Proceedings of The National Conference On Undergraduate Research (NCUR) 2014 University of Kentucky, Lexington, KY April 3-5, 2014

More Money, More Problems? A Study of Aid Effectiveness on Economic Growth

Samantha Aw, Louise Gappa, Megan Morris Department of Economics Albers School of Business and Economics Seattle University, Seattle, WA

Faculty Advisor: Dr. Quan Le

Abstract

In light of the recent austerity measures of developed countries, the effectiveness of foreign aid on economic growth has been widely debated. Aid effectiveness has also become increasingly important to the donor community. This study aims to measure the impact of aid on growth in developing countries. The authors analyze data from 1980-2010 with a set of 98 countries using ordinary least squares estimation. A more recent data set allows for a more realistic depiction of the current aid situation compared to existing literature. The model developed controls for the macroeconomic policy variables of trade per capita, money supply, and government effectiveness as well as a new institutional variable for technology. While technology becomes increasingly significant in the developing world, the literature of aid and growth does not take into account this major factor. Controlling for technology provides a more effective measure of aid and growth through increasing explanatory power of our econometric model. Overall, the model indicates a negative relationship between aid and growth until reaching a threshold value of aid per capita of \$132.27, at which point aid and growth are positively related. These results were robust and statistically significant at the 1% level. The concept of a threshold level of aid is crucial for policymakers to consider when determining the allocation of funds due to donors' desire to invest in more effective amounts of aid.

Keywords: Economic Growth, Foreign Aid, Policy

1. Introduction

Foreign aid has become an important, and sometimes controversial, policy tool to stimulate development and provide assistance to developing countries. One aim of foreign aid has been to stimulate investment, and thereby economic growth, within recipient countries. Many studies have attempted to measure the impact of foreign aid (hereafter referred to as "aid") on economic growth. On a macro level, previous empirical findings have been consistently ambiguous. In some cases, aid has proven effective on a micro level in generating short-term growth. Overall, it has been demonstrated that aid has both a positive and negative impact on growth, depending heavily on the countries and their corresponding policy and macroeconomic environments (Durbarry, et. al 1998).

In the post-World War II era, billions of dollars have been transferred to developing countries, but many of the biggest recipients still remain poor (Easterly 2003). A better understanding of aid's impact on growth can assist multilateral donors and aid organizations to make sound decisions regarding aid distribution. After reviewing the literature on foreign aid and growth, we offer our analysis using a 98-country cross-sectional data set spanning from 1980-2010. We examine Official Development Assistance per capita (ODA) as a measurement of foreign aid and its effect on economic growth in these countries. Our large sample size and recent data provides a timely addition to the foreign aid literature and debate. Our model account for confounding policy landscapes by controlling for rates of money growth and government effectiveness. In addition, inclusion of an institutional index for technology

infrastructure advances the current literature on foreign aid impacts on economic growth. Our findings allow us to draw conclusions and stress the importance of policy environment for aid effectiveness in ODA recipient countries.

This paper is organized as follows. Section 1 provides an objective of the study. Section 2 reviews the literature. Section 3 describes our data set, followed by the regression results in Section 4. Section 5 discusses policy implications, and finally, Section 6 provides a conclusion of the study.

2. Literature Review

Most recent growth literature has been based on the seminal work of Robert Barro (1991). Likewise, the present study utilizes variables from Barro's study to control for convergence hypothesis and human capital accumulation in our model of aid and economic growth. Our paper has built largely upon the research of Ekanayake and Chatrna (2010). Their study aimed to improve the existing growth and aid model by using a larger data set and longer time period, spanning from 1980-2007. A quadratic model of aid on economic growth is utilized in their study. They modeled the effect of aid over the entire time span as well as three separate time periods. They found that aid has a mixed effect on growth, depending on the time period. Over the entire time span, they found a negative and insignificant relationship with a negative, insignificant quadratic term. They also separated the data set based on income and region, finding more mixed and statistically insignificant results. We attempt to extend their model with a larger and more recent data set in order to find more robust results.

Another study that influenced our work was from Durbarry, Gemmell and Greenaway (1998). In this paper, the researchers apply the Easterly-Fischer and Barro models of economic growth to their study of foreign aid. They argue that previous research surrounding foreign aid has been based on outdated models and does not demonstrate robust evidence. They examine the effect of aid in a cross-section of 68 developing countries from 1970-93, controlling for the macroeconomic policy variables of openness to trade, inflation, and money supply growth. Their results find that aid has a positive impact on growth, but is dependent on a good policy environment. They also found that very high and very low aid to GDP ratios do not result in faster growth, indicating there is an optimal level of aid. Similarly, we posit that low amounts of aid are ineffective.

Boone (1996) expands on foreign aid literature by considering the influence of policy environment. Boone assesses the effectiveness of aid using net ODA and argues that it is necessary to examine political regimes since growth resulting from aid depends heavily on fiscal, monetary, and trade governmental policies. He concludes that aid does not generally help increase GDP per capita in countries with non-liberal regimes, while his findings were ambiguous for liberal regime states. Boone found aid in non-liberal regimes increases the size of these governments, measured by an increase in government consumption from aid receipts. A critique of aid program evaluations was also brought up in this article, which is crucial to keep in mind as we determine the implications of our own regression results. Similar to Boone, we emphasize a political regime's power in controlling policy and, ultimately, allocating aid.

Burnside and Dollar (2004) further develop the theory of good policy, aid, and growth in their study. They create a policy index using openness, budget surplus, and inflation, and created interaction terms between aid and this policy index. They found that, on average, aid had little impact on growth; however, there was robust evidence that good policy increases the effectiveness of aid. We consider their measures of policy in the construction of our model, and utilize these findings when discussing policy implications of aid and growth.

Policy environment is very important as the effectiveness of aid distribution plays a large role in determining the level of economic growth and poverty reduction in a country. Lee, Ji-Hye, and Park (2012) study aid effectiveness with a focus on Latin American Countries (LAC). They found that if foreign aid allocations from the Development Assistance Committees were to be improved, the LACs would be able to use the aid allocated to them more efficiently to generate economic growth. The study examined both donor and recipient countries.

Finally, Easterly (2003) offers a critique of the literature regarding aid and its effects on growth in developing countries. He found good governance and policy to be the most important factors in aid effectiveness. To this end, countries with good fiscal, monetary, and trade policies benefit from aid. Easterly stresses that aid needs conditionality and selectivity in all cases. He echoes Boone's call for unbiased program evaluations. He admits, though, this is nearly impossible from the lack of resources, particularly if it were to come from outside of the foreign aid organizations. Easterly's paper was a necessary critique on current growth literature. Its applicability to our aid model occurs at each level, with his demand for these critical effectiveness measures to be taken into account.

3. Data

The data we use is a cross-sectional data set of 98 countries from 1980-2010. This time span captures the recent era of foreign aid and is one of the most up-to-date time series in the literature. We believe the included countries demonstrate a relatively large spread of the least developed countries around the world.

Our dependent variable is economic growth, which is measured by the average GDP per capita growth rate. Our variable of interest is Official Development Assistance per capita. ODA is defined by the World Bank as:

"Disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent," (WDI).

We obtain net per capita measurements of ODA (ODAPC) for each country in our data set for all the available years, and calculate the average value for each country. ODAPC ranges from 0.23 to 293.0 USD. GDPPC80 is included to measure the initial GDP levels in 1980 for each country. This variable controls for convergence hypothesis, as shown in Barro (1991). The level of human capital is measured by PRIMARYNET, which is net primary school enrollment. Human capital is important to measuring growth due to the influence of Barro's (1991) work. Both of these variables are common in the growth literature.

The literature also demonstrates that policy and governmental actions are key factors in a model of aid and growth. Both the allocation of aid, as well as aid's impact on growth, is likely correlated to policy environment. Excluding these variables would possibly cause omitted variable bias, rendering our results inaccurate. To capture policy environments, we include M2GROWTH and TRADE. M2GROWTH measures the growth of money supply, which is a proxy for monetary policy. The TRADE variable is the sum of exports and imports scaled as a percentage of GDP and serves as a proxy for open trade policy. We hypothesize that high M2GROWTH will correlate with low growth and high TRADE will correlate with higher rates of growth.

Another group of control variables we take into account are institutional variables. In the case of aid, we look at government effectiveness and access to technology. GOVEFF is an index for government effectiveness. We expect that government effectiveness will increase the growth rate within a country. Our technology index (TECHINDEX) was created through factor analysis using the following variables: number of mobile cell subscriptions, fixed broadband, internet users, secure internet servers, and telephone lines. We predict that this index will add greater explanatory value to our model, as growth will likely be affected by technological progress. Finally, we include geographical dummy variables that control for African countries and China in our model. Aid allocation and growth varies by region. African countries received a large amount of aid in the 1980-2010 period. China saw extremely high growth between 1980-2010 with a relatively low amount of aid; therefore, it was depicted as an outlier in our data set.

The ODA variable, along with a set of control variables excluding government effectiveness, was obtained from the World Bank World Development Indicators (2012). The World Bank WDI is a compilation of development indicators from international, officially-recognized sources. The WDI is updated quarterly and dates back to the 1960s. Government effectiveness data was obtained from the World Governance Indicators.

Three outliers were identified in our data set while looking at the scatter plot of aid and growth: French Polynesia, New Caledonia, and Bhutan. New Caledonia and French Polynesia received very high amounts of aid. This could be because of their position as special "collectivities" of France. French appeasement towards independence movements in these states could have resulted in high levels of ODA. Bhutan had relatively high levels of growth that could possibly be a result of renegotiation of their treaty between India and Bhutan. Removing these countries allowed for a more reliable and accurate model of aid and growth.

Our model specification for growth and aid is presented in equation (1). We have modeled a quadratic relationship between aid and growth:

$$GDPPC_{i} = a_{0} + a_{1}ODAPC_{i} + a_{2}ODASQD_{i} + a_{3}GDPPC80_{i} + a_{4}PRIMARYNET_{i} + a_{5}TRADEPCGDP_{i}$$
(1)
+ $a_{6}M2GROWTH_{i} + a_{7}GOVEFF_{i} + a_{8}TECHINDEX_{i} + a_{9}AFRICA + a_{10}CHINA DUMMY + \varepsilon_{i}$

We expect initial GDPPC80 to be negative, accounting for convergence, while primary enrollment can be expected to be positive. Our policy variables, trade and money growth, will be positive and negative, respectively. We also expect that our institutional variables, government effectiveness and technology, will have a positive relationship with growth. Table 1 presents the descriptive statistics for our data set.

	n	Minimum	Maximum	Mean	Std. Deviation
GDPPC	98	-2.76	8.89	1.4499	1.82293
ODAPC	98	.23	293.29	58.5853	67.91874
PRIMARYNET	98	31.72	99.24	82.9254	16.02394
GDPPC80	98	141.32	61374.75	3320.8177	7295.81911
TRADE	98	20.27	277.94	81.6363	41.94339
M2GROWTH	98	7.38	839.29	46.0847	123.63422
TECHINDEX	98	31	3.07	0844	.57653
GOVEFF	98	-1.77	1.25	1707	.57390
AFRICA	98	.00	1.00	.3737	.48626
CHINA	98	.00	1.00	.0101	.10050

Table 1: Descriptive statistics

The variable of interest, ODAPC (Official Development Assistance Per Capita), has a minimum of \$0.23 and a maximum of \$293.29 with a standard deviation of \$67.92. There is quite a large differential gap for the amount of aid received per person. Our human capital and initial Gross Domestic Product (GDPPC80) variables both have positive averages whereas the averages of TECHINDEX and GOVEFF were both negative in value. There is a large variation between the levels of initial GDP between the countries, the lowest GDP being \$141.32 and the highest being \$61,374.75, giving a differentiation gap of \$61,233.43.

Important to note is the variable of money supply growth (M2GROWTH). As observed above, there is a large range of M2GROWTH percentage over the 30 year period. Even the minimum growth rate of 7.38% is noteworthy. We deduce these countries have high amounts of corruption and inflation and keep these factors in mind when testing our model.

4. Regression Results

Examining the scatter plot of ODAPC and Growth in Figure 1, we see a quadratic relationship. We also tested a linear model using the Ordinary Least Squares (OLS) estimation method and saw a positive relationship between aid and growth. However, the quadratic model provides a more accurate view of aid and growth as compared to the linear model. In the scatterplot, it is clear that China has an extremely high level of growth, skewing the overall relationship between aid and growth. We also see in Figure 3, the scatter plot of GDPPC80 and growth, that our data set demonstrates convergence, as noted in Barro (1991). Finally, Figure 2 shows the positive relationship of human capital through a scatter plot of PRIMARYNET and growth, also noted in Barro (1991).



Figure 1: GDPPC Growth & ODAPC



Figure 2: Human capital and GDP per capita growth



Figure 3: Initial GDP per capita (1980) and GDP per capita growth

Table 2 presents the OLS regression results of aid and economic growth. The first equation demonstrates a quadratic relationship of aid, controlling for convergence (through GDPPC80) and levels of human capital (measured by PRIMARYNET). We find mild evidence of convergence. The magnitude on the GDPPC80 coefficient is extremely small, though highly significant. PRIMARYNET is positive, although only significant in the first four equations. The quadratic relationship continues throughout our model progression with increasing statistical significance. This quadratic relationship differs from that found in the research of Burnside and Dollar (2004), Ekanayake and Chatrna (2010) and Boone (1996). The addition of policy variables TRADE and M2GROWTH results in increased significance with our variable of interest, ODAPC, with p-values changing from .183 to .043. Aid remains significant with the addition of institutional and regional variables. Our final equation explains 50% of the variation in economic growth.

Variables	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>
<u>ODAPC</u>	0114	022	020	021	017
	(.008)*	(.008)***	(.008)***	(.008)***	(.007)***
<u>ODAPCSQD</u>	6.17E-5	8.31E-5	7.59E-5	7.4E-5	6.426E-5
	(2.97E-5)**	(3.05E-5)***	(2.90E-5)***	(2.84E-5)***	(2.53E-5)***
<u>GDPPC80</u>	-9.61E-5	-1.13E-4	-1.22E-4	-1.25E-4	-1.21E-4
	(2.35E-5)***	(2.38E-5)***	(2.28E-5)***	(2.23E-5)***	(2.00E-4)***
<u>PRIMARYNET</u>	.034	.029	.021	.019	.009
	(.011)***	(.011)***	(.010)**	(.01)*	(.01)
<u>TRADE</u>		.009 (.005)*	.006 (.004)	.004 (.004)	.005 (.004)
M2GROWTH		003	002	002	002

Table 2: Regression results

		(.001)**	(.001)*	(.001)*	(.001)**
<u>GOVEFF</u>			.985 (.295)***	.900 (.291)***	.794 (.262)***
<u>TECHINDEX</u>				.649 (.288)**	.634 (.257)**
<u>AFRICA</u>					381 (.334)
<u>CHINA</u>					6.529 (1.132)***
Constant	743 (.960)	540 (.925)	.495 (.931)	.94 (.933)	1.525(.971)
<u>N</u>	98	98	98	98	98
<u>R^2</u>	.202	.266	.339	.367	.502

A benefit of modeling aid's impact on growth through a quadratic term is that we can find the threshold level of aid. Aid begins to have a positive impact on growth at a relatively high per capita level of aid, found to be \$132.27. Before this point, aid has a decreasingly negative impact on GDPPC growth, controlling for all other factors. Table 3 shows the marginal effect of aid on growth evaluated at four different levels of aid. The average aid values of each quartile in our dataset, as calculated in Table 4, are used to compare the marginal effect of aid on growth. This enables conceptualization of the varying effect of aid.

Table 3: Marginal effect of aid on GDP per capita growth

Aid per capita Amount:	Low-aid countries (\$6.18)	Lower-middle aid recipients (\$28.89)	Upper-middle aid recipients (\$54.30)	High aid recipients (\$150.08)
Marginal effect on Growth:	0162%	0133%	010%	.002%

Note: Marginal effects were evaluated at the average value of each quartile.

The first three values of aid result in negative marginal effects of aid on growth. Only the fourth quartile has an average aid value that is above the threshold amount of per capita aid, resulting in a positive marginal effect on growth. Our findings indicate that there is an optimal level of aid to promote growth. Controlling for other factors, a country that receives aid below the threshold level will actually be negatively impacted by aid. These marginal effects are calculated using the coefficients of aid and the quadratic of aid, which are highly significant at the 1% level. One explanation for this quadratic relationship with aid and growth could be that in many developing countries, corruption is a large issue. Smaller amounts of aid may be skimmed off by the government, leaving little aid left to reach the end goal and resulting in little to no impact. An example of this was found in a 2004 survey in Chad that tracked the transition of aid that reached its final destination in health clinics. A shocking 1% reached the clinics, while the other 99% was lost through corruption along the way (Collier 2007). Durbarry et al. (1998) also

found a threshold of effective aid in their study on aid and growth, although their results indicated that extremely high levels of aid have a negative effect on growth. Our results do not corroborate this result.

To examine if aid effectiveness is impacted by technology, we calculate the threshold level for equation 3 that did not have the technology index and the threshold level for equation 4 that had this index and obtain threshold levels of \$132.37 and \$135.14, respectively. These two values are not statistically significantly different, indicating that technology does not determine aid effectiveness. The addition of technology is still important as it provides a more comprehensive model of economic growth.

Furthermore, the macroeconomic policy variables trade per capita and money growth were crucial to add into our model. The addition of trade causes the aid parameter estimates to increase in significance and explained a large amount of variation. This term carries a positive relationship with growth, holding true that open economies are "better off" in terms of maximizing comparative advantages of all. An increase in trade is related to an increase in growth. In contrast, our second policy variable, money growth, is negatively related to growth. The parameter estimate is negative in all the models, and is statistically significant at a 5% level in the final model. As expected, we find that ineffective monetary policy (demonstrated by higher money supply growth rates) decreases growth. These two variables are particularly necessary to control for a country's macroeconomic policies and have important policy implications.

The government effectiveness parameter estimate remains positive and highly significant in its relationship with growth, as expected. The more effective a government's institutional structures, the higher growth a country is likely to experience, holding all else constant. The same is true with our technology index. Its parameter estimate holds a positive sign and is significant at the 5% level, indicating a strong relationship between access to technology and economic growth.

The two dichotomous variables included in our model have opposite impacts on growth. The parameter estimate for China is highly significant at the 1% level and positively related, with a large magnitude. The parameter estimate for African countries demonstrates a negative relationship with growth, not surprising due to African countries' comparatively low levels of growth during this time period. It is possible that African countries are less likely to experience ideal growth from foreign aid. However, the finding is insignificant and we cannot draw a definite conclusion from this estimate.

5. Policy Implications

Our findings indicate that different amounts of aid can have different effects on growth. Identifying the "right" amount of aid is an important tool for policy makers in donor countries who aim to stimulate growth in recipient countries. Giving small amounts of aid may actually do more harm than good. However, the right amount of aid is not an arbitrary amount, but depends on the policy environment in a recipient country, as noted by Burnside and Dollar (2004), Boone (1996), among others. Their findings suggest that we can actually decrease the amount of aid necessary for a positive impact on growth by improving the policy environment in a recipient country.



1160

Figure 4: ODAPC & GOVEFF

However, we test an interaction variable of GOVEFF*ODA to see how government effectiveness impacts the effectiveness of aid on growth, we do not find conclusive support. Contrary to prior literature, the interaction term was statistically insignificant, indicating no relationship. One explanation for this is that the policy environment simply may not be a main determinant of aid effectiveness. However, prior research and theory suggests otherwise. Instead, it is possible that a different measurement of the policy environment would be more suited to examine its impact on aid effectiveness.

 α^{2}

04

02

QI	Q2	Q5	Q4
12.13	12.38	38.1	74.21
1.21	13.44	39.13	75.3
1.31	14.43	40.54	75.71
1.4	15.08	41.29	76.89
1.69	15.38	42.21	80.13
1.74	17.21	43.4	84.07
1.92	17.25	46.15	84.98
1.96	18.24	46.18	85.96
3.06	19.05	46.3	96.26
3.3	21.66	46.51	99.49
5.37	26.74	48.63	106.4
5.82	27.18	50.1	107.33
6.45	28.51	53.82	125.34
6.62	29.23	54.13	131.75
6.85	30.93	55.48	134.59
7.2	31.29	58.52	143.03
7.44	31.58	59.51	178.29
7.91	31.64	59.52	179.87
8.51	31.77	66.73	195.81
8.71	31.96	67.68	231.43
9.97	35.65	68.27	253.62
10.25	35.71	70.25	276.24
10.36	36.43	70.5	276.51
11.19	36.61	70.68	285.45
12.13	37.97	73.93	293.29
Averages:			
6.18	25.8928	54.3024	150.078

Table 4: ODAPC Quartiles and Averages

01

6. Conclusion

This paper seeks to make a meaningful contribution in the discussion of foreign aid effectiveness on economic growth with a large cross-sectional data set and the addition of a technology index with emphasis on access to

communication. Our results find that aid and growth are quadratically related. As the aid amount increases and reaches a threshold point, we see a positive impact on growth. At low amounts of aid, we find a negative impact on growth. This is important for policy makers today who are increasingly interested in financing effective aid programs. Literature suggests that monetary, fiscal, and trade policies are among the most important determinants of effect of aid use. However, our results find that the right amount of aid is also crucial to its impact on economic growth. More aid is not necessarily better, which must be emphasized in the advancement of global development strategies. In every study there are limitations, but the overall findings of this study are significant and robust.

Our limitations include not addressing the possible issue of endogeneity in aid. It is very possible that aid could be allocated due to low GDP growth. The data available was limited, especially in terms of macroeconomic variables necessary to our model. We were unable to use the corruption index (CPIA) due to many missing data points, though corruption is an important determinant of aid effectiveness. Other missing data from certain countries in earlier years limited our study to a 30 year period instead of a 50 year period (starting GDP/per capita in 1980 instead of 1960). Measuring ODA per capita may be misleading for certain aid programs with high fixed costs, such as dams or large infrastructure projects. Even if the same aid amount is granted for a more populous country, aid per capita is higher in smaller countries. Many powerful countries provide certain levels of aid due to political matters, like securing resources for export. We are unable to control for their extraneous reasons in our model. Future research would benefit from control variables that better address these limitations.

7. References

Barro, Robert. "Economic Growth in a Cross Section of Countries." Quarterly Journal of Economics, May 1991, 106(2), pp. 407-44.

Boone, Peter. "Politics and the Effectiveness of Foreign Aid." European Economic Review 40.2 (1996): 289-329.

Burnside, Craig, and David Dollar. "Aid, policies, and growth: revisiting the evidence." World Bank Policy Research Working Paper 3251 (2004).

Collier, Paul. The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done about It. Oxford: Oxford UP, 2007.

Durbarry, Ramesh, Norman Gemmell, and David Greenaway. New Evidence on the Impact of Foreign Aid on Economic Growth. Centre for Research in Economic Development and International Trade, University of Nottingham, 1998.

Easterly, William. "Can Foreign Aid Buy Growth?." The Journal of Economic Perspectives 17.3 (2003): 23-48.

Ekanayake, E. M., and Dasha Chatrna. "The Effect of Foreign Aid on Economic Growth in Developing Countries." Journal of International Business and Cultural Studies 3.2 (2010).

Lee, Kye-Woo, Ji-Hye Seon, and Tae-Jun Park. "Can the Current Aid to Latin America Contribute to Economic Growth and Poverty Alleviation?." Asian Journal of Latin American Studies 25.2 (2012): 83-114.