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The Impact of Foreign Aid on Economic Growth in Ethiopia

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This paper investigates the impact of foreign aid on investment and economic growth of Ethiopia for the period 1971-2010. The result indicates that foreign aid has a statistically significant positive impact on domestic investment, while aid's positive impact on per capita GDP growth does not depend on any macroeconomic policy conditionality. Rather, aid effectiveness depends on the peculiar social, political and economic institutions of particular periods. Aid is effective during both socialist and democratic regimes. However, aid's impact on growth was greater for socialist regimes.

Keywords: Foreign aid, capital formation, economic growth, democratic regime, Ethiopia

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I. INTRODUCTION

This paper investigates the impact of foreign aid on investment and economic growth (GDP per capita) of Ethiopia. Theoretically it has been argued that foreign aid could relax savings, foreign exchange, and fiscal constraints. Thus, it is anticipated to have positive impact on investment and growth. However, cross-country empirical studies on aid effectiveness showed mixed results. Some studies documented the positive impact of aid on economic growth (Papanek 1973, Hansen and Tarp 2000, Gomanee et al. 2005, Sachs 2008 and Arndt et al. 2010), whilst others have found evidence to the contrary, i.e the relationship to be insignificant (see Mosley et al. 1987 and Boone 1996), or even negative (Ovaska 2003, Bräutigam and Knack 2004). Apart from this, an intermediate position has been that aid spurs growth under specific conditions (see Burnside and Dollar 1997, 2004 and Clemens et al. 2004).

To date, the debate on the effectiveness and/or conditionality of aid has been driven mainly by the results from cross-country regression analysis. However, cross country studies in aid effectiveness literature cannot properly capture the heterogeneous characteristics of the countries involved. Since each country differs remarkably in terms of the problems that they face, and the type and amount of aid that they need, it is improper to pool all countries into a basket and treat them equally. Although one can control the conditions peculiar to each country included in a study, the statistical techniques are still too crude and imperfect to control all peculiarities of the aid donors and recipients. This can make cross-country empirical work more difficult and can cause one to doubt the robustness of the result obtained. As cited by Mavrotas and McGillivray (2009), Riddell (2007) argues that cross-country aid-growth studies, as currently conducted, are unnecessary, as it simply reaffirms what we already know with many loopholes and caveats. In general, more studies on a specific country over time are needed to verify or confirm the result of cross-country analyses concerning the impact of aid on investment and economic growth. Although “one solution fits all” cannot be applied, a proliferation of studies on the basis of each country would reveal more robust results and insights on the effects of aid on investment and growth.

It is against this backdrop that this paper assesses the impact of aid on investment and economic growth in a single country, Ethiopia. It is one of the poorest developing countries, judged by any conventional standard. The economic growth of Ethiopia is hampered by shortages of both physical and human capital, which has serious implications for economic growth. According to the conventional development theories, especially the neoclassical growth theories, no countries in the world can be developed economically without an adequate level of investment.

If productive investment is to increase, there must be savings or postponement of current consumption. But many developing countries are not in a position to mobilize enough domestic resources needed for investment to develop its economy rapidly. In addition, they cannot afford to attract foreign direct investment or to borrow money for their investments in international capital markets at the ongoing market interest rate. Thus, the only external capital readily available to support development undertakings has to come from aid.

Foreign aid has a long history in Ethiopia as it was started during 1950s. However, the trajectory of its economic growth makes one wonder about the effectiveness of foreign aid on economic growth over the long history of some 60 years. As of 2010, foreign aid financed almost 50 percent of the capital budget (Gebergziabher, 2011) and reached about 20 percent of GDP. This level of aid makes Ethiopia one of the most aid-dependent countries in the world and caused even some IMF staff to raise their eyebrows (Aiyar et al, 2005). However, even with the remarkable donor interventions, Ethiopia, on the one hand, is still suffering from a high level of poverty (29 % of total population) with low per capita income (\$1,100 (PPP) in 2011). On the other hand, since 2004, the country's real GDP has been growing on average at 11 % per annum, which makes Ethiopia one of the fastest growing non-oil producing economies in sub-Saharan Africa. There has been also significant progress in human development indicators over the past two decades from (Africa Economic Outlook, 2012).¹ This conflicting picture of the economic history in Ethiopia motivates us to investigate the real relationship between aid and economic growth by adopting a methodology and set of variables which are different from the conventional cross-section studies.

The major research question to be addressed in this study is this: Does foreign aid contribute to the enhancement of investment and economic growth in Ethiopia? Based on the related literature examined and the recent record of growth achievement of the country, this paper advances the following hypothesis: *Aid relaxes financing constraints so that the government can finance investment in physical and human capital that promotes economic growth.* We also hypothesize that the *transition from a socialist economic system to a market economy and the policy change introduced in the country in 1991, promote the growth impact of aid.* To test these propositions, we used two equations: one for the aid-investment relationship, and another for the aid-economic growth relationship. Methodologically, this study differs from other previous studies on aid effectiveness by analyzing the data over a longer period of time (40 years) in one country. Most aid effectiveness studies in the literature have been cross-country studies of a much shorter period.

The remainder of this paper is structured as follows. Section 2 deals with a literature review on the relationship between aid and growth; Section 3 presents

the econometric analysis of investment and growth equations, using official development assistance (ODA) as one of the regressors; and Section 4 presents conclusions and policy recommendations.

II. LITERATURE REVIEW

Numerous empirical studies confirmed that economic growth is the necessary condition for sustained improvement of human welfare and poverty reduction (Dollar and Kraay, 2002). However, when it comes to the causes of growth, scholars disagree. One of the disputed points is whether or not foreign aid can spur economic growth of developing countries. It remains a running controversy over a long period and one of the most contested topics in developmental economics.

Cross-country studies have tended to yield ambiguous, sometimes even conflicting results. The literature is filled with stories of success and failure with foreign aid. But studies differ in terms of the econometric specifications used, the number of years covered in the analysis, the independent variables included, and the number of countries investigated in the studies. Like many cross-country analyses, time-series country studies also failed to produce any conclusive results. The subsequent section reviews both cross-country and time-series literature on aid..

1. *Cross-Country Analysis*

The cross-country empirical studies of aid effectiveness can be categorized into three groups. The first group study results are in favor of the aid effectiveness on growth. The second group study results are against the aid effectiveness argument. The third group study results are in favor of the aid effectiveness argument only when certain conditions are satisfied. They are briefly summarized in sequence, as follows.

(1) **Studies in Favor of Aid Effectiveness:**

Papanek (1973) assessed empirically the link between foreign aid, savings and foreign private investment using data acquired from 85 developing nation for the time period 1950s and 1960s. He generates a growth equation as follows:-

$$G = a_0 + a_1S + a_2A + a_3FOPI + a_4O + \mu$$

Where S represent savings, A: aid, FOPI: foreign private investment, O: other foreign inflows, and μ residual. He found a positive and significant impact of

foreign aid on growth. Foreign aid even appeared as a dominant variable triggering growth greater than domestic savings for Asia and Mediterranean countries, but it was an insignificant determinant of growth for Africa and Latin America. Another study, performed by Dowling Jr and Hiemenz (1983), also validates a positive and statistically significant impact of aid and economic growth in Asia.

Bacha (1990) acknowledges that the revenue of less developed countries is low, so that aid can relax the fiscal gap, which discourages public investment. Hansen and Tarp (2000, 2001) also acknowledged the importance of assessing the impact of aid on investment. According to them, aid is meant to impact growth via capital accumulation, and they did find a significant positive impact of aid on investment. They also found that aid has a positive impact on economic growth. Addison et al. (2005) reviewed recent empirical studies on aid and growth and found that majority of them (around 30 studies) show the positive impact of aid on economic growth, which indicates that growth would be lower in the absence of aid.

It's known fact that the growth performance of sub-Saharan countries is not encouraging, even with huge inflows of foreign aid for the last half century. The main question is: "Could Africa's poor growth record be attributable to aid ineffectiveness?" Studies provide mixed results. In this regard, Gomanee et al. (2005) argued that foreign aid does have strong positive impact on economic growth in sub-Saharan countries, and the poor growth record is explained by other factors like population growth, political conflicts, etc.

A study by Arndt et al (2010) also supports the positive impact of aid on growth. They studied the effectiveness of aid on economic growth, using a sample of 78 less developed countries for the period 1970-2000, and found that a 1% increase in foreign aid can increase growth by 0.1% approximately. Mekasha and Tarp (2011) have re-done the Doucouliagos and Paldam (2009) meta-analysis with 69 papers and find that the effect of aid on growth is positive and statistically significant.

(2) Studies Against Aid Effectiveness:

Earlier studies on aid effectiveness postulate a linear relationship between aid and growth because most of them are Harrod-Domar type. However, the assumption of a linear association between capital and output is incorrect. Easterly (1998) found a weaker link between investment and growth, so that only 1 out of 138 countries passed the test. Moreover, the growth impact of foreign aid is not one-to-one, as postulated by the Harrod-Domar type. Rather, foreign aid may substitute domestic resources, may affect the exchange rate

and, therefore, may bring a lower level of domestic investment and undesirable results. Beside this aid fungibility issue, various internal and external factors may break up the link that runs from aid to investment to growth. Corruption may be one factor in which aid money may be embezzled. Hence, the simplistic view of early theories and their promising results on the impact of aid and growth is incorrect.

In this regard, Boone (1996) investigated the impact of foreign aid on investment, consumption, and measures of well-being for 91 countries for the period 1971-90. He found that aid increased consumption more than investment and growth. He argued that the current political regimes in aid recipient countries prevent the aid from being an effective tool for promoting growth, and that a liberal political regime is important in promoting growth and reducing poverty through aid.

Ovaska (2003) studied 86 developing countries over a period 1975-1998 and found a negative relationship between aid and economic growth. Rajan and Subramanian (2005) also failed to find any positive effects of aid on economic growth in the short and medium terms and found even negative relationship in the long run.

In their survey, Doucouliagos and Paldam (2009) count 97 studies on the aid-growth relationship by the end of 2004 and made a meta-analysis of 68 studies with a conclusion: "After 40 years of development aid, the preponderance of the evidence indicates that aid has not been effective."

(3) Studies in Favor of Aid Effectiveness under Specific Conditions:

Mosley et al (1987) studied the effectiveness of foreign aid for 80 less developed countries for the period 1960-1980. They found that foreign aid is statistically insignificant in affecting the growth rate of GNP. Their analysis suggests that the rate of return to investment, the proportion of aid allocated to recurrent budget, and the impact of aid on private investment should be attached as conditionality to raise the effectiveness of aid.

The most influential and controversial paper in recent years is by Burnside and Dollar (1997). They examine aid effectiveness by looking at the relationship between foreign aid and economic growth through an interaction of aid with policy. They first estimate their growth equation without a policy variable and found no significant impact of aid on growth. Conversely, when they incorporated an aid-policy interaction variable, the impact of aid is positive and indeed significant. The policy index used includes fiscal surplus, inflation, and trade openness.

However, subsequent empirical research questioned the robustness of the result. Dalgaard and Hansen (2001) argued that the result of Burnside and Dollar

(1997) was extremely data dependent and found that foreign aid had a positive impact on growth in any policy environment. Hansen and Tarp (2000) also didn't find the conditionality of foreign aid on good policy. They used the same data and same sample with different econometric specifications and estimation methods, and found that aid had positive impact on economic growth, and it was not conditional on the economic policy. Guillaumont and Chauvet (2001) also didn't find the conditionality of aid on good macroeconomic policy environment, but urged the need to consider other factors that have direct or indirect link to aid. According to them, aid works best in countries with difficult economic environments, characterized by volatile and declining terms of trade, low population, and natural disasters. Additionally, Easterly et al. (2003) and Rajan and Subramanian (2005) did not find evidence that supports Burnside and Dollar's results. In addition, criticisms were raised that the policy index used by them was too narrow.

In response to these criticisms, Collier and Dollar (2002) used a broader measure of policies and institutions, and reconfirmed the previous results of Burnside and Dollar (1997), emphasizing that good institutions and policies facilitate the growth impact of aid. However, Clemens et al (2004) found that aid effectiveness is conditional not on the policies or institutions, but on the sectors to which aid is applied. While disaster relief aid has negative effects on economic growth, aid for indirectly productive sectors like education and health has positive but weak effects on economic growth, and aid for directly productive sectors like infrastructure and agriculture has positive and strong effects on economic growth in a short period of four years. They found that direct and indirect aid was effective in all countries, irrespective of the quality of their policies, but was more effective in countries with good policies/institutions and a high level of human capital.

Other groups of practitioners and OECD/DAC argued that aid is effective when it is untied, is given to countries with ownership, and by donors which are vigilant in monitoring and evaluation of the results in harmony with other donors with lean organizations and fewer reporting requirements, utilizing recipients' systems and procedures (OECD Paris Declaration, 2005). However, there has been no comprehensive empirical proof of these arguments to date.

Still other groups of scholars stressed the importance of democracy and market liberalization for the effectiveness of foreign aid. Isham, Kaufmann, and Pritchett (1995) and Svensson (1999) found that the long-run growth impact of aid is conditional on the degree of political and civil liberties in the recipient country. They conclude that aid has a positive impact on growth in countries with institutionalized check on government power; that is, in more democratic countries. In addition, Kosack (2003) found that, aid effectiveness, as defined by the ability

to improve the quality of life and measured by the U.N.'s Human Development Index, is conditional on the extent of democracy in recipient countries, and that aid is ineffective and even harmful in autocratic countries.

Generally, the aid-growth literature, which relied almost entirely on the estimates of cross-country growth studies, fails to reach a consensus on the aid effectiveness issue. In addition, general conclusions based on cross-country studies may not have accurate and broad applicability, as there is a wider variation of circumstances across developing countries. Considering this, we review country specific aid-growth relationships in the following.

2. Time-Series Studies

Like cross-country analyses, time-series country studies also failed to produce any consistent results. Lloyd et al. (2001) investigate the effectiveness of foreign aid for the case of Ghana. They found that aid contributes to long-run growth of private consumption and that policy reform enhanced the effectiveness of aid. Mavrotas (2002), for instance, examined the impact of aid on the economic growth of India for the period 1970-1992. He disaggregates aid data as project, program and technical assistance. He found that both program aid and project aid have negative impacts on economic growth. Another study by Feeny (2005) found that aid provided in the form of projects has positive impact to economic growth of Papua New Guinea for the period 1965-99.

A timeseries study by AbuAl-Foul (2007) using the vector autoregressive analysis also reveals a positive long run relationship between foreign aid and economic growth for Jordan during the period 1960-2005. However, he failed to find long run relationship between foreign aid and economic growth for Egypt over the same period. Another study by Mohey-ud-din (2005) on aid and economic growth of Pakistan for the period 1960-2002 depicts a positive effect of aid on economic growth. However, his growth equation is very simple. He formulates the growth equation by using aid as a single independent variable and added only aid squared, as follows:

$$GDP = \alpha + \beta_1 ODA + \beta_2 ODA^2$$

Mohey-ud-din failed to incorporate other determinants of GDP like investment and human capital. The exclusion of these variables leads to the correlated omitted variable problem in the econometric analysis, which makes the result to be biased.

A study conducted by Martins (2007) assessed the impact of foreign aid inflows on public expenditure, revenue and domestic borrowing in Ethiopia covering

the period 1964-2005. He disaggregates foreign aid inflows into grant and loan components. He found that aid inflows increase public investment, with loans having stronger impact than grants. Both grant and loan aids have a strong negative effect on domestic borrowing, suggesting that aid and domestic financing are close substitutes.

The varied findings of the time-series country studies demonstrate that each country has a unique situation regarding the aid-growth relationship. Although they show different findings in different countries, there have not yet been any different findings on the same country over the same period of time. This is a vindication of time-series studies on the relationship between aid and economic growth; hence, it is justified to conduct a time-series analysis of the aid-growth relationship in Ethiopia.

III. AID, INVESTMENT AND GROWTH IN ETHIOPIA

The Ethiopian economy has gone through major changes across more than five decades. In political terms, three main regimes can be identified: the Imperial regime (1930-1974), the Derg regime (1975-1991), and the Ethiopian People's Revolutionary Democratic Front (EPRDF) (1991-present). Before 1975, the macroeconomic policy largely pursued a market-oriented economic system. Economic performance during that period was normal, with real GDP growing at 4% annually, while per capita GDP at 1.5 percent per annum.

The imperial period ended by the popular revolution in 1974. The Derg regime was characterized by a centrally-planned economic system with a strong military power, and it was politically non-democratic. Geda and Degefe (2005) showed that economic performance under this regime was poorer than the past imperial period, with GDP growing at 1.6 % per year, while annual per capita GDP growth was negative (-0.8%) on average.

Another major change in the Ethiopian economic and political context occurred in 1991, when a coalition of rebel forces (EPRDF) succeeded in overthrowing the military regime. This new period shows a transformation of the country to a market economy and a democratic system. The growth performance of this democratic regime, especially since 2004, was much better than the previous two regimes. Total and per capita GDP growth during the post-Derg period averaged at 6.4 percent and 0.7 percent per annum, respectively. However, the per capita GDP growth before 2004 was not particularly higher than the previous regime. The following figure shows the performance of the economy before and after the fall of the Derg government.

FIGURE 1. GDP of Ethiopia (value in million US dollar constant 2000)

Source: World Bank, world development indicator

The figure shows the dismal performance of the economy under the military regime, followed by the GDP growth under the democratic regime, which was typically erratic and sluggish for a long period of time up to 2003. Only starting from 2004, the GDP grew on average at no less than 10% per year.

During the whole period in question, Ethiopia received foreign aid from different donors. The first aid to Ethiopia came from US in 1953 during the era of Emperor Haile Sillasse. The country also received aid from other donors like Sweden and Soviet Union. During the socialist period (1974-1991), Ethiopia received development assistance from Eastern Block donors, particularly from the Soviet Union and East Germany, as well as from Western bilateral and multilateral donors. Ethiopia also benefited from the technical assistance from Cuba, North Korea, and East European countries, which were all socialists. Following the end of the military regime (1991) the country got more aid. Between 2002 and 2010, aid to Ethiopia more than tripled and continued rising since then.

The following graph shows the growth rate of real GDP and aid. Typically the figure does not show any systematic relationship between aid and economic growth, which necessitates an econometric analysis.

FIGURE 2. Annual percentage growth of ODA and real GDP

Source: Based on World Bank data: world development indicator

However, the following figure shows the positive relationship between investment and aid as percentage of GDP

FIGURE 3. Domestic investment and Aid as percentage of GDP

IV. EMPIRICAL ANALYSIS

The main research question of this paper is: Does foreign aid contribute to the enhancement of investment and economic growth in Ethiopia? To answer this question, the controversy in the literature has been reviewed, and the following hypothesis is advanced: *Aid relaxes financing constraints so that the government can finance investment in physical and human capital that promotes economic growth.* In addition, a related hypothesis is formulated: *The transition from a socialist economic system of the military regime to a market economy of the democratic regime introduced in the country in 1991 promotes the growth impact of aid.* This subsidiary hypothesis aims to test the argument in the literature that civil and political rights or the democratic political system is a necessary condition for positive aid impact on economic growth or the quality of life (Isham et al 1995, Kosack 2003).

To test these propositions, we used two equations: one for an aid-investment link, and another for an aid-economic growth link. The two equations are estimated, using OLS with autoregressive and co-integration models. Methodologically, the fundamental models of the two equations are similar to the ones used by the proponents of the positive aid impacts on investment and growth. For the aid-investment link, the Hansen and Tarp (2000, 2001) model is used; for the aid-growth link, the model used by Burnside and Dollar (1997), Hansen and Tarp (2000, 2001) and Collier and Dollar (2002) is basically adopted. However, this study differs from previous studies on aid effectiveness by analyzing the data over a longer period of time (40 years) in one specific country, i.e., Ethiopia. Most aid effectiveness studies in the literature have been cross-country studies of a much shorter period. Moreover, the specification of the models used in this paper is an improved version of the previous studies. Data for this study have been collected over a period 1971-2010 from different sources, as presented in Annex 1.

1. The Investment Equation

Following the model used by Hansen and Tarp (2000), our hypothesis for investment equation for Ethiopia is that foreign aid, along with other variables, has a positive contribution to domestic investment. Our main question here is to what extent the percentage increase of aid flows to Ethiopia helps raise the investment rate of the country. We also include other variables used by Hansen and Tarp, such as inflation and savings, which are supported by neoclassical growth models. However, we do not include other in-flows, such as private aid and other flows partly because of the fact that there had been little such in-flows in Ethiopia. Instead, we include other variables, which we believe affect

investment, such as debt servicing, based on the empirical study of Hansen et al. (2002), the debt overhang theory by Krugman (1988) and the crowding-out theory by Cohen (1993)). Therefore, the investment model is formulated as follows:

$$\ln I_t = B_0 + B_1 \ln S_t + B_2 \ln A_t + B_3 \ln DS_t + B_4 \ln INF_t + B_5 MAR \text{ -----(1)}$$

where I: ratio of investment to GDP, S: ratio of savings to GDP, DS: ratio of debt service to GDP, INF; annual inflation rate, and MAR is dummy variable (1 for the period 1991-2010; and 0 for otherwise).

Earlier studies give some ideas about how we should expect aid to have an impact on investment. For instance, Levy (1987) and Hansen and Tarp (2000) show the positive impact of foreign aid on domestic investment. However, there is no guarantee that these homogenous occurrences are always justifiable.

Another independent variable included in the investment model is debt servicing. If a component of aid is a loan, it necessitates its future payments in the form of debt service. Thus, if the recipient's repayment capacity fails to increase, debt servicing is likely to crowd out investment activity by consuming the foreign exchange available from aid. Therefore, it is equally important to assess whether debt servicing weakens investment or not. The expected sign of the debt servicing variable in the investment equation is negative.

Other controlled variables included in the investment equation are inflation and savings. The theoretical explanation of inflation is that it makes the general price of goods and services more uncertain, which makes investors to be reluctant in investing, raises the cost of borrowing, and thus lowers the domestic investment. On the side of savings, early macroeconomic theories reveal savings as the main determinant of investment. The theory mainly rests on closed economies where it is assumed that savings equals investment. Nonetheless, matters are more complicated in an open economy. The increase in domestic savings may not result in an immediate boom in domestic investment. As Keynes (1937) pointed out, savings and investment are not always made by the same individuals, which indicates that the desire to save does not necessarily generate investment. In this way an individual country's savings ideally would flow to whatsoever country which gives the highest interest rate. Even in an open economy, however, Baxter and Crucini (1993) discovered a strong correlation between domestic savings and investment. They found a correlation coefficient close to 0.9. Thus, it is important to control the effect of inflation and domestic savings on investment.

The symbol MAR is a dummy variable, which assumes 1 for the period 1991-2010, and 0 otherwise. During the period 1991-2010, the country was transformed into a market-oriented economic structure, and the role of the state in the

market was minimized, which helped create strong legal, institutional and policy environments that enhanced private sector investment. In the political sphere the country transformed into a democratic system, and political stability was maintained. Thus, we believe that the period, during which reform measures were undertaken, could have a positive impact on investment in the country.

Since this study employs a time-series analysis, it is mandatory that the stationary nature of the data be tested. A regression of one non-stationary series on another non-stationary series can generate the so-called “spurious regression” and can lead to incorrect statistical inferences (Granger and Newbold, 1974). According to Baumöhl and Lyócsa (2009) an important indicator of spurious regression is that Durbin-Watson statistics remain less than the coefficient of determination. If such problem does not arise in the model, it is recommended that OLS method be used rather than the complex Co-Integration technique. Since in the investment equation model $DW > R^2$, so the researcher used OLS estimation method (as indicated in the second column of the following table). Although autocorrelation is not a serious problem in the investment regression equation and the values of the coefficients are acceptable, we undertook an autoregressive model (to totally eliminate serial correlation) and a White Heteroskedasticity-Consistent regression model. Surprisingly, both estimation models produce remarkably similar results with slight differences in the value of the parameters. This result indicates the robustness of the estimation model. The result is given in the following table

TABLE 1. Estimation of the Investment Equation (1)

Explanatory variable	Expected sign	OLS regression	Autoregressive (Generalized differencing)
Intercept	+	2.203*** (12.09)	2.03*** (8.01)
INF	-	-0.0098** (-2.36)	-0.006* (-1.88)
A	?	0.33*** (4.72)	0.27** (2.56)
S	?	-0.059 (-1.10)	0.019 (0.41)
MAR	?	0.0107 (0.125)	0.108 (0.86)
DEBTS	-	-0.029 (-0.82)	-0.0008 (-0.023)
		$R^2 = 0.60$	$R^2 = 0.675$
		Adjusted $R^2 = 0.53$	Adjusted $R^2 = 0.602$
		Durbin-Watson Stat. = 1.30	Durbin-Watson Stat. = 2.12

Notes: t-ratios in parenthesis; *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

For most of the parameters of the model, the estimated results are consistent with the prior theoretical expectations and have correct signs and a reasonable magnitude. The R^2 of the model describes that 67.5% of the variation of gross domestic investment is explained by the independent variables employed in the model. The result reveals that savings has an insignificant effect on domestic investment. This implies that for the period under consideration, the role of savings was negligible in improving investment. The main reason, as argued by Keynes in 1930s, is because savings depends mainly on income, while investment relies on profitability and risk (Meltzer, 2005). Thus, in open economy savings may not result in an immediate boom in investment. Another plausible reason is that investment can be undertaken with the help of foreign aid even when domestic saving is low and fairly stable, as found by Levy (1987) in many low income countries. For instance in 2010 domestic saving of Ethiopia is 0.4% of GDP while investment is 21% of GDP.

The coefficient of aid is 0.27 and significant, which indicates that a 1 percentage increase in foreign aid leads to a 0.27 percentage growth of domestic capital formation. A similar result was found in the cross-section studies by Hansen and Tarp (2000), Hansen et al. (2002), Lensink and Morrissey (2000). Therefore, we can argue that during the period under consideration aid improved the level of investment.

The result further shows that inflation has a significant negative impact on investment for the period under consideration. However, the magnitude of its effect on domestic investment is small (one percent increase in the inflation rate results in around 0.006% decline in domestic investment).

Unlike the theoretical expectation, the debt service variable produces negative but statistically insignificant effects in both models. Successive debt relief provided for the current regime and rescheduling of debt in the previous regime may be some of the reasons why debt serving is insignificant. Additionally, a large portion of the aid for Ethiopia constitutes a grant element. Thus, loans, which account for a small portion of aid, may not have strong effect in crowding out investment.

The parameter for the dummy variable MAR (1 for the period when the country was ruled by a democratic government (1991-2010)) is insignificant, but the sign is consistent with our theoretical expectation. Therefore, there is no statistical evidence that aid enhances investment more during the democratic and market-oriented regimes.

2. Growth Equation

The growth equation is modeled in the following way:

$$\ln Y_t = B_0 + B_1 \ln I_t + B_2 \ln HD_t + B_3 \ln P_t + B_4 \ln A_t + B_5 \ln P_t * A_t + B_6 \ln A_t^2 + B_7 MAR1 + B_8 MAR2 + B_9 \ln A_t * MAR1 + B_{10} \ln A_t * MAR2 + B_{11} \ln Pop_t + e_t \dots \dots \dots (2)$$

where Y: real GDP per capita in 2000 constant US \$,

I: the ratio of fixed capital formation to GDP,

HD: human development, proxied by life expectancy,

A: the ratio of net official development assistance to GDP,

P: policy index,

P*A: policy index (P) interacted with the ratio of official development assistance to GDP,

A²: the square of the ratio of official development assistance to GDP,

A*MAR1: Official development assistance interacted with a dummy variable MAR1(1 for 1974-1991; and 0 for other periods),

A*MAR2: Official development assistance interacted with a dummy variable MAR2(1 for 1991-2010; and 0 for other periods) and

Pop: population in million persons.

The model includes investment and human capital as independent variables. Growth theory, in general, rests upon the role of investment on economic growth. As described in the literature review part, both Harrod-Domar and the conventional neoclassical growth models regarded investment as a core variable and praised the effect of capital formation on growth. One of the main weaknesses of Burnside and Dollar (1997) is the exclusion of investment from their growth model. Also, the new endogenous growth theory advocates that the rate of fixed capital formation is not the sole determinant of growth, but also that other factors should be included in a growth model. According to the model, policy, institutional factors and technological progress also affect economic growth. Thus, we include other variables, such as human capital and policy, in the growth model as presented above. In addition, we add two dummy variables and interaction variables to test whether the political/economic system makes any difference in aid impacts on growth. Population is also added, since the population growth rate was higher in recent years.

The expected sign of the independent variable, investment (I), is positive, as shown in the previous section. Investment (I) is defined as a percentage of GDP.

The independent variable A, the ratio of official development assistance to GDP, is used to examine the effectiveness of aid in spurring economic growth. Since past studies did not reach consensus regarding the impact of aid on growth, it seems difficult to predict the sign of A in our estimation.

P is a policy index composed of fiscal deficit, economic openness, inflation,

and hydro used per capita. The weight for each component is obtained following the technique used by Burnside and Dollar (1997) and Hansen and Tarp (2000, 2001).

Policy index (P) interacted with the ratio of aid to GDP (A), i.e., (P*A), helps examine whether the aid-growth relationship is conditional on good macroeconomic policy environment or not. Consensus is not reached as to whether the growth impact of aid is conditional on the economic policy environment or not.

A² Symbolizes the square of the ratio of aid to GDP, which can help assess whether the aid-growth relationship is non-linear, and therefore whether aid inflow has been beyond the absorptive capacity of Ethiopia or not. Based on the literature (Aiyar et al 2005) and the fact that the country is highly dependent on foreign aid, we expect that this variable would have a negative sign.

HD denotes human development, proxied by life expectancy. It represents the total life expectancy at birth in the given year. The new endogenous growth model praised the significance of human capital in determining growth, which was also confirmed by most empirical studies. Most empirical analyses use, as a proxy of human capital, either school enrollment ratios or UN's Human Development Index (HDI). We believe that HDI a better proxy than school enrollment ratios since it is more comprehensive. However, HDI is not available for the long sample period. Thus, we use the life expectancy, which is a component of the HDI, as a proxy for human capital, following many other studies (Baum and Lake, 2003). This is because a long life time chases many human development ingredients. We also expect that HD would have positive impact on growth.

MAR is a dummy variable for each time period. MAR1 is for the military and social economic regime during 1975-1990, and MAR2 is for the democratic and market economic regime during 1991-2010.

A*MAR symbolizes that aid interacts with the dummy variables. This will help us assess whether the impact of aid is conditional on political and economic institutional environment, such as the degree of market economy and democracy. Our prior expectation is that the institutional change that is undertaken since 1991 has helped avoid misusing aid resources relative to the previous political regime period, and aid during the democratic and market-oriented regime (A*MAR2) must have started showing significant and greater positive impact on economic growth than aid during the socialistic military regime (A*MAR1).

Population is expected to have a negative sign since it has adverse effects on per capita GDP in a labor surplus economy.

To estimate the relationship between growth of real GDP per capita and growth of other independent variables (equation (2)), OLS estimation method is used, since $DW > R^2$. The estimation result of the growth equation (2) is

presented in the Table below as OLS2. In addition, variations to the equation (2) have been made by deleting insignificant variables and dummy variables from equation (2), and their OLS estimation results are also presented as OLS 3-7.

The result reveals that domestic investment (I) and human development index (HD) have an insignificant impact on real GDP per capita of the country in all estimation models. Although these variables may theoretically affect the per capita GDP over a long period, they do not appear effective in the short term models as used in this study.

Foreign aid (A), our main concern, has also appeared to have had insignificant impact on the real GDP per capita of Ethiopia at the usual t-ratio throughout all models. Even though A^2 is insignificant in all models, the sign is negative as we expected only in one model (OLS7). Both policy (P) and policy interacted with aid ($P*A$) are significant only in two of the six models. However, the policy interacted with aid ($P*A$) has a negative sign in the two models. This indicates that aid is ineffective even when macro-policies are getting sounder, and that the effectiveness of foreign aid is not dependent on good macroeconomic policies in Ethiopia. Our findings are consistent with the results of a cross-country study on aid by Korea (Lee 2008), but inconsistent with the cross-country study results found by Burnside and Dollar (1997).

However, when foreign aid interacted with the dummy variable MAR1 (which becomes 1 for the period when the country was ruled by the previous military and socialist regime: 1975-1991, and zero for other years) and MAR2 (which becomes 1 for the period when the country was ruled by the royal, democratic and market-oriented regime 1971-1974 and 1991- 2010, and zero for other years), the coefficient is insignificant; however, it becomes positive and statistically significant in one of the six estimation models. Moreover, in this model, the magnitude of the coefficient of the aid interacted with the military and socialist regime ($A*MAR1$) is greater than the aid interacted with the democratic and market-oriented regime ($A*MAR2$) by one-half. These findings indicate that aid alone is not effective in promoting growth of GDP per capita, but is effective only when it interacts with economic and political regimes. However, the results also indicate that aid is effective with both socialist and democratic regimes. In fact, aid played more effective role in spurring growth during the socialist regime than the democratic and market-oriented regime. Our finding is different from the results of Kosack (2003) cross-country study, which has found that aid effectiveness is conditional on the extent of democracy in recipient countries, and aid is ineffective and even harmful in autocratic countries.

TABLE 2. Estimation of the Growth Equation (2) and Its Variations

Variable	OLS2	OLS3	OLS 4	OLS 5	OLS6	OLS7
Constant	4.4 (0.59)	-1.50 (-0.31)	3.4 (0.46)	0.7 (0.48)	4.5 (0.59)	6.4 (0.78)
I	-0.10 (-0.86)	-0.058 (-0.51)		-0.09 (-0.77)	-0.08 (-0.7)	-0.05 (-0.44)
HD	-1.2 (-0.5)	0.91 (0.77)	-0.76 (-0.32)		-0.61 (-0.25)	-0.81 (-0.30)
P	1.5 (1.21)	2.27** (2.29)	1.4 (1.19)	1.89** (1.998)	0.74 (0.62)	-0.06 (-0.05)
A	0.32 (0.70)	0.56 (1.41)	0.33 (0.72)	0.47 (1.35)	0.14 (0.33)	0.098 (0.21)
A ²	0.12 (0.73)	0.16 (0.96)	0.14 (0.83)	0.13 (0.78)	0.011 (0.11)	-0.10 (-1.18)
P*A	-0.40 (-0.95)	-0.66* (-1.94)	-0.4 (0.83)	-0.55* (-1.7)	-0.12 (-0.3)	0.16 (0.40)
Mar 1	0.95* (1.92)	0.99* (1.98)	1.03** (2.10)	0.94* (1.91)	0.39*** (4.03)	
Mar 2	0.11 (0.12)	0.38 (0.42)	0.38 (0.43)	0.09 (0.10)	0.10 (0.74)	
A*Mar1	-0.45 (-1.24)	-0.45 (-1.23)	-0.5 (-1.4)	-0.43 (-1.20)		0.26*** (3.38)
A*Mar2	-0.27 (-0.54)	-0.35 (-0.71)	-0.39 (-0.82)	-0.25 (-0.51)		0.18** (2.20)
Pop	0.87 (1.02)		0.60 (0.76)	0.50 (1.19)	0.41 (0.57)	0.28 (0.32)
R ² = 0.86 R ² = 0.85 R ² = 0.86 R ² = 0.86 R ² = 0.84 R ² = 0.82						
Adjusted R ² Adjusted R ² Adjusted R ² Adjusted R ² Adjusted R ² Adjusted R ²						
= 0.81 = 0.81 =0.81 = 0.81 = 0.80 = 0.76						
DW = 1.04 DW = 1.03 DW =0.97 DW = 1.03 DW = 1.07 DW = 1.05						

Notes: t-ratios in parenthesis; *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively

While one dummy variable (MAR2) is insignificant in all estimation models, the other dummy variable (MAR1) is the only variable that consistently shows a significant and positive coefficient in all six estimation models. Especially, in OLS2 and OLS6, it alone has a significant and positive coefficient. Unfortunately, however, the exact characteristics of this variable are unknown since it is a dummy variable. Since it is significant when the size of population is also controlled, which is insignificant in all models by itself, we can only suspect that this dummy variable represents peculiar economic, political, and social

institutions in Ethiopia during the period 1975-1991. As shown, when it interacts with aid (A), aid becomes effective in promoting per capita GDP (OLS7). However, when we consider OLS2, OLS6 and OLS7 together, the dummy variable MAR1 plays more important role than aid (A) itself in promoting per capita GDP. It is because the interactive terms ($A \cdot \text{MAR1}$ and $A \cdot \text{MAR2}$) become insignificant when we include the dummy variables MAR 1 and MAR2 in the estimation models, and only MAR1 consistently shows significant and positive coefficients in all models.

In sum, foreign aid to Ethiopia seems to have enhanced per capita GDP when it interacted with peculiar social, political and economic conditions of Ethiopia. Moreover, although aid was effective during both the military, social regime and the democratic, market-oriented regime, it was more effective during the military, social regime.

V. CONCLUSION AND RECOMMENDATION

There is much literature on the investigation of aid effectiveness. However, the studies in question employ mostly cross-country models. The great failing of these cross-country literatures is that they have not yet reached a consensus on their findings, especially on the impact of aid on economic growth, which is clearly of great relevance to development policies and strategies.

Unlike the previous studies, this study relies on a time-series model on the relationship between foreign aid on the one hand, and investment and economic growth on the other hand, in Ethiopia. This study has examined the impact of foreign aid on the growth of domestic investment and per capita GDP in Ethiopia. The study employed econometric techniques to estimate two equations: aid-investment and aid-growth relationships. The main outcome of the empirical estimation of the aid-investment equation confirms that foreign aid has significant contribution to the growth of investment in Ethiopia. Similar results were found in the cross-country studies done by Hansen and Tarp (2000, 2001), Hansen et al. (2002), Lensink and Morrissey (2000). By contrast, foreign aid's impact on per capita GDP growth is highly sensitive to the specification of the estimation model in Ethiopia, which is similar to the findings of the cross-section studies of Hansen and Tarp (2001). Aid's impact on growth does not depend on macroeconomic policy conditionality, which is different from the findings of the cross-section studies by Burnside and Dollar (1997) and Collier and Dollar (2002). Rather, aid is effective, depending on the social, political and economic institutions of a particular period. Moreover, aid is effective during both socialist and democratic regimes in Ethiopia. However, aid's impact on growth was greater

during the socialist regime, which is different from the findings of the cross-country studies by Isham et al (1995) and Kosack (2003).

Future studies should replicate the methodology used in this study to disaggregated aid data. For instance, aid should be subdivided into loan and grant components or by type such as projects, programs, and technical assistance. Future studies should also refine the methodology for estimating the effects of investment and/or human development on growth. Economic theory and experience indicate the positive effects of investment and human development on growth. However, empirical studies like this one do not capture their effects properly. Perhaps, a proper time lag should be allowed between the dependent and independent variables. Another aspect of future studies should focus on investigating the exact nature of the social, political and economic institutions of different periods. Still another direction of future research would be replicating this study in other developing countries and draw on any commonality and lessons among many country studies.

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Annex 1. Sources of Data

Variable	Source	URL
GDP	World Bank national accounts data and Ethiopian Economic Association CD-ROM(2010)	http://databank.worldbank.org/ddp/html-jsp/QuickViewReport.jsp?RowAxis=WDI_Series~&ColAxis=WDI_Time~&PageAxis=WDI_Ctry~&PageAxisCaption=Country~&RowAxisCaption=Series~&ColAxisCaption=Time~&NEW_REPORT_SCALE=1&NEW_REPORT_PRECISION=0&newReport=yes&ROW_COUNT=1&COLUMN_COUNT=52&PAGE_COUNT=1&COMMA_SEP=falses
ODA	OECD online database	http://stats.oecd.org/qwids/#?x=2&y=6&f=3:51,4:1,1:1,5:3,7:1&q=3:51+4:1+1:1+5:3+7:1+2:59+6:1971,1972,1973,1974,1975,1976,1977,1978,1979,1980,1981,1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997,1998,1999,2000,2001,2002,2003,2004,2005,2006,2007,2008,2009,2010
Life expectancy	World Bank	http://databank.worldbank.org/ddp/html-jsp/QuickViewReport.jsp?RowAxis=WDI_Series~&ColAxis=WDI_Time~&PageAxis=WDI_Ctry~&PageAxisCaption=Country~&RowAxisCaption=Series~&ColAxisCaption=Time~&NEW_REPORT_SCALE=1&NEW_REPORT_PRECISION=0&newReport=yes&ROW_COUNT=1&COLUMN_COUNT=52&PAGE_COUNT=1&COMMA_SEP=true
Gross domestic Investment	EEA (Ethiopia Economic Association) CD-ROM(2010)	
Gross domestic saving	World Bank & EEA CD-ROM(2010)	http://databank.worldbank.org/ddp/html-jsp/QuickViewReport.jsp?RowAxis=WDI_Series~&ColAxis=WDI_Time~&PageAxis=WDI_Ctry~&PageAxisCaption=Country~&RowAxisCaption=Series~&ColAxisCaption=Time~&NEW_REPORT_SCALE=1&NEW_REPORT_PRECISION=0&newReport=yes&ROW_COUNT=1&COLUMN_COUNT=52&PAGE_COUNT=1&COMMA_SEP=true
Openness	University of Pennsylvania center for international comparison	http://pwt.econ.upenn.edu/php_site/pwt70/pwt70_retrieve.php
Debt servicing	World Bank, Global development Finance	http://data.worldbank.org/data-catalog/global-development-finance
Inflation	World Bank	http://databank.worldbank.org/ddp/html-jsp/QuickViewReport.jsp?RowAxis=WDI_Series~&ColAxis=WDI_Time~&PageAxis=WDI_Ctry~&PageAxisCaption=Country~&RowAxisCaption=Series~&ColAxisCaption=Time~&NEW_REPORT_SCALE=1&NEW_REPORT_PRECISION=0&newReport=yes&ROW_COUNT=1&COLUMN_COUNT=52&PAGE_COUNT=1&COMMA_SEP=falses
Export	EEA CD-ROM(2010)	
import	EEA CD-ROM(2010)	
Government Revenue	IMF & EEA CD-ROM(2010)	http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weorept.aspx?sy=1980&ey=2010&scsm=1&ssd=1&sort=country&ds=.&br=1&pr1.x=56&pr1.y=10&c=644&s=GGR&grp=0&a=

ENDNOTES

- ¹ <http://www.africaneconomicoutlook.org/en/countries/east-africa/ethiopia/>