Quantity or quality? foreign aid implications on economic growth in least developed countries

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ABSTRACT

Using panel data for the period of 1975-2011, this study attempts to answer the question of whether the quantity or quality of foreign aid matters to economic growth of least developed countries (LDCs). Quality effects are captured using different specifications of both bilateral and multilateral aid. The quantity effects are measured by the squared term on the aid variable. The timing of effects between aid and growth are controlled for using both short term (annual) and long term (5-year averaged) panel data. Issues of endogeneity, measurement bias, simultaneity and reverse causality are addressed. Generally, after controlling for trade, fiscal and monetary policies and other institutional factors, results from this study support the conclusion that quantity rather than quality of aid matters for economic growth of LDCs. These results are robust to different samples and estimation techniques. Nonetheless, the study does not discount the importance of the quality of aid, rather, emphasizes that regardless of the type of aid flows, quantity and continuous flow is important for LDCs.

Key Words: Foreign aid, economic growth, LDCs, SGMM

JEL codes: F35, F43, O11, O19

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I. INTRODUCTION

It has been forty decades since the first United Nations (UN) program of action in support of least developed countries (LDCs) was developed and adopted in 1981 at the Paris UN conference on the LDCs. The objective of this program of action was to provide targeted support to the special needs of these countries with a goal of steering them on a sustained, accelerated, pro-growth and development path. Three additional programs of action have been adopted since; yet, these countries continue to face widespread poverty. Notwithstanding, most of these countries are still struggling to meet the goals set in those programs of action, including the millennium development goals (MDGs).

Overseas development assistance (ODA) or foreign aid, remain the largest source of external financing of the development of LDCs. At the recent 2011 UN conference on LDCs held in Istanbul, Turkey, a renewed call was made for increased foreign aid flows to LDCs [targeted at approximately 0.15% to 0.20% of gross national income for development assistance committee (DAC) members]. Yet, little conclusive empirical evidence exists in literature in support of growth enhancing relationship between foreign aid and economic growth. Nevertheless, some studies have recommended doubling foreign aid flows, especially to countries in sub-Saharan Africa (UNDP, 2005; IMF and World Bank, 2005; EU, 2005 and Sachs, 2005). The argument in these studies holds that the current quantity of

foreign aid flowing into these countries is not sufficient to provide the needed "big push" in order for them to leapfrog out of the poverty trap.

Literature on aid-growth linkage is vast but empirical findings are mixed. The results range from neutral relationship (Boone, 1996; Easterly, Levine and Roodman, 2004 and Easterly, 2007a, 2007b, 2005) to significant but growth depressing effects (Bobba and Powell, 2007). Other studies have argued that aid can be growth enhancing under certain conditions (Burnside and Dollar, 2000; Hansen and Tarp, 2001; Dalgaard, Hansen and Tarp, 2004). Furthermore, some have emphasized on the type of aid and timing of aid effects as important factors in determining the effectiveness of aid on growth (Minoiu and Reddy, 2009). Another key factor that has come up in this literature is the functional form of the aid-growth equation. Clemens, Radelet, Bhavnani and Bazzi (2011), for example, provide empirical evidence in support of the non-linear relationship. They cite the lack of non-linear specification as the reason why Burnside and Dollar (2000) did not find non-conditional aid effects on growth. Besides, including the non-linear effects lend support to the implications of aid in the poverty trap theory.

Majority of these studies, including the most influential ones [Boone, 1996; Burnside and Dollar, 2000; Hansen and Tarp, 2001; Rajan and Subramanian, 2008], have based their conclusions on data of developing countries as a group. Conclusions based on such general data set can be misleading. Different income groups within developing countries, vary, for example, in terms of economic structure (see figure 1 in appendix), policy formulation

environment and access to international capital markets, all of which may influence a country's aid absorptive capacity and hence its effectiveness. Furthermore, the growth of countries that have good access to international capital markets, may be determined by other factor besides foreign aid (Burnside and Dollar, 2000)

The most vulnerable of the developing countries and the most highly advocated (by the international community) for increased aid flow, are the LDCs. Yet, there is little empirical analysis on aid effectiveness in these countries as a group. This study fills in that gap. We attempt to answer the question: is it the quantity or quality of aid that matters for economic growth of LDCs? Consequently, we transcend the conventional approach of focusing exclusively on total aid and provide a comprehensive analysis based on different types of aid [total bilateral aid, bilateral aid based on sub-groups, bilateral aid from US, UK and EU and Multilateral aid from United Nations agencies (UNDP, UNICEF, UNFPA, UNTA, UNHCR and WFP[1])]. We pay attention to the rationale provided in Clemens et al (2011) for the divergence in the empirical findings and suggestions of harmonizing the results in literature.

Additionally, we account for the non-linear effects of aid on growth, based on the argument in the takeoff hypothesis (Sachs, 2005). The findings from this paper will contribute to the discussions on the relevancy of aid on economic growth of LDCs and its importance (if any) in helping them graduate from the least developed countries status. Methodological issues such as endogeneity bias, measurement bias, simultaneity and reverse causality bias are

addressed. Arellano-Bond system Generalized Methods of Moment (SGMM) is used as the primary estimation technique. Nonetheless, results based on fixed effects (FE) are also reported. Our findings are robust to different aid specifications, samples and estimation techniques. The rest of the paper is organized as follows; section II highlights the relevant literature, section III focuses on methodology and results, and section IV concludes.

II. LITERATURE REVIEW

There are three strands of literature that explain the foreign aid – growth relationship in poor countries: the takeoff hypothesis, the conditionality requirement and the "timing and type of aid" argument. The takeoff hypothesis strand advocates for increased flow of foreign aid to poor countries (Sachs, 2005). The underlying argument hinges on the fact that LDCs face a big financing gap. As a result, their physical capital accumulation has failed to keep up with the depreciation and the high population growth rates[2]. The financing gap is caused by among other factors; their low domestic savings, limited and undiversified tax base and poor access to international capital markets. Consequently, they lack sufficient capital stock required to lift them above subsistence level onto a more accelerate and rapid development path. In other words, there exists a threshold level[3] of capital stock, beyond which capital begins to have meaningful growth enhancing effects. Therefore, a reasonable and sustained flow of foreign aid can help these countries meet and surpass that minimum capital stock, necessary for the takeoff into self sustained growth[4] (UNDP, 2005; IMF and World Bank, 2005;EU, 2005) .

Empirical studies have attempted to incorporate this concavity of physical capital – growth relationship by including both the linear and non-linear specifications of foreign aid in the growth equation. The non-linear term is either entered as a standalone (Dalgaard and Hansen, 2001; Lensik and White, 2001; Dalgaard, Hansen and Tarp, 2001, 2004; Clemens et al. 2004; Rajan and Subramanian, 2008; Moreira, 2005) or as an interaction with a policy variable (Burnside and Dollar, 2000). The sign on the non-linear term has varied across studies. However, in line with the takeoff hypothesis, it is expected for the linear term to have a negative sign, while the squared term to have a positive sign.

Anecdotal evidence provides some hint as to why the squared term of aid has not fared consistently in empirical analysis. For example, there are some poor countries in Africa that have received relatively large amount of aid for prolonged periods of time with no improvement in their economic growth and poverty reduction. Easterly (2006) points out that a large proportion of these aid flows has been used, in some cases, to finance growth-retarding government consumption rather than growth-enhancing public investment.

The second strand of literature (conditionality strand) holds that certain conditions in the aid recipient country must be in place before foreign aid effects on growth can be realized. The championing study in this line of argument is that of Burnside and Dollar (2000). This study examines the relationship between foreign aid and economic growth within certain macroeconomic policies environment. They use a sample of 56 developing countries, with the data averaged over 4-year periods, starting with 1970-73 to 1990-1993. They concluded that aid tends to be more effective in developing countries with good fiscal,

monetary and trade policies (as evidenced by the positive and significant coefficient on the interaction term between aid and their calculated policy index). Nonetheless, when they interact the non-linear specification of aid with the policy index, the resulting coefficient is insignificant (with a negative sign) – putting more emphasize on the policy rather than the surge in aid as predicted in the takeoff hypothesis.

Despite the numerous criticisms of the Burnside and Dollar [see Easterly 2003; Easterly, Levine and Roodman 2004] approach and their emphasis on the policy condition, other studies have also arrived at a similar conclusion (Collier and Dollar, 2002). Nevertheless, other critics have provided competing evidence, suggesting, for example, that geographical factors (such as the proportion of a country's land in the tropics), which account for "deep structural" characteristics, rather than policies, are key in determining the effectiveness of foreign aid on growth (Dalgaard, Hansen and Tarp, 2001, 2004; Roodman, 2004). Geographical factors, for example, may affect productivity, especially in the agricultural sector (Bloom and Sachs, 1998; Sachs, 2001, 2003 and Masters and McMillan, 2001) and may also have influence on slow moving structural characteristics such as institutions (Easterly and Levine, 2003 and Acemoglu, Simon and James, 2002). Dalgaard, Hansen and Tarp (2004) captures the conditional effects of aid on economic growth by interacting aid with the proportion of land in the tropics. Based on their empirical analysis, they provide a convincing conclusion that their findings (that aid is ineffective in the tropics) are superior to those based on policy interaction (Burnside and Dollar, 2000) and concavity effects (Dalgaard and Hansen, 2001). Roodman (2004) asserted that foreign aid works well outside of the tropic and not in the tropical countries. However, Radelet, Clemens and

Bhavnani, (2005) dismisses the validity of geographical factors as merely a separation of countries where aid has worked from those countries where it has failed, rather than an explanation of a causation of aid ineffectiveness.

The third strand of literature incorporates some of the elements from the aforementioned two strands with an additional twist. They account for the quality of aid and the timing of aid effects on growth (Clemens et al, 2011; Minoiu and Reddy, 2009; Rajan and Subramanian, 2008; Headey, 2007; Bobba and Powell, 2007; Clemens, Radelet and Bhavnani, 2004). In reference to the quality of aid, these studies distinguish between multilateral aid[5] and bilateral aid and, further, separate development aid (non-geopolitical/non-geostrategic) from non-development aid (geopolitical/geostrategic[6]). They conclude that aid flows based on geopolitical factors have neutral effects on growth, while the non-geopolitical aid have growth enhancing effects (Rajan and Subramanian, 2008; Bobba and Powell, 2007).

Timing of the aid impact also matters in determining the aid-growth relationship (Clemens et. al, 2011). For example, Clemens, Radelet and Bhavnani (2004) find that aid allocated to sectors such as agriculture, industry and public infrastructure investment tend to have immediate/short run impact on growth, relative to aid supporting democracy, environment, health and education, which usually has postponed/late impact on growth. Overall, development aid (aid allocated towards investment spending), will tend to have immediate/direct impact on the economy and support long run economic growth, while non-development aid (aid responding to disasters or social issues) will tend to have

indirect impact on economic growth. Therefore, effects stemming from development aid are more likely to be captured in the short run data relative to those coming from non-development aid (Clemens et al, 2011).

An area that has received little attention in the aid-growth literature is how aid effects are transmitted to growth. Gomanee, Girma and Morrissey (2005) attempted to address the transmission question. Using a sample of 25 sub-Saharan African countries over the period of 1970-1997, they find that aid effects are transmitted to growth via investment spending. They dismiss government consumption spending as a possible transmission mechanism. They also find that while aid has some effects on imports, imports do not matter in growth. Boone (1996) also provided evidence supporting the positive relationship between aid and investment.

Generally, empirical studies have yielded divergent evidence on aid-growth linkage[7]. These divergent results, according to Clemens et.al (2011), are due to; (i) lack of controlling of the timing of aid effects on growth and, (ii) using invalid and/or weak instrumental variables. Particularly, results in the leading studies [Boone, 1996; Burnside and Dollar, 2000; Rajan and Subramanian, 2008] in the aid-growth literature rests their strength of accounting for aid endogeneity primarily on population growth. To resolve this divergence, Clemens et al (2011) incorporates three changes in the three leading studies. First, they allow aid to affect growth with a time lag. Second, they first-difference the data to remove the effects of time invariant omitted variables. Third, they disaggregate aid data into "early impact" and

late impact" components. By incorporate these changes they arrive at a harmonized conclusion that aid has modest growth-enhancing effects.

III. METHODOLOGY AND RESULTS

In this section we discuss the variables used in the empirical model and the estimation techniques. We also discuss the samples used, our sensitivity analysis and variable and data description. Finally we present our results based on the baseline regressions and robust checks.

4.1. Empirical Model

Unbalanced panel data is used to evaluate the impact of foreign aid on economic growth of 39 least developed countries for the period of 1975 to 2010. We exclude nine countries (3 in Africa and 6 in Asia[8]) due to missing data on most of the variables. Following Minoiu and Reddy (2009), we disaggregate the aid data into various categories: total overseas development assistance; total bilateral aid; bilateral aid from US, UK and EU; bilateral aid based on three sub-groups and multilateral aid from UN agencies (UNDP, UNICEF, UNFPA, UNTA, UNHCR, UNTA and WFP). This allows us to observe the distinct effects on growth from the different types of aid.

Total overseas development assistance is assumed to have both early impact and late impact components. We also assume that bilateral aid has both geostrategic and non-geostrategic components. For example, if UK and France rewards their former colonies

(regardless of the county's policy environment and political institutions), then we expect such bilateral aid to have a different impact relative to a non-geostrategic aid. On the other hand, we assume that the effects of multilateral aid from UN agencies depend on the goals and objectives of that agency. For example, the goal of United Nations Development Programs (UNDP) is to help countries achieve their development objectives. UNDP works with individual countries in areas including; poverty reduction, democratic governance, crisis prevention and recovery, environment and energy and HIV/Aids. Therefore, we expect aid from UNDP to have immediate and sustainable impact on growth relative to aid from United Nations High Commission for Refugee (UNHCR), which responds to growth-retarding crisis. Overall, we expect a large proportion of aid from the UN agencies to have delayed but sustainable impact on growth.

We also run regressions based on bilateral aid from 3 sub groups. Countries under each group are identified based on the commitment to development index (CDI, 2011[9]) that ranks donors based on among other factors; quantity and quality of aid, openness to trade and investment policies[10]. Group 1 consists of 5 Scandinavian countries that have the highest ranking on the CDI index (Sweden, Norway, Denmark and Finland) and therefore assumed to provide development friendly aid. Group 2 consists of group 1 plus 5 non-Scandinavian countries (Austria, Canada, Ireland, New Zealand and Switzerland) that are also believed to provide development friendly aid. Group 3 consists of group 1 plus Belgium, France, Switzerland, UK and US. Aid from France, UK and US is assumed to be geostrategic in nature. Overall, the degree of development friendliness decreases as we move from group 1 to group 3.

In order to evaluate whether aid effects in sub-Saharan Africa (SSA) LDCs are different from non-sub-Saharan Africa LDCs, we report results based on the SSA sub-sample. Due to the small sample size of the non-SSA LDCs, and thus the inefficiency of the regressions, we do not report results using this sub-sample. The baseline regressions are based on the annual (short period) panel data, allowing us to increase the efficiency of the regressions (because the panel is unbalanced and therefore, some countries have very few data points). However, this approach also enables us to determine whether timing of aid effects influences aid effectiveness on growth. Moreover, according to Clemens eta al (2011), short periods decrease the bias from omitted variables that change slowly over time and permit estimates with country-specific effects (Islam, 1995) to remove the bias of omitted time invariant characteristics. Nonetheless, for robust checks and to be consistent with other studies, we also regress initial values of aid on 5-year averaged growth data (with the exception of the last period), giving us 7 non-overlapping periods from 1975-1979 to 2005-2010. This allows us to net out the short run cyclical effects, to counter the effects of reverse causality (Kumar and Woo, 2010) and to control for the timing of aid effects.

We follow closely the findings in Sala-i-Martin, Doppelhofer and Miller (2004) in selecting the core sets of growth determinants; however, the estimated model is constraint by the available data and sample size. Specifically, we include general government consumption share, trade openness and geographical dummies. System GMM (SGMM) of Arellano and Bover (1995) and Blundell and Bond (1998) is used as the primary estimation technique. SGMM controls for various methodological biases such as; endogeneity bias, measurement bias, unobserved country-specific fixed effects and omitted variable bias. Also relative to

different GMM, SGMM is robust to weak instruments bias. It uses suitable lagged levels and lagged first differences of the regressors as their instruments. In accordance with GMM estimation techniques, Sargan test of over-identifying restrictions and the Arellano-Bond test that the average autocovariance of residuals of order two is zero are reported. Additionally, we conduct sensitivity analysis using fixed effects (FE) estimation technique. While FE controls for omitted variable bias that arises due to the correlation between country specific effects and the regressors, it also suffers from endogeneity and measurement error.

In the formal analysis, we evaluate the effects of the aforementioned categories of aid on economic growth while controlling for other determinants of growth, broadly defined as; policy variables, institutional variables and dummy variables. The argument that good policies are a precondition for aid effectiveness has been widely debated since Burnside and Dollar (2000). While the disagreements are obvious, there is hardly any contention on the importance of good macroeconomic policies for economic growth. As a result, most studies have incorporated some elements of policy measure in their aid-growth regressions, with the main focus on the monetary, fiscal and trade policies.

Monetary policy is usually proxied by inflation rate (Fischer, 1993). Fiscal policy on the other hand has been proxied by budget surplus and in some cases, government consumption spending (Easterly and Rebelo, 1993; Barro, 1991). Because of lack of sufficient data on trade policy instruments (such as tariffs and non-tariffs barrier), a number of studies have used either, Sachs and Warner (1995) openness index or the

recently updated index by Wacziag and Welch (2003). The problem with this index is that its data is available until 2000. Consequently, this may create a problem of misclassifying a country as closed when in fact; it has made significant progress towards openness in the last ten years. Nevertheless, other studies have used policy outcome measures such as trade volume as a share of GDP as a proxy for trade openness (Baliamoune-Lutz and Ndikuma, 2007).

In this study we follow what has been used elsewhere in literature and include in the regression analysis a measure of trade, monetary and fiscal policies, hereby defined as the *policy variables*. We use inflation rate, government consumption spending[11] and share of trade volume in GDP as proxies for monetary, fiscal and trade policies respectively. Because of the inconclusive results in literature on the interaction between aid and policy[12], we do not include that interaction term in this study.

Another group of variables that have been factored into the aid-growth equation are the *institutional variables*; a measure of governance, political stability, development of financial market institutions and social services institutions. Good governance and political stability both provide conducive environment for economic growth. Particularly, proponents of the free market system argue that in countries where the role of the government is limited, for example, to providing public goods such as infrastructure and public security; maintaining the rule of law and enforcing contracts, not only reduces social discontent but also ensures a healthy private sector competition, which promotes productivity and growth.

Furthermore, a country with good governance is also more likely to promote growth enhancing policies.

Polity2 index from the polity IV project (2011) is used as a proxy for governance. The index is measured on a scale of -10 to 10; with -10 indicating strongly autocratic (political suppression) and 10, strongly democratic (political freedom). Barro (1994) assessed the effects of democracy on growth using a sample of 100 countries from 1960 to 1990. He found that, after controlling for all other core determinants of growth, democracy had a weak negative effect on growth. In a non-linear specification however, there was evidence that democracy enhances growth at low levels of political freedom, but depresses growth when moderate level of freedom has been achieved. Consequently, we specify this measure of governance in both linear and quadratic form.

The proportion of Money supply (M2 or M3) in GDP is used as a proxy for the depth of the financial market development. King and Levine (1993) evaluates the effects of Money supply[13] (expressed as a share of GDP) and three other alternative measures of financial market development and conclude that higher levels of financial market development accelerates economic growth, by leading growth. Additionally, they found that the effects based on the money supply measure were stronger in poor countries.

The need to control for fertility rate in aid-growth regressions was highlighted in Easterly (2006). There are a number of ways that increasing fertility rate can have undesirable effects on economic growth. For example, increasing fertility rates can negatively impact

economic growth by diverting resources away from production goods to childrearing (Becker and Barro, 1988). It can also penalize the steady state level of output per worker in the neoclassical growth model. Specifically, if the population is growing faster than the level of economic growth, then a portion of the economy's investment is allocated towards providing capital for new workers, rather than increasing capital per worker (Barro, 1994). These effects can have undesirable implications on aid effectiveness. On the other hand, declining fertility rates can be an indication of the development of social institutions such as healthcare and education (which expands with economic growth) (Schultz, 1989; Behrman, 1990 and Barro and Lee, 1994)

Finally we include a *dummy* variable for sub-Saharan Africa, since, 69% of LDCs are in sub-Saharan Africa, with the remaining 29% in Asia and only one country in Latin America. The lag of the log of real per capita GDP is included in line with the standard Barro (1991) growth model, to test for convergence across countries over time towards a common level of real per capita income.

Based on the discussions above, the formal regression equation is as outlined in equation (1) below:

$$\Delta RPYG_{it} = \beta_0 + \beta_1 \Delta \log RPY_{it-1} + \beta_2 \Delta \log Aid_{it} + \beta_3 \Delta \log Aid^2_{it} + \beta_4 \Delta \log Trade_{it} + \beta_5 \Delta \log G_{it} + \beta_6 \Delta \log(1 + Infl)_{it} + \beta_7 \Delta \log M2_{it} + \beta_8 \Delta Polity2_{it} + \beta_9 \Delta Polity2^2_{it} + \beta_{10} \Delta \log Fertility_{it} + \beta_{11} dSSA_{it} + \varepsilon_{it}$$

Where: *RPYG* and RPY_{t-1} are the real per capita GDP growth and the lag of real per capita GDP respectively, in country *i* at time *t*. β_0 is the common intercept, ε_{it} is the error term

and Δ is the difference operator. *Aid* and Aid^2 are the various aid categories (as previously defined) and its quadratic form, expressed as a percentage of GDP. *Trade* is the share of trade in goods and services expressed as a percentage of GDP – a proxy for trade policy. *G is* the share of general government consumption expenditure in GDP – a proxy for fiscal policy. *Infl* is the inflation rate (consumer prices) – proxy for monetary policy. *M2* is the money and quasi money (as a percentage of GDP). *Polity2* and $Polity2^2$ is measure of governance from the polity IV project and its square. *Fertility* – fertility rate (birth per woman). *dSSA* is the dummy variables for sub-Saharan Africa LDCs.

4.2. Data and Econometric Results

All the data are downloaded from World Bank's World Development indicators (2012) website. The least developed countries included in the sample are drawn from the website of United Nations office of the High Representative for Least Developed Countries, landlocked developing Countries and Small Island developing countries (UN-OHRLLS). A country is classified as a least developed country based on UN's 3 criteria: low-income criterion, human assets index and economic vulnerability index. Also, to qualify as an LDC, the country's population must not exceed 75 million. Currently there are 48 LDCs; 33 in Africa, 14 in Asia and Pacific and 1 in Latin America. A list of the LDCs used in this study can be found in table (A.1).

Variable description and notation explanation is detailed in table (A.2). Descriptive Statistics and correlation matrix of selected variables used in our model are provided in

Tables A.3 and A.4 respectively. Table 1 contains baseline regression results using SGMM. Consistency check regressions using averaged data and fixed effects estimation techniques are reported in table 2 and 3 respectively. The SGMM results pass the Sargan test for validity of the instruments and the Arellano bond test of average autocovariance of residuals. We also conduct the Hausman test, which rejects the random effect in favor of fixed effects.

In an attempt to answer the question of whether the quantity or quality of foreign aid matters to economic growth of LDCs, we analyze aid effects based on different categories of aid. Additionally, we include a squared term to capture the concavity effects as predicted by the takeoff hypothesis. Table 1.1 reports results based on total aid (overseas development assistance), total bilateral aid and aid from EU, UK and US. After controlling for policy, institutional and other determinants of growth, we find a significant U-shaped relationship between aid and economic growth, regardless of the type of aid. This is contrary to the expectations and literature predictions due to some elements of geostrategic (delayed impact effects) in these aid categories. Also the coefficient on the dummy variable for sub-Saharan Africa (SSA) LDCs is statistically significant in the three (total aid, total bilateral aid and bilateral aid from UK) out of the five categories. The lack of significance in the SSA dummy under the EU category is somewhat surprising since a large proportion of EU aid flows to SSA LDCs relative to Asian and Latin America LDCs (see figure 2)

Table 1.1 about here

Notwithstanding, when we disaggregate the data and focus on the SSA sub-sample, we find a highly significant U-shaped relationship across all the five aid categories.

Table 1.2 about here

Table 1.3 tabulates the results based on aid from six UN agencies. Again a highly significant U-shaped relationship between aid and economic growth is observed across all the aid categories. The dummy variable for SSA is positive and significant in all categories with the exception of aid from UNICEF and WFP. Generally, aid flows from the six UN agencies averages less than 1% of these countries' GDP (see figure 3). Additionally, annual trends signal declining flows since 1996, coinciding with the World Bank/IMF debt relief initiatives (see figure 4).

Table 1.3 about here

Table 1.4 provides estimates based on the SSA sub-sample. Similarly, we observe a U-shaped significant relationship between aid from all the UN agencies and economic growth of SSA LDCs.

Table 1.4 about here

In addition, we follow specifications in Minoiu and Reddy (2009) and categorize bilateral aid into three groups (as previously defined). Aid based on these groups is used as proxies for development friendly aid. The degree of development friendliness decreases as we move from group 1 to group 3. Findings based on these categories are tabulated in table 1.5. Table 1.5 contains results from the full sample and SSA sub-sample. These results

support the findings tabulated in tables 1.1 – 1.4. Needless to mention, a significant U-shaped relationship is observed, regardless of the aid category and sample.

Table 1.5 about here

Generally, based on the baseline regression results above, it is evident that it is not the type of aid that matters to economic growth of LDCs, rather, the quantity of aid. Also, notice these results are based on annual panel data, reinforcing, in hindsight that the timing of aid effects is not as important as the quantity of aid.

To ensure that these results are robust even when timing of aid effects is factored into the regressions, we run regressions using initial values of aid (at the beginning of each period) on 5-year averaged growth data. Due to the unbalanced nature of panel data, we are limited to the 5-year average – going beyond that only decreases the efficiency of the model. Results based on these regressions are tabulated in tables 2. The U-shaped relationship is still apparent, even in cases where the relationship is not significant.

Nonetheless, table 2.1 indicates that initial values of aggregated aid (total aid, total bilateral and bilateral from EU) relative to aid from individual donors (US and UK) matters to economic growth of LDCs. The lack of meaningful relationship between initial values of US and UK aid on subsequent growth might be due to quantity effects rather than quality effects. This reasoning is supported by the observed significant effects when annual data is used, signifying that continuous flows (rather a onetime lump sum) of aid matters to economic growth in these countries (partly because of the significance of foreign aid in the

development budgets of these countries). We also find that SSA dummy is positive and significant only in the aggregate aid categories.

Table 2.1 about here

The above effects are also observed when the bilateral aid is categorized into the three groups. The significant effects increase with the level of aggregation and not the quality of aid. For example, while a significant U-shaped relationship is observed in group 3, we do not observe the same in groups 1 and 2. Particularly the average share of group 3 bilateral aid in GDP for the period of 1975-2010 was 5.47% compared to 1.3% and 2.1% for groups 1 and 2 respectively (see descriptive statistics in table A.3).

Table 2.2 about here.

Table 2.3 also provides support for a significant U-shaped relationship in the cases of aid from United Nations development programs (UNDP) and United Nations transition authority (UNTA). Furthermore, the dummy variable for SSA is significant only in those two cases

Table 2.3 about here

The results based on FE estimation technique is tabulated in table 3 (see appendix). While these results are affected by methodological biases such as endogeneity bias and measurement error, they still provide a consistent pattern similar to the one observed above. Particularly, we observe the U-shaped relationship between aid and economic growth of LDCs regardless of the type of aid.

IV. CONCLUSION

Using panel data for the period of 1975 – 2010, this study attempts to answer the question of whether the quantity or quality of aid matters to economic growth of least developed countries (LDCs). To capture the quality effects, we use different categories of both bilateral and multilateral aid, in addition to the total aid and total bilateral aid. The quantity effects are measured by the squared term on the aid variable. Both short term (annual) and long term (5-year averaged) panel data are used. This allows us to test the timing of aid effects. Methodological issues such as endogeneity bias, measurement error and reverse causality are addressed. After controlling for trade, fiscal and monetary policies and other institutional factors, results support the conclusion that quantity rather than quality of aid matters for economic growth of least developed countries. These results are robust when the SSA sub-sample is used and when FE estimation technique is used. Nonetheless, the study does not discount the importance of the quality of aid, rather, emphasizes that regardless of the type of aid flows, quantity and continuous flow is important.

The findings of this study lend support to the Sachs (2005) takeoff hypothesis, at least for the case of LDCs. While the channel through which aid affects economic growth is beyond the scope of this paper, further empirical analysis is required to establish whether the transmission mechanism of aid effects on growth are via investment spending as predicted by the takeoff hypothesis.

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Table 1.1

Table 1.1: Aid Impact on Growth, based on Annual data (Full sample, SGMM Estimation)					
	Total Aid	Bilateral Aid	Bilateral - EU	Bilateral - UK	Bilateral - US
$\Delta logrpy_{t-1}$	-9.48 (3.01)****	-8.6 (3.06)***	-6.36 (3.11)**	-13.15 (3.49)***	-14.24 (4.2)***
ΔLog(Aid/GDP)	-9.63 (2.38)****	-8.83 (2.36)***	-10.28 (2.41)***	-10.71 (2.53)***	-12.24 (2.79)***
$\Delta log(Aid/GDP)^2$	4.72 (1.36)****	4.04 (1.29)***	4.94 (1.24)***	5.17 (1.28)***	5.78 (1.43)***
ΔLog(Trade)	5.32 (1.49)***	5.68 (1.49)***	5.53 (1.48)***	5.89 (1.82)***	5.64 (1.7)***
Δlog (1+Infr)	-0.08 (0.3)	-0.04 (0.3)	-0.1 (0.3)	-0.08 (0.3)	-0.04 (0.31)
Δlog(G)	-1.75 (1.39)	-1.83 (1.39)	-2.52 (1.39)**	-2.96 (1.51)**	-0.81 (1.53)
Δlog(fertility)	-15.11 (5.24)***	-13.82 (5.32)***	-14.87 (5.78)***	-13.96 (6.08)***	-10.91 (6.77)*
ΔPolity2	0.05 (0.11)	0.07 (0.11)	0.02 (0.11)	0.14 (0.18)	0.22 (0.12)*
$\Delta Polity2^2$	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.04 (0.04)	0.06 (0.02)***
Δlog M2	-3.13 (1.81)*	-2.99 (1.81)*	-4.19 (1.83)***	-0.75 (1.95)	-1.72 (2.16)
Dummy- SSA	0.25 (0.13)**	0.23 (0.13)*	0.22 (0.15)	0.36 (0.16)***	0.18 (0.16)
Constant	-0.47 (0.12)***	-0.42 (0.12)***	-0.55 (0.12)***	-0.47 (0.15)***	-0.37 (0.17)***
N	257	257	253	206	215
Sargan ($p>\chi^2$)	1.0	1.0	1.0	1.0	1.0
Autocorrelation (pr > z)	0.933	0.972	0.994	0.166	0.745

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 1.2

Table 1.2: Aid Impact on Growth, based on Annual data (sub-Saharan Africa LDCs, SGMM Estimation)					
	Total Aid	Bilateral Aid	Bilateral - EU	Bilateral - UK	Bilateral - US
$\Delta logrpy_{t-1}$	-29.11 (7.31)***	-28.26 (7.36)***	-24.53 (8.06)***	-34.79 (7.82)***	-29.3 (7.39)***
ΔLog(Aid/GDP)	-21.63 (5.08)***	-20.62 (5.01)***	-22.78 (5.05)***	-25.33 (5.29)***	-21.89 (4.94)***
$\Delta log(Aid/GDP)^2$	10.72 (2.8)***	9.83 (2.62)***	11.5 (2.59)***	12.39 (2.63)***	10.79 (2.55)***
ΔLog(Trade)	5.27 (3.52)	6.13 (3.32)**	5.02 (3.35)***	5.52 (3.79)	5.14 (3.30)
Δlog (1+Infr)	-0.48 (0.5)	-0.45 (0.5)	-0.4 (0.5)	-0.8 (0.53)	-0.42 (0.51)
Δlog(G)	2.83 (2.11)	2.47 (2.11)	2.72 (2.11)	2.24 (2.23)	2.72 (2.07)
Δlog(fertility)	-21.01 (17.11)	-16.14 (17.5)	-10.94 (19.08)	-20.72 (17.22)	-18.06 (16.83)
ΔPolity2	-0.28 (0.2)	-0.25 (0.2)	-0.3 (0.2)	-0.23 (0.33)	-0.04 (0.24)
$\Delta Polity2^2$	-0.05 (0.03)	-0.04 (0.03)	-0.04 (0.03)	-0.03 (0.07)	0.01 (0.05)
Δlog M2	-8.38 (3.21)***	-8.07 (3.21)***	-8.25 (3.21)***	-7.07 (3.49)**	-8.42 (3.23)***
Constant	-0.48 (0.18)***	-0.41 (0.19)***	-0.54 (0.19)***	-0.43 (0.22)**	-0.39 (0.19)***
N	111	111	109	88	108
Sargan ($p>\chi^2$)	1.0	1.0	1.0	1.0	1.0
Autocorrelation (pr > z)	0.647	0.727	0.686	0.332	0.744

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 1.3

Table 1.3: Aid Impact on Growth, based on Annual data (Full sample, SGMM Estimation)						
	UNDP	UNFPA	UNICEF	UNTA	UNHCR	WFP
$\Delta logrpy_{t-1}$	-8.45 (3.1)***	-6.66 (3.48)**	-7.47 (3.11)***	-10.38 (3.07)***	-30.64 (6.97)***	-6.03 (3.36)*
ΔLog(Aid/GDP)	-9.34 (2.3)***	-9.36 (2.48)***	-9.18 (2.34)***	-14.41 (2.63)***	-18.68 (3.7)***	-11.82 (2.61)***
$\Delta log(Aid/GDP)^2$	4.94 (1.15)***	4.71 (1.34)***	4.63 (1.23)***	7.76 (1.41)***	9.48 (1.88)***	5.77 (1.34)***
ΔLog(Trade)	5.37 (1.5)***	4.56 (1.55)***	3.6 (1.67)***	4.35 (1.49)***	7.62 (2.59)***	5.49 (1.8)***
Δlog (1+Infr)	-0.14 (0.31)	-0.08 (0.31)	-0.09 (0.31)	-0.11 (0.32)	-0.19 (0.37)	-0.1 (0.31)
Δlog(G)	-1.79 (1.42)	-1.43 (1.47)	-1.59 (1.48)	-2.52 (1.43)*	-0.2 (2.37)	-2.45 (1.51)*
Δlog(fertility)	-15.81 (5.35)***	-14.53 (5.87)***	-10.02 (6.49)	-14.39 (5.45)***	-21.81 (13.15)*	-6.29 (6.45)
ΔPolity2	0.05 (0.11)	0.13 (0.13)	-0.01 (0.12)	0.1 (0.11)	0.76 (0.37)	0.09 (0.13)
$\Delta Polity2^2$	0.01 (0.02)	0.02 (0.02)	0.003 (0.02)	0.01 (0.02)	0.07 (0.06)	0.04 (0.02)*
Δlog M2	-3.31 (1.85)*	-4.33 (1.93)***	-3.35 (1.95)*	-0.81 (2.02)	0.62 (2.64)	-2.58 (2.01)
Dummy- SSA	0.26 (0.14)**	0.32 (0.17)**	0.1 (0.16)	0.33 (0.14)***	0.9 (0.31)***	0.07 (0.18)
Constant	-0.47 (0.13)***	-0.51 (0.14)***	-0.3 (0.17)*	-0.64 (0.13)***	-1.09 (0.34)***	-0.38 (0.17)***
N	251	236	225	246	134	211
Sargan ($p>\chi^2$)	1.0	1.0	1.0	1.0	1.0	1.0
Autocorrelation (pr > z)	0.977	0.726	0.899	0.869	0.366	0.949

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 1.4

Table 1.4: Aid Impact on Growth, based on Annual data (sub-Saharan Africa LDCs, SGMM Estimation)						
	UNDP	UNFPA	UNICEF	UNTA	UNHCR	WFP
$\Delta logrpy_{t-1}$	-27.75 (7.65)***	-30.17 (7.26)***	-29.69 (7.39)***	-28.85 (8.31)***	-35.87 (10.17)***	-27.24 (9.12)***
ΔLog(Aid/GDP)	-21.71 (4.87)***	-25.13 (5.0)***	-21.93 (4.89)***	-22.47 (5.1)***	-26.05 (5.76)***	-22.79 (5.35)***
$\Delta log(Aid/GDP)^2$	11.17 (2.47)***	13.56 (2.71)***	10.75 (2.48)***	11.51 (2.67)***	13.06 (2.91)***	11.26 (2.72)***
ΔLog(Trade)	5.11 (3.17)*	4.48 (3.33)	5.22 (3.21)*	5.06 (3.4)	5.47 (5.49)	5.49 (3.72)
Δlog (1+Infr)	-0.45 (0.5)	-0.25 (0.5)	-0.46 (0.5)	-0.43 (0.52)	-0.26 (0.58)	-0.36 (0.54)
Δlog(G)	2.93 (2.07)	2.61 (2.22)	2.86 (2.07)	2.49 (2.2)	3.55 (3.49)	2.00 (2.24)
Δlog(fertility)	-23.58 (17.14)	-20.07 (17.4)	-19.39 (17.7)	-24.78 (17.76)	-5.15 (21.05)	-2.61 (20.49)
ΔPolity2	-0.25 (0.2)	-0.19 (0.33)	-0.29 (0.2)	-0.26 (0.2)	0.56 (0.55)	0.16 (0.28)
$\Delta Polity2^2$	-0.05 (0.03)	-0.05 (0.03)	-0.05 (0.03)	-0.04 (0.03)	0.06 (0.08)	0.06 (0.06)
Δlog M2	-8.43 (3.18)***	-8.65 (3.22)***	-8.03 (3.29)***	-7.04 (3.83)**	-3.83 (3.78)	-7.69 (3.73)***
Constant	-0.51 (0.18)***	-0.57 (0.24)***	-0.45 (0.2)***	-0.52 (0.19)***	-0.27 (0.23)	-0.36 (0.2)*
N	111	105	111	106	80	97
Sargan ($p>\chi^2$)	1.0	1.0	1.0	1.0	1.0	1.0
Autocorrelation (pr > z)	0.712	0.569	0.685	0.733	0.376	0.947

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 1.5

Table 1.5: Aid Impact on Growth, based on Annual data (SGMM Estimation)						
	Full Sample			Sub-Saharan Africa LDCs		
	Bilateral Group 1	Bilateral Group 2	Bilateral Group 3	Bilateral Group 1	Bilateral Group 2	Bilateral Group 3
$\Delta logrpy_{t-1}$	-9.14 (3.18)***	-16.37 (3.96)***	-10.56 (3.12)***	-38.75 (8.55)***	-32.03 (7.69)***	-33.51 (7.61)***
ΔLog(Aid/GDP)	-10.07 (2.8)***	-14.32 (2.9)***	-7.55 (2.64)***	-20.96 (5.05)***	-20.8 (4.82)***	-16.2 (5.04)***
$\Delta log(Aid/GDP)^2$	4.96 (1.5)***	7.05 (1.48)***	4.00 (1.4)***	9.93 (2.53)***	8.9 (2.46)***	7.84 (2.68)***
ΔLog(Trade)	4.75 (1.74)***	4.34 (1.5)***	5.67 (1.53)***	5.55 (3.27)*	3.07 (2.94)	7.17 (3.17)***
Δlog (1+Infr)	0.02 (0.31)	0.1 (0.3)	-0.06 (0.3)	-0.4 (0.52)	0.55 (0.54)	-0.65 (0.48)
Δlog(G)	-2.4 (1.51)	-2.09 (1.51)	-1.96 (1.39)	1.46 (2.13)	-1.92 (2.19)	1.89 (2.02)
Δlog(fertility)	-11.74 (6.36)**	-37.01 (8.59)***	-17.33 (5.36)	-12.98 (17.28)	-23.72 (17.59)	-9.15 (16.78)
ΔPolity2	0.14 (0.13)	0.03 (0.12)	0.07 (0.11)	0.18 (0.26)	0.27 (0.29)	-0.26 (0.19)
$\Delta Polity2^2$	0.04 (0.02)*	-0.01 (0.02)	0.02 (0.02)	0.07 (0.05)	-0.03 (0.03)	-0.03 (0.03)
Δlog M2	-1.96 (2.07)	-0.73 (1.95)	-3.77 (1.86)**	-7.02 (3.7)**	-7.53 (3.22)***	-11.01 (3.36)***
Dummy-SSA	0.25 (0.17)	0.89 (0.23)***	0.18 (0.14)			
Constant	-0.38 (0.19)**	-1.49 (0.29)***	-0.41 (0.12)***	-0.18 (0.2)	-0.43 (0.31)	-0.3 (0.18)*
N	218	185	252	102	79	109
Sargan ($p>\chi^2$)	1.0	1.0	1.0	1.0	1.0	1.0
Autocorrelation (pr > z)	0.617	0.665	0.986	0.605	0.225	0.786

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 2.1

Table 2.1: Aid Impact on Growth, based on 5-year averaged data (Full sample, SGMM Estimation)					
	Total Aid	Bilateral Aid	Bilateral - EU	Bilateral - UK	Bilateral - US
$\Delta logrpy_{t-1}$	7.25 (3.72)**	7.41 (3.99)**	9.48 (3.67)***	21.07 (4.85)***	15.53 (6.96)***
ΔLog(Aid/GDP)	-10.2 (2.82)***	-10.41 (2.98)***	-9.41 (2.66)***	-1.56 (3.57)	-6.54 (5.2)
$\Delta log(Aid/GDP)^2$	4.66 (1.58)***	5.03 (1.64)***	4.46 (1.34)***	0.77 (1.82)	2.98 (2.65)
ΔLog(Trade)	6.23 (1.81)***	5.98 (1.89)***	6.36 (2.04)***	-0.28 (2.08)	3.3 (2.87)
Δlog (1+Infr)	0.05 (0.37)	0.04 (0.39)	0.07 (0.4)	-0.34 (0.36)	-0.2 (0.46)
Δlog(G)	-2.1 (2.54)	-2.51 (2.51)	-2.67 (2.34)	-1.67 (2.57)	-1.77 (2.69)
Δlog(fertility)	24.26 (5.36)***	25.67 (5.57)***	27.65 (5.47)***	31.12 (6.32)***	19.22 (8.05)***
ΔPolity2	-0.16 (0.15)	-0.16 (0.16)	-0.16 (0.16)	0.37 (0.19)**	0.12 (0.23)
$\Delta Polity2^2$	0.02 (0.03)	0.01 (0.03)	0.01 (0.03)	0.1 (0.04)***	-0.003 (0.03)
Dummy- SSA	2.41 (1.12)***	2.56 (1.11)***	2.31 (1.07)***	-0.24 (1.29)	0.63 (1.62)
Constant	-0.55 (0.91)	-0.38 (0.96)	0.12 (0.89)	2.68 (1.62)*	0.45 (2.0)
N	28	28	28	20	23
Sargan ($p>\chi^2$)	0.209	0.1682	0.137	0.921	0.355
Autocorrelation (pr > z)	0.376	0.4351	0.194	0.834	0.488

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 2.2

Table 2.2: Aid Impact on Growth, based on 5-year averaged data (Full sample, SGMM Estimation)			
	Bilateral: Group 1	Bilateral: Group 2	Bilateral: Group 3
$\Delta logrpy_{t-1}$	12.98 (6.44)**	15.99 (9.36)*	7.6 (4.32)*
ΔLog(Aid/GDP)	-3.27 (6.32)	-1.46 (6.97)	-9.83 (3.1)***
$\Delta log(Aid/GDP)^2$	1.17 (3.54)	-0.1 (3.74)	4.47 (1.79)***
ΔLog(Trade)	3.67 (2.57)	5.14 (3.44)	6.06 (1.94)***
Δlog (1+Infr)	-0.27 (0.51)	0.78 (0.75)	0.07 (0.41)
Δlog(G)	-0.81 (3.79)	-4.72 (4.23)	-2.42 (2.83)
Δlog(fertility)	25.86 (7.6)	41.51 (10.02)***	24.19 (6.36)***
ΔPolity2	-0.22 (0.24)	0.33 (0.71)	-0.12 (0.18)
$\Delta Polity2^2$	0.01 (0.03)	-0.08 (0.11)	0.02 (0.04)
Dummy-SSA	0.93 (1.83)	2.6 (2.47)	2.7 (1.16)***
Constant	1.75 (2.17)	3.66 (2.73)	-0.61 (1.01)
N	24	20	27
Sargan ($p>\chi^2$)	0.268	0.530	0.230
Autocorrelation (pr > z)	0.268	0.612	0.453

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 2.3

Table 2.3: Aid Impact on Growth, based on 5-year averaged data (Full sample, SGMM Estimation)					
	UNDP	UNFPA	UNICEF	UNTA	WFP
$\Delta logrpy_{t-1}$	9.3 (4.41)***	18.24 (5.2)***	14.28 (6.49)***	6.52 (4.28)	15.99 (5.17)***
ΔLog(Aid/GDP)	-10.44 (2.96)***	-3.05 (4.25)	-5.89 (4.87)	-8.56 (3.94)***	-2.59 (3.76)
$\Delta log(Aid/GDP)^2$	5.65 (1.5)***	2.03 (2.14)	2.72 (2.76)	4.36 (2.45)*	0.68 (1.88)
ΔLog(Trade)	4.85 (2.03)***	1.79 (2.76)	3.37 (2.73)	5.3 (1.87)***	4.75 (2.27)**
Δlog (1+Infr)	0.12 (0.41)	0.14 (0.73)	-0.1 (0.45)	0.06 (0.46)	-0.09 (0.35)
Δlog(G)	-5.31 (3.04)*	-4.41 (6.01)	-1.75 (3.23)	-4.97 (2.73)*	-1.29 (2.35)
Δlog(fertility)	27.80 (5.83)***	7.41 (11.58)	27.57 (7.25)***	20.99 (6.47)***	18.54 (6.1)***
ΔPolity2	-0.02 (0.19)	0.29 (0.48)	-0.06 (0.2)	-0.16 (0.16)	-0.03 (0.16)
$\Delta Polity2^2$	-0.01 (0.03)	-0.06 (0.08)	-0.005 (0.03)	0.01 (0.03)	-0.03 (0.03)
Dummy- SSA	2.75 (1.19)***	1.39 (2.33)	0.65 (1.91)	2.76 (1.18)***	-0.34 (1.32)
Constant	-0.18 (1.12)	-0.66 (1.52)	1.33 (2.02)	-0.77 (0.98)	0.97 (1.55)
N	26	20	24	24	23
Sargan ($p>\chi^2$)	0.356	0.781	0.209	0.217	0.643
Autocorrelation (pr > z)	0.762	0.507	0.1873	0.596	0.575

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

APPENDIX

I. List of Tables

Table 3.1

Table 3.1: Aid Impact on Growth, based on 5-year averaged data (Full sample, FE Estimation)					
	Total Aid	Bilateral Aid	Bilateral - EU	Bilateral - UK	Bilateral - US
$logrpy_{t-1}$	0.45 (0.87)	0.65 (0.88)	0.73 (0.87)	0.86 (0.81)	0.82 (0.97)
Log(Aid/GDP)	-7.28 (2.35)***	-7.96 (2.31)***	-8.95 (2.3)***	-7.98 (2.35)***	-8.95 (2.67)***
$log(Aid/GDP)^2$	2.87 (1.4)**	3.55 (1.3)***	4.28 (1.13)***	3.69 (1.21)***	4.26 (1.37)***
Log(Trade)	5.85 (2.49)***	5.24 (2.43)***	5.96 (2.67)***	5.46 (2.66)**	5.45 (3.14)*
log (1+Infr)	-0.56 (0.48)	-0.53 (0.48)	-0.51 (0.49)	-0.89 (0.55)	-0.62 (0.53)
log(G)	1.61 (1.66)	1.63 (1.68)	1.34 (1.66)	2.03 (1.84)	1.43 (2.05)
log(fertility)	13.32 (4.22)***	12.11 (4.63)***	13.46 (4.38)***	13.61 (5.29)***	15.45 (6.89)***
Polity2	0.01 (0.14)	0.02 (0.15)	0.001 (0.15)	0.04 (0.15)	0.07 (0.18)
$Polity2^2$	0.04 (0.03)	0.03 (0.03)	0.03 (0.03)	0.02 (0.04)	0.03 (0.04)
Constant	-85.6 (28.91)	-93 (29.84)	-108.45 (27.78)***	-103.04 (31.81)***	-112.84 (40.25)***
N	64	64	64	55	55

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 3.2

Table 3.2: Aid Impact on Growth, based on 5-year averaged data (Full sample, FE Estimation)					
	UNDP	UNFPA	UNICEF	UNTA	WFP
$\Delta logrpy_{t-1}$	1.07 (0.83)	0.79 (0.84)	0.9 (0.67)	5.87 (3.34)*	0.49 (0.79)
ΔLog(Aid/GDP)	-8.85 (2.36)***	-8.15 (2.41)***	-5.58 (2.0)***	-4.36 (3.39)	-5.87 (2.55)***
$\Delta log(Aid/GDP)^2$	4.78 (1.31)***	3.82 (1.24)***	1.36 (1.17)	1.45 (1.91)	2.34 (1.32)*
ΔLog(Trade)	3.7 (2.54)	5.32 (2.59)**	3.42 (2.11)	5.89 (2.48)***	5.71 (2.54)***
Δlog (1+Infr)	-0.42 (0.51)	-0.6 (0.52)	-0.26 (0.41)	-0.8 (0.52)	-0.32 (0.48)
Δlog(G)	0.44 (1.79)	3.09 (2.23)	2.93 (1.6)*	1.13 (1.76)	0.87 (1.73)
Δlog(fertility)	12.08 (4.54)***	11.68 (4.55)***	11.27 (3.77)***	12.2 (5.26)***	10.95 (4.46)***
ΔPolity2	0.02 (0.15)	-0.18 (0.2)	-0.08 (0.12)	0.02 (0.15)	-0.06 (0.14)
$\Delta Polity2^2$	0.02 (0.03)	0.02 (0.03)	-0.005 (0.03)	-0.002 (0.04)	-0.002 (0.03)
Constant	-101.29 (28.64)***	-103.42 (30.31)***	-69.06 (25.11)***	-102.71 (34.61)***	-78.49 (29.33)***
N	62	59	57	59	56

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table 3.3

Table 3.3: Aid Impact on Growth, based on 5-year averaged data (Full sample, FE Estimation)			
	Bilateral: Group 1	Bilateral: Group 2	Bilateral: Group 3
$logrpy_{t-1}$	0.79 (0.91)	4.81 (5.38)	0.65 (0.9)
Log(Aid/GDP)	-7.53 (2.78)***	-3.28 (5.89)	-7.66 (2.43)***
$log(Aid/GDP)^2$	3.63 (1.57)***	1.22 (3.65)	3.43 (1.42)***
Log(Trade)	3.81 (2.66)	8.00 (3.82)**	5.18 (2.5)**
log (1+Infr)	-0.53 (0.51)	-1.62 (0.89)*	-0.52 (0.49)
log(G)	0.99 (1.98)	6.67 (5.28)	1.94 (1.8)
log(fertility)	10.56 (5.7)*	13.82 (9.12)	11.7 (4.85)***
Polity2	-0.01 (0.15)	-0.59 (0.47)	0.01 (0.15)
$Polity2^2$	0.02 (0.04)	0.03 (0.09)	0.04 (0.04)
Constant	-86.18 (35.46)***	-117.49 (71.52)	-91.82 (30.97)***
N	58	45	63

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Table A.1: Sample LDCs

Sub-Saharan Africa LDCs(30)		Asia and Latin America LDCs (9)	LDCs excluded from Sample (9)
Benin	Mauritania	Haiti	Sao Tome and Principe
Burkina Faso	Mozambique	Bangladesh	Afghanistan
Burundi	Niger	Bhutan	Somalia
Central African Republic	Rwanda	Cambodia Nepal	Myanmar Eritrea
Chad	Senegal	Lao PDR	Kiribati
Congo, Dem. Rep.	Sierra Leone	Solomon Islands	Timor-Leste
Equatorial Guinea	Sudan	Vanuatu	Tuvalu
Ethiopia	Tanzania	Yemen, Rep	Samoa
Guinea	Togo		
Guinea-Bissau	Uganda		
Liberia	Zambia		
Madagascar	Comoros		
Malawi	Djibouti		
Mali	Angola		
Gambia, The	Lesotho		

Table A.2

Table A.2: Variable Description	
Notation	Description
RPYG	GDP per capita growth (annual %)
RPY	GDP per capita (constant 2000 US$)
ODA	Net official development assistance received (constant 2009 US$) (as % of per real GDP)
Bilateral Aid	Net bilateral aid flows from DAC donors, Total (current US$) (% of GDP)
Group 1 (G1)	Bilateral Aid from: Denmark +Finland +Netherlands +Norway + Sweden (% of GDP)
Group 2	Bilateral aid from: G1 + Austria + Canada + Ireland + Switzerland + New Zealand (% of GDP)
Group 3	Bilateral aid from: G1 + Belgium + France + Switzerland + UK + US (% of GDP)
US	Net bilateral aid flows from DAC donors, United States (current US$) (% of GDP)
UK	Net bilateral aid flows from DAC donors, United Kingdom (current US$) (% of GDP)
EU	Net bilateral aid flows from DAC donors, European Union institutions (current US$) (% of GDP)
UNDP	Net official flows from UN agencies, UNDP (current US$) (% of GDP)
UNFPA	Net official flows from UN agencies, UNFPA (current US$) (% of GDP)
UNHCR	Net official flows from UN agencies, UNHCR (current US$) (% of GDP)
UNICEF	Net official flows from UN agencies, UNICEF (current US$) (% of GDP)
UNTA	Net official flows from UN agencies, UNTA (current US$) (% of GDP)
WFP	Net official flows from UN agencies, WFP (current US$) (% of GDP)
M2	Money and quasi money (M2) as % of GDP
Fertility	Fertility rate, total (births per woman)
Infl	Inflation, consumer prices (annual %)
Polity2	Polity2 index from the polity IV project (2011). The index is measured on a scale of -10 (strongly autocratic) to 10 (strongly democratic)
Trade	Trade (% of GDP)
G	General government final consumption expenditure (% of GDP)

Table A.3

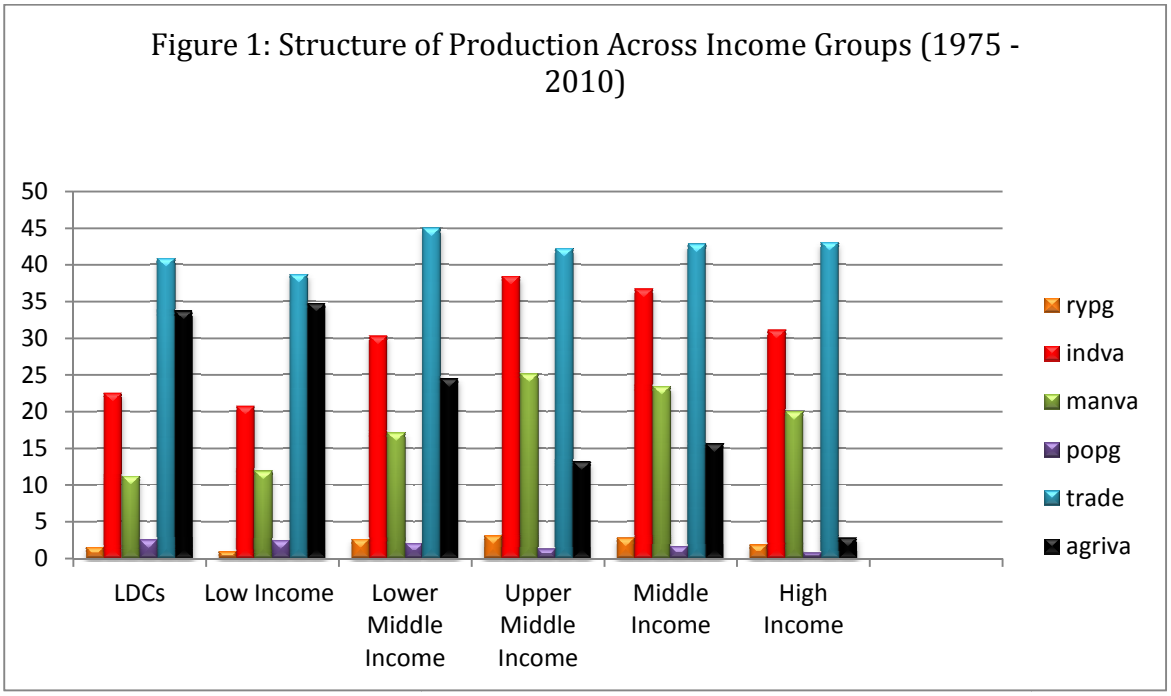
Table A.3: Descriptive Statistics for Selected variables					
Variable	Mean	Std Dev	Min	Max	N
RPYG	1.066	7.265	-50.29	92.586	1222
ODA	25.807	22.517	0.169	144.910	1267
Bilateral Aid	4.051	6.289	-0.014	47.359	1267
Group 1	1.347	2.361	-0.021	24.491	1267
Group 2	2.090	2.572	-0.522	16.456	814
Group 3	5.470	5.508	-0.048	69.663	1267
US	0.509	1.149	-0.002	25.460	1267
UK	1.187	2.557	-0.017	32.758	1267
EU	7.354	9.421	-0.070	103.003	1264
UNDP	0.386	0.502	-0.002	3.810	1267
UNFPA	0.067	0.079	0.000	0.659	1190
UNHCR	0.145	0.599	0.000	9.970	1267
UNICEF	0.189	0.353	0.000	5.680	1267
UNTA	0.115	0.160	0.000	2.270	1267
WFP	0.495	2.280	-3.770	47.329	1267
M2	22.23	59.8	-68.37	1021.901	1186
Fertility rate	9.813	12.074	2.245	63.160	647
Inflation rate	56.281	764.908	-17.64	23773.130	1055
Polity2 Index	-2.18	5.44	-10.0	9.0	1334

Table A.4: Correlation Matrix for Selected Variables

	rpyg	ODA	BAID	G1	G2	G3	US	UK	EU	UNDP	UNFPA	UNHCR	UNICEF	UNTA	WFP	M2	FERTR	INFRATE
rpyg	1																	
ODA	-0.15	1																
BAID	-0.09	0.66	1															
G1	0.07	0.57	0.22	1														
G2	0.05	0.58	0.28	0.96	1.00													
G3	-0.19	0.75	0.42	0.60	0.64	1.00												
US	-0.22	0.28	0.38	0.10	0.20	0.59	1.00											
UK	0.05	0.44	-0.01	0.29	0.28	0.48	-0.01	1.00										
EU	-0.12	0.59	-0.06	0.51	0.46	0.57	0.04	0.61	1.00									
UNDP	-0.04	0.49	0.25	0.50	0.51	0.39	0.08	0.10	0.20	1.00								
UNFPA	-0.06	0.40	0.23	0.44	0.51	0.45	0.12	0.30	0.19	0.39	1.00							
UNHCR	-0.17	0.22	0.09	0.06	0.05	0.12	0.07	0.02	0.06	0.07	0.09	1.00						
UNICEF	-0.09	0.56	0.27	0.66	0.67	0.57	0.16	0.22	0.36	0.78	0.48	0.26	1.0					
UNTA	-0.10	0.42	0.28	0.29	0.31	0.23	-0.05	0.12	0.13	0.45	0.48	0.08	0.39	1.0				
WFP	-0.12	0.33	0.09	0.23	0.24	0.21	0.06	0.03	0.16	0.35	0.15	0.66	0.44	0.21	1.0			
M2	-0.02	-0.06	0.25	-0.17	-0.14	-0.07	0.04	0.00	-0.36	-0.14	0.02	-0.05	-0.24	0.20	-0.15	1.0		
FERTR	-0.05	0.21	-0.35	0.24	0.20	0.24	-0.1	0.39	0.76	0.02	-0.02	-0.003	0.11	-0.002	0.10	-0.43	1.0	
INFRATE	0.07	-0.04	-0.03	0.01	0.00	-0.03	-0.01	-0.01	-0.01	-0.03	-0.05	-0.01	0.01	-0.05	0.00	-0.05	-0.004	1.0
Polity2	-0.12	0.09	0.07	-0.19	-0.21	0.11	0.15	0.20	0.30	-0.29	-0.09	0.01	-0.17	-0.12	-0.14	-0.06	0.25	-0.04

II. List of figures

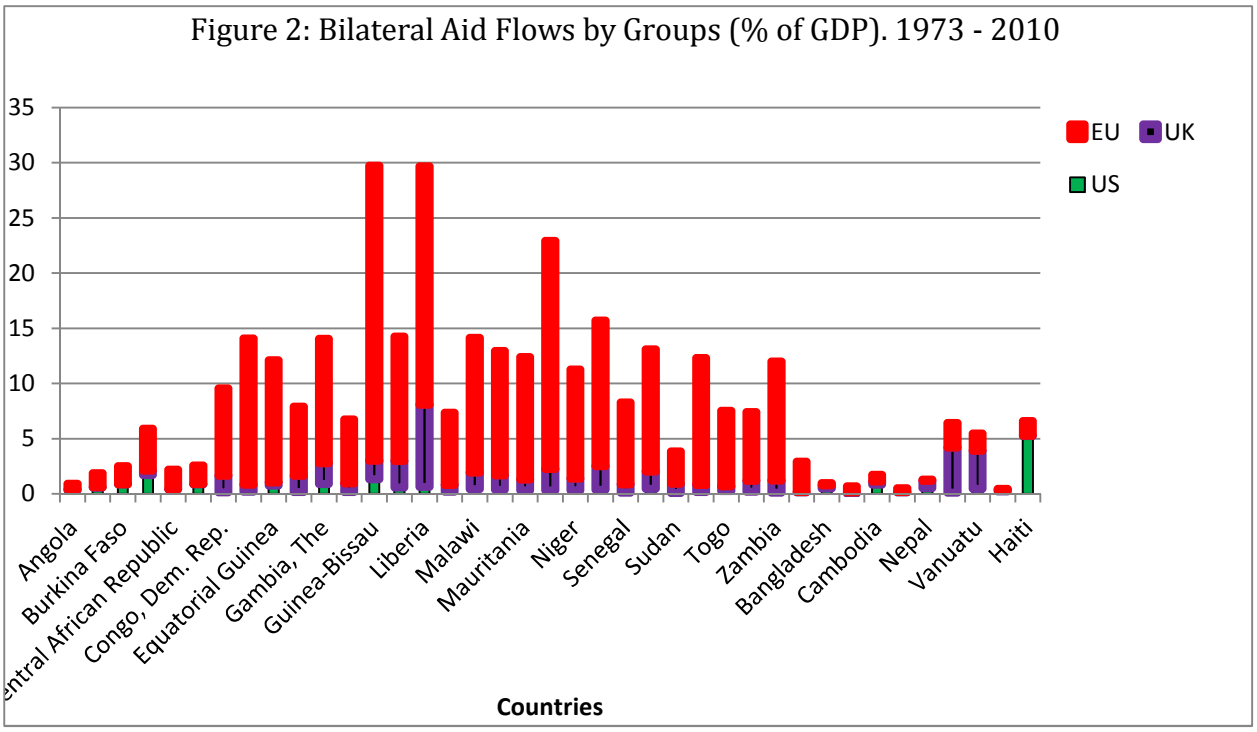
Figure 1



Source: World Development Indicators, 2012

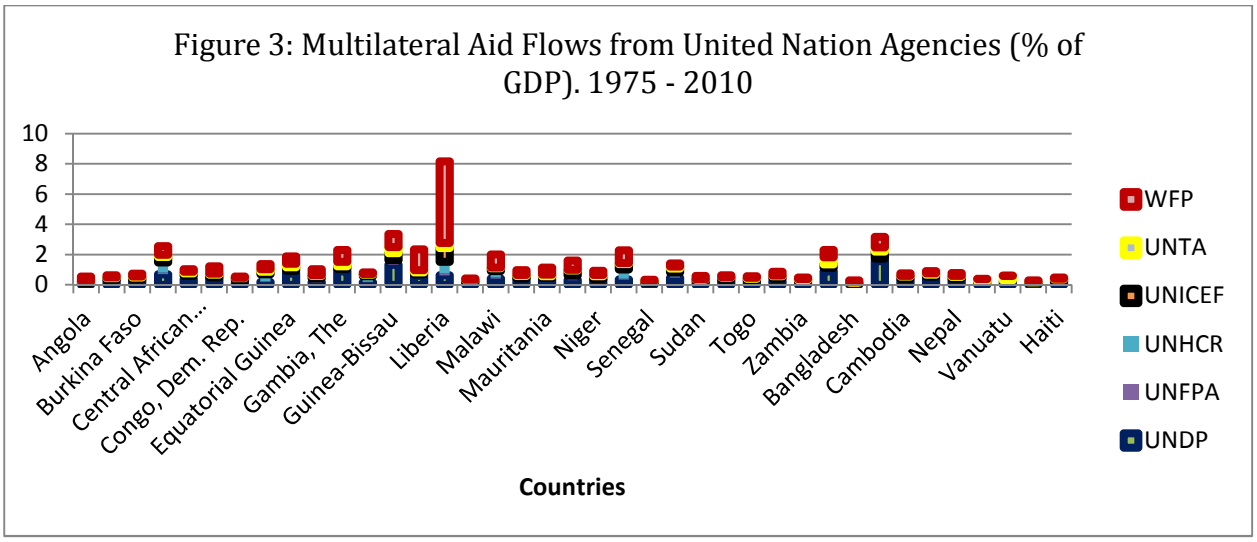
Note: indva - industry value added (% of GDP); manva- manufacturing value added (% of GDP); popg – population growth rate; agriva – agriculture value added (% of GDP)

Figure 2



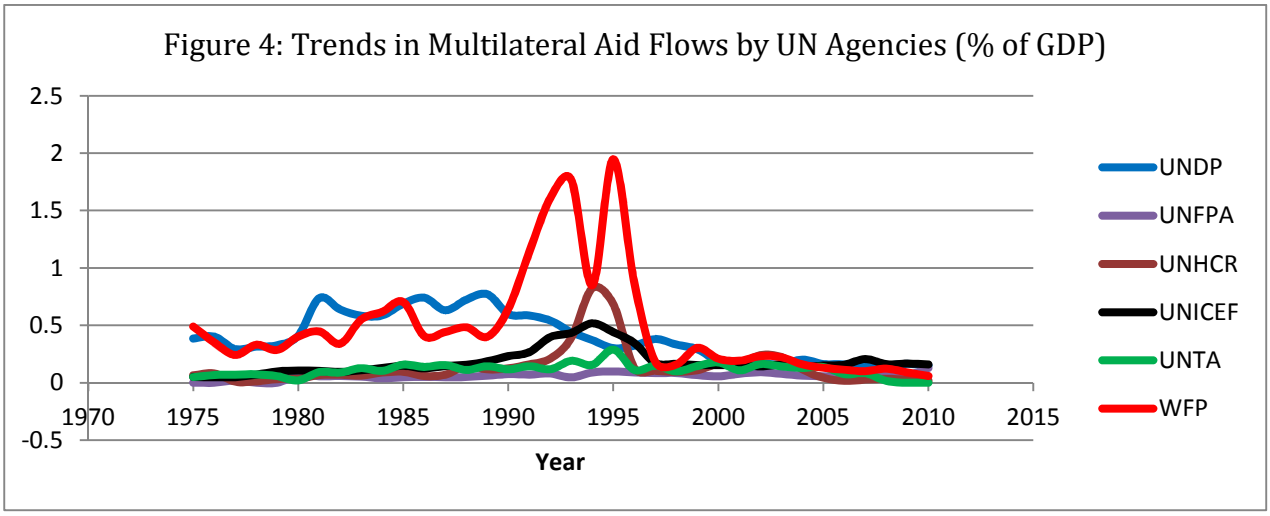
Source: World Development Indicators, 2012

Figure 3



Source: World Development Indicators, 2012

Figure 4



Source: World Development Indicators, 2012

ENDNOTES

[1] UNDP (United Nations Development Programs), UNICEF (United Nations Children's Fund), UNFPA (United Nations Population Fund), UNTA (United Nations Transitions authority), UNHCR (United Nations High Commissioner for Refugees), WFP (World Food Program)

[2] See Galor and Weil, 1996, 2000 for discussions on the linkage between population growth and capital accumulation.

[3] See an example in Sachs (2005, page 250) regarding an impassable road due to a missing bridge for further explanation on the threshold effects.

[4] For more discussions on the takeoff hypothesis, please see Easterly, William, 2006. "Reliving the 1950s: The Big Push, Poverty Traps and Takeoffs in Economic Development". *Journal of Economic Growth*. Vol. 11(4), pp289-318

[5] It is generally assumed that multilateral aid tend to be development in nature (assuming short run shocks)

[6] Aid disbursed to political allies regardless of a country's policy and institutional environment. For example, Israel and Egypt have benefited from aid flows from United States due to regional strategic reasons.

[7] For example, there is substantial evidence of neutral effects of aid on growth (Easterly, 2007a, 2007b, 2005; Easterly, Levine and Roodman, 2004; Boone, 1994, 1996). Others have found depressing effects[7] (Bobba and Powell, 2005). Yet, some have found positive relationship between aid and growth (Clemens, et al, 2004; Lensink and Morrissey, 2000).

[8] Africa: Eritrea, Somalia and Sao Tome and Principe. East Asia: Afghanistan, Kiribati, Myanmar, Samoa, Timor Leste, Tuvalu.

[9] The Commitment to Development Index ranks 22 of the world's richest countries on their dedication to policies that benefit the 5.5 billion people living in poorer nations. Moving beyond standard comparisons of foreign aid volumes, the CDI quantifies a range of rich-country policies that affect poor people in developing countries: Quantity and quality of aid; Openness to exports; Investment policies; Migration policies; Environmental policies; Security policies and Support for new technologies

[10] We use these groupings as a proxy to capture the effects of development aid. The best approach to determining whether specific aid is development friendly or not, would be to use sector level aid disbursements data. However, such data is not available for our study period.

[11] We do not have enough data for our sample of countries on budget surplus.

[12] Several studies have tested the interaction between aid and the Burnside and Dollar (2000) policy index and they found the interaction to be insignificant. See Easterly et.al, 2003; Dalgaard and Hansen, 2001; Hansen and Tarp, 2000, 2001 and Lensink and White, 2001.

[13] They caution that money supply (M2 or M3) as a share of GDP does not capture the quality of the financial market development. However, the bias that may arise from the quality effects is not central to this study.