.062)	0.095 (0.067)
GDI (-1)	-0.060 (0.042)	-0.108 (0.099)	-0.096 (0.078)	-0.060 (0.042)	-0.060 (0.042)	-0.060 (0.043)	-0.002 (0.037)
Govt Cons (-1)	-0.011 (0.038)	0.055 (0.100)	-0.212 (0.131)	-0.008 (0.054)	-0.008 (0.054)	-0.009 (0.054)	-0.086** (0.041)
Imports (-1)	0.015 (0.055)	0.091 (0.055)	-0.021 (0.079)	0.021* (0.037)	0.022 (0.038)	0.022 (0.037)	0.020 (0.013)
Pop Growth	-0.549* (0.295)	-1.213*** (0.403)	0.707 (0.522)	-0.568 (0.292)	-0.568 (0.293)	-0.564 (0.299)	-0.112 (0.264)
Log Initial GDP	-5.356*** (1.575)	-3.745 (3.186)	-5.775* (2.961)	-5.503*** (1.556)	-5.504*** (1.580)	-5.515 (1.583)	0.157 (0.416)
Int Repay (-1)	0.318 (0.199)	-0.500 (0.496)	0.720* (0.365)	0.335* (0.201)	0.335* (0.201)	0.335 (0.201)	-0.361** (0.155)
Exports (-1)	-0.038 (0.034)	-0.118 (0.076)	-0.010 (0.058)	-0.039 (0.034)	-0.039 (0.034)	-0.038 (0.034)	0.013 (0.019)
Conflict	-0.876 (0.598)	-1.176 (0.735)	-1.728* (1.000)	-0.953 (0.592)	-0.953 (0.594)	-0.943 (0.611)	0.285 (0.469)
Freedom	-1.404*** (0.490)	-0.964* (0.535)	-2.633** (1.078)	-1.348*** (0.476)	-1.349*** (0.483)	-1.412 (0.729)	-1.236*** (0.312)
Log Life Exp	5.998** (2.858)	4.555 (5.893)	16.368** (6.598)	6.538** (2.750)	6.538** (2.768)	6.495 (2.786)	0.301 (0.720)
Intercept	14.965 (14.449)	10.740 (28.346)	-22.187 (34.795)	13.686 (14.686)	13.689 (14.333)	13.983 (14.844)	
Method	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	OLS
Periods	8	4	4	8	8	8	8
Countries	25	24	25	25	25	25	25
Observations	193	94	100	193	193	193	193
Adjusted R ²	0.441	0.463	0.516	0.443	0.439	0.439	0.194
Log likelihood	-415.767	-195.198	-176.563	-416.122	-416.122	-416.111	-470.538
F-statistic	4.446***	3.056***	3.638***	4.551***	4.418***	4.419***	
Durbin-Watson	2.075	2.503	2.125	2.046	2.046	2.048	1.812

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.4 Impact of Multilateral and Bilateral Aid, 1970-2012

	(1) 1982-2012 Aid=Grant	(2) 1982-1997 Aid=Grant	(3) 1998-2012 Aid=Grant	(4) 1982-2012 Aid=ODA	(5) 1982-1997 Aid=ODA	(6) 1998-2012 Aid=ODA
Multilateral Aid (-2)	0.053 (0.182)	-0.066 (0.498)	0.518** (0.244)	0.132 (0.123)	-0.353 (0.353)	0.296** (0.136)
Multilateral Aid (-3)	0.077 (0.175)	0.212 (0.595)	0.661** (0.281)	0.150* (0.086)	0.860* (0.461)	0.221* (0.112)
Bilateral Aid (-2)	0.009 (0.076)	-0.346 (0.284)	0.064 (0.089)	-0.031 (0.077)	0.049 (0.229)	0.072 (0.064)
Bilateral Aid (-3)	0.064 (0.089)	0.891*** (0.307)	-0.134 (0.095)	-0.023 (0.070)	0.198 (0.214)	-0.026 (0.067)
FDI (-1)	0.083 (0.062)	-0.007 (0.185)	-0.010 (0.101)	0.068 (0.063)	-0.182 (0.183)	0.018 (0.111)
GDI (-1)	-0.058 (0.044)	-0.139 (0.088)	-0.112 (0.076)	-0.058 (0.043)	-0.102 (0.102)	-0.101 (0.076)
Govt Cons (-1)	-0.011 (0.058)	-0.009 (0.106)	-0.302** (0.130)	-0.018 (0.056)	0.072 (0.107)	-0.231* (0.135)
Imports (-1)	0.020 (0.038)	0.134** (0.060)	0.038 (0.080)	0.011 (0.039)	0.074 (0.062)	-0.035 (0.085)
Pop Growth	-0.536* (0.314)	-0.947** (0.453)	0.899 (0.559)	-0.545* (0.280)	-1.144** (0.465)	0.748 (0.525)
Log Initial GDP	-5.454*** (1.606)	-3.785 (2.902)	-3.864 (3.235)	-5.647*** (1.624)	-4.184 (3.333)	-5.874** (2.900)
Int Repay (-1)	0.326 (0.204)	-0.182 (0.443)	0.499 (0.342)	0.349* (0.202)	-0.556 (0.531)	0.838** (0.352)
Exports (-1)	-0.040 (0.034)	-0.159* (0.088)	-0.047 (0.062)	-0.026 (0.034)	-0.101 (0.081)	0.010 (0.060)
Conflict	-0.905 (0.615)	-0.599 (0.837)	-1.713* (0.943)	-0.852 (0.582)	-1.354 (0.915)	-1.584* (0.924)
Freedom	-1.406*** (0.497)	-1.373** (0.581)	-2.035* (1.020)	-1.402*** (0.496)	-0.779 (0.625)	-2.814** (1.099)
Log Life Exp	6.013* (3.217)	2.559 (6.001)	11.540 (7.107)	6.063** (2.776)	4.622 (6.312)	16.213** (6.548)
Intercept	15.481 (15.622)	18.818 (27.700)	-15.491 (36.864)	16.465 (14.484)	12.557 (29.557)	-20.990 (34.337)
Method	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV
Periods	8	4	4	8	4	4
Countries	25	24	25	25	24	25
Observations	193	94	99	193	94	99
Adjusted R ²	0.431	0.498	0.505	0.441	0.456	0.508
Log likelihood	-416.186	-190.296	-173.382	-414.468	-194.003	-173.072
F-statistic	4.164***	3.247***	3.384***	4.295***	2.904***	3.413***
Durbin-Watson	2.045	2.396	2.391	2.078	2.500	2.271

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.5 Impact of Disaggregated Social Sector Aid, 1995-2012

	(1) 2004-2012 Aid=Grants	(2) 2004-2012 Aid=Grants	(3) 2004-2012 Aid=ODA	(4) 2004-2012 Aid=ODA
Education (-3)	2.106** (0.855)	1.910** (0.719)	1.951*** (0.373)	1.737*** (0.347)
Health (-3)	1.424 (1.503)	1.684 (1.221)	2.464** (1.061)	2.189** (0.910)
Population (-3)	-0.791 (1.301)	-2.101* (1.062)	-0.911 (1.192)	-2.046* (1.143)
Water (-3)	-1.015 (2.128)	-1.398 (2.078)	0.163 (0.859)	-0.379 (0.760)
Government (-3)	0.862 (1.012)	0.523 (1.002)	1.056* (0.553)	0.999** (0.465)
Other Social (-3)	-1.238 (1.958)	-1.616 (1.627)	-0.444 (0.883)	-1.080 (0.725)
FDI (-1)	-0.006 (0.137)	0.021 (0.122)	-0.143 (0.095)	-0.082 (0.081)
GDI (-1)	0.040 (0.140)	0.060 (0.120)	0.078 (0.110)	0.089 (0.100)
Imports (-1)	0.027 (0.102)	0.035 (0.087)	0.004 (0.072)	0.017 (0.066)
Govt Cons (-1)	-0.122 (0.173)	-0.062 (0.132)	0.078 (0.161)	0.065 (0.116)
Log Initial GDP	-14.237** (5.820)	-15.588*** (4.699)	-14.946*** (4.405)	-15.965*** (3.414)
Pop Growth	-2.694 (1.729)	-3.333** (1.372)	-2.389 (1.750)	-2.413 (1.424)
Int Repay (-1)	-0.415 (1.140)	-0.220 (0.845)	-0.327 (0.891)	-0.260 (0.706)
Exports (-1)	-0.066 (0.102)	-0.051 (0.074)	-0.119 (0.076)	-0.097 (0.074)
Conflict	0.429 (1.500)	0.002 (1.165)	1.491 (1.348)	1.117 (0.949)
Log Life Exp	5.704 (19.335)	12.889 (16.324)	-6.460 (16.025)	-1.584 (12.790)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Political Stability	2.243 (1.357)		2.584** (1.116)	
Governance		1.711*** (0.430)		1.539*** (0.346)
Intercept	79.433 (70.444)	63.700 (53.354)	129.423* (64.171)	119.822** (46.225)
Method	LSDV	LSDV	LSDV	LSDV
Periods	3	3	3	3
Countries	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.598	0.716	0.752	0.820
Log likelihood	-100.576	-87.907	-82.894	-71.295
F-statistic	3.433***	5.121***	5.969***	8.440***
Durbin-Watson	2.515	2.857	2.747	3.130

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.6 Impact of Disaggregated Economic Aid, 1995-2012

	(1) 2004-2012 Aid=Grants	(2) 2004-2012 Aid=Grants	(3) 2004-2012 Aid=ODA	(4) 2004-2012 Aid=ODA
Transport (-3)	0.885 (0.789)	0.699 (0.795)	-0.234 (0.763)	0.293 (0.706)
Communication (-3)	-4.442 (9.239)	-2.037 (9.510)	1.472 (7.224)	2.263 (5.605)
Energy (-3)	0.278 (2.584)	-0.299 (2.169)	0.249 (1.125)	0.358 (0.895)
Banking (-3)	-10.988 (9.190)	-7.300 (7.906)	3.389 (3.976)	-0.540 (4.071)
Business (-3)	5.827 (7.557)	6.474 (6.720)	-1.441 (1.507)	-2.894 (1.502)
FDI (-1)	0.081 (0.154)	0.110 (0.139)	0.049 (0.147)	0.087 (0.139)
GDI (-1)	-0.082 (0.192)	-0.099 (0.171)	-0.131 (0.187)	-0.163 (0.156)
Imports (-1)	0.119 (0.164)	0.136 (0.149)	0.162 (0.152)	0.172 (0.121)
Govt Cons (-1)	-0.162 (0.209)	-0.058 (0.187)	-0.085 (0.160)	0.080 (0.154)
Log Initial GDP	-15.804** (7.277)	-18.748*** (6.159)	-17.858** (7.391)	-18.918*** (5.987)
Pop Growth	-2.520 (2.205)	-3.237 (2.114)	-2.811 (2.118)	-3.935** (1.795)
Int Repay (-1)	0.152 (1.130)	0.326 (1.036)	-0.157 (0.727)	0.290 (0.668)
Exports (-1)	-0.124 (0.152)	-0.116 (0.138)	-0.158 (0.137)	-0.088 (0.115)
Conflict	-0.402 (1.604)	-0.397 (1.410)	0.771 (1.640)	1.099 (1.350)
Log Life Exp	34.368 (26.822)	29.531 (23.239)	34.927 (30.396)	29.844 (24.751)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Political Stability	1.568 (1.265)		1.764 (1.286)	
Governance		1.388*** (0.366)		1.849*** (0.530)
Intercept	-23.889 (95.371)	17.20 (80.548)	-12.544 (94.325)	17.003 (77.354)
Method	LSDV	LSDV	LSDV	LSDV
Periods	3	3	3	3
Countries	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.476	0.577	0.440	0.592
Log likelihood	-111.528	-103.721	-113.964	-102.389
F-statistic	2.520***	3.282***	2.314***	3.429***
Durbin-Watson	2.529	2.575	2.662	2.851

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.7 Impact of Disaggregated Production Sector Aid, 1995-2012

	(1) Aid=Grants 2004-2012	(2) Aid=Grants 2004-2012	(3) Aid=ODA 2004-2012	(4) Aid=ODA 2004-2012
Agriculture (-3)	0.047 (1.045)	-0.053 (0.925)	-0.629 (0.686)	-0.250 (0.588)
Industry (-3)	3.390* (1.894)	2.622 (1.682)	2.390** (1.074)	2.154** (0.971)
Trade (-3)	-7.986 (6.794)	-8.499 (5.395)	-0.005 (4.699)	-3.976 (4.378)
Tourism (-3)	22.551*** (6.647)	20.155** (7.548)	25.486*** (6.888)	20.691*** (7.290)
FDI (-1)	0.069 (0.125)	0.109 (0.113)	0.035 (0.114)	0.093 (0.109)
GDI (-1)	-0.105 (0.129)	-0.100 (0.122)	-0.012 (0.142)	-0.079 (0.127)
Imports (-1)	0.066 (0.096)	0.072 (0.092)	0.013 (0.102)	0.054 (0.093)
Govt Cons (-1)	0.029 (0.166)	0.088 (0.148)	-0.079 (0.165)	0.091 (0.159)
Log Initial GDP	-9.947 (6.071)	-12.067** (5.222)	-11.521** (5.585)	-12.788** (5.037)
Pop Growth	-2.457 (1.659)	-3.002* (1.580)	-2.669 (1.640)	-2.983* (1.558)
Int Repay (-1)	0.071 (0.832)	0.139 (0.729)	-0.078 (0.838)	0.349 (0.733)
Exports (-1)	-0.052 (0.097)	-0.042 (0.093)	-0.052 (0.105)	-0.040 (0.097)
Conflict	0.823 (1.008)	0.515 (0.871)	0.989 (1.043)	0.511 (0.945)
Log Life Exp	10.268 (19.270)	7.906 (18.067)	14.513 (18.661)	8.919 (18.166)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Political Stability	1.876* (0.950)		1.343 (1.004)	
Governance		1.246*** (0.294)		1.175*** (0.326)
Intercept	31.799 (65.239)	57.654 (57.723)	27.698(65.158)	58.055 (59.065)
Method	LSDV	LSDV	LSDV	LSDV
Periods	3	3	3	3
Countries	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.650	0.709	0.667	0.715
Log likelihood	-98.023	-91.321	-96.238	-90.533
F-statistic	4.184***	5.171***	4.429***	5.300***
Durbin-Watson	2.556	2.593	2.663	2.607

Robust White heteroskedastic consistent standard errors are reported in parentheses.
 ***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.8 Impact of Disaggregated Multisector Aid, 1995-2012

	(1) Aid=Grants 2004-2012	(2) Aid=Grants 2004-2012	(3) Aid=ODA 2004-2012	(4) Aid=ODA 2004-2012
Environment (-3)	9.898** (4.457)	7.427 (4.959)	2.306 (3.337)	1.758 (3.293)
Other Multisector (-3)	-9.744** (4.737)	-8.046 (5.146)	1.989** (0.781)	1.516* (0.830)
FDI (-1)	0.137 (0.148)	0.159 (0.145)	0.050 (0.117)	0.088 (0.109)
GDI (-1)	-0.064 (0.135)	-0.076 (0.126)	-0.035 (0.118)	-0.059 (0.107)
Imports (-1)	0.092 (0.116)	0.113 (0.112)	0.052 (0.095)	0.080 (0.091)
Govt Cons (-1)	-0.131 (0.176)	-0.058 (0.166)	0.111 (0.178)	0.136 (0.151)
Log Initial GDP	-8.760 (6.802)	-12.794** (5.960)	-11.523* (6.175)	-14.124** (5.605)
Pop Growth	-2.624 (1.934)	-3.293* (1.808)	-2.340 (2.092)	-3.020 (2.019)
Int Repay (-1)	-0.342 (0.951)	-0.232 (0.891)	0.361 (0.691)	0.429 (0.657)
Exports (-1)	-0.068 (0.115)	-0.074 (0.107)	-0.072 (0.098)	-0.078 (0.096)
Conflict	-0.285 (1.220)	-0.051 (1.047)	-0.499 (1.251)	-0.450 (1.072)
Log Life Exp	26.782 (22.796)	25.068 (20.879)	13.665 (22.233)	14.675 (21.162)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Political Stability	1.131 (1.064)		1.354 (1.149)	
Governance		1.233*** (0.397)		1.111*** (0.356)
Intercept	-41.247 (77.031)	-4.763 (70.668)	25.855 (83.479)	42.211 (75.641)
Method	LSDV	LSDV	LSDV	LSDV
Periods	3	3	3	3
Countries	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.563	0.630	0.594	0.645
Log likelihood	-108.511	-102.411	-105.785	-100.939
F-statistic	3.316***	4.065***	3.635***	4.265***
Durbin-Watson	2.723	2.770	2.546	2.620

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

Table A3.9 Impact of Disaggregated General Aid, 1995-2012

	(1) Aid=Grants 2004-2012	(2) Aid=Grants 2004-2012	(3) Aid=ODA 2004-2012	(4) Aid=ODA 2004-2012
General Budget Support (-3)	0.556 (0.477)	0.457 (0.464)	0.881*** (0.216)	0.795*** (0.238)
Food Aid (-3)	2.645 (2.115)	1.519 (1.916)	2.286 (1.922)	0.012 (1.853)
Capital Import Support (-3)	12.004 (14.762)	3.946 (11.817)	1.050 (2.472)	3.269 (2.163)
Commodity Import Support (-3)	5.162 (3.742)	6.442* (3.328)	1.218 (3.578)	2.714 (3.043)
FDI (-1)	0.010 (0.119)	0.054 (0.108)	-0.036 (0.091)	0.014 (0.084)
GDI (-1)	-0.111 (0.158)	-0.076 (0.147)	-0.076 (0.116)	-0.020 (0.108)
Imports (-1)	0.056 (0.119)	0.057 (0.110)	0.066 (0.093)	0.064 (0.093)
Govt Cons (-1)	-0.053 (0.163)	0.000 (0.130)	-0.144 (0.156)	-0.150
Log Initial GDP	-11.267* (5.874)	-14.082** (5.326)	-16.973*** (5.413)	-17.763*** (4.973)
Pop Growth	-3.180 (1.989)	-4.090** (1.890)	-4.601** (2.151)	-4.886** (2.237)
Int Repay (-1)	-0.425 (0.822)	-0.216 (0.739)	-0.661 (0.729)	-0.393 (0.660)
Exports (-1)	-0.044 (0.111)	-0.036 (0.103)	-0.094 (0.095)	-0.074 (0.100)
Conflict	1.472 (1.369)	1.171 (1.135)	0.987 (1.201)	1.068 (0.837)
Log Life Exp	13.105 (21.241)	11.622 (18.675)	24.362 (18.984)	23.044 (18.633)
Inflation	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000 (0.000)
Political Stability	1.758 (1.061)		2.819*** (1.007)	
Governance		1.376*** (0.372)		1.452*** (0.296)
Intercept	31.701 (70.417)	59.657 (59.276)	29.181 (66.030)	42.060 (56.613)
Method	LSDV	LSDV	LSDV	LSDV
Periods	3	3	3	3
Countries	25	25	25	25
Observations	73	73	73	73
Adjusted R ²	0.556	0.639	0.678	0.728
Log likelihood	-106.743	-99.127	-95.018	-88.817
F-statistic	3.143***	4.038***	4.604***	5.589***
Durbin-Watson	2.949	2.998	2.994	3.034

Robust White heteroskedastic consistent standard errors are reported in parentheses.

***, ** and * represent significance at the 1%, 5% and 10% levels respectively.

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