Long Run Effects of Foreign Aid on Economic Growth

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This paper finds evidence of long run effects on a country's per capita Gross Domestic Product (GDP) growth using a panel data set of 57 countries that received Official Development Aid (ODA) between 1970 and 2017. The results suggest a statistically significant "multiplier effect" that is sizable. Looking at foreign aid per capita the results suggests that policy makers can achieve a permanent 1% increase in per capita GDP growth by increasing per capita ODA by approximately $110. Similar results are found when using an alternative measure—ODA per Gross National Income—of foreign aid.

Keywords: economic growth, foreign aid, long run effects

INTRODUCTION

The efficacy of foreign aid has been extensively researched, but the conclusions have remained theoretically ambiguous (Burnside and Dollar 2000) and empirically inconsistent. With more $2.3 trillion in foreign aid being given to developing countries (Easterly 2006), anecdotally a positive result may not be very convincing as more than 1.1 billion people were living in extreme poverty around the start of this century (Sachs 2005). With the amount of money being spent, and the lives at stake, a consensus answer to the question of foreign aid's efficacy is needed.

Researchers have found conflicting results that range from a negative relationship, a positive, a conditional on other variables within the country, or even dependent upon the size of the foreign aid that is received. A number of studies (Boone 1996, Brautigam and Knack 2004, and Obstfield 1999) have found foreign aid to have either a negative, or no, relationship between foreign aid and the economic growth of the recipient country. These studies conclude that, by and large, foreign aid is largely ineffective, and may actually hinder the economic growth of recipient countries. Other studies have concluded that a positive (Papanek 1973, Dowling and Himenz 1982, Gupta and Islam 1983, Hansen and Tarp 2000, and Dalgaard et al. 2004) and perhaps permanent (Karras 2006) relationship exists between foreign aid and economic growth. Other influential studies have analyzed the "policy variables" within the country and found that these may matter (Burnside and Dollar 2000), or not (Easterly et al. 20004). This could create a conditionality argument on which country should receive foreign aid. Under theoretically (Sachs 2004) assumptions of a poverty trap it has been shown empirically (Larsen 2016a and 2016b) that the magnitude of foreign aid matters in its efficacy.

Karras (2006) analyzed the efficacy of foreign aid using a panel dataset, diverging from the majority of literature that had focused primarily on only a cross-sectional analysis. By including a time dimension with the data, Karras was able to derive sharper estimates of the effect of foreign aid. He suggests that focusing primarily on cross-sectional work researchers could be finding misleading insignificant results.

This paper follows similar methodology as Karras (2006), but instead of analyzing annual data it looks at four-year periods more similar to Burnside and Dollar (2000) and additionally includes controls for the recipient countries human capital. This paper uses a panel methodology that analyzes four-year data from 1970-2017 for 57 developing countries that reported data for all variables during this time period.

This paper finds results that are both economically and statistically significant. The results suggest the effect of foreign aid on per capita economic growth is both positive and permanent. When looking at per capita foreign aid, the results suggest that if policy makers wanted to target a 1% permanent increase in per capita economic growth, they should increase per capita foreign aid by approximately $110. This result is robust even when including other theoretically important variables to steady state effects. Under an alternative specification of foreign aid, the results are not quite as large, but they are still positive and statistically significant. A permanent increase in aid by 1% of the recipient countries GNI permanently raises the per capita economic growth by approximately 0.007%. The results that we find are in general consistent with the previous results found by Karras (2006).

The rest of the paper is organized as follows. In section 2 the data is defined, and a simple cross-sectional regression is presented for comparison to some previous studies and to illustrate the limitations a cross-sectional methodology. In section 3 the main empirical model that is used is discussed and the results are presented. Section 4 discusses some potential policy implications and the conclusions of the paper.

DATA

The data consists of a panel of 57 countries that received foreign aid, from 1970-2017 obtained from the Penn World Table 9.1 (Feenstra et. al 2015). For data that is reported in current dollars an implied GDP deflator is created using the PWT measures for current and constant GDP to translate current variables into constant 2010 dollars. The descriptive statistics for the variables can be found in the appendix. The dependent and independent variables are defined as follows.

Dependent Variable:

1. Growth: $(\ln (GDP/N)_{i,t} - \ln(GDP/N)_{i,t-4})/4$
2. Level: $(\ln (GDP/N)_{i,t})$

Explanatory Variables for a "standard" neoclassical growth model:

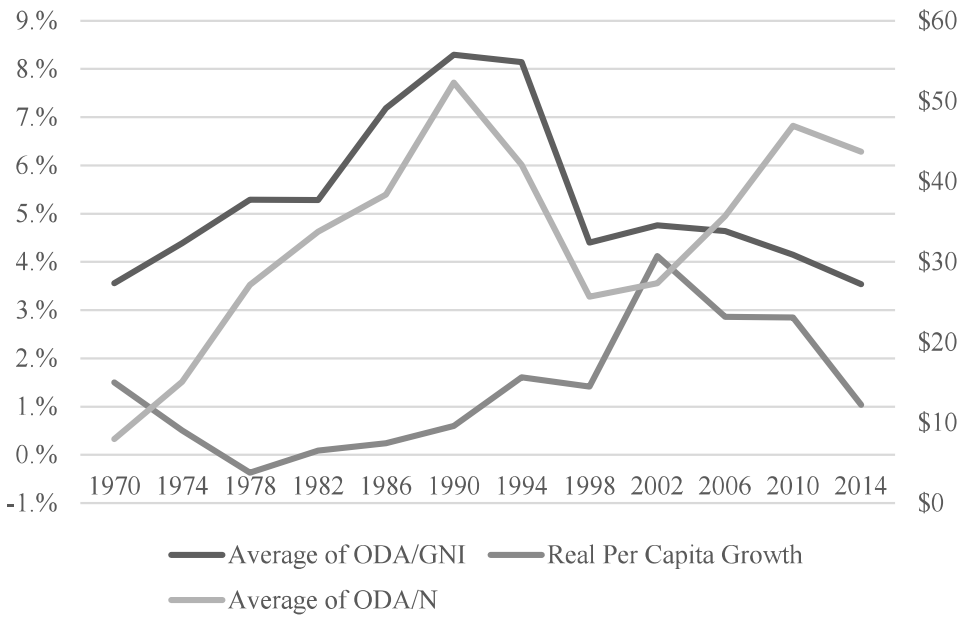
1. Natural log of initial year GDP/N.
2. Natural log of average percent of investment to GDP by time period (Ln I).
3. Natural log of average percent of government expenditure to GDP by time period (Ln G).
4. Natural log of average human capital index (Ln HC).
    - Based on years of schooling and returns to education.
    - Described in "Human Capital" in PWT 9.
5. Natural log of population growth (Ln Pop)
    - Population growth is the averaged growth rate of the population by time period.

Measures of Foreign Aid considered:

1. Natural log of average percentage of foreign aid per Gross National Income (GNI) a country receives over the time period.
    - Measured as the nominal Net Official Development Aid over the nominal GNI averaged over the time period.
    - ODA is from oecdstat at www.oecd.org
2. Natural log of average percentage of foreign aid per capita a country receives over the time period.
    - Measured as the real Official Development Aid per capita averaged over the time period.
    - ODA is from oecdstat at www.oecd.org.

In Figure 1 we present the trends of the foreign aid and per capita economic growth for the 57 recipient countries for each time period used in this study. In generally, the amount of foreign aid that was received—both measured as per capita and as a percentage of GNI—increased from 1970 to the early 1990s. This increase corresponds to the United Nations' 1970 call for developed countries to give .7% of their ODA/GNI. While stagnating in the 1970s, the developing countries on average appeared to start accelerating their per capita economic growth following the increase in foreign aid, and subsequently falling off following the drop in foreign aid. Visually analyzing the data suggests that there may be a lagged response between foreign aid that is received and the per capita economic growth.

FIGURE 1
AVERAGE REAL FOREIGN AID RECEIVED AND PER CAPITA ECONOMIC GROWTH, AVERAGED BY 57 COUNTRIES



Tables 1 and 2 present the cross-sectional regressions for per capita level of income and per capita economic growth, respectively. These regressions are not the main empirical model of this paper but are used as a comparison to the later panel regressions. The cross-sectional regressions are similar to the seminal work on neoclassical growth models found in Mankiw et al. (1992) and other studies which lay out the theoretical justification for variable inclusion. This cross-sectional regression averaged data for the sample of 57 developing countries that received foreign aid and reported data for each year from 1970-2017. The results are generally consistent with much of the neoclassical growth literature, though not the statistically significant for all variables.

Analyzing the independent variables for the per capita level of income suggest that the human capital index is a significant predictor of the level of income. Population growth and investment, while not statistically significant are of the correct sign. Even though only the human capital index is statistically significant the cross-sectional model's adjusted R-squared suggests that the human capital index is able to explain a large percentage of the variation of the per capita level of income. The importance of human capital is one of the major findings of Mankiw et al. (1992) and is something that was omitted in Karras' (2006) analysis. This basic finding supports the inclusion of the human capital index in the later panel regressions.

TABLE 1
CROSS-SECTIONAL REGRESSION FOR PER CAPITA LEVEL OF INCOME

Dependent: Level	(1)	(2)	(3)
lnHC	2.2700***	2.1789***	1.5666***
	(0.4310)	(0.4146)	(0.3839)
lnPop	-0.4007	-0.2421	-0.0725
	(0.2454)	(0.2443)	(0.2137)
lnI	0.5014	0.4414	0.3597
	(0.2559)	(0.2464)	(0.2138)
lnG	-0.4175	-0.1797	-0.0370
	(0.2572)	(0.2658)	(0.2263)
lnAidN		-0.2016*	
		(0.0845)	
lnAidGNI			-0.2913***
			(0.0585)
Constant	5.9598***	7.5567***	6.9566***
	(1.0457)	(1.2047)	(0.8889)
Observations	57	57	57
R-squared	0.6327	0.6696	0.7529
Adj R-sq	0.604	0.637	0.729

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Similar to the level of income, the regressions for the per capita economic growth illustrate the significance of the consideration of human capital index. In terms of direction the independent variables are consistent with most literature for the neoclassical growth models, though investment, population growth, and government expenditure are not statistically significant. The coefficient of the initial income being negative and statistically significant indicates that there is a conditional convergence between higher and lower income countries.

TABLE 2
CROSS-SECTIONAL REGRESSION FOR PER CAPITA ECONOMIC GROWTH

Dependent: Growth	(1)	(2)	(3)
lnGDP0	-0.0146***	-0.0147***	-0.0189***
	(0.0031)	(0.0029)	(0.0028)
lnHC	0.0394***	0.0377***	0.0309***
	(0.0095)	(0.0091)	(0.0084)
lnPop	-0.0072	-0.0040	-0.0015
	(0.0050)	(0.0050)	(0.0045)
lnI	0.0091	0.0079	0.0072
	(0.0052)	(0.0050)	(0.0045)
lnG	-0.0070	-0.0021	-0.0006
	(0.0053)	(0.0054)	(0.0047)
lnAidN		-0.0041*	
		(0.0017)	
lnAidGNI			-0.0058***
			(0.0013)
Constant	0.0848**	0.1184***	0.1315***
	(0.0287)	(0.0307)	(0.0267)
Observations	57	57	57
R-squared	0.4631	0.5192	0.6132
Adj R-sq	0.410	0.462	0.567

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

In both tables when either measure of foreign aid is included in the model the coefficient of foreign aid is statistically significant and negative. This could imply that foreign aid leads to slower growth, or a lower level of income, but reaching a causal conclusion should be cautioned. It is entirely possible that we are seeing reverse causality. Poorer countries are more likely than rich countries to receive foreign aid. Studies that focus on cross-sectional data can use a variety of identification strategies—for example instrumental variables—to identify the true relationship. In this paper the cross-sectional regressions are used to show a cross-sectional approach omits important information that can introduced when considering a time component as suggested by Karras (2006).

MAIN EMPIRICAL MODEL

This paper follows the methodology of Jones (1995), which analyzed the horizon over which investment affects growth, and Karras (2006), to analyze the permanent impact of foreign aid on economic growth. Karras (2006) points out a major weakness of the previous cross-sectional models is that they forgo much of the information that is present by incorporating a time dimension into the model. The previous study does not include human capital in the analysis. It is possible that increases in foreign aid can lead to higher levels of schooling, or returns to schooling, which would increase economic growth. Because of this, the omission of human capital can lead to an upward bias in the estimation of the coefficient on foreign aid.

Initially we follow the methodology of Karras (2006), and later extend the analysis to include a measure for human capital, we estimate the dynamic time-series model:

$$growth_{i,t}=w_i+v_t+C(L)growth_{i,t-1}+b*aid_{i,t}+B(L)\Delta aid_{i,t}+u_{i,t} \quad (1)$$

with i and t being for countries and time respectively. C(L) is a $(p-1)^{th}$ order lag polynomial. In this model if B(1)>0, then a permanent shock to foreign aid will permanently raise the growth rate.

In this model the beta on $aid_{i,t}$ is a parameter that is equal to the sum of coefficients of the A(L) lag operator polynomial, Δ =1-L is the difference operator, and B(L) is the $(p-1)^{th}$-order polynomial. The w_i and v_t represent country and time fixed effects. The model is run both with and without fixed effects. Excluding fixed effects means imposing that all the w_i and v_t*'s* are exactly equal to 0. It is not likely that both the period and country fixed effects are exactly 0, but these regressions are as a comparison for the model with fixed effects and something not possible with a cross-sectional methodology. The country and time fixed effects allow us to capture exogenous movements that are country and time specific. Following Jones (1995) the foreign aid enters into the first difference in the specification of the model and will be stationary and uncorrelated with the time trend. In this paper considers both a 1 period (4 year) lag and a 2 period (8 year) lag. The results that we find are consistent with Karras (2006).

In order to examine how a change in foreign aid can have a permanent impact on the recipient country's per capita economic growth we utilize a long run "multiplier" developed in Karras (2006) and Jones (1995). From the model the "multiplier" is constructed as:

$$l=b_{aid}/(1-C(1)_{Growth}) \quad (2)$$

TABLE 3
PANEL REGRESSIONS FOR LONG-RUN IMPACT OF FOREIGN AID ON ECONOMICS GROWTH

	(1) Lag	w/FE	(2) Lag	w/FE
	Regression for Aid/N			
(L)Growth	0.2424***	0.0943*	0.2697***	0.1232**
	(0.0411)	(0.0450)	(0.0439)	(0.0460)
(L)Growth			-0.0740	-0.2219***
			(0.0440)	(0.0457)
Aid/N	-0.0007	0.0082*	-0.0012	0.0078*
	(0.0013)	(0.0032)	(0.0014)	(0.0035)
(L)ΔAid/N	-0.0023	0.0003	-0.0026	-0.0004
	(0.0027)	(0.0033)	(0.0030)	(0.0035)
(L2)ΔAid/N			0.0004	0.0079*
			(0.0029)	(0.0035)
Constant	0.0118**	0.0135	0.0148**	0.0489***
	(0.0044)	(0.0125)	(0.0048)	(0.0131)
Observations	556	556	498	498
R-squared	0.0620	0.2207	0.0750	0.2727
Adj R-sq	0.0569	0.112	0.0656	0.155

Regression for Aid/GNI				
(L)Growth	0.2250***	0.1123*	0.2512***	0.1368**
	(0.0420)	(0.0449)	(0.0444)	(0.0461)
(L)Growth			-0.0864	-0.1994***
			(0.0450)	(0.0464)
Aid/GNI	-0.0018*	0.0059*	-0.0021*	0.0053
	(0.0009)	(0.0025)	(0.0010)	(0.0028)
(L)ΔAid/GNI	-0.0005	0.0008	-0.0026	-0.0012
	(0.0025)	(0.0027)	(0.0027)	(0.0029)
(L2)ΔAid/GNI			0.0029	0.0062*
			(0.0028)	(0.0030)
Constant	0.0024	0.0615**	0.0030	0.0949***
	(0.0038)	(0.0223)	(0.0041)	(0.0252)
Observations	556	556	498	498
R-squared	0.0679	0.2186	0.0846	0.2652
Adj R-sq	0.0628	0.110	0.0752	0.147

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

In Table 3 the regression results for equation (1) are presented for both measurements of foreign aid, for one or two lags, and with and without country and time specific fixed effects. The results of interest in these regressions are the betas *C(1)*—for the lag of growth (l.Growth)—and *b*—the coefficient on foreign aid in order to calculate the "multiplier" for the permanent impact of foreign aid on per capita economic growth. When including the fixed effects in the model all *b*'s are positive and statistically significant, with the exception of the two-lag model when foreign aid is defined as a percentage of GNI which is positive but not statistically significant. The models that exclude fixed effects imply that aid has a negative growth effect, but the estimates generally lack statistical significance and the adjusted R-squares are rather poor. The inclusion of the fixed effects improves the fit of the model suggesting that the original model is mis-specified.

Using the results for per capita foreign aid, the estimated *b*'s are 0.0082 and 0.0078—depending on which lagged model is used—gives an implied *l* of approximately 0.009. This would imply that if foreign aid donors wanted to generate a permanent increase in a country's per capita economic growth by 1% they could increase foreign aid by approximately $110 per person. Based on the other specification of foreign aid—as a percentage of GNI—the statistically significant estimated *b* of 0.0059 gives an implied *l* of approximately 0.007. This multiplier implies that for every 1% increase of foreign aid/GNI the recipient country would have a permanent increase in their per capita economic growth of 0.007%.

In general, the results from Table 3 suggest that the effect of foreign aid—particularly when looking at per capita foreign aid—is statistically significant, positive, and can permanently increase per capita economic growth. The results for the alternative specification of foreign aid provides similar evidence but is not as robust.

It is possible that in Table 3 we are finding a positive result not because foreign aid is affected per capita economic growth, but rather is operating through an important omitted variable like investment or human capital. The theoretical relationship between these and per capita economic growth is positive, which would mean that the omission of these variables is causing an upward bias on our estimation. To eliminate this potential bias, we extend our model to include controls for the other variables that are predicted to have steady state effects by standard neoclassical growth models. As we considered in the previous cross-sectional regressions, we include controls for human capital, investment, population growth, and government expenditure. We extend the generalization of equation (1), following Karras (2006) but also

including a control for human capital which has been shown to be an important predictor of steady state effects (Mankiw, Romer, Weil 1992)—as follows:

$$Growth_{i,t} = w_i + v_t + C(L)Growth_{i,t-1} + b_{aid}*aid_{i,t} + B_{aid}(L)\Delta aid_{i,t} + b_{HC}*HC_{i,t} + B_{HC}(L)\Delta HC_{i,t} + b_{Pop}*Pop_{i,t} + B_{Pop}(L)Pop_{i,t} + b_I*I_{i,t} + B_I(L)\Delta I_{i,t} + b_G*G_{i,t} + B_G(L)\Delta G_{i,t} + u_{i,t} \quad (3)$$

The empirical results for equation (3) are provided in Table 4 using one lag with and without fixed effects.

TABLE 4
PANEL REGRESSIONS FOR LONG-RUN IMPACT OF FOREIGN AID ON ECONOMICS GROWTH CONTROLLING FOR HUMAN CAPITAL, INVESTMENT, POPULATION GROWTH, AND GOVERNMENT EXPENDITURE

VARIABLES	(1)	(2) With FE	(3)	(4) With FE
(L)Growth	0.1982***	0.0912*	0.1987***	0.1080*
	(0.0423)	(0.0457)	(0.0428)	(0.0457)
Aid/N	0.0007	0.0065*		
	(0.0014)	(0.0032)		
*(L)Δ*Aid/N	0.0002	0.0017		
	(0.0027)	(0.0033)		
Aid/GNI			0.0002	0.0042
			(0.0011)	(0.0026)
*(L)Δ*Aid/GNI			-0.0000	0.0017
			(0.0025)	(0.0027)
Human Capital	0.0119	-0.0529	0.0121	-0.0515
	(0.0075)	(0.0343)	(0.0079)	(0.0345)
*(L)Δ*Human Capital	0.1978**	0.1734	0.1979**	0.1748
	(0.0669)	(0.0920)	(0.0669)	(0.0925)
Pop Grow	-0.0028	0.0059	-0.0026	0.0050
	(0.0039)	(0.0071)	(0.0039)	(0.0072)
*(L)Δ*Pop Grow	0.0050	0.0019	0.0050	0.0020
	(0.0061)	(0.0064)	(0.0061)	(0.0065)
Investment	0.0033	0.0044	0.0033	0.0048
	(0.0034)	(0.0051)	(0.0034)	(0.0051)
*(L)Δ*Investment	0.0025	-0.0061	0.0026	-0.0064
	(0.0058)	(0.0065)	(0.0058)	(0.0065)
Gov Exp	-0.0089*	-0.0106	-0.0085*	-0.0101
	(0.0039)	(0.0059)	(0.0038)	(0.0059)
*(L)Δ*Gov. Exp	-0.0026	0.0055	-0.0027	0.0059
	(0.0070)	(0.0081)	(0.0071)	(0.0081)
Constant	-0.0297	0.1030*	-0.0255	0.1362**
	(0.0202)	(0.0507)	(0.0183)	(0.0523)
Observations	550	550	550	550
R-squared	0.1066	0.2413	0.1063	0.2384
Adj R-sq	0.0884	0.119	0.0880	0.116

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

In this analysis the most important variables are the *b*'s that correspond to the foreign aid estimates. When including the additional controls, we find similar results to the previous model—positive and statistically significant when analyzing per capita foreign aid, but not as robust of results under the alternative specification. When including fixed effects, the *b* that corresponds to per capita foreign aid is found to be 0.0065. Using equation (2) this means our implied multiplier *l* has decreased slightly and is now approximately 0.007. This would imply that to achieve a permanent 1% increase in per capita growth it would now require almost $140 per person.

CONCLUSION

In this paper the relationship between foreign aid and per capita economic growth is analyzed using panel data of 57 aid recipient developing countries from 1970 to 2017. The analysis considers traditional variables that are predicted to have steady state effects—human capital, investment, population growth, and government expenditure—as well as two measures of foreign aid—total net ODA per capita and total net ODA as a percentage of GNI. By incorporating a time element this study is able to take advantage of time and country specific fixed effects as well as find evidence of statistically significant, positive, and permanent effects of foreign aid on economic growth.

Our findings suggest that when looking at per capita foreign aid the effect of foreign aid on per capita economic growth is both statistically economically significant. The results are consistent with the previous studies even when controlling for human capital—a theoretically important variable for steady state level effects. The results for the alternative specification of foreign aid is not as robust. The results would suggest that if donor policy makers increased per capita foreign aid by approximately $110 and $140—depending on the model—the recipient country would have a permanent increase in per capita growth by 1%. The findings may also suggest that for policy makers it maybe more important for them to focus on how much money is being given per capita rather than by the size of the total economy of the recipient country. This might be an interesting avenue for future research to determine the optimal strategy for the deployment of scarce resources.

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STATISTICAL APPENDIX

TABLE 1
DESCRIPTIVE STATISTICS FOR COUNTRIES THAT RECEIVED FOREIGN AID

Variable	Obs	Mean	Std. Dev.	Min	Max
Growth	57	0.0174	0.0156	-0.0138	0.0651
Ln(Initial GDP/N)	57	7.8112	0.6537	6.3944	9.0023
Ln (Final GDP/N)	57	8.6450	0.9408	6.5893	10.2133
Ln(HC)	57	0.5695	0.2392	0.0851	1.0244
Ln(Pop)	57	-3.8415	0.3769	-5.4213	-3.2814
Ln(I)	57	-1.7487	0.3560	-2.7528	-0.9662
Ln(G)	57	-1.7482	0.3099	-2.6647	-1.0434
Ln(Aid/N)	57	3.0992	1.0601	0.5306	5.2815
Ln(Aid/GNI)	57	-3.7154	1.5412	-7.5795	-1.6656