Aid and Growth: The Current Debate and Some New Evidence

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Controversies about the effectiveness of foreign aid go back decades. Milton Friedman (1958), Peter Bauer (1972), William Easterly (2001) and other economists have leveled stinging critiques at aid, charging that it has enlarged government bureaucracies, perpetuated bad governments, enriched the elite in poor countries, or just been wasted. They cite the widespread poverty in Africa and South Asia despite three decades of aid, and point to countries that have received significant amounts of aid and have had disastrous growth records, including the Central African Republic, the Democratic Republic of the Congo, Haiti, Papua New Guinea, and Somalia. Critics call for aid programs to be dramatically reformed, substantially curtailed, or eliminated altogether.

Supporters counter that these arguments, while partially correct, are overstated. Jeffrey Sachs (2004), Joseph Stiglitz (2002), Nicholas Stern (2002) and others have argued that although aid has sometimes failed, it has supported poverty reduction and growth in some countries and prevented even worse performance in others. Advocates argue that many of the weaknesses of aid have more to do with donors than recipients, especially since much aid is given to political allies rather then to support development. They point to a range of successful aid recipients such as Botswana, Korea, Taiwan, Indonesia, and (more recently) Uganda and Mozambique, along with broader aid-financed initiatives such as the Green Revolution, the campaign against river blindness, and the introduction of oral rehydration therapy. They note that in the 40 years since aid became widespread in the 1960s, poverty indicators have fallen in many countries around

the world and health and education indicators have risen faster than any other 40-year period in human history.

This paper explores the current debates on aid and growth. It begins by providing an overview of three different views of the aid growth relationship: that there is (1) no relationship (or a negative one), (2) a positive relationship, usually with diminishing returns; or (3) a conditional relationship in which aid works in some circumstances but not in others, depending on the characteristics of the recipient country or the practices and procedures of the donors. It then explores in depth one of the newer contributions to the debate – evidence that different types of aid have different relationships to growth. Specifically, aid that is actually aimed directly at growth (e.g., for infrastructure and agriculture) has had a strong and positive impact on growth, on average.

I. Thee Broad Views on Aid Effectiveness

Most of the academic debate on aid effectiveness has centered on the relationship between aid and growth (even though a substantial portion of aid is not primarily aimed at growth). Three broad strands have emerged in the empirical literature.[1]

1. Aid has no affect on growth, and may actually undermine growth. Peter Bauer was perhaps the most outspoken proponent of this view (e.g., Bauer, 1972), arguing that aid created disincentive effects on investment, undermined the private sector, and otherwise inhibited development. However, while influential, he never provided empirical research to support his argument. Griffen and Enos (1970) were among the first to publish empirical research questioning aid effectiveness, finding negative simple

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[1] This summary draws heavily from the review in Clemens, Radelet and Bhavnani (2004).

correlations between aid and growth in 27 countries. Many other studies followed

showing little or no relationship (Mosley, 1980; Mosley et al, 1987; Dowling and

Hiemenz, 1982; Singh, 1985; Boone, 1994).

Researchers have suggested a variety of reasons why aid might not support

growth. First, it simply could be wasted on limousines or presidential palaces. Second, it

could encourage corruption, not just in aid programs but more broadly. Third, it could

undermine private sector incentives for investment or to improve productivity. Aid can

cause the currency to appreciate, undermining the profitability of the production of all

tradable goods (known as the Dutch disease). Food aid, if not managed appropriately, can

reduce farm prices and hurt farmer income. Fourth, aid flows can reduce saving, both

private saving (through its impact on interest rates) and government saving (though its

impact on government revenue). Fifth, it can help keep bad governments in power, thus

helping to perpetuate poor economic policies and postpone reform.

While the empirical studies have been influential, many are of questionable

quality, especially using today's research standards. For example, one of the most widely

cited studies is Boone (1994), which concludes that there is no relationship between aid

and growth. However, his aid-growth results were never published, assumed only a

simple linear relationship between aid and growth, ignored potential endogeniety, and

used an unconventional set of co-regressors.

2. Aid has a positive relationship with growth on average across countries

(although not in every country), but with diminishing returns as the volume of aid

increases. Early analysts assumed that aid would increase growth by augmenting saving,

financing investment, and adding to the capital stock. Aid might also help increase

worker productivity (e.g., through investments in health or education) or provide a conduit for the transfer of technology or knowledge from rich countries to poor countries (by paying for capital goods imports or through technical assistance). Several early studies found a positive relationship between aid and growth (e.g., Papenek, 1973; Levy, 1988), sparking a lively debate between researchers that found a positive relationship and those that did not.

This strand of the literature took a significant turn in the mid-1990s when researchers began to investigate whether aid might spur growth with diminishing returns. Oddly – given Solow's response to the Harrod-Domar model in the 1950s -- research on aid and growth until the mid-1990s only tested a linear relationship. Most of the newer studies that allow for diminishing returns have found a positive relationship (Hajimichael, et. al, 1995; Durbarry et al, 1998; Dalgard and Hansen, 2000; Hansen and Tarp 2000 and 2001; Lensink and White, 2001; and Dalgaard, et al, 2004). Most of these studies do not conclude that aid has always worked, but rather that on average higher aid flows have been associated with more rapid growth. These studies have received much less attention that those that have found a zero of conditional relationship. Roodman (2004) conducts sensitivity analyses on three of these studies, and finds two of the three (Dalgaard, 2004 and the GMM results of Hansen and Tarp, 2001) to be reasonably robust.

3. Aid has a conditional relationship with growth, only helping to accelerate growth under certain circumstances. This view is based on the idea that aid has supported growth in some circumstances but not others, and searches for key characteristics associated with the difference. This "conditional" strand of the literature

has two sub-categories, with the effectiveness of aid depending on either the characteristics of the recipient country or the practices and procedures of the donors.

- *Recipient country characteristics*. Isham, Kaufmann, and Pritchett (1995) found that World Bank projects had higher rates of returns in countries with stronger civil liberties. Burnside and Dollar (2000), in a very influential study, concluded that aid stimulated growth in countries with good policies, but not otherwise. Other researchers have proposed different country characteristics that might affect the aid-growth relationship, including export price shocks (Collier and Dehn 2001), climatic shocks and the terms of trade (Guillaumont and Chauvet 2001, Chauvet and Guillaumont 2002), policy and institutional quality (Collier and Dollar 2002), institutional quality alone (Burnside and Dollar 2004), policy and warfare (Collier and Hoeffler 2002), 'totalitarian' government (Islam 2003), and location in the tropics (Dalgaard, 2004).

All of these studies rely on an interaction term between aid and the variable in question, and (not surprisingly) many of the interaction terms are fragile. Easterly, Levine, and Roodman (2004) find that the original Burnside and Dollar results do not hold up to modest robustness checks. Roodman (2004) tests several other "conditional" studies and finds most of them to be relatively fragile, although the conclusions of Delgaard (2004) are more robust.

Nevertheless, the view that aid works best (or in a stronger version, aid works *only*) in countries with good policies and institutions has become the conventional wisdom among donors, partly based on this research and partly due to development practitioners that believe this to be the case based on their own experience. The appeal of this approach is that it can explain why aid seems to have supported growth in countries

like Korea, Botswana, Indonesia and more recently Mozambique and Uganda, while at the same time not stimulating growth in countries like Haiti, Liberia, Zaire (now DROC), and the Philippines. These findings have had an enormous impact on donors (World Bank 2000). The concept feeds directly into the World Bank's Performance Based Allocation (PBA) system for distributing IDA funds, and was the foundation for the United States' new Millennium Challenge Account (Radelet, 2003).

- *Donor practices*. Many analysts have argued that donor practices strongly influence aid effectiveness. For example, multilateral aid might be more effective than bilateral aid, and untied aid is thought to have higher returns than tied aid. Many observers argue that donors that have large bureaucracies, do not coordinate or harmonize with other donors, or have ineffective monitoring and evaluation systems undermine the effectiveness of their own programs. Two influential and overlapping views argue that aid would be more effective if there were greater "country ownership" or broader "participation" among government and community groups in recipient countries in setting priorities and designing programs. There has been substantial debate about these issues which in some cases has begun to lead to changes in donor practices, but to date there has been very little systematic research connecting specific donor practices to aid effectiveness.

II. New Directions in Aid-Growth Research: Not All Aid is Alike

Recent research has begun to explore the idea that not all aid is alike in its impact on growth. Most research on aid and growth is flawed, for two reasons: substance and timing. On substance, almost all studies look at the relationship between total aid and

growth, when large portions of aid are not directed at growth. Food aid, for example, is directed at supporting consumption, not growth. The same is true for the provision of medicines, bed nets, and school books. Aid to support democracy or for humanitarian relief efforts are not primarily aimed at stimulating growth. Since growth is not the objective, it would not be surprising if much of this aid had no relationship with growth. By contrast, aid to build roads, bridges, telecommunications facilities or to support agriculture and industry should be expected to accelerate growth. But research that combines these different kinds of aid is likely to get mixed results, and to show an overall weak relationship between aid and growth.

With respect to timing, most cross-country studies of economic growth (whether they are examining aid or some other factor that might influence growth) use panel data with each observation (usually) corresponding to four years. This is a very short time horizon in which to examine the aid-growth relationship. Aid to support education and health, for example, may stimulate growth, but the impact is likely to take decades, not years. One option for researchers, of course, is to use a longer time period, ideally (to be consistent with theory) as long as possible. But there is a trade-off: the longer the time period, the harder it is to isolate the impact of aid (or any other variable) on growth from other influences.

Only a few studies have explored this line of reasoning, and most focus on specific countries. Owens and Hoddinott (1999) find that household welfare in Zimbabwe is increased by "development aid" (infrastructure, agricultural extension, etc.) far more than by "humanitarian aid" (food aid, emergency transfers, etc.). In Uganda, Mavrotas (2003) finds a positive effect from program and project aid, but negative impacts from

technical cooperation and food aid. However, in India, Mavrotas (2002) finds a negative

correlation between growth and three categories of aid.

Growth and Growth-Oriented Aid: Some New Results

In a new study (Clemens, Radelet, and Bhavnani, 2004) we examine the

relationship between growth-oriented aid and growth across 67 countries between 1974

and 2001. Here we summarize or key results and their policy implications.[2]

We begin by dividing aid into three categories. To illustrate, some of the major

types of aid in each of the three categories are shown in Table 1. The first group is aid for

disasters, emergencies, and humanitarian relief efforts, including food aid. We expect that

this kind of aid would have a *negative* simple relationship with growth, since a disaster

would simultaneously cause growth to fall and aid to increase. For example, Hurricane

Mitch in Central America caused extensive damaged and undermined economic growth,

and donors responded with substantial increases in aid. In a simple cross country growth

regression, these cases would appear has high aid and low or negative growth, making it

appear that aid had a poor relationship with growth. But this is misleading, since both the

high aid and the low growth are being caused by something else – the disaster – which is

left out of the analysis. More sophisticated modeling techniques in theory could correct

for this effect, but it would be difficult to do so effectively and almost no growth

regressions attempt to do so. We simply recognize that the aid-growth relationship here is

different from other kinds of aid, and exclude this category of aid from our main analysis.

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[2] Some of the text in the sections that follow is drawn from the original paper.

The second category is aid that might affect growth, but if so only indirectly and over a long period of time. No one should expect that aid to halt environmental degradation or to support democratic or judicial reform will affect economic growth quickly, and certainly not over a four year period. Similarly, aid to strengthen health and education is likely to affect labor productivity over many years, but not immediately (with some exceptions). In a standard cross country growth regression, these observations are likely to appear as high aid and zero growth.

The third category is aid the might reasonably be expected to affect economic growth in the four-year period standard in most cross-country growth regressions. Aid to build infrastructure -- roads, irrigation systems, electricity generators and ports -- should affect growth rates fairly quickly. So should aid to support directly productive sectors, such as agriculture, industry, trade, and services. Aid that comes as cash, such as budget or balance of payments support, also should be expected to positively affect growth fairly immediately if it is to do so at all. In our disaggregation, this kind of aid accounts for slightly more than half of all aid flows. For these kinds of aid flows, it is perfectly reasonable for policymakers to expect and for researchers to test for a positive relationship with growth over a four-year period.

Most research lumps all three of these kinds of aid together, even though their impacts on growth are likely to be quite different. Seen this way, it is not surprising that research on aid and growth has shown a weak relationship between aid and growth. Indeed, it would be astonishing if these mixed inputs gave any clear results at all. Instead, when we disaggregate aid and concentrate on aid flows that are aimed at growth, a much clearer picture emerges. We find a strong, positive and causal effect between this "short-

impact" aid, as we call it, and economic growth over a four year period. The results

exhibit diminishing returns, with larger amounts of aid have a progressively smaller

impact on growth. The estimated impact is large – conservatively more than double the

magnitude found in other studies. The results are also very robust, remaining firm across

a variety of specifications and estimation techniques. We find the impact of aid on

growth is somewhat larger in countries with stronger institutions, but controlling for

institutions is not necessary to establish the result. The results do not imply that aid has

worked everywhere – it most definitely has not – but rather that on average, this type of

aid has had a positive and significant impact on growth.

The Core Results

Table 2 shows some of the basic results. Column one shows the relationship

between aggregate aid (net of debt repayments) and growth, controlling for a wide variety

of other factors that might influence growth such as geography, policy, and health

endowments. In this example, we use a two-stage least squared estimation technique to

control for possible endogeneity.[3] We include terms for both aid and aid squared to allow

for diminishing returns. The coefficient on aid is positive and statistically significantly

different from zero at the 5 percent level, but it is fairly small. These results are in accord

with the studies cited above that have found a positive relationship with growth when

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[3] The instruments, here and in later regressions using 2SLS, are all the independent variables,
supplemented by the instruments in Hansen and Tarp (2000), including a dummy for Egypt, arms imports,
a lagged policy index and its square, population interacted with policy, GDP and its square interacted with
policy, and each of the lagged variables and the lagged variables interacted with policy. As we show later,
the results do not depend on instrumentation.

allowing for diminishing returns, such as Dalgaard, Hansen and Tarp (2004). But in our view, these results, while positive, are misleading.

Column two shows the results including all three of our subcategories of aid separately but simultaneously, with debt repayments as a separate term. The coefficient on "short-impact" aid is more than three times the coefficient on gross aid and is significant at the ten percent level. As expected, the coefficient on long-impact aid is small and insignificant, while the coefficient on humanitarian aid is negative. These results show that these three categories and debt repayments of aid have dramatically different relationships with growth. Note that our results do not mean that long-impact and humanitarian aid have no impact on growth – just that standard cross country regressions with four year panels are the wrong technique to try to measure these other impacts. Examining these relationships appropriately would require different models and estimation techniques, which we leave to future work.

Column three shows the results using exclusively short-impact aid. The estimated coefficient is now more than four times larger than the original and is significant at the one percent level. Column four shows the results for the same specification, but this time estimating the results using the more efficient generalized method of moments (GMM) estimator.

Figure 1 shows these estimated relationships between aid and growth in graphical form. The bold curve shows the relationship between net aid and growth, while the other three curves show the estimated relationship for the three sub-categories of aid. Short-impact aid has a much stronger relationship with growth than the other sub-categories,

and combining the three together, as is done in most research, masks these differential effects and shows a much weaker relationship.

Since the instrumentation used in 2SLS raises some difficult issues, Table 3 shows the results using some alternative estimation techniques. Column one shows the results using ordinary least squares (OLS). To control for possible endogeneity, we used short-impact aid (and short-impact aid squared) lagged one four-year period. In this case the estimated coefficient (not surprisingly) is smaller, although it remains significant at the one percent level. Since this is the smallest coefficient among our results, to be conservative we use it in our interpretation of the results in the next section. Columns 2-4 run the same regression in differences to eliminate country fixed effects that may bias the coefficients. Differencing introduces endogeneity bias for differenced log initial GDP per capita, which is instrumented in the results shown in column 3. Column 4 re-introduces long-impact aid and shows that its effect differs from that of short-impact aid using the OLS estimator as well. These results stand, with the coefficient slightly larger than in column one and still significantly different from zero.

What about the claim that aid works best in countries with good policies and institutions? Our results show that short-impact aid has a positive impact on growth, on average. This does not mean that aid works equally well everywhere. Some of the observations fall above the line, suggesting a strong aid-growth relationship, while others fall below the line, suggesting a weaker relationship. We examined each of the independent variables as possible explanations of a stronger or weaker relationship: level of income, policy, geography, etc. Only two variables stood out as showing some explanatory power in distinguishing countries with stronger or weaker relationships:

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institutional quality and life expectancy, as shown in Table 4. The results are suggestive

that in countries with better institutions the relationship between short-impact aid and

growth is stronger than otherwise (but we emphasize the results do not depend on strong

institutions). Similarly, in countries with higher life expectancy (that is, better health) the

relationship is stronger than in countries with low life expectancy (controlling for other

variables, including income levels).

Interpreting the Results

To interpret the results, we use the smallest and most conservative of the

estimated relationship between short-impact aid and growth, as found with the OLS

estimation in table 3, column 1. Our results show diminishing returns to aid, so the

marginal impact on growth is largest with smaller amounts of aid, and falls as the amount

of aid climbs. To give some sense of the magnitude, we focus on the mean observation,

where short-impact aid is 2.7% of GDP. Since short-impact aid is about half of total aid,

this is equivalent to total aid of about 5.4% of GDP for the representative country. At

this point, we find that a one percentage point of GDP increase in aid produces and

additional 0.31 percentage points of annual growth over the four year period. Since the

increment to GDP will be maintained to some extent over time, we find a high payoff for

short-impact aid on average using plausible assumptions (a discount rate and depreciation

rate summing to 35%). Each $1 in short-impact aid yields $1.64 in increased in income in

the recipient country in net present value terms. Under reasonable assumptions this

corresponds to a project-level rate of return of around 13%, a quite plausible result. From

a different perspective, we find that higher-than-average short-impact aid to sub-Saharan

Africa raised per capita growth rates there by about one percentage point over the growth that would have been achieved by average aid flows.

Our results with diminishing returns suggest some limits on the ability of typical recipient countries to absorb very large amounts of short-impact aid. However, the point at which the marginal impact of aid reaches zero is well above the amount of aid that most countries receive. Whereas the average country receives short-impact aid flows of about 2.7% of GDP, our estimates indicate that the maximum total growth rate (where the marginal impact of additional aid reaches zero) occurs on average when short-impact aid represents 8-9% of GDP. Note that since short-impact aid is slightly more than half of total aid on average, this implies that the marginal impact of aid reaches zero when total aid reaches around 16-18% of GDP in the typical country. This does not mean that in any particular country, short-impact aid flows greater than 8-9% of GDP are a bad idea. Instead, this represents the typical pattern over the last 30 years. Absorptive capacity can be expanded over time, and some countries undoubtedly can absorb more aid flows than others. Indeed we find that in the presence of strong institutions and better health the maximum point occurs with larger amounts of aid.

Moreover, we stress that although the quadratic term implies a region in which large amount of aid could have a negative marginal impact on growth, the data do not support such a conclusion. There are not observations in the sample with short-impact aid exceeding 9 percent of GDP, so the data do not support a conclusion of negative returns to aid. The quadratic simply represents a good approximation of the relationship as short-impact aid increases from 0 to 9% of GDP, but not thereafter.

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Policy Implications and Conclusions

In recent years scholars have tried to explain the weak relationship between aid and growth in terms of differences in recipient countries. While that explanation retains merit, these results suggest that differences in types of aid are a very strong part of the explanation. Since significant amounts of aid are not directly aimed at supporting growth, it makes little sense for researchers or policymakers to gauge aid effectiveness for those types of aid by their impact on growth. Thus the strong pessimism on aid effectiveness expressed by some analysts is too strong and based on faulty analysis: there is a strong positive and casual relationship between growth-oriented aid and growth.

At the same time, no one should conclude that aid has always worked or that it cannot be made to be more effective. There are many countries that have received substantial amounts of aid that have stagnated or worse, and much aid that has been wasted, stolen, or otherwise used to support poor governments. The results reviewed here suggest, however, that on average growth-oriented aid has had a positive impact on growth. There is little doubt that aid can be made even more effective by reducing aid bureaucracies, harmonizing donor procedures to reduce the cost on recipients, making aid flows more predictable, reducing tied aid, and allocating aid based on ability to achieve results (Birdsall, 2004; Radelet, 2004; World Bank, 1998).

The relationship between short-impact aid and growth seems to be stronger in countries with good institutions and better health. Thus those that argue that aid works *only* in countries with good institutions overstate their case. It would be more accurate to say that aid works better in countries with good institutions, but can be effective in other situations as well. While it is easy to think of countries with weak institutions that have

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failed, there are some that have had some success as well. Aid helped support growth in Mozambique and Uganda in the early years after their civil conflict ended even through policies and institutions were far from ideal. Most observers believe that aid has played an important supporting role in stabilizing Sierra Leone since its cease fire. Aid helped to support sustained growth and poverty reduction in Indonesia during the Suharto regime, even in the 1970s and 1980s when institutions were weak, corruption was problematic, and policies were less than ideal.

We hasten to add that the weak relationship between long-impact and humanitarian aid and growth over a four year period should not be interpreted to mean that they are ineffective. Different modeling techniques are required to explore those questions which we leave for future research. There is other evidence that at least some aid for health and education ahs been effective. For example, recent works has shown the role that aid has played in supporting large scale successful health interventions, such as eradicating small pox, significantly reducing the prevalence of polio and river blindness, and reducing the incidence of diarrheal diseases (Levine et al, 2004).

Finally, the evidence (from the study reviewed here and from other research on aid and growth) suggests that absorptive capacity constraints are real, but should not be seen as an immutable barrier to growth. The impact of aid on growth appears to diminish as aid volumes increase. But the impact can be enhanced by improving health and by strengthening institutions. In other words, absorptive capacity can be expanded by strengthening human and institutional capacity. This suggests that policy discussions should not focus on determining the limits of aid on growth, but rather on how those

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limits can be expanded, and how aid can be made even more effective in supporting

growth and development in the future.

Table 1. Three Categories of Aid

Humanitarian Aid	"Short-Impact" Aid	"Long-Impact" Aid
Disaster relief	Transport and storage	Government and civil society
Emergency aid	Communications	General environmental protection
Humanitarian relief	Energy generation and supply	Women in development
Food aid	Most banking and financial services	Health
	Business and other services	Education
	Agriculture, forestry, & fishing	Populations policies
	Industry, mineral resources, & mining	Water supply and sanitation
	Construction	Policy and administrative management
	Structural adjustment assistance	Support to NGOs
	Budget support	Other social infrastructure and services
	Debt relief	

Table 2. Core results

Dependent variable: GDP per capita growth	1 2SLS	2 2SLS	3 2SLS	4 GMM
Net ODA	0.248			
	(0.105)**			
Net ODA squared	-0.00660			
	(0.00358)*			
Short-impact aid		0.793	0.960	0.930
		(0.413)*	(0.328)***	(0.251)***
Short-impact aid squared		-0.0556	-0.0588	-0.0507
		(0.0285)*	(0.0264)**	(0.0190)***
Long-impact aid		0.146		
		(0.266)		
Long-impact aid squared		0.0000762		
		(0.012)		
Humanitarian aid		-0.407		
		(1.29)		
Humanitarian aid squared		0.146		
		(0.317)		
Log repayments		-0.404	-0.384	-0.508
		(0.189)**	(0.188)**	(0.159)***
Log initial GDP per capita	0.018	0.0223	-0.0593	-0.253
	(0.402)	(0.496)	(0.493)	(0.439)
East Asia	2.333	2.33	2.39	2.62
	(0.630)***	(0.635)***	(0.648)***	(0.601)***
Institutional quality	0.301	0.299	0.333	0.323
	(0.107)***	(0.121)**	(0.114)***	(0.106)***
Inflation	-1.80	-1.83	-1.60	-1.30
	(0.541)***	(0.530)***	(0.558)***	(0.403)***
Budget balance	8.29	6.90	8.28	6.22
	(5.30)	(5.18)	(5.47)	(4.24)
Openness Sachs-Warner	1.16	1.32	1.41	1.47
	(0.435)***	(0.460)***	(0.456)***	(0.388)***
Tropics	-2.11	-2.23	-2.13	-2.28
	(0.374)***	(0.423)***	(0.398)***	(0.290)***
Log initial life expectancy	3.37	3.12	3.49	4.06
	(1.710)**	(2.12)	(1.85)*	(1.54)***
Civil war	-1.90	-1.75	-2.19	-1.82
	(0.726)***	(0.767)**	(0.891)**	(0.813)**
Lagged civil war	1.78	1.27	1.86	1.56
	(0.494)***	(0.617)**	(0.730)**	(0.644)**
Observations	368	366	368	368
R-squared	0.444	0.398	0.388	0.383

Note: Dependent variable is four-year average GDP per capita growth. Robust and clustered standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.   All regressions include period dummies and a constant term. Aid, aid squared and repayments are instrumented.

Figure 1. The Relationship Between Aid and Growth
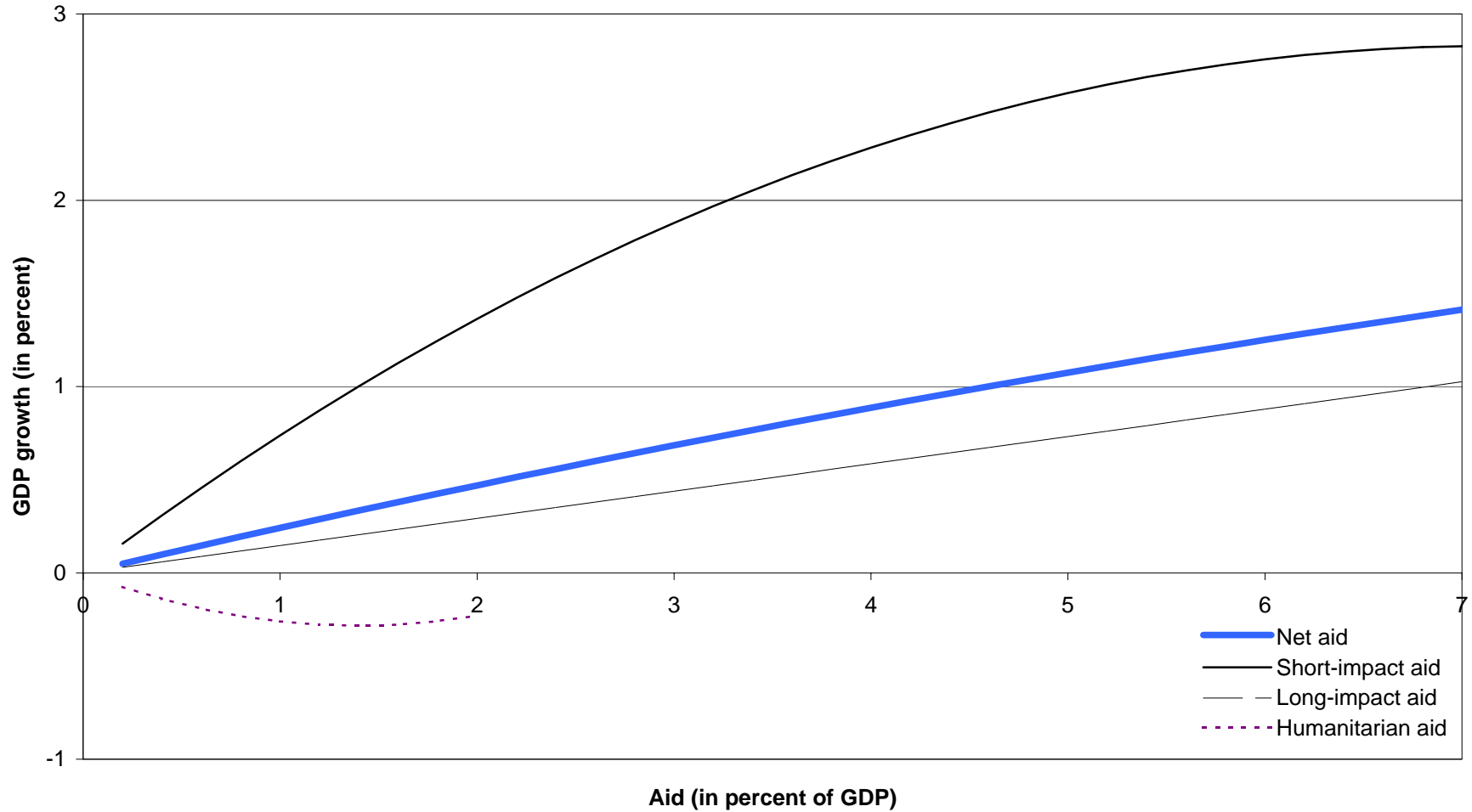
Based on the estimated coefficients in column 2 of table 2.

Note: As we emphasize in the text, the weaker relationship for "long-impact" and "humanitarian" aid does not necessarily mean these flows have no impact on growth. In our view, a different modeling technique is required to explore these relationships, which we leave for future research.

Table 3. Robustness tests

	1 OLS	2 OLS	3 2SLS	4 GMM
		Difference equations (boldface coefficients correspond to instrumented varaibles)		
Short-impact aid lagged	0.484	0.679	0.590	0.525
	(0.162)***	(0.251)***	(0.297)**	(0.256)**
Short-impact aid squared lagged	-0.0275	-0.0403	-0.0362	-0.0289
	(0.0110)**	(0.0147)***	(0.0202)*	(0.0166)*
Long-impact aid lagged				0.000864
				(0.163)
Long-impact aid squared lagged				-0.00789
				(0.00549)
Log repayments lagged	-0.307	-0.307	-0.244	-0.179
	(0.133)**	(0.277)	(0.316)	(0.325)
Log initial GDP per capita	-0.370	-6.34	**-10.0**	**-10.8**
	(0.351)	(1.38)***	**(4.65)**	**(4.59)**
East Asia	2.10			
	(0.479)***			
Tropics	-1.94			
	(0.342)***			
Log initial life expectancy	3.23	-5.66	-2.80	-1.70
	(1.41)**	(7.24)	(5.56)	(5.18)
Civil war	-2.22	-2.17	-2.10	-2.26
	(0.580)***	(0.774)***	(0.715)***	(0.818)***
Lagged civil war	1.95	1.38	0.906	0.645
	(0.584)***	(0.748)*	(1.14)	(1.07)
Institutional quality	0.341	0.344	0.343	0.334
	(0.100)***	(0.299)	(0.226)	(0.238)
Inflation	-1.97	-1.84	-1.91	-2.05
	(0.377)***	(0.567)***	(0.517)***	(0.513)***
Budget balance	7.74	11.2	10.5	10.0
	(3.59)**	(5.26)**	(8.36)	(8.36)
Openness Sachs-Warner	1.38	1.40	1.20	1.24
	(0.389)***	(0.735)*	(0.536)**	(0.551)**
Observations	367	297	297	298
Adjusted R-squared	0.430	0.263	0.280	0.280

Note: Dependent variable is (differenced, in regressions 2-4) four-year average GDP per capita growth. Robust and clustered standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include period dummies and a constant term.

Table 4. Aid interaction effects

Dependent variable: GDP per capita growth	1 2SLS	2 GMM	3 2SLS	4 GMM
Short-impact aid	-3.47	-2.32	0.424	0.356
	(1.98)*	(1.45)	(0.341)	(0.273)
Short-impact aid squared	-0.0416	-0.0379	-0.0519	-0.0651
	(0.0118)***	(0.0081)***	(0.0211)**	(0.0131)***
Log repayments	-0.450	-0.535	-0.460	-0.568
	(0.173)***	(0.160)***	(0.178)***	(0.161)***
Log initial GDP per capita	0.010	-0.404	-0.138	-0.153
	(0.517)	(0.414)	(0.591)	(0.479)
East Asia	2.44	2.70	2.51	2.96
	(0.607)***	(0.564)***	(0.688)***	(0.624)***
Tropics	-2.27	-2.35	-2.13	-2.36
	(0.372)***	(0.290)***	(0.507)***	(0.353)***
Log initial life expectancy	-2.05	0.15	3.52	3.80
	(3.31)	(2.46)	(1.90)*	(1.61)**
Civil war	-1.32	-1.70	-2.23	-1.57
	(0.771)*	(0.721)**	(0.901)**	(0.827)*
Lagged civil war	1.39	1.38	2.01	1.56
	(0.625)**	(0.582)**	(0.698)***	(0.621)**
Institutional quality	0.419	0.398	0.103	0.008
	(0.118)***	(0.108)***	(0.272)	(0.196)
Inflation	-1.86	-1.68	-1.63	-1.06
	(0.658)***	(0.534)***	(0.558)***	(0.354)***
Budget balance	6.89	5.90	7.78	4.64
	(4.86)	(4.22)	(5.34)	(4.58)
Openness Sachs-Warner	1.52	1.43	1.52	1.50
	(0.431)***	(0.371)***	(0.468)***	(0.383)***
Short-impact aid x log inital life expectancy	1.04	0.748		
	(0.485)**	(0.352)**		
Short-impact aid x institutional quality			0.104	0.162
			(0.122)	(0.086)*
Observations	363	363	370	370
R-squared	0.374	0.386	0.350	0.278

Note: Dependent variable is four-year average GDP per capita growth. Robust and clustered standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include period dummies and a constant term. Aid, aid squared, interaction terms and repayments are instrumented.

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