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BOCCONI UNIVERSITY  
Milan, Italy

# **REFLECTIONS ON AID AND GROWTH**

By  
Amy Heyman

A dissertation submitted in partial fulfillment of the  
Requirements for the PhD in Economics

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Almost 50 years ago, Chenery and Strout's 1966 paper "Foreign Assistance and Economic Development" set off a proliferation of research that addressed the fundamental question about the impact of international aid inflows on a country's economy. This question has significant economic and policy implications. Does aid have a long-term effect on economic growth? Or are the benefits merely short-term, in the form of consumption? Or does aid lead to growth conditional on other factors? Or is there no impact at all? In light of the amount of money disbursed by high-income donors on aid, these questions are paramount. In 2007 alone, over \$100 billion went to developing countries in the form of aid. Approximately \$3 trillion has flowed from the developed to the developing world since these data have been recorded methodically in 1960. These financial flows are not secondary; until the early 1990s, aid flows were just as large as FDI. Yet the jury is still out about the effectiveness of aid.

These three papers fit into the most recent strand of the aid/growth literature, which attempts to disaggregate aid as a more effective way of answering the abovementioned questions. The first, entitled "Challenging the Effectiveness of Short-term Aid: A Comment on Counting Chickens When They Hatch" looks at short-impact aid. The second paper "Drilling Down Aid" analyzes the effects of sectoral aid on economic growth. The third paper "Aid and Trade?" shifts away from right-hand side variables and instead focuses on "episodes" as an alternative dependent variable.

Completion of this work would not have been possible without the support and feedback of my professor, Francesco Giavazzi. Your comments are concise, yet constructive and provocative. A special thanks also goes to the orals committee members, professors Laura Bottazzi and Francesco Daveri.

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**Challenging the Effectiveness of Short-term Aid:  
A Comment on Counting Chickens When They Hatch**

**Abstract**

Clemens, Radelet, and Bhavnani (2003) offer a novel approach to the aid/growth literature by breaking down aid from its aggregate. They find that “short-impact” aid – defined as “budget support or ‘program’ aid given for any purpose and project aid given for real sector investments for infrastructure or directly to support production in transportation, communications, energy, banking, agriculture and industry” – has a positive impact on a country’s growth. Specifically, the effect of short-impact aid on growth is two-to-three times larger than aggregate aid. I conduct a data gathering exercise that expands their dataset from 1970-2003 to 1970-2007 and updates the series they use. Using two stage least squares, a methodology originally implemented by the authors, I find that their results are not robust to the use of the new/updated data. This does not necessarily mean that “short-impact” aid is not important or should be avoided. It may suggest that its average effect on growth is too small to be measured statistically or that it may have an impact in other ways.

## **Introduction**

As high-income countries continue to funnel large amounts of money to developing countries in the form of aid, the question always remains: is aid effective? And, if it is, in what capacity? Do aid flows have an impact on the poor, purportedly the target population of aid? Or does it, as we have seen cases of in the past, end up in the pockets of developing countries' politicians? Or, even more cynical, does it end up bloating international agencies in the form of technical assistance? If aid does make a difference within a developing country, what is the best form?

Practitioners and academics have grappled with these and similar questions. Within economics, most of the debate has taken place within the growth literature. Does aid lead to a country's growth?

This research builds on the existing paper "Counting Chickens When They Hatch: The Short Term Effect of Aid on Growth," by Michael Clemens, Steven Radelet and Rikhil Bhavnani. Whereas most of the growth literature looks at aggregate aid over short periods of time (generally four or five years), this paper offers a novel approach by narrowing down the aid variable into different types of aid. They enter the research with the idea that aid of various types will have different effects on growth. They conclude that "short impact" aid has a positive effect on a country's growth. I conduct a data gathering exercise to test the strength of their paper.

## **Literature review**

The goal of this paper is not to offer a comprehensive overview of the aid and growth literature. The following information, however, is material to provide background for this paper. For a larger overview of the literature, please refer to chapter one of this research.

The growth/aid literature has progressed significantly since the first papers within this field. The first generation treated capital inflows equal and attempted to measure their impact on growth. This is best represented by the works of Griffin (1970), Griffin and Enos (1970), and Weisskopf (1972). The next generation then built on this methodology but tried to distinguish aid flows from other types of capital. Key thinkers of this period include Papanek (1973) and Gulati (1978). The next group of academics improved measurement techniques by instrumenting for aid. This step is extremely useful in addressing issues of causality. Main proponents of this group include Mosley (1980), Gupta and Islam (1983), and Boone (1994 and 1996).

The explosion, however, occurred in the fourth – and most recent – body of literature. In addition to the common question that guided past research – of whether or not aid led to an economy’s growth – one of the paramount themes has become whether or not aid works conditional on other factors. The most well-known duo to address this is Burnside and Dollar in their seminal paper “Aid, Policies and Growth” (2000). They conclude that aid has a positive effect on growth in countries with good policy environments. Other include, but are not limited to, inflation, budget balance, and “openness” (Kudlyak 2002); export price shocks (Collier and Dehn 2001); climatic shocks and volatility in terms of trade (Guillaumont and Chauvet 2001, Chauvet and Guillaumont (2002); policy and institutional quality (Collier and Dollar 2002); policy and warfare (Collier and Hoeffler 2002); ‘totalitarian’ governments (Islam 2003); “economic freedom” (Ovaska 2003); tropics (Dalgaard, Hansen, and Tarp 2004); and fungability (Pettersson 2004).

After decades of debate, the jury is still out of whether aid has an effect – either positive or negative – on growth. Up until now, however, aid has almost always been in its aggregate form. Some papers have attempted to look at gross or net aid. Another set of authors experiment with Effective Development Assistance, which excludes technical assistance and includes development loans (Burnside and Dollar 2004; Chang, Fernandez-Arias, and Serven 1998). Reddy and Minoiu (2006) break aid down into “developmental” – defined as growth-enhancing – and “geopolitical” – possibly growth depressing – components.

The most recent wave of studies have been asking whether or not there is no clear result about the effectiveness of aid because “aid” is too broad and, in order to determine its impact, must be narrowed down. In their paper “Counting Chickens,” Clemens, Radelet and Bhavnani (from now on referred to as CRB) contribute to this strand by drilling down aid into three specific categories: short impact aid, long-term aid, and humanitarian aid [please see below for detailed definitions]. In the past, most research has examined the impact of aid flows over a short period of time, generally four or five years. Yet aid is used for many different projects, from health and education to infrastructure to peace-building to emergency assistance. As such, some aid is targeted for short-term goals, while others strive to achieve a long-term effect. And still others are channeled immediately, as is the case in a post-natural disaster situation. The effects of aid may not be evident in the short period of four (or five) years. Increasing the span of time to, say, ten years, may only pick up extra noise, thus making it difficult to clearly measure the impact of aid flows on growth. So CRB rightly make the attempt to measure the effects of “short impact” aid over the short period. They find that narrowing the definition of aid significantly improves the relationship between aid and growth. The impact of short impact aid is two to three times larger than net aid. In sum, their results show that, even at a conservatively high discount rate, at the mean a \$1 increase in short-impact aid raises output (and income) by \$1.64 in present value in a typical country. They claim that their results do not depend on level of income or strong institutions, as in the influential paper by Burnside and Dollar (2000). However, they do not make any claims on the other types of aid: humanitarian and long-term aid.

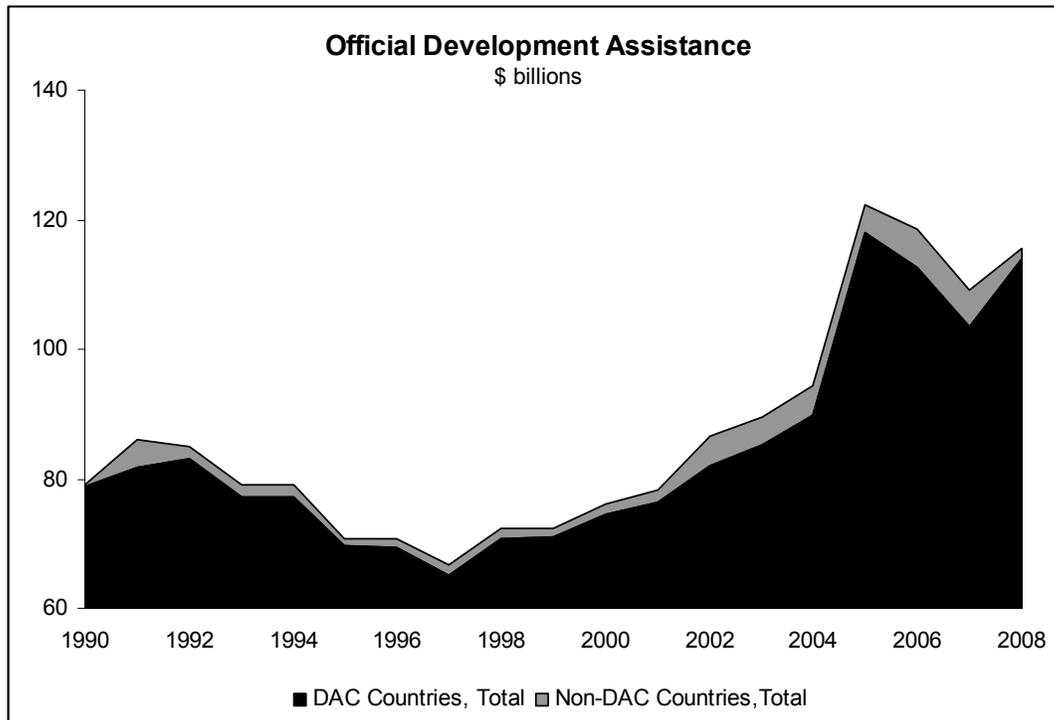
Reddy and Minoiu (2006) slice aid from the donor perspective. They look at the impact of multilateral and bilateral aid on average annual growth rate of per capita GDP. They find that multilateral aid has a strong and positive impact on growth. Katharina Michaelowa and Anke Weber (2006) have followed a similar approach by looking at education aid. In addition, they consider an alternative outcome variable. By instrumenting education aid flows and using a 2SLS, they find a positive effect of development assistance on primary enrollment and completion rates. This result is also conditional on the policy environment; aid flows may

have a negative impact on countries with a bad policy environment. Axel Dreher, Peter Nunnenkamp, and Rainer Thiele (2006) confirm the results, although they do not find any relevance of institutional quality. Prachi Mishra and David Newhouse (2007) perform a similar exercise for health. With a dynamic panel data model with country fixed effects, which is estimated using the Generalized Method of Moments (GMM), they find that health aid has a statistically significant effect on infant mortality. Doubling per capita health aid is associated with a two percent reduction in the infant mortality rate.

### **Motivation and methodology**

CRB use data that was available to them at the time; they cover the period 1973-2001. I not only expand the aid data to cover 1973-2007, I also update data for other key indicators, some that have changed significantly (see ICRG and budget balance). And I test if the major conclusions from CRB – that short impact aid have a positive impact on growth – still hold.

The results from “Counting Chickens” could be significant, especially for multilateral and bilateral donors. If in fact certain types of aid, in this case “short term,” has a greater impact on growth, then donors may be better able to direct their money. Yet how robust are their results? Their data are from 1974, the first year that CRS aid data are available, to 2001. Yet, since 2001, there has been a significant increase in aid flows thanks to Gleneagles G8 and UN Millennium +5 summits, which occurred in 2005. Net aid flows (from both DAC and non-DAC donors) increased from \$78 billion in 2001 to \$116 billion in 2008. Between 2004 and 2005 alone, aid flows grew 1.3 percent, a significant jump. Aid flows grew by approximately 2 percent per year between 1974 and 2001, the years of the original CRB study. They grew over six and a half percent per year between 2002 and 2007. Hence the period after the CRB paper could potentially be key in understanding the impact of aid flows on growth.



In addition, CRB only includes 67 countries in their sample (please see table 10 for a list of countries). This leaves out approximately 70 potential developing countries, albeit some quite small. But it does leave out countries that house 15 percent of the population of the developing world, some significant recipients of aid. For example Iraq and Afghanistan were the two largest recipients of net aid flows in 2007, yet they were not included in the CRB sample.

I do not deviate from the basic CRB specification. Therefore my task in this paper is four-fold: 1) I go to original sources to update the indicators in the original CRB dataset; 2) I extend the data from 2001 – where their data end – to 2007, which is the most recent year available; 3) I include all developing countries with available data; and 4) I test the robustness of the CRB paper with the extended dataset to re-examine if short impact aid leads to growth.

In order to test the robustness of the core results, I follow the paper's basic structure and methodology. I use two key sources of data for the aid flows, both from the OECD: the Credit Reporting System (CRS) database and the Development Assistance Committee (DAC) database. The data are compiled in two primary steps.

Similar to CRB, I estimate short-impact, long-impact, humanitarian aid and administrative costs. They define these three mutually exclusive as follows:

- **Short-impact aid** is an aid disbursement funding an intervention that can plausibly raise GDP per capita within approximately four years to a permanently higher level. CRB define this as “budget support or ‘program’ aid given for any purpose and project aid given for real sector investments for infrastructure or directly to support production in transportation, communications, energy, banking, agriculture and industry.”
- **Long-impact aid** goes towards an intervention that targets permanently raising GDP per capita but would do so in a period greater than four years. CRB categorize this as “technical cooperation given for any purpose and most social sector investments, including education, health, population control, and water.”
- **Humanitarian aid** is aid that is for very short impact consumption smoothing and may not necessarily be used directly to improve long-term GDP growth. Some examples are emergency assistance and food aid.

The DAC database contains information on *disbursements* by sector, but only for the 1990s. So the only database that has longer timeseries data is the CRS, which reports annual aid *commitments* disaggregated into specific categories by donors and by recipients back to the beginning of the 1970s. Each category is broken down into a purpose code, and all flows from donors to recipients have been assigned one. Examples include “statistical capacity building” (purpose code 16362); “primary education” (purpose code 11220); and “emergency food aid” (purpose code (71010)). In CRB, each purpose code had been assigned one of the following categories: short impact, long impact, or humanitarian. Technical assistance, which is a very

small percentage of aid flows, is excluded. I also categorize all data after 2001 to a specific breakdown. This included using pre-existing purpose codes or assigning one of the four categories to new purpose codes. Overall, I classified approximately 800,000 donor-recipient transactions from 1973-2007 as short impact, long impact, humanitarian aid, or administrative costs. Please see table 9 for a breakdown.

I then derive “weights” for each country for each year based on this breakdown, which is in essence the fraction of each of these categories of commitments for each country. These ratios are applied to total disbursements, which is taken from the OECD’s DAC database. Therefore the fraction of each of these three categories is equal for both commitments and disbursements. For example, 45 percent of aid flows to India was short term, while 54 percent was long term (the remaining one percent is humanitarian). I then multiply these percentages by total net disbursements to India, which were taken from the DAC database. The indicators are then divided by GDP. Therefore the following assumption is made:

$$d_{i,t}^s = d_{i,t}^{agg} \left( \frac{d_{i,t}^s}{d_{i,t}^{agg}} \right) \approx d_{i,t}^{agg} \left( \frac{c_{i,t}^s}{c_{i,t}^s + c_{i,t}^l + c_{i,t}^h} \right)$$

Where  $d^s$  is short impact gross disbursements,  $d^{agg}$  is aggregate aid disbursements, and  $c$  is (short term, long term, and humanitarian aid) commitments. CRB perform an exercise to find out how well commitments approximate disbursements, and they find a strong correlation between the two. Therefore, we can assume that these weights, which are based on commitments, can serve as a useful proxy for disbursements.

### *Endogeneity*

Endogeneity is a problem that arises when one considers the impact of aid – including short-term – on growth. Aid may very well have an impact on a country’s growth rate. One may

also imagine, however, that aid received by a country may be as a result of present or future growth rates. A country may receive less aid in a given year if it does not “perform” well, as demonstrated by a low growth rate. At the same time, a country may also receive greater aid with a lower growth rate, as may be the case in an emergency situation.

Given the challenges of endogeneity in aid/growth regressions, I followed the technique that has been applied extensively in the literature. Similar to CRB, I instrument for aid, aid squared, and repayments using donor interest and geopolitical indicators and apply a two-stage least squares regression. Instrumental variables include a dummy for Egypt, arms imports, policy lagged, a lag of policy squared, population interacted with policy,  $\ln(\text{GDP})$  interacted with policy,  $\ln(\text{GDP})$  squared interacted with policy, a lag of each of the aid variables, a lag of the square of each of the aid variables (ie: short-term or long-term), a lag of each of the aid variables interacted with policy, and a lag of the square of the aid variables interacted with policy. Unless specified in the table, the instruments are consistent throughout the regressions. The dependent variable is GDP per capita growth.

It is important to state that I do not question the appropriateness of the instrument. This could lead us to a black hole. But one may ask if, for example, arms imports or Egypt (as opposed to a dummy for Afghanistan) still makes sense. Or whether they are statistically sound. In his 2008 paper “Through the Looking Glass, and What OLS Found There: On Growth, Foreign Aid, and Reverse Causality,” David Roodman looks more specifically at the methodological problems of these indicators and cross-country regressions that plague the growth literature. Specifically he discusses autocorrelation; “instrument proliferation,” defined as an excess number of instruments; and multicollinearity. For the purpose of this exercise, I accept the instruments as a given.

## **Data**

*Time periods.* I used four-year arithmetic averages. Similar to CRB, the time periods include: 1974-77, 1978-81, 1982-85, 1986-89, 1990-93, 1994-97, 1998-2001. I then added two new

periods: 2002-2005 and 2006-2007. Table one shows the summary statistics for the two sets of data for the specified time periods. The first part summarizes the CRB data, and the second includes the new data.

In addition to extending the CRB dataset, there have also been several key changes to the data. In their original dataset, CRB use the indicator *budget balance*, which was taken from the World Development Indicators. The World Bank used to get this indicator from the International Monetary Fund's Government Finance Statistics (GFS). Recently, however, the IMF shifted from the 1986 to the 2001 GFS manual to harmonize with the 1993 System of National Accounts (SNA). Because the institution has not yet been able to reconcile the series from the two systems, government data from this source are now only available from 1990. Therefore, as an alternative, I used *overall balance* from the IMF's International Finance Statistics (IFS), which takes the information from the Balance of Payments (BoP). This allows me to have a longer time series. Therefore the new data are no longer consistent with the previous dataset. It is defined as the difference between all credits and all debits with the exemption of reserve assets and other assets held by the monetary authorities. A deficit is usually financed by a decline in net foreign assets that illustrates the extent to which the central bank has been financing payments imbalances or regulating imbalances indirectly by intervening in the exchange rate market.

There also appear to be major changes in the ICRG data. The CRB data come from Roodman (2003) and somehow go back to 1950. The most recent iteration of the data, which I take from the PRS Group, only covers the period from 1985 to 2008. To the best of my knowledge there has not been an exercise to extend these data in a systematic manner back to 1950. And, given the content of this composite indicator – which takes a simple average of corruption, bureaucratic quality, and rule of law – it is difficult to understand how more recent data can be applied to previous years. One cannot assume that what is valid in 1985 can apply to the 1970s; governments change, and therefore policies, with great ease.

The *openness* indicator is a 0/1 dummy variable that comes from Sachs and Warner (1995) but includes an update from Wacziarg and Welch (2003). Data are only available, however, through 1999. I also attempt to extend these data through 2007 by using the most recent value available.

Lagged arms imports as a percent of GDP comes from “Anarchy of Numbers” (Roodman 2007). The original source is *World Military Expenditures and Arms Transfers* from the United States Department of State. Complete WMEAT data are only available through 2000. WMEAT 2005, which includes data past 1999, are not yet made public. In the original dataset, made available on the State Department’s website, many countries have the value of zero. In my updated dataset, I treat the value of zero not as a true value of zero but instead as not available. I did this because I question whether a country like Djibouti really had no arms imports in the 1990s and instead conclude that these data are not available.

Other indicators for the core regression include:

- *Short-impact, long-impact, and humanitarian aid*. In percent GDP. Numerator is commitment data, which comes from the CRS database, OECD. The denominator GDP is from the World Development Indicators.
- *Net ODA*. In percent GDP. Table 2a, DAC database, OECD. The denominator GDP is from the World Development Indicators.
- *Gross ODA*. DAC database, OECD. The denominator GDP is from the World Development Indicators.
- *GDP*. Both current and constant figures were taken from the World Development Indicators.
- *Repayments on aid*. In percent GDP. Calculated by taking total gross ODA (from the DAC database) minus total net ODA (from the DAC database). The denominator GDP is from the World Development Indicators.
- *East Asia* (based on the World Bank definition)
- *Tropics*. 0/1 dummy indicator of whether a majority of a country is within a tropical region. Taken from William Easterly’s GDN database.

- *Inflation*. This is calculated as the logarithm of 1 plus the CPI. Data are from the World Development Indicators.
- *Policy index*. The methodology to calculate this indicator is based on Burnside and Dollar (2000). They constructed an index that includes inflation, budget balance (now overall balance) and openness. The regression coefficients from a linear regression determine the relative importance of the policies.
- *Population*. World Development Indicators.
- *Civil wars*. From “Anarchy of Numbers” (Roodman 2007), which draws on data from the Correlates of War 2 (COW2) database. A value of 1 shows that any part of an “intrastate war” occurred during the specified period. Modifications were made based on information supplemented from a variety of other sources.
- *Eurfrac*. The fraction of a country's population speaking one of the five primary Western European languages – English, French, German, Portuguese, and Spanish – as a mother tongue (Burnside and Dollar, 2004; updated with data from <http://www.ethnologue.com/>)
- *Engfrac*. The fraction speaking English as a mother tongue (Burnside and Dollar, 2004; updated with data from <http://www.ethnologue.com/>).
- *Latitude*. The distance from the equator to the capital city. (Burnside and Dollar, 2004)

## Results

The first step is to re-create the original results, which show that short impact aid has a positive effect on per capita growth rates. Table 2 shows a comparison between the original core regression in CRB (regression 1), taken from their paper, my re-creation of the core regression using CRB data, and my estimates using updated data. How well do their findings hold up? Regressions 2 – which only include countries in the original CRB sample – and 3 – which includes all countries with available data – are my re-creation of the core regression from the CRB paper. Just as in the original regression, short impact aid is significant and positive. The R-squared for the three regressions are approximately the same, as are the p-

values of the Hansen J-statistic and the Shea partials for the three instrumented variables. All in all, the re-created results come close to mirroring the original estimates. Therefore we can see that short impact aid has a positive effect on growth.

Regression 4 implements the CRB specification, including the same time period and the same countries, but utilizes the new data. But the key independent indicator – short impact aid – is no longer significant, not even at the 10 percent level. Hence the CRB results do not seem to hold when I use new data. This is also the case when I estimate using fixed effects (regression 5). Regression 6 utilizes all countries with available data with all else constant. The coefficient on the aid variable of -0.414 comes back significant. But this time it is negative, therefore implying that short impact aid has a negative relationship with growth. Some of the variables in these regressions are significant, including ICRG, overall balance, openness, lagged civil war, initial GDP per capita, budget balance, and tropics. We must be cautious in our interpretation, however. In this regression, instruments do not appear to be appropriate, even though the coefficient on the aid variable is significant. The p-value on the Hansen J statistic is 0.004, well below the threshold of 0.10. The null hypothesis can safely be rejected. This implies that the excluded instruments are not necessarily uncorrelated with the error term and correctly excluded from the estimated equations. Again, results do not hold with the new data, either with the CRB sample or with all available countries. Therefore we can conclude that results for the main variable of interest – short impact aid – in regressions 4 and 6 lead us to very different conclusions than the original CRB paper.

#### *Additional robustness checks*

In the next set of tables, I make minor changes to the sets of regressions to see if I can draw the same conclusion as CRB about the significance of short impact aid. In table 5, test the dependent variable to see if the log of the *level* of GDP per capita as opposed to the *growth* rate of GDP per capita makes a difference with the updated data. Regression 1 includes only CRB countries, while regression 2 includes all countries with available data. In the latter

regression, the coefficient on short-term aid is significant at the 5 percent level. The coefficient, however, is negative (-0.00602). This would again lead us to draw the conclusion that short impact aid has a negative effect on growth, not positive. Short impact aid squared is also significant (and positive), as is the East Asia dummy, life expectancy, ICRG, openness, lagged civil war, initial GDP per capita. Civil wars and tropics are significant but negative. But, similar to regression 6 in table 2, the p-value on the Hansen J-statistic is low, therefore implying a weak set of instruments for this regression. Again, when put through another test of introducing a new dependent variable, the CRB results on short impact aid are not robust.

As stated above, arms imports data from the Department of State are only available through 1999. WMEAT 2005 has not yet been released in its entirety. This clearly ties our hands on fully exploiting the aid data through 2007. In order to account for this limitation, I leave arms imports out as an instrumental variable. Table 6 shows the results. Regressions 1 and 2 are the original CRB specification with CRB data (both the CRB sample and all countries). The only change is the exclusion of arms imports. Short impact aid continues to have positive and significant coefficients, albeit at the 10 percent level. The instruments continue to be strong, as is clear from the p-value of the Hansen J statistic. When I conduct the same exercise with the new data, the results for short impact aid change. With the CRB sample, the key indicator is no longer significant. And, even though it is significant for all countries, the coefficient is negative and the instruments used are weak. Therefore, the robustness test fails again.

In addition to the arms data limitation – which is only available through 1999 – there are also constraints with the openness indicator. The original data come from the 1995 Sachs and Warner paper entitled “Economic Reform and the Process of Global Integration” and were updated and newly estimated by Wacziarg and Welch (2002). Yet the data are only through 1999, and no similar exercise has been conducted to further extend the data. If one looks at the original data, the zero/one indicator remains quite constant over time. So, for the purpose of this paper, I extend the data from 1999 to 2007 by using the value in the most recent year. I refer to this indicator as “extended openness.” Regressions 1 and 2 in table 7 use the same instruments as the original specification. Regression 1, which only includes countries in the

CRB sample, does not have a significant coefficient on the short-term independent variable. Regression 2, which includes all available countries in the sample, does have a significant coefficient for short impact aid; yet it is negative. And finally regressions 3 and 4 include “extended openness” and exclude arms as an instrument, therefore allowing us to exploit as much of the data as possible. As a result, regression 4 – which includes all countries with available data – captures 320 observations. A similar pattern emerges. The regression that utilizes all countries in the sample has a negative and significant coefficient, and the instruments are weak.

I also tested the instrument set to determine if, by changing the instruments, I was able to get CRB results. I experimented with mixing and matching the current instruments as well as adding new ones, such as the share of the population that speaks English, the share that speaks a continental European language, and the distance from the equator (taken from Burnside and Dollar 2004). Again CRB results do not hold.

## **Conclusion**

This paper tests the strength of the CRB paper, which finds a positive, causal relationship between short impact aid and growth. Their paper – which adds novelty by narrowing down aid into short impact, long impact, and humanitarian aid – contributes to the very well developed literature on aid, which has yet to conclude whether or not aid really does make a difference on a country’s growth and, if so, under what conditions. Their paper uses data through 2001, yet there have been considerable increases in aid flows since then thanks to recent wars and international financial institution initiatives.

Their core specification is not robust when tested with new and updated data. And, when the short impact aid indicator is significant, it is negative. Where does this leave us? From this, we cannot conclude that aid is not effective. On the contrary, CRB have stimulated the conversation about *what kind of aid is effective*. Is it aid for education or health, as several

papers have concluded? Are there other ways that countries can better target their aid to be more effective? Additional research will help us answer some of these questions.

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**Table 1: Summary data****CRB data (1970-2001)**

| Variable               | Obs  | Mean   | Std. Dev. | Min        | Max    |
|------------------------|------|--------|-----------|------------|--------|
| Short impact aid       | 1230 | 4.12   | 7.08      | 0          | 114.18 |
| Repayments             | 1132 | -1.23  | 1.88      | -12.27     | 2.81   |
| Life expectancy        | 1701 | 4.13   | 0.19      | 3.3        | 4.4    |
| ICRG                   | 1035 | 4.51   | 1.8       | 0          | 10     |
| Inflation              | 1302 | 0.16   | 0.32      | -0.11      | 3.88   |
| Balance                | 1116 | -63.31 | 1,670.49  | -54,395.59 | 0.48   |
| Openness               | 968  | 0.45   | 0.49      | 0          | 1      |
| Civil wars             | 2394 | 0.04   | 0.2       | 0          | 1      |
| Initial GDP per capita | 1331 | 7,041  | 7,176     | 211        | 45,672 |
| GDP per capita         | 1362 | 7,166  | 7,265     | 213        | 44,076 |
| GDP per capita growth  | 1444 | 1.59   | 4.57      | -42.27     | 48.51  |
| Tropics                | 1899 | 0.53   | 0.5       | 0          | 1      |
| Policy                 | 740  | -0.12  | 0.85      | -6.43      | 1.45   |

**New data (1970-2007)**

| Variable               | Obs  | Mean  | Std. Dev. | Min    | Max    |
|------------------------|------|-------|-----------|--------|--------|
| Short impact aid       | 1254 | 4.25  | 6.53      | 0      | 114.14 |
| Repayments             | 1138 | -1.29 | 1.82      | -10.66 | 3.65   |
| Life expectancy        | 2502 | 4.1   | 0.2       | 3.31   | 4.41   |
| ICRG                   | 916  | 2.94  | 1.18      | 0.33   | 6      |
| Inflation              | 1664 | 0.13  | 0.29      | -0.06  | 3.99   |
| Balance                | 1321 | -0.45 | 6.22      | -69.04 | 37.44  |
| Openness               | 1960 | 0.3   | 0.45      | 0      | 1      |
| Openness extended      | 2230 | 0.32  | 0.47      | 0      | 1      |
| Civil wars             | 2875 | 0.04  | 0.19      | 0      | 1      |
| Initial GDP per capita | 1887 | 5,463 | 8,314     | 61.07  | 59,733 |
| GDP per capita         | 1967 | 5,567 | 8,485     | 72.51  | 62,563 |
| GDP per capita growth  | 1943 | 2.09  | 4.57      | -42.88 | 47.97  |
| Tropics                | 2875 | 0.49  | 0.49      | 0      | 1      |
| Policy                 | 948  | 0.33  | 0.97      | -4.08  | 4.36   |

**Table 2: Baseline results**

|                                     | (1)                   | (2)                  | (3)                   | (4)                  | (5)                  | (6)                   | (7)                  |
|-------------------------------------|-----------------------|----------------------|-----------------------|----------------------|----------------------|-----------------------|----------------------|
|                                     | Original paper        | CRB data             |                       | New data             |                      |                       |                      |
|                                     |                       | 2SLS                 | 2SLS                  | 2SLS                 | FE                   | 2SLS                  | FE                   |
|                                     |                       | CRB sample           | All countries         | CRB sample           |                      | All countries         |                      |
| Short-term aid                      | 0.96***<br>(0.328)    | 0.672*<br>(0.388)    | 0.778*<br>(0.408)     | -0.0121<br>(0.281)   | 1.065<br>(0.653)     | -0.414**<br>(0.192)   | 0.274<br>(0.438)     |
| Short-term aid sq.                  | -0.0588**<br>(0.0264) | -0.0500*<br>(0.0280) | -0.0517**<br>(0.0255) | -0.00573<br>(0.0196) | -0.0814*<br>(0.0471) | 0.0239**<br>(0.00978) | -0.00544<br>(0.0141) |
| repayments                          | 0.384**<br>(0.188)    | -0.361<br>(0.314)    | -0.563*<br>(0.333)    | -0.247<br>(0.242)    | 1.138<br>(0.852)     | 0.120<br>(0.313)      | 0.521<br>(0.923)     |
| East Asia                           | 2.39***<br>(0.648)    | 2.594***<br>(0.460)  | 2.502***<br>(0.459)   | 1.176*<br>(0.661)    |                      | 1.261*<br>(0.658)     |                      |
| Log life expectancy                 | 3.49*<br>(1.85)       | 1.336<br>(2.339)     | 2.548<br>(2.173)      | 1.014<br>(2.402)     | -11.20**<br>(5.523)  | 4.172*<br>(2.276)     | -6.452<br>(4.769)    |
| ICRG                                | 0.333***<br>(0.114)   | 0.302**<br>(0.117)   | 0.278**<br>(0.113)    | 1.033***<br>(0.230)  | 0.826*<br>(0.431)    | 0.646***<br>(0.226)   | 0.923***<br>(0.354)  |
| Inflation                           | -1.6***<br>(0.558)    | -1.158***<br>(0.393) | -1.089***<br>(0.408)  | -0.749*<br>(0.390)   | -0.153<br>(0.688)    | -0.624<br>(0.409)     | -0.631<br>(0.633)    |
| Openness                            | 1.41***<br>(0.456)    | 1.103**<br>(0.453)   | 1.225***<br>(0.441)   | 1.543***<br>(0.426)  | 1.670**<br>(0.739)   | 1.229***<br>(0.420)   | 1.532**<br>(0.740)   |
| Civil war                           | -2.19**<br>(0.891)    | -2.175**<br>(0.905)  | -2.098**<br>(0.893)   | -0.969<br>(0.620)    | -1.382<br>(0.844)    | -1.556***<br>(0.558)  | -2.031***<br>(0.767) |
| Laged civil war                     | 1.86**<br>(0.73)      | 0.830<br>(0.761)     | 0.730<br>(0.757)      | 1.171**<br>(0.550)   | 0.611<br>(0.771)     | 1.275**<br>(0.563)    | 0.938<br>(0.742)     |
| Log initial GDP pc                  | -0.0593<br>(0.493)    | -0.215<br>(0.693)    | -0.549<br>(0.650)     | -0.785**<br>(0.316)  | -1.716<br>(1.560)    | -0.876***<br>(0.299)  | -3.978***<br>(1.362) |
| Tropics                             | -2.13***<br>(0.398)   | -1.920***<br>(0.422) | -1.931***<br>(0.403)  | -1.051**<br>(0.461)  |                      | -1.062***<br>(0.394)  |                      |
| Budget balance                      | 8.28<br>(5.47)        | 4.183<br>(4.673)     | 5.665<br>(4.577)      | 0.153***<br>(0.0424) | 0.237***<br>(0.0669) | 0.161***<br>(0.0377)  | 0.158***<br>(0.0513) |
| Observations                        | 368                   | 357                  | 383                   | 224                  | 220                  | 292                   | 286                  |
| R-squared                           | 0.388                 | 0.264                | 0.208                 | 0.380                | 0.253                | 0.344                 | 0.258                |
| Hansen/Sargan(p-value)              | 0.773                 | 0.9642               | 0.8463                | 0.0376               | 0.1304               | 0.0039                | 0.3205               |
| Shea partial R <sup>2</sup> aid     | 0.314                 | 0.2644               | 0.1275                | 0.462                |                      | 0.4044                |                      |
| Shea partial R <sup>2</sup> aid sq. | 0.257                 | 0.2198               | 0.0862                | 0.3979               |                      | 0.2918                |                      |
| Shea partial R <sup>2</sup> repayr  | 0.537                 | 0.5249               | 0.4068                | 0.5333               |                      | 0.589                 |                      |
| Number of groups                    |                       |                      |                       |                      | 51                   |                       | 67                   |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3: First stage results for baseline regression**

|               | (1)                 | (2)                |                         | (3)                  | (4)                  | (5)                  |  | (6)        |
|---------------|---------------------|--------------------|-------------------------|----------------------|----------------------|----------------------|--|------------|
|               | Aid                 | CRB sample         |                         | Repayments           | Aid                  | New data             |  | Repayments |
|               |                     | Aid2               |                         |                      |                      | Aid2                 |  |            |
| eap           | -0.503<br>(0.361)   | -11.14*<br>(6.503) | 0.103<br>(0.147)        | -0.251<br>(0.326)    | 0.879<br>(7.163)     | 0.090<br>(0.127)     |  |            |
| llife         | -3.361*<br>(1.807)  | -52.82<br>(37.16)  | 0.126<br>(0.542)        | -3.644<br>(1.816)**  | -38.302<br>(41.937)  | 0.381<br>(0.579)     |  |            |
| icrg          | -0.196<br>(0.161)   | -1.725<br>(2.614)  | -0.186***<br>(0.0619)   | 0.193<br>(0.171)     | 4.668<br>(3.639)     | -0.131<br>(0.066)**  |  |            |
| infl          | -4.837<br>(5.033)   | 9.124<br>(85.37)   | 0.322<br>(1.724)        | -1.79<br>(7.432)     | 21.369<br>(264.914)  | -2.017<br>(1.419)    |  |            |
| openamy       | 5.649<br>(6.047)    | -1.919<br>(101.3)  | -0.513<br>(2.029)       | 2.713<br>(8.978)     | 2.648<br>(321.908)   | 2.416<br>(1.66)      |  |            |
| civil         | -0.191<br>(0.611)   | 2.946<br>(12.43)   | 0.120<br>(0.195)        | -0.29<br>(0.578)     | 1.65<br>(12.18)      | 0.13<br>(0.233)      |  |            |
| L.civil       | -0.218<br>(0.519)   | -10.52<br>(9.644)  | -0.173<br>(0.217)       | 0.395<br>(0.537)     | 8.104<br>(13.21)     | -0.254<br>(0.231)    |  |            |
| lpcgdpinit    | -0.142<br>(0.217)   | -2.012<br>(3.779)  | -0.145*<br>(0.0774)     | -0.193<br>(0.21)     | -2.485<br>(5.068)    | -0.251<br>(0.086)*** |  |            |
| tropics       | -0.0344<br>(0.243)  | -4.913<br>(3.900)  | -0.0642<br>(0.114)      | 0.052<br>(0.241)     | -6.874<br>(5.873)    | -0.079<br>(0.107)    |  |            |
| balance       | 0.624<br>(0.602)    | 0.625<br>(10.13)   | -0.0797<br>(0.207)      | 0.257<br>(0.917)     | -1.711<br>(32.983)   | 0.21<br>(0.169)      |  |            |
| egypt         | -0.723<br>(2.381)   | -10.75<br>(34.10)  | -0.146<br>(0.601)       | -0.345<br>(2.408)    | -13.194<br>(35.911)  | -0.035<br>(0.665)    |  |            |
| arms          | 0.179<br>(1.717)    | -5.770<br>(34.02)  | -0.769<br>(0.764)       | -1.141<br>(1.765)    | -13.543<br>(33.16)   | -0.837<br>(0.481)*   |  |            |
| L.policy      | 0.347<br>(0.466)    | 16.42*<br>(8.837)  | 0.205<br>(0.171)        | -0.221<br>(0.458)    | 10.536<br>(12.71)    | -0.064<br>(0.127)    |  |            |
| L.policy2     | 0.175*<br>(0.0943)  | 3.108**<br>(1.550) | 0.0427<br>(0.0293)      | 0.026<br>(0.139)     | 0.418<br>(3.896)     | 0.032<br>(0.028)     |  |            |
| lpoppolicy    | 0.0483<br>(0.0781)  | 1.161<br>(1.324)   | -0.0106<br>(0.0381)     | -0.127<br>(0.129)    | -6.272<br>(4.342)    | -0.08<br>(0.041)*    |  |            |
| lgdppolicy    | -1.473<br>(1.267)   | -3.385<br>(20.53)  | 0.174<br>(0.482)        | 0.23<br>(1.853)      | 36.581<br>(63.28)    | -0.086<br>(0.4)      |  |            |
| lgdp2policy   | 0.0901<br>(0.0805)  | 0.136<br>(1.319)   | -0.0115<br>(0.0326)     | -0.029<br>(0.116)    | -2.78<br>(3.907)     | 0.001<br>(0.027)     |  |            |
| L.aid         | 0.983***<br>(0.192) | 6.508*<br>(3.704)  | 0.247***<br>(0.0487)    | 1.026<br>(0.115)***  | 13.035<br>(3.495)*** | 0.075<br>(0.033)**   |  |            |
| L.aid2        | -0.0158<br>(0.0134) | 0.285<br>(0.273)   | -0.0171***<br>(0.00308) | -0.023<br>(0.004)*** | -0.201<br>(0.146)    | -0.004<br>(0.001)*** |  |            |
| L.aidpolicy   | -0.363*<br>(0.214)  | -8.196*<br>(4.400) | -0.109**<br>(0.0516)    | -0.239<br>(0.177)    | -9.48<br>(6.094)     | -0.036<br>(0.028)    |  |            |
| L.aid2policy  | 0.0145<br>(0.0134)  | 0.257<br>(0.267)   | 0.00826***<br>(0.00290) | 0.006<br>(0.006)     | 0.252<br>(0.204)     | 0.001<br>(0.001)     |  |            |
| L.repayments  | -0.0699<br>(0.141)  | -3.566<br>(2.494)  | 0.694***<br>(0.0742)    | -0.175<br>(0.104)*   | -7.098<br>(3.185)**  | 0.711<br>(0.053)***  |  |            |
| L.repaypolicy | 0.0406<br>(0.129)   | 3.270<br>(2.329)   | 0.0511<br>(0.0631)      | -0.14<br>(0.121)     | -0.058<br>(3.399)    | 0.004<br>(0.047)     |  |            |
| Observations  | 224                 | 224                | 224                     | 292                  | 292                  | 292                  |  |            |
| R-squared     | 0.782               | 0.651              | 0.813                   | 0.7723               | 0.6286               | 0.8773               |  |            |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4: OLS with new data**

|                            | (1)<br>CRB sample    | (2)<br>All countries   |
|----------------------------|----------------------|------------------------|
| Short-term aid             | -0.247<br>(0.171)    | -0.145<br>(0.0952)     |
| Short-term aid squared     | 0.00734<br>(0.0108)  | 0.00686**<br>(0.00329) |
| Repayments                 | 0.0278<br>(0.191)    | 0.0517<br>(0.132)      |
| East Asia                  | 0.939*<br>(0.556)    | 1.307**<br>(0.575)     |
| Log life expectancy        | 0.544<br>(2.069)     | 4.139**<br>(1.780)     |
| ICRG                       | 1.099***<br>(0.246)  | 0.827***<br>(0.219)    |
| Inflation                  | -0.802<br>(0.511)    | -0.163<br>(0.469)      |
| Budget balance             | 0.136***<br>(0.0404) | 0.121***<br>(0.0330)   |
| Openness                   | 1.540***<br>(0.429)  | 1.522***<br>(0.364)    |
| Civil war                  | -1.003<br>(0.731)    | -1.628**<br>(0.663)    |
| Lagged civil war           | 1.328*<br>(0.694)    | 1.844***<br>(0.646)    |
| Log initial GDP per capita | -0.710**<br>(0.303)  | -0.935***<br>(0.235)   |
| Tropics                    | -0.989**<br>(0.413)  | -1.452***<br>(0.377)   |
| Observations               | 237                  | 341                    |
| R-squared                  | 0.385                | 0.353                  |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5: Robustness check, 2SLS, dependent variable log of GDP per capita**

|  | (1)<br>CRB sample        | (2)<br>All countries     |
|--|--------------------------|--------------------------|
| Short-term aid                         | -0.00230<br>(0.00470)    | -0.00602*<br>(0.00317)   |
| Short-term aid squared                 | 0.000116<br>(0.000319)   | 0.000336**<br>(0.000165) |
| Repayments                             | -0.00307<br>(0.00418)    | 0.00216<br>(0.00485)     |
| East Asia                              | 0.0276***<br>(0.0106)    | 0.0311***<br>(0.0104)    |
| Log life expectancy                    | 0.0417<br>(0.0383)       | 0.0682*<br>(0.0378)      |
| ICRG                                   | 0.0146***<br>(0.00382)   | 0.00956**<br>(0.00393)   |
| Inflation                              | -0.00436<br>(0.00699)    | -0.00153<br>(0.00723)    |
| Openness                               | 0.0253***<br>(0.00817)   | 0.0202***<br>(0.00767)   |
| Civil wars                             | -0.0308***<br>(0.0113)   | -0.0293***<br>(0.0105)   |
| Lagged civil war                       | 0.0262**<br>(0.0102)     | 0.0246**<br>(0.0103)     |
| Log initial GDP pc                     | 0.986***<br>(0.00585)    | 0.986***<br>(0.00524)    |
| Tropics                                | -0.0128*<br>(0.00753)    | -0.0174***<br>(0.00667)  |
| Budget balance                         | 0.00235***<br>(0.000744) | 0.00237***<br>(0.000700) |
| Observations                           | 224                      | 292                      |
| R-squared                              | 0.999                    | 0.999                    |
| Hansen (p-value)                       | 0.0033                   | 0.0018                   |
| Shea partial R <sup>2</sup> aid        | 0.462                    | 0.4044                   |
| Shea partial R <sup>2</sup> aid sq.    | 0.3979                   | 0.2918                   |
| Shea partial R <sup>2</sup> repayments | 0.5333                   | 0.589                    |

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 6: Robustness check, excluding arms as an instrument**

|  | (1)                | (2)                   | (3)                | (4)                   |
|--|--------------------|-----------------------|--------------------|-----------------------|
|  | CRB data           |                       | New data           |                       |
|  | 2SLS<br>CRB sample | 2SLS<br>all countries | 2SLS<br>CRB sample | 2SLS<br>all countries |
| Short-term aid                         | 0.658*             | 0.804*                | 0.0416             | -0.338**              |
|  | (0.400)            | (0.435)               | (0.275)            | (0.171)               |
| Short-term aid squared                 | -0.0473*           | -0.0523*              | -0.00954           | 0.0156**              |
|  | (0.0287)           | (0.0272)              | (0.0194)           | (0.00705)             |
| Repayments                             | -0.315             | -0.532                | -0.341             | 0.138                 |
|  | (0.312)            | (0.338)               | (0.239)            | (0.290)               |
| East Asia                              | 2.547***           | 2.456***              | 1.012              | 1.246*                |
|  | (0.466)            | (0.464)               | (0.666)            | (0.659)               |
| Log life expectancy                    | 1.526              | 2.730                 | 0.527              | 2.766                 |
|  | (2.317)            | (2.154)               | (2.398)            | (2.122)               |
| ICRG                                   | 0.328***           | 0.312***              | 1.083***           | 0.838***              |
|  | (0.118)            | (0.113)               | (0.229)            | (0.211)               |
| Inflation                              | -1.611***          | -1.527***             | -0.814**           | -0.00754              |
|  | (0.489)            | (0.491)               | (0.386)            | (0.563)               |
| Openness                               | 0.989**            | 1.155***              | 1.810***           | 1.367***              |
|  | (0.453)            | (0.441)               | (0.413)            | (0.401)               |
| Civil wars                             | -2.042**           | -1.943**              | -0.845             | -1.620***             |
|  | (0.894)            | (0.887)               | (0.620)            | (0.552)               |
| Lagged civil war                       | 0.986              | 0.857                 | 1.141**            | 1.803***              |
|  | (0.759)            | (0.756)               | (0.544)            | (0.533)               |
| Log initial GDP pc                     | -0.0710            | -0.415                | -0.794**           | -0.822***             |
|  | (0.676)            | (0.626)               | (0.313)            | (0.269)               |
| Tropics                                | -1.924***          | -1.951***             | -1.125**           | -1.302***             |
|  | (0.421)            | (0.407)               | (0.459)            | (0.389)               |
| Budget balance                         | 4.466              | 5.765                 | 0.135***           | 0.152***              |
|  | (4.602)            | (4.574)               | (0.0422)           | (0.0349)              |
| Observations                           | 363                | 391                   | 233                | 320                   |
| R-squared                              | 0.292              | 0.232                 | 0.374              | 0.358                 |
| Hansen (p-value)                       | 0.8612             | 0.6279                | 0.0589             | 0.0041                |
| Shea partial R <sup>2</sup> aid        | 0.2426             | 0.1172                | 0.4508             | 0.3487                |
| Shea partial R <sup>2</sup> aid sq.    | 0.2026             | 0.0799                | 0.395              | 0.2211                |
| Shea partial R <sup>2</sup> repayments | 0.5147             | 0.3934                | 0.5228             | 0.5656                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 7: Robustness check, "extended openness"**

|  | (1)                         | (2)                  | (3)                             | (4)                   |
|--|-----------------------------|----------------------|---------------------------------|-----------------------|
|  | Arms included as instrument |                      | Arms not included as instrument |                       |
|  | CRB sample                  | All countries        | CRB sample                      | All countries         |
| Short-term aid                         | -0.151<br>(0.281)           | -0.456**<br>(0.193)  | -0.0985<br>(0.276)              | -0.403**<br>(0.172)   |
| Short-term aid squared                 | 0.00202<br>(0.0196)         | 0.0250**<br>(0.0101) | -0.00172<br>(0.0194)            | 0.0182**<br>(0.00747) |
| repayments                             | -0.175<br>(0.243)           | 0.132<br>(0.317)     | -0.276<br>(0.239)               | 0.151<br>(0.294)      |
| East Asia                              | 1.155*<br>(0.658)           | 1.271*<br>(0.654)    | 0.984<br>(0.662)                | 1.229*<br>(0.656)     |
| Log life expectancy                    | 0.763<br>(2.437)            | 3.888*<br>(2.284)    | 0.208<br>(2.419)                | 2.516<br>(2.149)      |
| ICRG                                   | 1.068***<br>(0.229)         | 0.684***<br>(0.226)  | 1.130***<br>(0.225)             | 0.876***<br>(0.212)   |
| Inflation                              | -0.868**<br>(0.390)         | -0.694*<br>(0.411)   | -0.943**<br>(0.389)             | -0.0702<br>(0.568)    |
| Openness                               | 1.273***<br>(0.448)         | 0.962**<br>(0.419)   | 1.568***<br>(0.434)             | 1.129***<br>(0.407)   |
| Civil wars                             | -0.905<br>(0.623)           | -1.532***<br>(0.570) | -0.748<br>(0.616)               | -1.559***<br>(0.556)  |
| Lagged civil war                       | 1.110**<br>(0.550)          | 1.219**<br>(0.573)   | 1.044*<br>(0.537)               | 1.694***<br>(0.537)   |
| Log initial GDP pc                     | -0.780**<br>(0.314)         | -0.860***<br>(0.297) | -0.802***<br>(0.309)            | -0.840***<br>(0.269)  |
| Tropics                                | -0.976**<br>(0.448)         | -1.020***<br>(0.389) | -1.054**<br>(0.446)             | -1.253***<br>(0.381)  |
| Budget balance                         | 0.164***<br>(0.0431)        | 0.168***<br>(0.0380) | 0.145***<br>(0.0429)            | 0.164***<br>(0.0354)  |
| Observations                           | 224                         | 292                  | 233                             | 320                   |
| R-squared                              | 0.378                       | 0.337                | 0.371                           | 0.344                 |
| Hansen (p-value)                       | 0.1393                      | 0.0038               | 0.1505                          | 0.0024                |
| Shea partial R <sup>2</sup> aid        | 0.4524                      | 0.3057               | 0.444                           | 0.3568                |
| Shea partial R <sup>2</sup> aid sq.    | 0.4899                      | 0.2921               | 0.3875                          | 0.2252                |
| Shea partial R <sup>2</sup> repayments | 0.5307                      | 0.5908               | 0.523                           | 0.5671                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 8: Robustness check, 2SLS with FDI, new data**

|  | (1)<br>CRB sample    | (2)<br>All countries  |
|--|----------------------|-----------------------|
| Short-term aid                         | 0.166<br>(0.308)     | -0.294<br>(0.208)     |
| Short-term aid squared                 | -0.0228<br>(0.0244)  | 0.0200**<br>(0.00965) |
| Repayments                             | 0.0112<br>(0.220)    | 0.204<br>(0.386)      |
| East Asia                              | 0.835<br>(0.644)     | 0.770<br>(0.655)      |
| Log life expectancy                    | -1.410<br>(2.997)    | 4.558*<br>(2.658)     |
| ICRG                                   | 0.930***<br>(0.228)  | 0.446*<br>(0.230)     |
| Inflation                              | -0.720*<br>(0.412)   | -0.702<br>(0.456)     |
| Openness                               | 1.054**<br>(0.424)   | 0.851**<br>(0.428)    |
| Civil wars                             | -0.481<br>(0.682)    | -1.429**<br>(0.570)   |
| Lagged civil war                       | 0.988*<br>(0.588)    | 1.382**<br>(0.592)    |
| Log initial GDP pc                     | -0.509<br>(0.333)    | -0.903***<br>(0.309)  |
| Tropics                                | -1.084**<br>(0.447)  | -1.014***<br>(0.391)  |
| Budget balance                         | 0.153***<br>(0.0411) | 0.168***<br>(0.0381)  |
| Log FDI                                | 0.368***<br>(0.113)  | 0.366***<br>(0.103)   |
| Observations                           | 209                  | 267                   |
| R-squared                              | 0.419                | 0.368                 |
| Hansen (p-value)                       | 0.083                | 0.0126                |
| Shea partial R <sup>2</sup> aid        | 0.4823               | 0.4136                |
| Shea partial R <sup>2</sup> aid sq.    | 0.3777               | 0.2998                |
| Shea partial R <sup>2</sup> repayments | 0.5791               | 0.5874                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9: CRS breakdown by purpose codes**

|  |   |
|--|---|
| 110 EDUCATION  | L |
| 111 Education, Level unspecified                                   | L |
| 11110 Education policy and administrative management               | L |
| 11120 Education facilities and training                            | L |
| 11130 Teacher training   | L |
| 11181 Educational research   | L |
| 112 Basic education  | L |
| 11220 Primary education  | L |
| 11230 Basic Life Skills for youth and adults                       | L |
| 11240 Early childhood education                                    | L |
| 113 Secondary education  | L |
| 11320 Secondary education  | L |
| 11330 Vocational training  | L |
| 114 Post-secondary education                                       | L |
| 11420 Higher education   | L |
| 11430 Advanced technical and managerial training                   | L |
| 120 HEALTH   | L |
| 121 Health, general  | L |
| 12110 Health policy and administrative management                  | L |
| 12181 Medical education/training                                   | L |
| 12182 Medical research   | L |
| 12191 Medical Services   | L |
| 122 Basic Health   | L |
| 12220 Basic Health care  | L |
| 12230 Basic Health infrastructure                                  | L |
| 12240 Basic nutrition  | L |
| 12250 Infectious disease control                                   | L |
| 12281 Health education   | L |
| 12282 Health personnel development                                 | L |
| 130 POPULATION POLICIES/PROGRAMMES & REPROD. HEALTH                | L |
| 13010 Population policy and administrative management              | L |
| 13020 Reproductive Health care                                     | L |
| 13030 Family planning  | L |
| 13040 STD control including HIV/AIDS                               | L |
| 13081 Personnel development for population and reproductive Health | L |
| 140 WATER SUPPLY AND SANITATION                                    | L |
| 14010 Water resources policy and administrative management         | L |
| 14015 Water resources protection                                   | L |
| 14020 Water Supply and Sanitation                                  | L |
| 14030 Water Supply and Sanitation - Small Systems                  | L |
| 14040 River development  | L |
| 14050 Waste management/disposal                                    | L |
| 14081 Education and training in water Supply and Sanitation        | L |
| 150 GOVERNMENT AND CIVIL SOCIETY                                   | L |
| 15010 Economic and development policy/Planning                     | L |
| 15020 Public Sector financial management                           | L |
| 15030 Legal and judicial development                               | L |
| 15040 Government administration                                    | L |
| 15050 Strengthening civil Society                                  | L |
| 15061 Post conflict peace-building (UN)                            | S |
| 15062 Elections  | L |
| 15063 Human rights   | L |
| 15064 Demobilisation   | S |
| 15065 Free flow of information                                     | L |
| 15066 Land mine clearance  | S |
| 160 OTHER SOCIAL INFRASTRUCTURE AND SERVICES                       | L |
| 161 Employment   | L |

|       |  |   |
|-------|--|---|
| 16110 | Employment policy and administrative management      | L |
| 162   | Housing  | S |
| 16210 | Housing policy and administrative management         | L |
| 16220 | Low-cost Housing                                     | S |
| 163   | Other Social Services                                | L |
| 16310 | Social/ welfare Services                             | L |
| 16320 | General government Services                          | L |
| 16330 | Settlement   | L |
| 16340 | Reconstruction relief                                | S |
| 16350 | Culture and recreation                               | L |
| 16361 | Narcotics control                                    | L |
| 16362 | Statistical capacity building                        | L |
| 16381 | Research/scientific institutions                     | L |
| 210   | TRANSPORT AND STORAGE                                | S |
| 21010 | Transport policy and administrative management       | L |
| 21020 | Road transport                                       | S |
| 21030 | Rail transport                                       | S |
| 21040 | Water transport                                      | S |
| 21050 | Air transport  | S |
| 21061 | Storage  | S |
| 21081 | Education and training in transport and Storage      | L |
| 220   | COMMUNICATIONS                                       | S |
| 22010 | Communications policy and administrative management  | L |
| 22020 | Telecommunications                                   | S |
| 22030 | Radio/television/print media                         | L |
| 230   | ENERGY GENERATION AND SUPPLY                         | S |
| 23010 | Energy policy and administrative management          | L |
| 23020 | Power generation/non-renewable Sources               | S |
| 23030 | Power generation/renewable Sources                   | S |
| 23040 | Electrical transmission/ distribution                | S |
| 23050 | Gas distribution                                     | S |
| 23061 | Oil-fired power plants                               | S |
| 23062 | Gas-fired power plants                               | S |
| 23063 | Coal-fired power plants                              | S |
| 23064 | Nuclear power plants                                 | S |
| 23065 | Hydro-electric power plants                          | S |
| 23066 | Geothermal energy                                    | S |
| 23067 | Solar energy   | S |
| 23068 | Wind power   | S |
| 23069 | Ocean power  | S |
| 23070 | Biomass  | S |
| 23081 | Energy education/training                            | L |
| 23082 | Energy research                                      | L |
| 240   | BANKING AND FINANCIAL SERVICES                       | S |
| 24010 | Financial policy and administrative management       | L |
| 24020 | Monetary institutions                                | S |
| 24030 | Formal Sector financial intermediaries               | S |
| 24040 | Informal/semi-formal financial intermediaries        | S |
| 24081 | Education/training in banking and financial Services | S |
| 250   | BUSINESS AND OTHER                                   | S |
| 25010 | Business Services                                    | S |
| 25020 | Privatisation  | S |
| 311   | AGRICULTURE  | S |
| 31110 | Agricultural policy and administrative management    | L |
| 31120 | Agricultural development                             | S |
| 31130 | Agricultural Land resources                          | S |
| 31140 | Agricultural water resources                         | S |
| 31150 | Agricultural inputs                                  | S |
| 31161 | Food crop production                                 | S |

|   |   |
|---|---|
| 31162 Industrial crops/export crops                       | S |
| 31163 Livestock   | S |
| 31164 Agrarian reform                                     | S |
| 31165 Agricultural alternative development                | L |
| 31181 Agricultural education/training                     | L |
| 31182 Agricultural extension                              | S |
| 31183 Agricultural research                               | L |
| 31184 Livestock research                                  | L |
| 31191 Agricultural Services                               | S |
| 31192 Plant and post-harvest protection and pest control  | S |
| 31193 Agricultural financial Services                     | S |
| 31194 Agricultural co-operatives                          | S |
| 31195 Livestock/veterinary Services                       | S |
| 312 FORESTRY  | S |
| 31210 Forestry policy and administrative management       | L |
| 31220 Forestry development                                | S |
| 31261 Fuelwood/charcoal                                   | L |
| 31281 Forestry education/training                         | L |
| 31282 Forestry research                                   | L |
| 31291 Forestry Services                                   | S |
| 313 FISHING   | S |
| 31310 Fishing policy and administrative management        | L |
| 31320 Fishery development                                 | S |
| 31381 Fishery education/training                          | L |
| 31382 Fishery research                                    | L |
| 31391 Fishery Services                                    | S |
| 321 INDUSTRY  | S |
| 32110 Industrial policy and administrative management     | L |
| 32120 Industrial development                              | S |
| 32130 SME development                                     | S |
| 32140 Cottage industries and Handicraft                   | S |
| 32161 Agro-industries                                     | S |
| 32162 Forest industries                                   | S |
| 32163 Textiles, Leather and Substitutes                   | S |
| 32164 Chemicals   | S |
| 32165 Fertilizer plants                                   | S |
| 32166 Cement/lime/plaster                                 | S |
| 32167 Energy manufacturing                                | S |
| 32168 Pharmaceutical production                           | S |
| 32169 Basic metal industries                              | S |
| 32170 Non-ferrous metal industries                        | S |
| 32171 Engineering   | S |
| 32172 Transport equipment industry                        | S |
| 32181 Technological research and development              | L |
| 322 MINERAL RESOURCES AND MINING                          | S |
| 32210 Mineral/mining policy and administrative management | L |
| 32220 Mineral prospection and exploration                 | S |
| 32261 Coal  | S |
| 32262 Oil and gas   | S |
| 32263 Ferrous metals                                      | S |
| 32264 Nonferrous metals                                   | S |
| 32265 Precious metals/materials                           | S |
| 32266 Industrial minerals                                 | S |
| 32267 Fertilizer minerals                                 | S |
| 32268 Offshore minerals                                   | S |
| 323 CONSTRUCTION  | L |
| 32310 Construction policy and administrative management   | L |
| 331 TRADE   | S |
| 33110 Trade policy and administrative management          | L |

|  |   |
|--|---|
| 33120 Wholesale/retail trade                             | S |
| 33130 Export promotion                                   | S |
| 33140 Multilateral trade negotiations                    | L |
| 33181 Trade education/training                           | L |
| 332 TOURISM  | L |
| 33210 Tourism policy and administrative management       | L |
| 400 MULTISECTOR/CROSS-CUTTING                            | L |
| 410 General environmental protection                     | L |
| 41010 Environmental policy and administrative management | L |
| 41020 Biosphere protection                               | L |
| 41030 Bio-diversity                                      | L |
| 41040 Site preservation                                  | L |
| 41050 Flood prevention/control                           | L |
| 41081 Environmental education/ training                  | L |
| 41082 Environmental research                             | L |
| 420 Women in development                                 | L |
| 42010 Women in development                               | L |
| 430 Other multisector                                    | L |
| 43010 Multisector aid                                    | L |
| 43020 Multisector aid for basic Social Services          | L |
| 43030 Urban development and management                   | L |
| 43040 Rural development                                  | L |
| 43050 Non-agricultural alternative development           | L |
| 43081 Multisector education/training                     | L |
| 500 COMMODITY AID AND GENERAL PROGRAMME ASSISTANCE       | S |
| 510 Structural Adjustment Assistance with World Bank/IMF | S |
| 51010 Structural adjustment                              | S |
| 520 Developmental food aid/Food Security assistance      | H |
| 52010 Food aid/Food Security programmes                  | H |
| 530 Other general programme and commodity assistance     | S |
| 53010 Balance-of-payments Support                        | S |
| 53020 Budget Support                                     | S |
| 53030 Import Support (capital goods)                     | S |
| 53040 Import Support (commodities)                       | S |
| 600 ACTION RELATING TO DEBT                              | S |
| 60010 Action relating to debt                            | S |
| 60020 Debt forgiveness                                   | S |
| 60030 Relief of multilateral debt                        | S |
| 60040 Rescheduling and refinancing                       | S |
| 60061 Debt for development Swap                          | S |
| 60062 Other debt Swap                                    | S |
| 60063 Debt buy-back                                      | S |
| 700 EMERGENCY ASSISTANCE                                 | H |
| 710 Emergency food aid                                   | H |
| 71010 Emergency food aid                                 | H |
| 720 Other emergency and distress relief                  | H |
| 72010 Emergency/distress relief                          | H |
| 72020 Aid to refugees (in donor country)                 | H |
| 72030 Aid to refugees (in recipient countries)           | H |
| 910 ADMINISTRATIVE COSTS OF DONORS                       | A |
| 91010 Administrative costs                               | A |
| 920 SUPPORT TO NON-GOVERNMENTAL ORGANISATIONS            | L |
| 92010 Support to national NGOs                           | L |
| 92020 Support to international NGOs                      | L |
| 92030 Support to local and regional NGOs                 | L |
| 998 UNALLOCATED/ UNSPECIFIED                             | L |
| 99810 Sectors not Specified                              | L |
| 99820 Promotion of development awareness                 | A |
| 16030 HOUSING POLICY AND ADMIN. MANAGEMENT               | L |

|   |   |
|---|---|
| 15150 STRENGTHENING CIVIL SOCIETY                                 | L |
| 15140 GOVERNMENT ADMINISTRATION                                   | L |
| 16020 EMPLOYMENT POLICY AND ADMIN. MGMT.                          | S |
| 15140 GOVERNMENT ADMINISTRATION                                   | L |
| 16061 CULTURE AND RECREATION                                      | L |
| 16010 SOCIAL/WELFARE SERVICES                                     | L |
| 43082 RESEARCH/SCIENTIFIC INSTITUTIONS                            | L |
| 15120 PUBLIC SECTOR FINANCIAL MANAGEMENT                          | L |
| 72040 EMERGENCY FOOD AID  | H |
| 15110 ECONOMIC AND DEVELOPMENT POLICY/PLANNING                    | L |
| 32182 TECHNOLOGICAL RESEARCH & DEVELOPMENT                        | S |
| 15164 WOMEN'S EQUALITY ORGANISATIONS AND INSTITUTIONS             | L |
| 16040 LOW-COST HOUSING  | L |
| 12261 HEALTH EDUCATION  | L |
| 73010 RECONSTRUCTION RELIEF                                       | H |
| 31166 AGRICULTURAL EXTENSION                                      | S |
| 93010 REFUGEES IN DONOR COUNTRIES                                 | H |
| 15230 POST-CONFLICT PEACE BUILDING (UN)                           | S |
| 15163 FREE FLOW OF INFORMATION                                    | L |
| 15130 LEGAL AND JUDICIAL DEVELOPMENT                              | L |
| 15162 HUMAN RIGHTS  | L |
| 15250 LAND MINE CLEARANCE   | S |
| 15161 ELECTIONS   | L |
| 16063 NARCOTICS CONTROL   | L |
| 15210 SECURITY SYSTEM MANAGEMENT AND REFORM                       | L |
| 16050 MULTISECTOR AID FOR BASIC SOC. SERV.                        | L |
| 11182 EDUCATIONAL RESEARCH  | L |
| 16062 STATISTICAL CAPACITY BUILDING                               | L |
| 15240 REINTEGRATION AND SALW CONTROL                              | S |
| 12262 MALARIA CONTROL   | L |
| 12263 TUBERCULOSIS CONTROL  | L |
| 22040 INFORMATION AND COMMUNICATION TECHNOLOGY                    | L |
| 15220 CIVILIAN PEACE-BUILDING, CONFLICT PREVENTION AND RESOLUTION | S |
| 16064 SOCIAL MITIGATION OF HIV/AIDS                               | L |
| 15261 CHILD SOLDIERS (PREVENTION AND DEMOBILISATION)              | L |
| 74010 DISASTER PREVENTION AND PREPAREDNESS                        | H |
| 72050 RELIEF CO-ORDINATION; PROTECTION AND SUPPORT SERVICES       | H |
| 33150 TRADE-RELATED ADJUSTMENT                                    | L |

**Table 10: CRB sample countries**

|                    |                      |
|--------------------|----------------------|
| Algeria            | Korea, Rep.          |
| Argentina          | Madagascar           |
| Bolivia            | Malawi               |
| Botswana           | Malaysia             |
| Brazil             | Mali                 |
| Bulgaria           | Mexico               |
| Burkina Faso       | Morocco              |
| Cameroon           | Nicaragua            |
| Chile              | Niger                |
| China              | Nigeria              |
| Colombia           | Pakistan             |
| Congo, Dem. Rep.   | Papua New Guinea     |
| Congo, Rep.        | Paraguay             |
| Costa Rica         | Peru                 |
| Cote D'Ivoire      | Philippines          |
| Cyprus             | Poland               |
| Dominican Republic | Romania              |
| Ecuador            | Russian Federation   |
| Egypt, Arab Rep.   | Senegal              |
| El Salvador        | Sierra Leone         |
| Ethiopia           | Singapore            |
| Gabon              | Sri Lanka            |
| Gambia, The        | Syrian Arab Republic |
| Ghana              | Thailand             |
| Guatemala          | Togo                 |
| Haiti              | Trinidad and Tobago  |
| Honduras           | Tunisia              |
| Hungary            | Turkey               |
| India              | Uganda               |
| Indonesia          | Uruguay              |
| Iran, Islamic Rep. | Venezuela, RB        |
| Jamaica            | Zambia               |
| Jordan             | Zimbabwe             |
| Kenya              |                      |



## **Drilling Down Aid**

### **Abstract**

The extensive literature of the impact of aggregate aid on growth has come up inconclusive. In the spirit of the most recent generation of the aid/growth literature, I examine the relationship between sectoral aid – including but not limited to education, health, government and civil society, energy, and humanitarian aid – and a country's growth. I do so by empirically analyzing the impact of these sectors for approximately 100 countries over the period 1973-2007. I implement both OLS and then system GMM in order to properly control for endogeneity between aid and growth. The final results show that water and sanitation and education aid have a significant yet negative effect on a country's per capita GDP, while humanitarian aid has a positive impact. Other sectors, for example energy or government and civil society, are not significant.

## **Introduction**

For decades, researchers have grappled with the question of whether or not foreign aid inflows lead to economic changes in a recipient country and, if so, in what form. This reflection is paramount given the billions of dollars that flow from high-income countries to the developing world. In 2008, aid flows from Development Assistance Committee (DAC) members – who are the primary donors and make up the majority of the flows – reached 0.30 percent of their combined gross national income. Does aid lead to long-term improvements in the recipient country in the form of increased growth? Or does it have a negative effect on an economy? And what type of aid leads to long-term growth?

There is no clear conclusion that emerges from the literature. Some conclude that aid has a positive result on a country's growth. Others find that these results are conditional on certain economic and political factors. Still others reveal that, by slightly changing the core specification – for example, as I have done in my paper “Challenging the Effectiveness of Short-term Aid: A Comment on Counting Chickens When They Hatch” by adding new data to the results of a paper where aid does have a positive effect – that the results are tenuous.

In the spirit of the most recent generation of the aid/growth literature, I drill down aid by sector – including but not limited to education, health, government and civil society, energy, and humanitarian aid – and look at its impact on the recipient country. The fundamental question I ask is: what form of sectoral aid leads to growth of a country's economy?

## **Literature review**

Up until now, the majority of the aid-growth literature has focused on aid in the aggregate form. My paper “Aid and Trade” gives an in-depth overview of the various waves of this literature. Yet, as Doucouliagos and Paldam (2005 and 2006) point out through their meta-analysis of the aid literature, the over 100 studies conducted on the topic on average show an

insignificant positive effect of aid on growth. Is there no clear result about the effectiveness of aid because “aid” as it has been defined thus far is too broad?

As we have learned from the most recent body of literature, aid can come in many forms: from emergency and humanitarian to support to local NGOs to statistical capacity building to specific sectoral aid (for example infrastructure, education, and health). The social and economic impacts of these various forms can be quite variable for a recipient country. Some aid may have short-term goals, for example banking and financial services, while others may hope to achieve long-term effects, for example reproductive health. Therefore it is necessary to “drill down aid” in order to understand the true impact of different forms of aid.

One part of this literature keeps growth as the dependent variable but changes the main independent variable to something other than aggregate aid. Clemens, Radelet, and Bhavnani 2004 (CRB) capture the spirit of this new branch in the literature by asking whether “short-impact aid” – defined as an aid disbursement funding an intervention that can plausibly raise GDP per capita within approximately four years to a permanently higher level – may lead to more significant results. They find a positive, causal relationship between “short-impact” aid and economic growth. More specifically they determine that it is at least two to three times larger than in studies using aggregate aid. At the mean, a \$1 increase in short-impact aid raises output by \$1.64 in a typical country. And their results are not conditional on other political or institutional factors. CRB base their analysis on data taken from the OECD’s DAC and Credit Reporting System (CRS) databases for the period 1973-2001. To make their results consistent with the literature (specifically Burnside and Dollar 2000), their country sample is based on countries used in prior studies, which includes 67 developing countries). They estimate the following model using 2SLS:

$$\begin{aligned} \dot{y}_{i,t}/y_{i,t} &= \alpha + \beta^s d_{i,t}^s + \beta^l d_{i,t}^l + \beta^h d_{i,t}^h + \beta^r \ln r_{i,t} + S_{i,t}\lambda + X_{i,t}\eta + \theta \ln y_{i,t} + \varepsilon_{i,t} \\ d_{i,t}^{net} &= Z_{i,t}\zeta + \nu_{i,t}, \end{aligned}$$

Where  $d_{i,t}^s$  is gross disbursements of “short-impact” aid,  $d_{i,t}^l$  is gross disbursements of “long-impact” aid,  $d_{i,t}^h$  is gross disbursements of “humanitarian” aid, and  $r_{i,t}$  is gross repayments on aid. Therefore  $d_{i,t}^{net} = d_{i,t}^s + d_{i,t}^l + d_{i,t}^h - r_{i,t}$ . Finally  $S_{i,t}$  is a vector of squared aid disbursements of the various types, and  $\lambda$  is a vector of constants.

Other studies break aid down into other categories. Mavrotas (2003) looks at the impact of different types of aid (project aid, program aid, technical assistance, and food aid) on Uganda’s fiscal sector. By employing non-linear Three Stage Least Squares, he finds that project and food aid cause a reduction in public investment, while program aid and technical assistance lead to positive changes. Reddy and Minoiu (2006) look at the impact of multilateral and bilateral aid on average annual growth rate of per capita GDP. By estimating their model using panel data and the system GMM estimator, they find that multilateral aid has a strong and positive impact on growth. Gupta, Clements, Pivovarsky, and Tiongson (2003) focus on grants versus loans. They analyze 107 countries during the period 1970-2000 and find that, while concessional loans lead to higher domestic revenue mobilization, the opposite is true for grants.

There is also a round of researchers who look at the effect of sectoral aid on different output indicators. In their paper entitled “Aid Effectiveness Reconsidered: Panel Data Evidence for the Education Sector,” Michaelowa and Weber (2006) look specifically at the impact of educational aid (both per capita and as a percentage of GDP) on primary enrollment and completion. They average their data over five year periods from 1971-2000. They estimate their base model using a dynamic panel analysis. In their regressions, educational aid is instrumented with its own lag. Energy aid is used as an alternative instrument. They find that educational aid does have a positive effect on primary enrollment and completion rates. Yet the coefficient estimates are small and sensitive to model specification.

Dreher, Nunnenkamp, and Thiele (2006) improve on Michaelowa and Weber's work, yet find similar results. They estimate a system of equations to test whether and to what extent the impact of educational aid depends on the extent to which aid adds to overall educational expenditure of the recipient government; the strength of the link between government expenditure and education; and the importance of institutions in recipient countries. They find that educational aid increases primary school enrollment but that institutions are not relevant. First they estimate fixed and random effects models but ignore the potential endogeneity issue. They then employ the GMM estimator and treat expenditure and aid as endogenous.

Finally Mishra and Newhouse follow a similar approach and examine the relationship between health and infant mortality. They find the statistically significant result that doubling per capita health aid is associated with a two percent reduction in the infant mortality rate. Therefore increasing per capita health aid from \$1.60 to \$3.20 will lead to roughly 1.5 fewer deaths per thousand births. They employ OLS and system GMM. In the latter model, all predetermined and endogenous variables are instrumented by their appropriate lags in order to eliminate introducing a spurious correlation between the variables and the error term.

Yet there can be considerable "technical" problems with this approach, especially with data quality, availability, and harmonization across countries. Output indicators – often collected through household or other types of surveys – are expensive to collect. Therefore they are not necessarily comparable across countries. Nor do they have consistent data over time. Michaelow and Weber run into this problem when looking at education. Gross primary enrollment is the most complete series. Yet it is often difficult to interpret the results. Therefore they resort to using net enrollments and completion rates. UNESCO, the original source of the data, shifted from taking model estimations to compiling the data from censuses and household surveys. Therefore series prior to a certain date are not comparable. The authors, however, combined the series to expand available years.

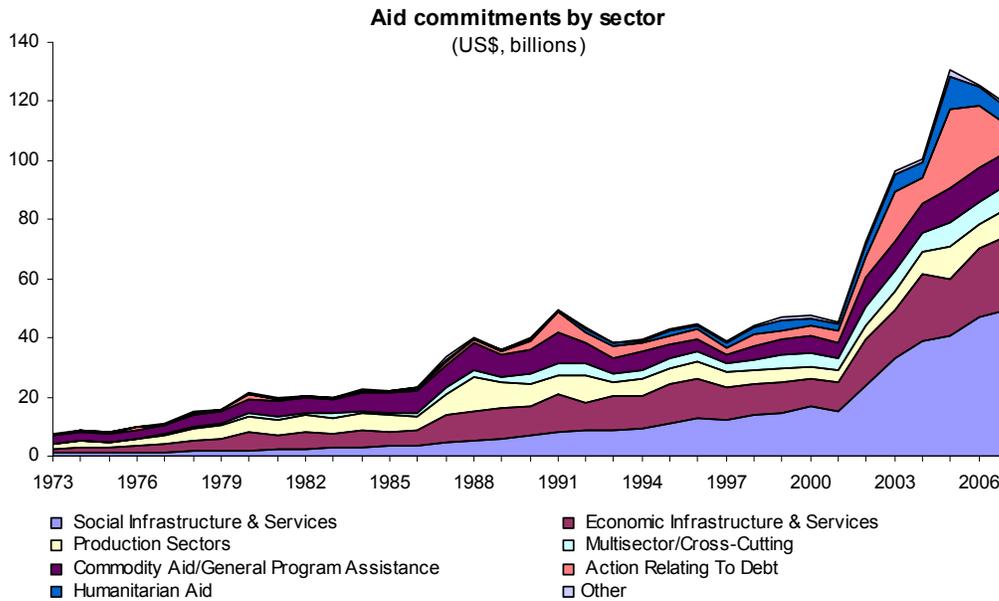
## **Motivation and methodology**

Within the current strand of the literature, researchers have “drilled down” aid – into for example project or program aid or grants and loans – instead of looking at its effects in the aggregate. Some have maintained growth or other related macroeconomic indicators as the dependent variable, while others have included output variables – such as infant mortality and enrollment/completion rates – for key independent variables. I follow this line of the literature by looking at the impact of sector-specific aid on growth. To the best of my knowledge, no paper has focused on impact of sectoral aid – as defined by the OECD – on growth. Growth still remains a key component in economic theory and in policymaking and therefore a key dependent variable in understanding the impact of aid. And the OECD provides the most widely used, largest, and most detailed sectoral breakdown of aid. And possibly the most useful breakdown. Whether or not to invest in an educational or statistical capacity building project will depend on the will of a policymaker. Whether aid will be a loan or grant will be the result of many other conditions and circumstances. OECD has developed a sophisticated hierarchy of these data (as seen below). They are further refined into three-digit “sector codes” and then five-digit “purpose codes.”

OECD Breakdown by sector (including DAC5) 3-digit code

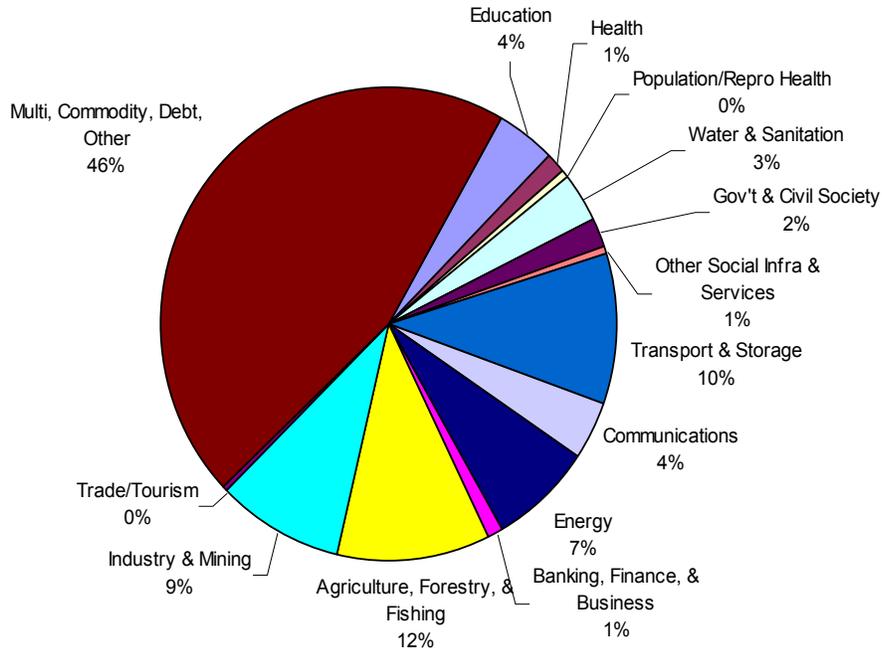
|  |   |
|--|---|
| <b>100: Social Infrastructure &amp; Services</b> | <b>110: Education</b><br>111: Education, Level Unspecified<br>112: Basic Education<br>113: Secondary Education<br>114: Post-Secondary Education<br><b>120: Health</b><br>121: Health, General<br>122: Basic Health<br><b>130: Population Pol./Progr. &amp; Reproductive Health</b><br><b>140: I.4. Water Supply &amp; Sanitation</b><br><b>150: I.5. Government &amp; Civil Society</b><br>151: Government & Civil Society-general<br>152: Conflict, Peace & Security<br><b>160: Other Social Infrastructure &amp; Services</b> |
| <b>200: Economic Infrastructure And Services</b> | <b>210: Transport &amp; Storage</b><br><b>220: Communications</b><br><b>230: Energy</b><br><b>240: Banking &amp; Financial Services</b><br><b>250: Business &amp; Other Services</b>  |
| <b>300: Production Sectors</b>                   | <b>310: Agriculture, Forestry, Fishing</b><br>311: Agriculture<br>312: Forestry<br>313: Fishing<br><b>320: Industry, Mining, Construction</b><br>321: Industry<br>322: Mineral Resources & Mining<br>323: Construction<br><b>331: Trade Policies &amp; Regulations</b><br><b>332: Tourism</b>   |
| <b>400: Multisector / Cross-Cutting</b>          | <b>410: General Environment Protection</b><br><b>430: Other Multisector</b>   |
| <b>500: Commodity Aid / General Prog. Ass.</b>   | <b>510: General Budget Support</b><br><b>520: Dev. Food Aid/Food Security Ass.</b><br><b>530: Other Commodity Ass.</b>  |
| <b>600: Action Relating to Debt</b>              |   |
| <b>700: Humanitarian Aid</b>                     | <b>720: Emergency Response</b><br>730: Reconstruction Relief & Rehabilitation<br>740: Disaster Prevention & Preparedness  |
| <b>910: Administrative Costs Of Donors</b>       |   |
| <b>920: Support to NGOs</b>                      |   |
| <b>930: Refugees In Donor Countries</b>          |   |
| <b>998: Unallocated/Unspecified</b>              |   |

Not only has the amount of aid increased over time, but the composition has changed:

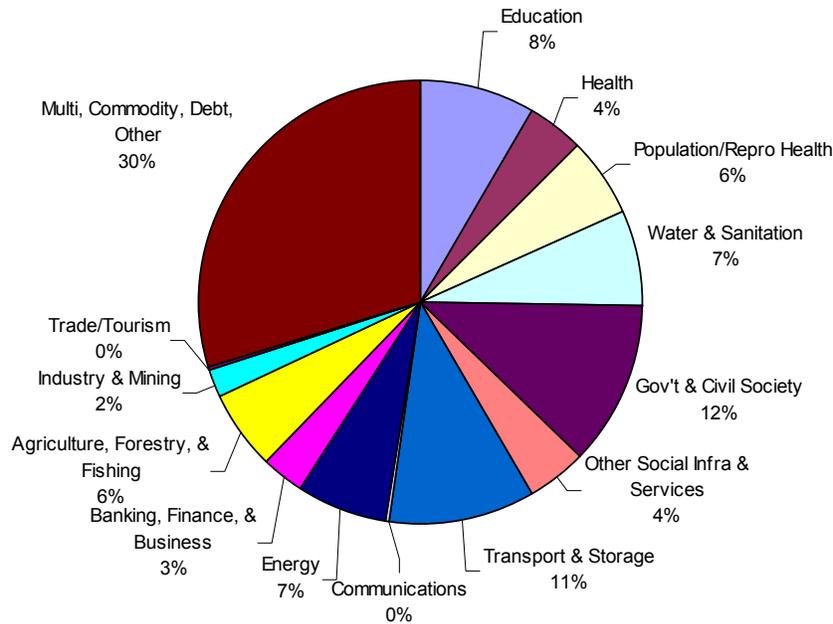


In 2007, Social Infrastructure and Services – which includes Education, Health, Population and Reproductive Health, Water and Sanitation, Government and Civil Service, and a catch-all category called Other Social Infrastructure – was the largest sector. The graphs below include a more detailed breakdown. The importance of aid going to specific sectors such as Education, Government and Civil Society, Health and Reproductive Health has increased since 1973. Other sectors – such as Communications, Agriculture, and Industry and Mining – and more programmatic aspects have become less of a focus.

1973



2007



I look at the broad OECD topics (for example Economic Infrastructure and Services). Two main identification strategies are employed for my baseline regression to estimate the effect of sectoral aid on growth. The first is OLS, which includes a rich set of both economic and social indicators.

The basic OLS regression can be expressed as follows:

$$\text{Ln}(Y_{rt}) = \alpha \text{Ln}(A_{rt-1}) + \beta X_{rt-1} + D_{rt} + \varepsilon_{rt} \quad (1)$$

where  $Y_{rt}$  is GDP per capita in country  $r$  in period  $t$ ,  $A_{rt-1}$  is the sectoral aid as a percent of GDP in country  $r$  during the previous period,  $\beta X_{rt-1}$  is a vector of control variables that capture a country's economic and political status (including  $Y_{rt-1}$ ), and  $D_{rt}$  is a dummy variable of civil war in a country. I have also included period dummies.

The former offers some very broad directions about the data and the relationship between growth and sectoral aid. Yet the issue of endogeneity plagues the aid/growth literature. Aid may have an impact on a country's growth rate. Yet it may also be possible that a country receives aid based on its economic performance. For example a country may receive less aid in a given aid if it has poor economic growth. At the same time, a country may also receive greater aid with a lower growth rate, as may be the case in a post-emergency situation. Therefore the causal effect of aid on growth may be misestimated thus leading to biased results. In addition, measurement error in aid may bias the OLS coefficient towards zero.

What are the key techniques in the literature for dealing with endogeneity? One such method, which has commonly been utilized in the literature – including my re-creation of the CRB paper in “Challenging the Effectiveness of Short-term Aid: A Comment on Counting Chickens When They Hatch” – is instrumenting for aid. This method isolates the exogenous source of variation in aid that does not come from growth. Albeit useful, this can pose

potential problems. First of all, one must carefully select instruments that make sense in both an economic and historic context. Yet many of the geopolitical instruments in the literature have been used because other researchers have used them, not necessarily because they are meaningful. In his paper “Through the Looking Glass, and What OLS Found There: On Growth, Foreign Aid, and Reverse Causality,” Roodman highlights some of the econometric problems of instrumenting.

Therefore I use GMM, which is technically possible because my dataset consists of a small T (five year simple averages covering the period 1973-2007) and a large N (all developing countries with available data). This efficiently allows us to draw instruments from within our dataset by using lags (most appropriately for  $y_{i,t-1}^*$  would be  $y_{i,t-2}$ ) without having to assume that we have excellent instruments waiting to be used. “Difference” GMM estimator, which was proposed by Arellano-Bover (1995) and utilizes lags of the levels of endogenous variables (or strictly exogenous regressors) as instruments, tends to perform poorly in empirical growth models because lagged levels are often poor instruments for first differenced variables. Although as part of my robustness check, I also utilize difference GMM.

Therefore I use the “system” GMM estimator for my baseline regression, developed by Blundell-Bond (1998). Whereas the difference GMM (Arellano-Bond) transforms the regressors to remove fixed effects, system GMM transforms the instruments to make them exogenous to fixed effects. The latter estimator includes both levels and differences. As Roodman (2006) captures it, “where Arellano-Bond instruments differences (or orthogonal deviations) with levels, Blundell-Bond instruments levels with differences.”

The following regression equations are estimated using the “system” GMM specification with the `xtabond2` command in Stata (Roodman 2006):

$$\log Y_{rt} = \alpha \log A_{rt-1} + \chi \log H_{rt-1} + \varphi X_{rt-1} + s_r + v_t + \varepsilon_{rt} \quad (2)$$

$$\Delta \log Y_{rt} = \alpha (\Delta \log A_{rt-1}) + \chi (\Delta \log H_{rt-1}) + \varphi (\Delta X_{rt-1}) + \Delta \varepsilon_{rt} \quad (3)$$

Where  $s_t$  is a vector of country fixed effects that control for time-invariant differences in growth across countries. Lagged differences (ie:  $\log Y_{rt-2} - \log Y_{rt-3}$ ),  $(X_{rt-2} - X_{rt-3})$  are used as instruments in the level equation (2). Lagged levels of the variables (ie:  $Y_{rt-2}$ ,  $X_{rt-2}$ ) are used as instruments in the first differenced equation (3). “Difference” GMM estimates (3), while “system” GMM obtains coefficients by solving the moment conditions defined by both equations (2) and (3). In the GMM specifications, one period lags are treated as endogenous, while two lags are used as instruments.

## Data

Table 7 contains detailed summary statistics of the data. I draw all of the data from two OECD databases: CRS and DAC. The CRS is a very rich database that makes reports annual aid *commitments* disaggregated into specific categories by donors and by recipients back to the beginning of the 1970s. Each category is broken down into a five-digit “purpose code,” and all flows from donors to recipients have been assigned one. Examples include “statistical capacity building” (purpose code 16362); “primary education” (purpose code 11220); and “emergency food aid” (purpose code (71010). Then each of these “purpose codes” falls into a broader three-digit category called “sector code.” Some examples include “basic health” (sector code 122) or “forestry” (sector code 312). I summed approximately 800,000 donor-recipient transactions from the CRS database by their purpose and sector codes. Therefore recipient countries have an entry for each of the 25 sectors for each year. Please see table 6 for a detailed breakdown.

One of the main constraints of the CRS dataset however is that only commitments data are available, not disbursements. Similar to the methodology used in CRB, I then derive “weights” for each country for each year based on this breakdown, which is in essence the fraction of each of these categories of commitments for each country. These ratios are applied to total disbursements, which is taken from the OECD’s DAC database. Therefore the fraction of each of these three categories is equal for both commitments and disbursements. For

example 16 percent of Zimbabwe's aid was targeted at population and reproductive health, while 34 percent was in the form of humanitarian aid. CRB perform an exercise to find out how well commitments approximate disbursements, and they find a strong correlation between the two. Therefore, we can assume that these weights, which are based on commitments, are an appropriate proxy for disbursements.

I used five-year arithmetic averages. Periods include: 1973-77, 1978-82, 1983-87, 1988-92, 1993-1997, 1998-2002, and 2003-2007. I have also included a policy indicator, which is based on a methodology created by Burnside and Dollar (2000). They constructed an index that includes inflation, budget balance (now overall balance) and openness (Sachs and Warner). The regression coefficients from a linear regression determine the relative importance of the policies. For a complete list of variables and data sources, please see table 8.

## **Results**

So what do the results show? Does sectoral aid have an impact on economic growth? And, if so, which sector? Tables 1 and 2 show the OLS estimation. In table 1, humanitarian aid in time (t-1) appears to have significant (at the 10 percent level) impact on the level of GDP per capita in time t, albeit with a small coefficient. None of the other sectors appear to be statistically significant. Table 2 includes period dummies to account for any period effects not captured by the explanatory variable. The results confirm what we see in table 1: humanitarian aid continues to be positive and significant, this time at the 5 percent level.

As I stated above, however, we must be skeptical of the OLS results, which are merely useful some general direction in the data. But we cannot stop here because of issues of endogeneity and must therefore implement a more sophisticated estimation technique. Table 3 presents the statistical results when system GMM is implemented. The dependent variable is GDP per capita growth. Again we see that humanitarian aid has a positive and statistically significant

coefficient at the 10 percent level. The lagged dependent variable is also positive and significant, as the lag of inflation and policy. Civil war is significant yet negative. With a Hansen (p-value) of 0.747, the instruments appear to be strong. Just like the OLS results, no other form of sectoral aid is statistically significant.

*Robustness check: Difference GMM estimation*

As stated above, system GMM is the most appropriate GMM estimation technique because difference GMM performs poorly in empirical growth models as the lagged levels are often poor instruments for first differenced variables. But, just like OLS, difference GMM can also provides some broad directions in the data and can offer potential confirmation or rejection of the system GMM results. Regression 7 in table 4 again shows humanitarian aid as statistically significant (at the 10 percent level) and positive. This confirms the results from the baseline regression. The lagged dependent variable – the log of GDP per capita – continues to be significant, as are policy and openness (Sachs). The log of population at time (t-1) and civil war also have significant yet negative coefficients. The Hansen (p-value) is greater than the generally accepted 0.10 threshold, therefore the null hypothesis cannot be rejected. The excluded instruments are uncorrelated with the error term and correctly excluded from the estimated equations.

*Robustness check: 2SLS*

As one final check, I use a two-stage least squares estimation technique with GDP per capita growth as my dependent variable. In this case, I use the following instruments: y variable at (t-2), the log of initial GDP per capita at (t-2), and a dummy variable for Egypt. Again, humanitarian aid is positive and significant at the five percent level. Both population and policy are also significant and positive. In this case, however, the F-statistic in the first stage regression is less than 10. In addition, the Kleibergen-Paap rk Wald F statistic (8.173) is less than the 5 percent confidence target of 13.01 set in the Stock-Yogo weak ID test for critical values. Therefore, in this case, the instruments appear to be weak.

## **Conclusion**

In this paper, I have attempted to determine if sectoral aid – social infrastructure and service, which includes education, health, water, or economic infrastructure and services, which includes transport and storage to energy to banking – has an impact on economic growth. I find that humanitarian aid has a strong, robustly significant and positive effect. These results are interesting. Humanitarian aid is used after a natural disaster – possibly a flood or earthquake – and is generally imagined for short-term consumption, not necessarily to build productive capacity (CRB 2004). CRB state that humanitarian “assistance should have a negative simple correlation with growth, as the disaster simultaneously causes both low growth and large aid inflows.” In fact, CRB’s estimation technique – including their choice of instruments and independent variables – finds humanitarian aid insignificant. When looking at GDP per capita in time  $t$  and aid flows in  $(t-1)$  and when using the estimation techniques proposed in this paper, this is not necessarily the case.

What is also surprising is that no other form of sectoral aid appears to have any effect on economic growth. This is true for aid targeted at shorter term projects/programs, like transportation, communications, and energy, as well as aid aimed at education, health, population control, and water.

One cannot therefore conclude that humanitarian aid is good and all other forms are ineffective. Instead, it is possible to “drill down” even further into the OECD sectoral aid data and therefore look more closely at specific sectors “such as government and civil society or agriculture. In addition, one can continue in the spirit of Michaelowa and Weber (2006) or Mishra and Newhouse (2007) in looking at the impact of various forms of aid on other output variables. And, most importantly, it is still too premature to give into the skepticism about aid/growth regressions. There is simply need to “drill down.”

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**Table 1: OLS**

|               | (1)                                    | (2)  | (3)                    | (4)                               | (5)   | (6)                          | (7)                    |
|---------------|--|--|------------------------|-----------------------------------|---|------------------------------|------------------------|
|               | Social<br>Infrastructure &<br>Services | Economic<br>Infrastructure<br>And Services | Production<br>Sectors  | Multisector/<br>Cross-<br>cutting | Commodity<br>Aid/General<br>Program<br>Assistance | Action<br>Related to<br>Debt | Humanitarian           |
| L.Inaid       | -0.00712<br>(0.00514)                  | 0.00403<br>(0.00547)                       | 0.000403<br>(0.00468)  | 0.000451<br>(0.00462)             | 0.00310<br>(0.00337)                              | -0.000615<br>(0.00242)       | 0.00566*<br>(0.00288)  |
| L.Inpcgdp     | 1.757***<br>(0.0789)                   | 1.839***<br>(0.0839)                       | 1.786***<br>(0.0829)   | 1.786***<br>(0.0859)              | 1.747***<br>(0.0870)                              | 1.892***<br>(0.0922)         | 1.671***<br>(0.0832)   |
| L.Ininitpcgdp | -0.766***<br>(0.0800)                  | -0.833***<br>(0.0855)                      | -0.786***<br>(0.0847)  | -0.782***<br>(0.0867)             | -0.740***<br>(0.0878)                             | -0.888***<br>(0.0926)        | -0.659***<br>(0.0840)  |
| L.Ininfl      | 0.0600**<br>(0.0278)                   | 0.0679**<br>(0.0291)                       | 0.0658**<br>(0.0280)   | 0.0637**<br>(0.0279)              | 0.0648**<br>(0.0279)                              | 0.0584**<br>(0.0267)         | 0.0516*<br>(0.0280)    |
| L.Inpop       | -0.00281<br>(0.00451)                  | 0.00390<br>(0.00431)                       | 0.00236<br>(0.00420)   | 0.00637<br>(0.00427)              | 0.00578<br>(0.00417)                              | 0.0106**<br>(0.00439)        | 0.00830**<br>(0.00400) |
| policy        | 0.0708***<br>(0.0109)                  | 0.0742***<br>(0.0112)                      | 0.0739***<br>(0.0112)  | 0.0688***<br>(0.0108)             | 0.0841***<br>(0.0132)                             | 0.0712***<br>(0.0134)        | 0.0774***<br>(0.0120)  |
| sachs         | -0.0237<br>(0.0196)                    | -0.0238<br>(0.0186)                        | -0.0392*<br>(0.0203)   | -0.0184<br>(0.0179)               | -0.0305<br>(0.0195)                               | -0.0601**<br>(0.0286)        | -0.0411**<br>(0.0196)  |
| civwar        | -0.0731***<br>(0.0249)                 | -0.0571**<br>(0.0256)                      | -0.0704***<br>(0.0247) | -0.0610**<br>(0.0247)             | -0.0764***<br>(0.0242)                            | -0.0670***<br>(0.0239)       | -0.0716***<br>(0.0257) |
| Observations  | 360                                    | 349  | 353                    | 329                               | 323   | 254                          | 316                    |
| R-squared     | 0.992                                  | 0.992                                      | 0.992                  | 0.992                             | 0.991   | 0.993                        | 0.992                  |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: ln(GDP per capita)

**Table 2: OLS with period dummies**

|               | (1)                                    | (2)  | (3)                    | (4)                               | (5)   | (6)                          | (7)                    |
|---------------|--|--|------------------------|-----------------------------------|---|------------------------------|------------------------|
|               | Social<br>Infrastructure<br>& Services | Economic<br>Infrastructure<br>And Services | Production<br>Sectors  | Multisector/<br>Cross-<br>cutting | Commodity<br>Aid/General<br>Program<br>Assistance | Action<br>Related to<br>Debt | Humanitarian           |
| L.Inaid       | -0.00552<br>(0.00538)                  | 0.00531<br>(0.00543)                       | 0.000224<br>(0.00477)  | 0.00263<br>(0.00486)              | 0.00312<br>(0.00340)                              | -0.000293<br>(0.00255)       | 0.00685**<br>(0.00292) |
| L.Inpcgdp     | 1.741***<br>(0.0786)                   | 1.796***<br>(0.0836)                       | 1.754***<br>(0.0830)   | 1.763***<br>(0.0857)              | 1.712***<br>(0.0871)                              | 1.858***<br>(0.0927)         | 1.635***<br>(0.0820)   |
| L.Ininitpcgdp | -0.748***<br>(0.0798)                  | -0.788***<br>(0.0851)                      | -0.754***<br>(0.0848)  | -0.755***<br>(0.0866)             | -0.705***<br>(0.0880)                             | -0.854***<br>(0.0930)        | -0.621***<br>(0.0829)  |
| L.Ininfl      | 0.0548**<br>(0.0275)                   | 0.0622**<br>(0.0285)                       | 0.0587**<br>(0.0275)   | 0.0585**<br>(0.0276)              | 0.0591**<br>(0.0277)                              | 0.0505*<br>(0.0265)          | 0.0438<br>(0.0274)     |
| L.Inpop       | -0.00139<br>(0.00468)                  | 0.00524<br>(0.00428)                       | 0.00293<br>(0.00415)   | 0.00841*<br>(0.00441)             | 0.00656<br>(0.00416)                              | 0.0108**<br>(0.00434)        | 0.0104***<br>(0.00400) |
| policy        | 0.0680***<br>(0.0109)                  | 0.0718***<br>(0.0111)                      | 0.0713***<br>(0.0111)  | 0.0674***<br>(0.0107)             | 0.0815***<br>(0.0131)                             | 0.0666***<br>(0.0132)        | 0.0770***<br>(0.0118)  |
| sachs         | -0.0150<br>(0.0205)                    | -0.0136<br>(0.0197)                        | -0.0281<br>(0.0214)    | -0.00904<br>(0.0189)              | -0.0199<br>(0.0206)                               | -0.0462<br>(0.0293)          | -0.0220<br>(0.0206)    |
| civwar        | -0.0761***<br>(0.0247)                 | -0.0589**<br>(0.0251)                      | -0.0716***<br>(0.0243) | -0.0637***<br>(0.0245)            | -0.0792***<br>(0.0240)                            | -0.0659***<br>(0.0235)       | -0.0720***<br>(0.0253) |
| Observations  | 360                                    | 349  | 353                    | 329                               | 323   | 254                          | 316                    |
| R-squared     | 0.992                                  | 0.992                                      | 0.992                  | 0.992                             | 0.991   | 0.993                        | 0.992                  |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: ln(GDP per capita)

**Table 3: System GMM, dependent variable GDP per capita growth**

|                    | (1)                                    | (2)  | (3)                   | (4)                               | (5)   | (6)                          | (7)                  |
|--------------------|--|--|-----------------------|-----------------------------------|---|------------------------------|----------------------|
|                    | Social<br>Infrastructure<br>& Services | Economic<br>Infrastructure<br>And Services | Production<br>Sectors | Multisector/<br>Cross-<br>cutting | Commodity<br>Aid/General<br>Program<br>Assistance | Action<br>Related to<br>Debt | Humanitarian         |
| L.gpcgdp           | 0.297***<br>(0.0830)                   | 0.301***<br>(0.0808)                       | 0.311***<br>(0.0731)  | 0.314***<br>(0.0815)              | 0.268***<br>(0.0833)                              | 0.277***<br>(0.0901)         | 0.277***<br>(0.0815) |
| L.Inaid            | -0.0973<br>(0.175)                     | 0.258<br>(0.299)                           | -0.288<br>(0.313)     | -0.137<br>(0.215)                 | -0.232<br>(0.189)                                 | -0.108<br>(0.105)            | 0.203*<br>(0.121)    |
| L.Inpcgdp          | -0.692<br>(0.574)                      | -0.125<br>(0.542)                          | -0.672<br>(0.630)     | -0.467<br>(0.566)                 | -0.577<br>(0.654)                                 | -0.566<br>(0.455)            | 0.187<br>(0.445)     |
| L.Ininfl           | 4.056***<br>(1.166)                    | 4.677***<br>(1.163)                        | 4.899***<br>(1.281)   | 3.887**<br>(1.531)                | 4.536***<br>(1.196)                               | 2.485**<br>(1.031)           | 4.728***<br>(1.053)  |
| L.Inpop            | -0.486*<br>(0.282)                     | -0.314<br>(0.372)                          | -0.397<br>(0.358)     | -0.251<br>(0.349)                 | -0.532*<br>(0.305)                                | -0.00692<br>(0.521)          | -0.0610<br>(0.310)   |
| policy             | 1.184***<br>(0.320)                    | 1.233***<br>(0.323)                        | 1.335***<br>(0.339)   | 1.330***<br>(0.387)               | 1.421***<br>(0.348)                               | 1.085**<br>(0.437)           | 1.306***<br>(0.334)  |
| sachs              | -0.0838<br>(0.726)                     | -0.130<br>(0.708)                          | -0.763<br>(0.819)     | -0.282<br>(0.678)                 | -0.194<br>(0.774)                                 | -0.549<br>(0.895)            | -0.367<br>(0.729)    |
| civwar             | -1.897**<br>(0.795)                    | -1.843**<br>(0.795)                        | -2.083**<br>(0.814)   | -1.684**<br>(0.833)               | -1.810**<br>(0.801)                               | -1.767*<br>(0.932)           | -1.882**<br>(0.829)  |
| Observations       | 403                                    | 388  | 397                   | 367                               | 360   | 280                          | 352                  |
| No. of countries   | 112                                    | 110  | 112                   | 109                               | 108   | 92                           | 108                  |
| Hansen (p-value)   | 0.173                                  | 0.180                                      | 0.0279                | 0.0443                            | 0.0316  | 0.657                        | 0.747                |
| AR1 test (p-value) | 0.00320                                | 0.00336                                    | 0.000959              | 0.00574                           | 0.00855   | 0.00554                      | 0.00366              |
| AR2 test (p-value) | 0.166                                  | 0.116                                      | 0.117                 | 0.183                             | 0.0844  | 0.521                        | 0.756                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: GDP per capita growth

Instrumenting for GDP per capita growth at (t-1)

**Table 4: Difference GMM, dependent variable ln(GDP per capita)**

|                    | (1)                                    | (2)  | (3)                   | (4)                           | (5)   | (6)                       | (7)                   |
|--------------------|--|--|-----------------------|-------------------------------|---|---------------------------|-----------------------|
|                    | Social<br>Infrastructure<br>& Services | Economic<br>Infrastructure<br>And Services | Production<br>Sectors | Multisector/C<br>ross-cutting | Commodity<br>Aid/General<br>Program<br>Assistance | Action Related<br>to Debt | Humanitarian          |
| L.lnpgdp           | 0.721***<br>(0.213)                    | 0.805***<br>(0.233)                        | 0.496**<br>(0.203)    | 0.583***<br>(0.178)           | 0.699***<br>(0.189)                               | 1.018***<br>(0.220)       | 0.649***<br>(0.243)   |
| L.lnaid            | 0.00885<br>(0.00974)                   | 0.0212<br>(0.0133)                         | 0.00518<br>(0.0158)   | 0.0173*<br>(0.00893)          | 0.00538<br>(0.0102)                               | 0.000429<br>(0.00410)     | 0.00829*<br>(0.00478) |
| L.lninitpgdp       | -0.121<br>(0.144)                      | -0.149<br>(0.160)                          | 0.0327<br>(0.133)     | -0.0561<br>(0.122)            | -0.111<br>(0.110)                                 | -0.323**<br>(0.148)       | -0.0726<br>(0.160)    |
| L.lninfl           | 0.0468<br>(0.0446)                     | 0.0447<br>(0.0395)                         | 0.0321<br>(0.0430)    | 0.0418<br>(0.0392)            | 0.0437<br>(0.0391)                                | 0.0567<br>(0.0394)        | 0.0224<br>(0.0359)    |
| L.lnpop            | -0.665**<br>(0.270)                    | -0.650**<br>(0.269)                        | -0.796***<br>(0.286)  | -0.979***<br>(0.275)          | -0.837***<br>(0.256)                              | -0.501<br>(0.309)         | -0.875***<br>(0.295)  |
| policy             | 0.0408**<br>(0.0160)                   | 0.0380**<br>(0.0153)                       | 0.0398**<br>(0.0160)  | 0.0327**<br>(0.0144)          | 0.0444**<br>(0.0176)                              | 0.0336<br>(0.0215)        | 0.0517***<br>(0.0130) |
| sachs              | -0.0668**<br>(0.0309)                  | -0.0404<br>(0.0299)                        | -0.0712**<br>(0.0325) | -0.0583*<br>(0.0309)          | -0.0650**<br>(0.0322)                             | -0.0501<br>(0.0450)       | -0.0730**<br>(0.0294) |
| civwar             | -0.0916**<br>(0.0418)                  | -0.0908**<br>(0.0410)                      | -0.0894**<br>(0.0419) | -0.0797**<br>(0.0393)         | -0.0871**<br>(0.0389)                             | -0.113**<br>(0.0458)      | -0.0758**<br>(0.0352) |
| Observations       | 254                                    | 246  | 249                   | 227                           | 225   | 163                       | 209                   |
| No. of countries   | 84                                     | 82   | 85                    | 81                            | 78  | 64                        | 77                    |
| Hansen (p-value)   | 0.250                                  | 0.600                                      | 0.384                 | 0.170                         | 0.375   | 0.389                     | 0.354                 |
| AR1 test (p-value) | 0.185                                  | 0.124                                      | 0.717                 | 0.825                         | 0.287   | 0.141                     | 0.427                 |
| AR2 test (p-value) | 0.243                                  | 0.139                                      | 0.303                 | 0.345                         | 0.294   | 0.592                     | 0.427                 |

Robust standard err

\*\*\* p<0.01, \*\* p<0.0

Dependent variable: ln(GDP per capita)

Instrumenting for: ln(GDP per capita) at (t-1)

**Table 5: 2SLS, dependent variable GDP per capita growth**

|                  | (1)                                    | (2)  | (3)                   | (4)                           | (5)   | (6)                       | (7)                 |
|------------------|--|--|-----------------------|-------------------------------|---|---------------------------|---------------------|
|                  | Social<br>Infrastructure &<br>Services | Economic<br>Infrastructure<br>And Services | Production<br>Sectors | Multisector/Cr<br>oss-cutting | Commodity<br>Aid/General<br>Program<br>Assistance | Action Related<br>to Debt | Humanitarian        |
| L.gpcgdp         | 0.233*<br>(0.124)                      | 0.214*<br>(0.125)                          | 0.185<br>(0.119)      | 0.183<br>(0.136)              | 0.227<br>(0.139)                                  | 0.154<br>(0.148)          | 0.211<br>(0.130)    |
| L.lnaid          | -0.204<br>(0.138)                      | 0.0987<br>(0.148)                          | -0.00139<br>(0.129)   | 0.0141<br>(0.147)             | 0.0878<br>(0.0825)                                | -0.0492<br>(0.0611)       | 0.143**<br>(0.0722) |
| L.lninitpcgdp    | -0.346<br>(0.238)                      | 0.120<br>(0.240)                           | -0.0128<br>(0.238)    | 0.0435<br>(0.244)             | 0.139<br>(0.166)                                  | 0.229<br>(0.159)          | 0.265<br>(0.174)    |
| L.lninfl         | 0.962<br>(0.795)                       | 1.017<br>(0.752)                           | 0.870<br>(0.761)      | 0.842<br>(0.759)              | 1.005<br>(0.742)                                  | 0.730<br>(0.732)          | 0.750<br>(0.780)    |
| L.lnpop          | -0.0488<br>(0.127)                     | 0.157<br>(0.116)                           | 0.107<br>(0.121)      | 0.211<br>(0.129)              | 0.163<br>(0.110)                                  | 0.228*<br>(0.123)         | 0.229**<br>(0.116)  |
| policy           | 1.245***<br>(0.322)                    | 1.416***<br>(0.320)                        | 1.367***<br>(0.326)   | 1.349***<br>(0.307)           | 1.589***<br>(0.353)                               | 1.458***<br>(0.397)       | 1.332***<br>(0.342) |
| sachs            | 0.0603<br>(0.534)                      | -0.0405<br>(0.501)                         | -0.318<br>(0.549)     | 0.129<br>(0.482)              | -0.179<br>(0.511)                                 | -1.059<br>(0.779)         | -0.0463<br>(0.544)  |
| civwar           | -1.423*<br>(0.844)                     | -1.134<br>(0.794)                          | -1.610**<br>(0.808)   | -1.174<br>(0.781)             | -1.318<br>(0.820)                                 | -1.462*<br>(0.859)        | -1.146<br>(0.744)   |
| Observations     | 339                                    | 328  | 332                   | 310                           | 306   | 244                       | 298                 |
| R-squared        | 0.276                                  | 0.303                                      | 0.287                 | 0.295                         | 0.275   | 0.307                     | 0.279               |
| Hansen (p-value) | 0.212                                  | 0.436                                      | 0.342                 | 0.689                         | 0.557   | 0.282                     | 0.182               |
| Shea partial     | 0.2294                                 | 0.2139                                     | 0.2283                | 0.2004                        | 0.1742  | 0.2006                    | 0.1982              |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: GDP per capita growth

Instrumenting for: GDP per capita at (t-1)

Instruments: GDP per capita growth at (t-2), ln(initial GDP per capita at (t-2)), Egypt (0/1)

**Table 6: CRS breakdown by purpose codes**

|  |
|--|
| 110 EDUCATION  |
| 111 Education, Level unspecified                                   |
| 11110 Education policy and administrative management               |
| 11120 Education facilities and training                            |
| 11130 Teacher training   |
| 11181 Educational research   |
| 112 Basic education  |
| 11220 Primary education  |
| 11230 Basic Life Skills for youth and adults                       |
| 11240 Early childhood education                                    |
| 113 Secondary education  |
| 11320 Secondary education  |
| 11330 Vocational training  |
| 114 Post-secondary education                                       |
| 11420 Higher education   |
| 11430 Advanced technical and managerial training                   |
| 120 HEALTH   |
| 121 Health, general  |
| 12110 Health policy and administrative management                  |
| 12181 Medical education/training                                   |
| 12182 Medical research   |
| 12191 Medical Services   |
| 122 Basic Health   |
| 12220 Basic Health care  |
| 12230 Basic Health infrastructure                                  |
| 12240 Basic nutrition  |
| 12250 Infectious disease control                                   |
| 12281 Health education   |
| 12282 Health personnel development                                 |
| 130 POPULATION POLICIES/PROGRAMMES & REPROD. HEALTH                |
| 13010 Population policy and administrative management              |
| 13020 Reproductive Health care                                     |
| 13030 Family planning  |
| 13040 STD control including HIV/AIDS                               |
| 13081 Personnel development for population and reproductive Health |
| 140 WATER SUPPLY AND SANITATION                                    |
| 14010 Water resources policy and administrative management         |
| 14015 Water resources protection                                   |
| 14020 Water Supply and Sanitation                                  |
| 14030 Water Supply and Sanitation - Small Systems                  |
| 14040 River development  |
| 14050 Waste management/disposal                                    |
| 14081 Education and training in water Supply and Sanitation        |
| 150 GOVERNMENT AND CIVIL SOCIETY                                   |
| 15010 Economic and development policy/Planning                     |
| 15020 Public Sector financial management                           |
| 15030 Legal and judicial development                               |
| 15040 Government administration                                    |
| 15050 Strengthening civil Society                                  |
| 15061 Post conflict peace-building (UN)                            |
| 15062 Elections  |
| 15063 Human rights   |
| 15064 Demobilisation   |
| 15065 Free flow of information                                     |
| 15066 Land mine clearance  |
| 160 OTHER SOCIAL INFRASTRUCTURE AND SERVICES                       |
| 161 Employment   |

- 16110 Employment policy and administrative management
  - 162 Housing
- 16210 Housing policy and administrative management
- 16220 Low-cost Housing
  - 163 Other Social Services
- 16310 Social/ welfare Services
- 16320 General government Services
- 16330 Settlement
- 16340 Reconstruction relief
- 16350 Culture and recreation
- 16361 Narcotics control
- 16362 Statistical capacity building
- 16381 Research/scientific institutions
  - 210 TRANSPORT AND STORAGE
- 21010 Transport policy and administrative management
- 21020 Road transport
- 21030 Rail transport
- 21040 Water transport
- 21050 Air transport
- 21061 Storage
- 21081 Education and training in transport and Storage
  - 220 COMMUNICATIONS
- 22010 Communications policy and administrative management
- 22020 Telecommunications
- 22030 Radio/television/print media
  - 230 ENERGY GENERATION AND SUPPLY
- 23010 Energy policy and administrative management
- 23020 Power generation/non-renewable Sources
- 23030 Power generation/renewable Sources
- 23040 Electrical transmission/ distribution
- 23050 Gas distribution
- 23061 Oil-fired power plants
- 23062 Gas-fired power plants
- 23063 Coal-fired power plants
- 23064 Nuclear power plants
- 23065 Hydro-electric power plants
- 23066 Geothermal energy
- 23067 Solar energy
- 23068 Wind power
- 23069 Ocean power
- 23070 Biomass
- 23081 Energy education/training
- 23082 Energy research
  - 240 BANKING AND FINANCIAL SERVICES
- 24010 Financial policy and administrative management
- 24020 Monetary institutions
- 24030 Formal Sector financial intermediaries
- 24040 Informal/semi-formal financial intermediaries
- 24081 Education/training in banking and financial Services
  - 250 BUSINESS AND OTHER
- 25010 Business Services
- 25020 Privatisation
  - 311 AGRICULTURE
- 31110 Agricultural policy and administrative management
- 31120 Agricultural development
- 31130 Agricultural Land resources
- 31140 Agricultural water resources
- 31150 Agricultural inputs
- 31161 Food crop production

31162 Industrial crops/export crops  
 31163 Livestock  
 31164 Agrarian reform  
 31165 Agricultural alternative development  
 31181 Agricultural education/training  
 31182 Agricultural extension  
 31183 Agricultural research  
 31184 Livestock research  
 31191 Agricultural Services  
 31192 Plant and post-harvest protection and pest control  
 31193 Agricultural financial Services  
 31194 Agricultural co-operatives  
 31195 Livestock/veterinary Services  
     312 FORESTRY  
 31210 Forestry policy and administrative management  
 31220 Forestry development  
 31261 Fuelwood/charcoal  
 31281 Forestry education/training  
 31282 Forestry research  
 31291 Forestry Services  
     313 FISHING  
 31310 Fishing policy and administrative management  
 31320 Fishery development  
 31381 Fishery education/training  
 31382 Fishery research  
 31391 Fishery Services  
     321 INDUSTRY  
 32110 Industrial policy and administrative management  
 32120 Industrial development  
 32130 SME development  
 32140 Cottage industries and Handicraft  
 32161 Agro-industries  
 32162 Forest industries  
 32163 Textiles, Leather and Substitutes  
 32164 Chemicals  
 32165 Fertilizer plants  
 32166 Cement/lime/plaster  
 32167 Energy manufacturing  
 32168 Pharmaceutical production  
 32169 Basic metal industries  
 32170 Non-ferrous metal industries  
 32171 Engineering  
 32172 Transport equipment industry  
 32181 Technological research and development  
     322 MINERAL RESOURCES AND MINING  
 32210 Mineral/mining policy and administrative management  
 32220 Mineral prospection and exploration  
 32261 Coal  
 32262 Oil and gas  
 32263 Ferrous metals  
 32264 Nonferrous metals  
 32265 Precious metals/materials  
 32266 Industrial minerals  
 32267 Fertilizer minerals  
 32268 Offshore minerals  
     323 CONSTRUCTION  
 32310 Construction policy and administrative management  
     331 TRADE  
 33110 Trade policy and administrative management

33120 Wholesale/retail trade  
 33130 Export promotion  
 33140 Multilateral trade negotiations  
 33181 Trade education/training  
 332 TOURISM  
 33210 Tourism policy and administrative management  
 400 MULTISECTOR/CROSS-CUTTING  
 410 General environmental protection  
 41010 Environmental policy and administrative management  
 41020 Biosphere protection  
 41030 Bio-diversity  
 41040 Site preservation  
 41050 Flood prevention/control  
 41081 Environmental education/ training  
 41082 Environmental research  
 420 Women in development  
 42010 Women in development  
 430 Other multisector  
 43010 Multisector aid  
 43020 Multisector aid for basic Social Services  
 43030 Urban development and management  
 43040 Rural development  
 43050 Non-agricultural alternative development  
 43081 Multisector education/training  
 500 COMMODITY AID AND GENERAL PROGRAMME ASSISTANCE  
 510 Structural Adjustment Assistance with World Bank/IMF  
 51010 Structural adjustment  
 520 Developmental food aid/Food Security assistance  
 52010 Food aid/Food Security programmes  
 530 Other general programme and commodity assistance  
 53010 Balance-of-payments Support  
 53020 Budget Support  
 53030 Import Support (capital goods)  
 53040 Import Support (commodities)  
 600 ACTION RELATING TO DEBT  
 60010 Action relating to debt  
 60020 Debt forgiveness  
 60030 Relief of multilateral debt  
 60040 Rescheduling and refinancing  
 60061 Debt for development Swap  
 60062 Other debt Swap  
 60063 Debt buy-back  
 700 EMERGENCY ASSISTANCE  
 710 Emergency food aid  
 71010 Emergency food aid  
 720 Other emergency and distress relief  
 72010 Emergency/distress relief  
 72020 Aid to refugees (in donor country)  
 72030 Aid to refugees (in recipient countries)  
 910 ADMINISTRATIVE COSTS OF DONORS  
 91010 Administrative costs  
 920 SUPPORT TO NON-GOVERNMENTAL ORGANISATIONS  
 92010 Support to national NGOs  
 92020 Support to international NGOs  
 92030 Support to local and regional NGOs  
 998 UNALLOCATED/ UNSPECIFIED  
 99810 Sectors not Specified  
 99820 Promotion of development awareness  
 16030 HOUSING POLICY AND ADMIN. MANAGEMENT

15150 STRENGTHENING CIVIL SOCIETY  
15140 GOVERNMENT ADMINISTRATION  
16020 EMPLOYMENT POLICY AND ADMIN. MGMT.  
15140 GOVERNMENT ADMINISTRATION  
16061 CULTURE AND RECREATION  
16010 SOCIAL/WELFARE SERVICES  
43082 RESEARCH/SCIENTIFIC INSTITUTIONS  
15120 PUBLIC SECTOR FINANCIAL MANAGEMENT  
72040 EMERGENCY FOOD AID  
15110 ECONOMIC AND DEVELOPMENT POLICY/PLANNING  
32182 TECHNOLOGICAL RESEARCH & DEVELOPMENT  
15164 WOMEN'S EQUALITY ORGANISATIONS AND INSTITUTIONS  
16040 LOW-COST HOUSING  
12261 HEALTH EDUCATION  
73010 RECONSTRUCTION RELIEF  
31166 AGRICULTURAL EXTENSION  
93010 REFUGEES IN DONOR COUNTRIES  
15230 POST-CONFLICT PEACE BUILDING (UN)  
15163 FREE FLOW OF INFORMATION  
15130 LEGAL AND JUDICIAL DEVELOPMENT  
15162 HUMAN RIGHTS  
15250 LAND MINE CLEARANCE  
15161 ELECTIONS  
16063 NARCOTICS CONTROL  
15210 SECURITY SYSTEM MANAGEMENT AND REFORM  
16050 MULTISECTOR AID FOR BASIC SOC. SERV.  
11182 EDUCATIONAL RESEARCH  
16062 STATISTICAL CAPACITY BUILDING  
15240 REINTEGRATION AND SALW CONTROL  
12262 MALARIA CONTROL  
12263 TUBERCULOSIS CONTROL  
22040 INFORMATION AND COMMUNICATION TECHNOLOGY  
15220 CIVILIAN PEACE-BUILDING, CONFLICT PREVENTION AND RESOLUTION  
16064 SOCIAL MITIGATION OF HIV/AIDS  
15261 CHILD SOLDIERS (PREVENTION AND DEMOBILISATION)  
74010 DISASTER PREVENTION AND PREPAREDNESS  
72050 RELIEF CO-ORDINATION; PROTECTION AND SUPPORT SERVICES  
33150 TRADE-RELATED ADJUSTMENT

**Table 7: Summary statistics**

|  | Obs  | Mean       | Std. Dev.  | Min    | Max           |
|--|------|------------|------------|--------|---------------|
| Education                                | 927  | 0.67       | 1.4        | 0      | 17.97         |
| Health                                   | 927  | 0.41       | 0.99       | 0      | 20.37         |
| Population/reproductive health           | 927  | 0.14       | 0.45       | 0      | 6.83          |
| Water supply and sanitation              | 927  | 0.45       | 0.83       | 0      | 10.14         |
| Government and civil society             | 927  | 0.61       | 1.96       | 0      | 36.26         |
| Other social infrastructure and services | 927  | 0.24       | 0.65       | 0      | 9.35          |
| Transport and storage                    | 927  | 0.94       | 1.57       | 0      | 12.52         |
| Communications                           | 927  | 0.15       | 0.41       | 0      | 4.45          |
| Energy                                   | 927  | 0.48       | 2.79       | 0      | 82.26         |
| Banking, financial services, business    | 927  | 0.18       | 0.49       | 0      | 7.31          |
| Agriculture, forestry, and fishing       | 927  | 1.2        | 2.28       | 0      | 31.88         |
| Industry, mining, and construction       | 927  | 0.26       | 0.57       | 0      | 5.34          |
| Trade policies and regulation/tourism    | 927  | 0.05       | 0.16       | 0      | 1.71          |
| Multisector/cross-cutting                | 927  | 0.75       | 1.46       | 0      | 16.58         |
| Commodity aid/general program assistance | 927  | 1.54       | 2.91       | 0      | 36.28         |
| Action relating to debt                  | 927  | 0.49       | 1.98       | 0      | 37.15         |
| Humanitarian aid                         | 927  | 0.57       | 3.2        | 0      | 65.49         |
| Other                                    | 927  | 0.22       | 0.62       | 0      | 9.11          |
| GDP                                      | 1253 | 123,412    | 625,882    | 24.77  | 12,400,000    |
| ln(1+inflation)                          | 1280 | 0.13       | 0.26       | -0.17  | 2.66          |
| Per capita GDP                           | 1508 | 5,586.63   | 8,635.10   | 73.76  | 66558.68      |
| Per capita GDP growth                    | 1490 | 2.03       | 4.24       | -25.82 | 47.97         |
| Aid per capita                           | 1050 | 7.5        | 10.57      | -0.33  | 96.66         |
| Population                               | 1989 | 23,400,000 | 94,400,000 | 12,395 | 1,300,000,000 |
| ICRG                                     | 655  | 2.95       | 1.17       | 0.33   | 5.56          |
| Civil war                                | 2230 | 0.04       | 0.18       | 0      | 1             |
| Sachs                                    | 1456 | 0.32       | 0.46       | 0      | 1             |
| arms                                     | 906  | 0.06       | 0.19       | -0.6   | 3.56          |
| Life expectancy                          | 1909 | 62.12      | 11.49      | 31.08  | 82.19         |
| Initial per capita GDP                   | 1281 | 5,148.46   | 7,895.62   | 77.87  | 54,622        |
| ln(per capita GDP)                       | 1508 | 7.53       | 1.56       | 4.3    | 11.11         |
| ln(life expectancy)                      | 1909 | 4.11       | 0.2        | 3.44   | 4.41          |
| ln(Initial per capita GDP)               | 1281 | 7.46       | 1.55       | 4.36   | 10.91         |
| ln(population)                           | 1989 | 14.98      | 2.16       | 9.43   | 20.99         |
| Policy                                   | 716  | 0.12       | 0.82       | -4.14  | 2.75          |

**Table 8: Metadata**

| <b>Variable</b> | <b>Source</b>  |
|-----------------|--|
| Sectoral aid    | CRS database, 2009, OECD                                       |
| Aggregate aid   | DAC database, 2009, OECD                                       |
| GDP             | WDI database, 2009, World Bank                                 |
| Inflation       | WDI database, 2009, World Bank                                 |
| Per capita GDP  | WDI database, 2009, World Bank                                 |
| Population      | WDI database, 2009, World Bank                                 |
| Life expectancy | WDI database, 2009, World Bank                                 |
| ICRG            | PRS Group, 2009  |
| Civil war       | Roodman 2007   |
| Sachs           | Wacziarg and Welch 2003  |
| Arms            | World Military Expenditures and Arms Transfers, Dept. of State |
| Life expectancy | WDI database, 2009, World Bank                                 |
| Overall balance | IFS database, 2009, IMF  |



## **Aid and Trade?**

As many high income countries continue to send billions of dollars in aid to developing countries, it is important to ask whether or not aid has an impact on a country's growth. Thus far, the key dependent variable in most cross-country regressions in the aid/growth has been GDP (or GDP per capita) growth. This paper offers an alternative to the standard approach by looking at periods of high aid inflows. These "episodes" – defined in this case as at least two consecutive years of net aid inflows of 2.5 percent of GDP (of the recipient country) or more each year – are used as an alternative to build the dataset. By defining an "episode" ex-ante, I establish a "before" and "after," thus making clear the direction of causality between macroeconomic variables and partially addressing the common problem of endogeneity of aid. In this dataset, which utilizes data from 1960-2007, there are 88 different "episodes" for 54 countries (with some countries having more than one "episode.") The result is that aid tends to have a positive impact on countries that are less "open." This affirms conclusions from some previous literature about the important relationship between the effectiveness of aid on growth and trade/openness.

## **Introduction**

“In the developed world, the great questions of growth and poverty are inseparable from debates about aid. Many believe foreign aid can help raise growth and fight poverty.”

- *The Growth Report: Strategies for Sustained Growth and Inclusive Development*

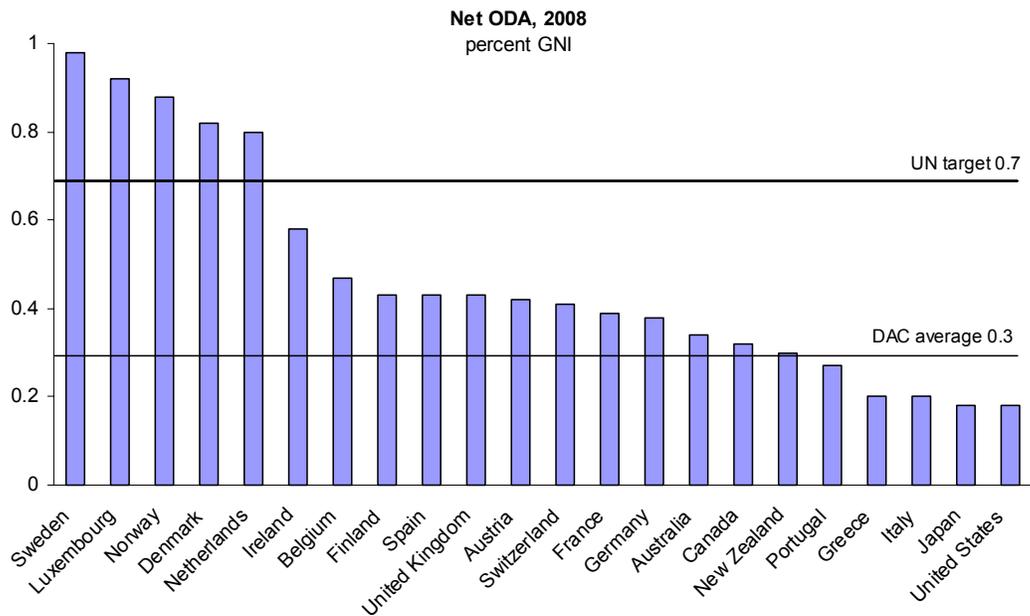
Aid flows make up a very small part of financial inflows for most countries. But some countries, those who may have limited access to other types of flows, rely heavily on assistance from high-income countries. In 2008, aid flows from DAC members to developing countries reached \$119.8 billion, the highest dollar figure ever recorded (OECD). And, as high-income countries continue to pump billions of dollars into the developing world in the form of aid, policymakers and academics ask if their efforts make a difference and in what form. One important question is: do aid (in)flows lead to growth?

## **Motivation**

There has been a renewed interest in the topic of growth. This has partially been aided by the recently released *Growth Report*, which brought together key intellectuals through their research, workshops, and many publications on the topic. One of the main questions guiding their journey continues to be: what factors lead countries to sustainable growth? The publication highlights key results from major strands of this literature.

The motivation for this research is two-fold. First of all, there is an empiric reason. Aid flows continue to be a mechanism of interaction between the developed and developing world. In light of the current economic crisis, aid flows become even more important as developing countries are also strained and further isolated from global integration through reduced access to liquidity and a slowing of trade flows. World trade is experiencing its largest decline since 1929, and exports of low-income countries continue to fall. Many countries, especially those defined as low-income or least developed countries, rely heavily on aid flows. In 2007, thirty percent of the aid recipient countries received aid that was 10 percent of their GNI or greater. These figures are quite significant.

DAC countries often speak about the goal of giving at least 0.7 percent of their GNI in aid. In 2008, five countries (Denmark, Luxembourg, the Netherlands, Norway, and Sweden) actually reached it.



In addition, aid flows have only increased over time and will probably continue to do so in these years that follow this most recent economic crisis and post Gleneagles G8 and UN Millennium +5 summits, which occurred in 2005. In 2008, total net official development assistance from DAC members rose by 10.2 percent in real terms. They have increased three-fold since 1960, up from \$36.3 billion.

An analytical reason also motivates this research. There has been intense theoretical debate on this topic, all of which emerge from the neoclassical growth literature. Hristos Doucouliagos and Martin Paldam capture the results of the debate in their paper entitled “The Aid Effectiveness Literature: The Sad Result of 40 Years of Research.” Through their meta-analysis on 97 studies, they find that studies of the effect on investments show that aid increases accumulation by about 30 percent (of aid), while the rest leads to an increase in

public consumption. Studies of the effect of growth show an insignificant positive effect, and studies of the effect on growth, conditional on something else, have shown weak results. In sum, when aggregating the studies that focus on aid and growth, there does not appear to be any strong result or key message. And, until now, standard practice has been to conduct cross-country analysis to determine the effects of aid on growth. [Please see below for an in-depth literature review.] In most cases, the basis for analysis regressions have been run using panel data with aid as the independent variable and growth as the dependent. The panel database has been constructed based on either four or five year averages.

This research proposes improvements in the methodology, which is based on the paper “Riduzione delle imposte e crescita economica nei Paesi Industrializzati” (2002), written by Daveri and De Romanis. The novelty of their approach is that they use episodes – as an alternative to a panel data – to construct their dataset. By defining an “episode” ex-ante, they are able to establish a “before” and “after,” thus making clear the direction of causality between the macroeconomic variables and helping to address the problem of endogeneity (also dealt with statistically, see below for a detailed explanation).

This paper follows a similar approach. An “episode” is defined as at least two consecutive years of net aid inflows of 2.5 percent of GDP (of recipient country) or greater in each year. In addition to being a convenient cut-off, it is also based on the median of countries with available data. For the period 1960-2007, the years with aid data, 77 countries have an average aid to GDP ratio of less than five percent, while 69 have more.

In addition to introducing a new dependent variable through the “episode approach” – the change in GDP before and after the episodes – this research also adds some data improvements to the existing literature. First of all, recently released 2008 aid data from the OECD’s DAC database is utilized as well as new World Bank estimates, including population and GDP, which were released in May.

Finally, an alternative independent variable for openness – taken from the Penn World Tables – is used. There are data problems with many of the policy indicators used in the past, and therefore they may not be appropriate for aid/growth regressions. The ICRG institutional quality indicator, most often used, only goes back to 1985 even though aid data are available from the OECD from 1960. Common praxis has been to use the 1985 value for all preceding years, although it is plausible to imagine that the institutional quality of a country changes over time, especially in a period of 25 years. In addition, the composite indicator was made up of five component parts. Recently it has been reduced to three: bureaucratic quality, corruption, and law and order. Thus it makes it difficult to compare results of other research without comparing apples to oranges. Sachs and Warner is also often used. The indicator/concept come from a paper written in 1995, and the data are therefore through 1992. No FSU countries are included, therefore key information may be left out an analysis using this indicator. Wacziarg and Welch attempted to update the data, albeit imposing a new definition of “openness.” The World Bank’s CPIA (Country Policy and Institutional Assessment) has also been used. Ratings are only available for IDA countries and therefore the poorest countries. We know, however, that a large part of aid also goes to middle-income countries. Therefore the Penn World Tables openness indicator may be more appropriate as a policy indicator.

### **Background literature**

There has been significant theoretical debate on whether aid flows lead to growth, all of which emerge from the neoclassical growth literature. Chenery and Strout (1966) were pioneers by introducing aid into a growth model. In their “two-gap” model, they find that aid has no effect on steady state capital stock and output but accelerated the pace of transition and raised consumption by the full amount of the aid inflow.

Clemens, Radelet, and Bhavnani (2004) neatly break down the aid literature into four major phases [see their paper, now referred to as CRB, for a very detailed literature review]. Most attention here will be dedicated to phase four, where considerable academic novelty has occurred in recent years. Within these phases, however, there are researchers that find that aid

leads to growth, those who find it does not, and those that find it has a conditional impact. Hence the jury is still out.

**Phase one** is quite general and attempts to model the relationship between capital inflows – the sum of foreign aid, foreign borrowing, and foreign investment – and growth. Key representatives this phase include Griffin (1970), Griffin and Enos (1970), and Weisskopf (1972). Instead they used the framework that if present consumption is a normal good, then foreign resources should lead to a rise in consumption. Their statistical results show that “foreign assistance” was negatively correlated with growth. They did not look specifically at aid, however, but instead at foreign borrowing/inflows from the current account balance.

**Phase two** is the first attempt to specifically introduce aid into a growth model growth. A typical model from this wave of thinking, developed by Papanek (1973) is represented as the following:

$$\dot{y}_{i,t}/y_{i,t} = \alpha + \beta d_{i,t}^{net} + X_{i,t}\eta + \varepsilon_{i,t}$$

Where  $y_{i,t}$  is income per capita in country  $i$  at time  $t$ ,  $d_{i,t}^{net}$  is net disbursements of aggregate aid,  $X_{i,t}$  is a vector of country characteristics,  $\alpha$  and  $\beta$  are constants,  $\eta$  is a vector of constants,  $\varepsilon_{i,t}$  is white noise, and a superscript dot represents the derivative with respect to time.

Papanek’s novelty to the research is that he separates aid from other types of foreign capital and becomes the first to regress growth on aid. He finds that there is a strong negative correlation between domestic savings and foreign aid, caused by exogenous factors affecting both.

**Phase three** begins with Mosley (1980), who attempts to show the direction of causality by instrumenting for aid. His model was

$$\dot{y}_{i,t}/y_{i,t} = \alpha + \beta d_{i,t}^{net} + X_{i,t}\eta + \varepsilon_{i,t}$$

$$d_{i,t}^{net} = Z_{i,t}\zeta + \nu_{i,t}$$

Where  $Z_{i,t}$  is a vector of exogenous instruments,  $\zeta$  is a vector of constants, and  $\nu_{i,t}$  is white noise. He finds a negative but insignificant effect of aid on growth, however. Other academics who belong to this phase are Gupta and Islam (1983), Levy (1988), Singh (1985). The most well-known from this period is Boone (1994, 1996), who concludes that aid has no impact on growth.

**Phase four** is the most significant in sophistication of techniques and use of data. Most importantly, however, as shown in CRB (2004), the field splinters into three parts: those who find that aid has a positive albeit conditional impact on growth (“conditional strand”), those who find that aid has on average a positive impact on growth (“unconditional strand”), and those that find that, given certain conditions, aid can have a positive impact on growth (“all aid is not alike strand”).

#### *Conditional*

The main conclusion from this strand is that, on average, aid has a positive effect on growth. The novelty of this group is that they introduce some country characteristics on which aid depends, including a wide range of interacted terms. The most well known from this group is Burnside and Dollar (2000 and updated in 2004), which concludes that aid has a greater impact on countries with good institutions. Other variables have included inflation, budget balance, and “openness” (Burnside and Dollar 2000, Kudlyak 2002); export price shocks (Collier and Dehn 2001); climatic shocks and volatility in terms of trade (Guillaumont and Chauvet 2001, 2002); policy and institutional quality (Collier and Dollar 2002); policy and warfare (Collier and Hoeffler 2002); ‘totalitarian’ governments (Islam 2003); an index of economic freedom (Ovaska 2003); tropics (Dalgaard, Hansen, and Tarp 2004); and

fungability of aid (Pettersson 2004). A generic model from this strand may look like the following:

$$\begin{aligned}\dot{y}_{i,t}/y_{i,t} &= \alpha + \beta d_{i,t}^{net} + \gamma q_{i,t} + \delta (d_{i,t}^{net} \times q_{i,t}) + X_{i,t}\eta + \theta \ln y_{i,t} + \varepsilon_{i,t} \\ d_{i,t}^{net} &= Z_{i,t}\zeta + \nu_{i,t}\end{aligned}$$

Where  $q_{i,t}$  is a country characteristic on which the effect of aid depends.  $\gamma$  and  $\delta$  are constants. In many of these papers, the positive effect of aid falls out when  $\delta$  is zero.

### *The unconditional strand*

This strand concludes that, although aid does not necessarily have the same effect everywhere, it does have a positive impact on growth. This line of thinking introduces a nonlinear relationship between aid and growth, which is therefore subject to diminishing returns. A possible model from this strand might be:

$$\begin{aligned}\dot{y}_{i,t}/y_{i,t} &= \alpha + \beta d_{i,t}^{net} + \lambda (d_{i,t}^{net})^2 + X_{i,t}\eta + \theta \ln y_{i,t} + \varepsilon_{i,t} \\ d_{i,t}^{net} &= Z_{i,t}\zeta + \nu_{i,t}\end{aligned}$$

Hadjimichael et al. (1995) uses the GLS technique. Dalgaard and Hansen (2000) instrument for aid. Hansen and Tarp (2000, 2001) use the GMM estimator in an aid growth regression.

### *“All aid is not alike”*

This strand focuses on the aid variable. Up until now, most papers have used Official Development Assistance (ODA) from the DAC OECD. And, in most cases, it has been net flows. Aid, however, includes many types of flows, and can come in the form of humanitarian aid, technical assistance, or even flows for infrastructure. Burnside and Dollar (2000) slightly modify this term and instead use DRS (External Debt Reporting System) data from the World

Bank that adds grant components of concessional loans to outright grants. In addition, they use GDP PPP.

CRB reason that aid has both short- and long-term effects. The effects of most aid flows are only seen in the long-term. As a result, they claim, the standard practice in the aid-growth literature of looking at aid's impact on growth over four year periods may not be the most appropriate. And, expanding the periods – as several academics have attempted to do (Easterly 2003, Mosley, Gupta and Islam, Levy) – may lead to more uncontrolled noise. So CRB break aid down into three groups: short-impact aid (budget support or “program” aid), long-impact aid (technical cooperation and social sector investments), and humanitarian aid (emergency assistance and food aid). They use CRS data and commitments as a proxy for disbursements because it has a fairly fine breakdown of flows by purpose. Their model is as follows:

$$\begin{aligned}\dot{y}_{i,t}/y_{i,t} &= \alpha + \beta^s d_{i,t}^s + \beta^l d_{i,t}^l + \beta^h d_{i,t}^h + \beta^r \ln r_{i,t} + S_{i,t}\lambda + X_{i,t}\eta + \theta \ln y_{i,t} + \varepsilon_{i,t} \\ d_{i,t}^{net} &= Z_{i,t}\zeta + \nu_{i,t},\end{aligned}$$

Where  $d_{i,t}^s$  is gross disbursements of “short impact” aid,  $d_{i,t}^l$  is gross disbursements of “long impact” aid,  $d_{i,t}^h$  is gross disbursements of “humanitarian” aid, and  $r_{i,t}$  is gross repayments on aid. Thus:

$$d_{i,t}^{net} = d_{i,t}^s + d_{i,t}^l + d_{i,t}^h - r_{i,t}$$

They find that the impact of “short-term” aid is at least two to three times larger than in studies using aggregated aid. At the mean, a \$1 increase in short-impact aid raises output (and income) by \$1.64 in present value in the typical country. Their results are highly significant, even when put up to several tests.

## **Data and methodology**

As stated above, one of the novelties of this research is using episodes to build the dataset as an alternative to the standard practice of panel datasets. In order to do so, I used (real) net aid flows from the OECD's DAC database for the numerator and (real) GDP from the World Bank's World Development Indicators database for the denominator. I then determined which countries received large aid flows, in this case defined as at least two consecutive years of at least 2.5 percent of GDP in each year. This threshold is high enough to truly capture the aid inflows rather than changes in GDP. There are a total of 88 episodes and 54 countries (some countries having more than one episode). Please see table 1 for the complete list. I then calculated the least squares growth rates for GDP in the three years before and after the episodes and then found the change between the two periods. This is my dependent variable. Initially I regressed the aid variable (change in aid during the episode) on GDP growth in the three years prior to the episode of high aid flows while controlling for selected policy and economic variables.

Although this leads to interesting results (see below), conclusions must be taken with caution. As similar research has already addressed, the problem of endogeneity exists. It is not implausible to imagine that aid flows increase precisely when GDP slows down (or vice versa). Countries that may not have access to private financial flows – including FDI – or trade may have to rely on aid flows. This will certainly be reflected in GDP. I have also used two-stage least squares in order to properly address issues of endogeneity. The instrumental variables, which include characteristics of geography and culture, come from the growth/aid literature (Burnside and Dollar, 2004; Hall and Jones, 1999). These are appropriately used for this purpose, especially when placed into a historical context. As Hall and Jones (1999) explain, the expansion of Western European countries in the past centuries has varied, therefore we can take their influence as exogenous. One can easily make the conclusion that a country's historic – often colonial – past plays a part in the aid it receives today. Not surprising that the United Kingdom's largest aid recipient in 2007 (most recent year available) was India. Nor is it difficult to imagine that Cameroon and Algeria are France's second and

third largest recipients in 2007 (after Iraq). More formal tests are available below to show the robustness of the instruments. The language variables include the fraction of a country's population speaking one of the five primary Western European languages – English, French, German, Portuguese, and Spanish – as a mother tongue, and the fraction speaking English as a mother tongue (Burnside and Dollar, 2004; updated with data from <http://www.ethnologue.com/>). The geographical variable is distance from the equator to the capital city.

One of the main conclusions – and the greatest debates – that have come out of the most recent aid literature is that aid can have a positive impact on growth conditional on the fact of certain existing country characteristics. There has been a fairly common set of indicators that have been used in this strand, albeit sometimes with different sources of the data. In keeping with the literature, I have used the following indicators as additional independent variables:

### ***Policy indicator***

- *Openness*. This indicator comes from Penn World Table (version 6.2). It is a measure of real trade, thus imports plus exports, divided by GDP. PWT openness has not been widely used in the literature and is therefore a novelty to the aid/growth literature. Years include 1950-2004.

### ***Macroeconomic indicators***

- *Inflation*. Following Fischer (1993), inflation serves as a measure of monetary policy. Similar to Roodman (2007), I used the CPI from the World Development Indicators 2009 database.
- *Overall balance*. The measurement of budget surplus came primarily from the International Monetary Fund's Government Finance Statistics. Recently, however, the IMF shifted from the 1986 to the 2001 GFS manual. Because the institution has not

yet been able to reconcile the series from the two systems, government data are now only available from 1990. Therefore, I used overall balance from the IMF's International Finance Statistics, which takes the information from the Balance of Payments.

- *Investment*. This is the investment share of real GDP, and it comes from Penn World Table (version 6.2). Years include 1950-2004.

I have converted all of my variables from levels to changes in levels. We are assuming that growth is a function of aid, therefore:

$$Y = Af(\beta)$$

Where Y equals growth, A represents efficiency, and  $\beta$  is savings/capital. If we are interested in the change in growth, then as a result we must look at the change in the other variables:

$$\Delta g = \alpha \Delta \text{aid} + \beta \Delta \text{inflation} + \gamma \Delta \text{openness} \dots$$

Therefore all variables are changes in levels.

### ***Episodes***

Table 1 includes key summary information. Included is a list of countries with episodes, the length of the episode, and the corresponding GDP growth rates in the period before and after the episodes. There are a total of 88 episodes. Sub-Saharan Africa had the largest number of episodes, followed by Latin America and the Caribbean and East Asia and Pacific.

**BY REGION**

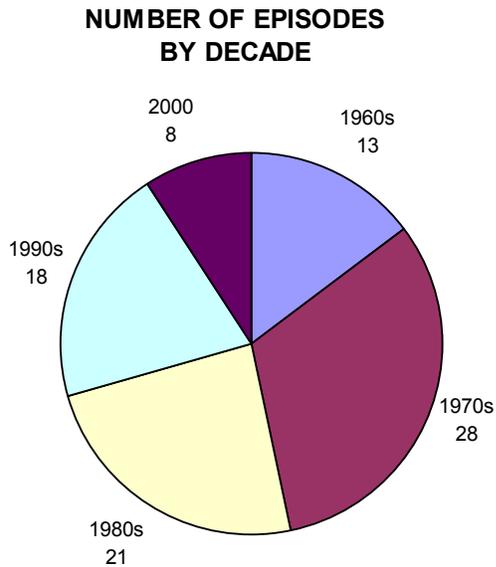
|                           | <b>Number of episodes</b> | <b>Number of countries</b> |
|---------------------------|---------------------------|----------------------------|
| East Asia and Pacific     | 12                        | 9                          |
| Europe and Central Asia   | 5                         | 5                          |
| Latin American and Carib. | 13                        | 8                          |
| Middle East and N. Africa | 2                         | 2                          |
| South Asia                | 2                         | 2                          |
| Sub Saharan Africa        | 54                        | 28                         |
| <i>Total</i>              | <i>88</i>                 | <i>54</i>                  |

Not surprising, the poorest nations – low income countries – had 54 episodes. Twenty-five episodes took place in lower-middle income countries, and the rest in upper-middle income nations.

**BY INCOME**

|                     | <b>Number of episodes</b> | <b>Number of countries</b> |
|---------------------|---------------------------|----------------------------|
| Low income          | 54                        | 30                         |
| Middle income       | 34                        | 24                         |
| Lower middle income | 25                        | 18                         |
| Upper middle income | 9                         | 6                          |
| High income         | 0                         | 0                          |
| <i>Total</i>        | <i>88</i>                 | <i>54</i>                  |

And the majority of the episodes took place in the 1970s and 1980s



With the oil crisis of the 1970s and its aftermath, historically this seems reasonable to imagine.

## Results

### *OLS*

Although far from reliable, the OLS equations help us understand some general patterns in the data. Results from a simple OLS regression are not surprising: aid as the key independent dependent variable produces positive and significant results (at the 5 percent level), albeit with a small R-squared and coefficients (table 2, regression 1). I then added both economic and policy indicators to try to improve the explanatory power of my regression equations. The change in aid remains positive and significant at the 10 percent level, but the economic indicators are insignificant when added to the equation.

Returning to the effectiveness of aid with strong policies, I then added the new variable of openness (table 2, regression 3). Change in aid remains significant and positive, and change in openness is significant and negative. Both are significant at the five percent level. This

enforces the idea the policies play a role, yet the negative coefficient adds an interesting new result.

One other significant result emerges. Many studies in the conditional strand interact variables to broaden the explanation of aid on a country's growth. Does the presence of both policy and aid – in this case with the interaction of aid and openness – make a difference on a country's growth rate, as seen in many recent studies in the conditional strand literature (see Burnside and Dollar, Collier and Dollar, Hansen and Tarp, etc.)? The answer with our basic OLS instruments: no (table 2, regressions 3 and 5-7). The results were not significant when using the openness indicator.

#### *Robustness check: Two-Stage Least Squares Growth Regressions*

As explained above, however, the right hand side of the equation should be considered endogenous. Therefore we should be skeptical of the OLS results above. They do give us some broad insights into the data. In order to properly address the regression's endogeneity, we must instrument for aid. As stated above, the three instruments used are the fraction of a country's population speaking one of the five primary Western European languages, the fraction speaking English as a mother tongue, and a capital city's latitude.

Different from the OLS results, aid – this time properly instrumented – is insignificant (table 3, regression 1). Although our instruments have low P-values, the F statistic is low, as is the Shea partial and the Hansen J statistic. Please see table five for first stage regression results. Even more important, however, aid is not significant in stage two of the regression. The results are similar in the second regression, which includes all of the economic indicators: overall balance, investment, and inflation. In addition, none of the instruments are significant at the 10 percent level in the first stage.

The sixth regression (table 3) – which includes the openness variable – reveals interesting results. In the regression, both aid and openness are significant at a 5 percent level. Aid has a positive coefficient, while openness is negative. Inflation, albeit with a positive coefficient, is not significant.

In addition, it is robust because it satisfies two key criteria. The first is that instruments are relevant and therefore  $\text{corr}(Z_i, X_i)$  is not equal to zero. The second is that the instruments are exogenous, therefore the  $\text{corr}(Z_i, u_i)$  is equal to zero. Based on Staiger and Stock (1997) and Stock and Watson (2003), the rule of thumb to determine weak instruments is a first stage F-statistic less than 10. The F-statistic of this regression is 27.54. More recently Stock and Yogo refined this “rule of thumb” and came up with the critical values for weak identification tests. According to the null, the estimate is weakly identified, and therefore rejection of the null shows the absence of weak instruments. Based on the 5 percent level (which, according to their table, is 13.91 for 1 endogenous variable and three instruments), the null can safely be rejected with the Kleibergen-Paap rk Wald F statistic of 19.4. And finally, the P-values of the instrumental variables are all significant. This shows the strength of my instruments.

The second criterion is also properly satisfied. Because there are more instruments than endogenous regressors, I can test for instrument exogeneity by testing for overidentifying restrictions. With a value of 0.2873, the P-value on the Hansen J statistic is greater than 0.10; therefore the null hypothesis cannot be rejected. This implies that the excluded instruments are uncorrelated with the error term and correctly excluded from the estimated equations. We can conclude that the regression’s endogeneity is properly addressed through our instruments and the 2SLS methodology. In addition, the historic and geographic variables used as instruments do affect growth.

Just like in the OLS regressions, and in the spirit of the most recent literature, I attempt to interact aid and policy (table 3, regression 7). In order to do so, however, I add openness interacted with change in aid to my regression. Both aid and openness continue to be significant, aid with a positive coefficient and openness with a negative. The interacted

variable is also significant (at a 10 percent level), albeit with a fairly small coefficient. In addition, the instruments are not valid. The F-statistic after the first regression is high with a P-value close to zero. At 0.1687, the p-value of the Hansen J statistic is greater than 0.10. But the Kleibergen-Paap rk Wald F statistic is 3.35, less than the necessary 13.91 in order to reject the null. Therefore the instruments prove to be weak in this case. Therefore, when using the 2SLS methodology the interactive term of aid and policy – in this case openness – is not significant.

*Robustness check: Two-Stage Least Squares Growth Regressions with period dummies*

Similar results hold when I add period dummies to account for variation over time. In the baseline regression (regression 6, table 4), aid continues to be positive and significant at the 10 percent level. Change in openness is also significant, yet negative. Yet different from the regression without period dummies, the interactive term of aid and openness is not significant. Table 5 includes first stage regression results for both baseline regressions (with and without period dummies).

## **Conclusions**

In this paper, I have investigated the impact of aid flows on the growth of a country. The novelty to the body of existing literature is three-fold. First of all, I use the methodology of episodes to create my dataset. As a result, I introduce a new dependent indicator as an alternative to the standard growth of GDP by creating a variable that takes into consideration growth both before and after the episode. This partially addresses the endogeneity issue of the regression. I also introduce a new policy variable: the trade openness from the Penn World Tables. This provides an alternative to the standard measures that are used – ICRG institutional quality indicator, Sachs and Warner dummy variable, and the World Bank's CPIA – but may not be most appropriate. And finally I use updated aid data.

What can we learn from the results? We see that a country's openness plays a role in the impact of aid on growth. When properly instrumented, aid is not significant. Therefore we can conclude that, on average, large inflows of aid, defined as 2.5 percent of GDP in at least two consecutive years, do not have an impact on a country's growth. Only when introducing openness – defined as imports plus exports, divided by GDP – does aid's impact on growth become significant. This is confirmed in both the OLS and the 2SLS results. What is most interesting is that the coefficient on openness is negative. This fits into the logic. Countries who receive aid may choose to be closed while they are receiving aid. They are not very willing to globally integrate so that they can buffer their economies. Therefore countries may not be willing to receive aid and globalize their economies in tandem. They are able to grow with aid inflows, so therefore they can shed foreign exposure of other forms of international flows, such as foreign direct investment.

On the other hand, the results from the interaction term are only significant when period dummies are not included. Therefore, on average, we cannot conclude that the impact of aid on growth is not a function of both "policy" (in this case openness, measured by the PWT openness indicator) and the change of aid.

Although these results are interesting, it must be stated that the coefficients on the regression are small. But they provide a point of departure for additional research. This may include exploring other trade indicators, limiting periods of time instead of using the entire span of 1960-2007. It may also include looking at different types of aid (short term vs. long term) to see if the results continue to hold.

Does aid undermine or contribute to a country's growth? This research attempts to contribute to the large body of literature that asks this question. Similar to other papers in the conditional strand, we can conclude that aid can have an impact on growth, conditional on its openness. The difference is, however, that the results indicate that a country may be less inclined to be open if it is receiving aid.

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**Table 1: Episodes of high aid flows**

|                          | Year      |      | Aid (as percent of GDP) |       |        | GDP growth     |               |            |
|--------------------------|-----------|------|-------------------------|-------|--------|----------------|---------------|------------|
|                          | Beginning | End  | Beginning               | End   | Change | Before episode | After episode | Difference |
| Albania                  | 1990      | 1992 | 0.3                     | 13.1  | 12.8   | 0.3            | 9.3           | 9.0        |
| Armenia                  | 1992      | 1994 | 1.2                     | 10.7  | 9.5    | -28.3          | 5.4           | 33.7       |
| Belize                   | 1960      | 1962 | 20.9                    | 49.2  | 28.2   | ..             | 5.0           | ..         |
| Belize                   | 1964      | 1969 | 8.7                     | 40.3  | 31.6   | 5.0            | 6.1           | 1.1        |
| Bhutan                   | 1983      | 1986 | 15.4                    | 32.0  | 16.6   | 8.7            | 12.2          | 3.5        |
| Burkina Faso             | 1972      | 1974 | 13.3                    | 28.1  | 14.8   | 1.3            | 4.4           | 3.1        |
| Burkina Faso             | 1976      | 1978 | 16.5                    | 24.8  | 8.3    | 6.2            | 2.7           | -3.5       |
| Burundi                  | 1967      | 1969 | 18.2                    | 24.9  | 6.7    | 7.1            | 5.0           | -2.1       |
| Burundi                  | 1977      | 1980 | 23.3                    | 39.1  | 15.8   | 6.7            | 4.2           | -2.5       |
| Burundi                  | 1980      | 1982 | 39.1                    | 43.6  | 4.5    | 0.7            | 4.6           | 3.9        |
| Burundi                  | 1999      | 2001 | 12.7                    | 26.7  | 14.0   | 1.1            | 2.3           | 1.2        |
| Burundi                  | 2002      | 2004 | 28.5                    | 44.6  | 16.1   | 1.9            | 3.4           | 1.5        |
| Central African Republic | 1973      | 1975 | 10.8                    | 16.7  | 5.9    | 0.9            | 3.5           | 2.6        |
| Central African Republic | 1978      | 1980 | 10.7                    | 19.2  | 8.5    | 3.5            | 0.0           | -3.5       |
| Central African Republic | 1982      | 1984 | 17.5                    | 27.2  | 9.7    | 0.2            | 1.0           | 0.8        |
| Chad                     | 1972      | 1974 | 8.4                     | 17.7  | 9.3    | 0.0            | 4.5           | 4.5        |
| Chad                     | 1983      | 1985 | 11.6                    | 19.2  | 7.6    | 7.0            | 2.1           | -4.9       |
| Comoros                  | 1983      | 1985 | 32.4                    | 40.0  | 7.6    | 5.2            | 2.0           | -3.1       |
| Congo, Dem. Rep.         | 2001      | 2003 | 5.4                     | 87.2  | 81.8   | -4.7           | 6.1           | 10.8       |
| Dominica                 | 1978      | 1980 | 15.9                    | 27.7  | 11.8   | 5.7            | 6.0           | 0.3        |
| Dominica                 | 1993      | 1996 | 5.2                     | 19.9  | 14.7   | 1.5            | 2.6           | 1.1        |
| Dominica                 | 2000      | 2002 | 6.3                     | 13.8  | 7.5    | 2.0            | 4.2           | 2.2        |
| Dominican Republic       | 1961      | 1963 | 0.0                     | 6.9   | 6.8    | -1.2           | 0.4           | 1.6        |
| Egypt, Arab Rep.         | 1972      | 1975 | 3.3                     | 36.0  | 32.6   | 3.7            | 11.2          | 7.5        |
| Ethiopia                 | 1982      | 1985 | 7.3                     | 28.9  | 21.6   | 0.5            | 8.4           | 8.0        |
| Ethiopia                 | 1989      | 1991 | 15.3                    | 20.6  | 5.2    | 4.1            | 3.2           | -0.9       |
| Eritrea                  | 1999      | 2001 | 15.0                    | 32.5  | 17.4   | 3.0            | 0.2           | -2.8       |
| Gambia, The              | 1970      | 1974 | 8.1                     | 31.1  | 23.0   | 5.7            | 7.6           | 2.0        |
| Gambia, The              | 1975      | 1978 | 20.0                    | 52.2  | 32.2   | 8.8            | 3.1           | -5.8       |
| Gambia, The              | 1979      | 1981 | 45.2                    | 77.1  | 31.9   | 3.1            | 5.1           | 2.0        |
| Georgia                  | 1992      | 1994 | 0.5                     | 6.3   | 5.8    | -27.5          | 8.3           | 35.8       |
| Ghana                    | 1987      | 1989 | 12.6                    | 18.3  | 5.7    | 5.0            | 4.3           | -0.8       |
| Grenada                  | 1983      | 1985 | 8.1                     | 26.8  | 18.7   | 3.1            | 7.9           | 4.8        |
| Guinea                   | 1979      | 1981 | 10.2                    | 18.3  | 8.2    | ..             | 1.5           | ..         |
| Guinea-Bissau            | 1973      | 1977 | 0.0                     | 65.7  | 65.7   | 1.6            | -0.7          | -2.3       |
| Guinea-Bissau            | 2005      | 2007 | 22.5                    | 35.4  | 12.8   | 1.7            | ..            | ..         |
| Guyana                   | 1988      | 1990 | 6.9                     | 41.4  | 34.5   | -1.0           | 7.4           | 8.4        |
| Guyana                   | 1995      | 1997 | 12.8                    | 38.7  | 25.9   | 7.4            | 0.2           | -7.1       |
| Haiti                    | 1993      | 1995 | 3.2                     | 19.9  | 16.7   | -5.0           | 3.0           | 8.0        |
| Kiribati                 | 1976      | 1978 | 27.5                    | 50.5  | 23.0   | 4.0            | -24.6         | -28.6      |
| Kiribati                 | 1971      | 1973 | 38.4                    | 56.2  | 17.8   | -1.2           | 4.0           | 5.2        |
| Kyrgyz Republic          | 1992      | 1995 | 1.3                     | 17.2  | 16.0   | -5.9           | 6.7           | 12.6       |
| Lesotho                  | 1960      | 1962 | 10.8                    | 32.5  | 21.8   | ..             | 7.1           | ..         |
| Lesotho                  | 1964      | 1966 | 24.8                    | 47.4  | 22.5   | 11.3           | 3.5           | -7.8       |
| Lesotho                  | 1978      | 1981 | 27.8                    | 44.5  | 16.7   | 17.4           | 2.5           | -15.0      |
| Lesotho                  | 1973      | 1975 | 20.2                    | 33.3  | 13.2   | 8.8            | 17.4          | 8.6        |
| Liberia                  | 1989      | 1993 | 8.0                     | 77.2  | 69.2   | -9.9           | -5.5          | 4.4        |
| Liberia                  | 1994      | 1996 | 51.3                    | 113.4 | 62.1   | -30.5          | 46.7          | 77.1       |
| Liberia                  | 2002      | 2004 | 8.8                     | 42.1  | 33.3   | 9.5            | 7.5           | -2.0       |
| Madagascar               | 1979      | 1981 | 8.6                     | 15.5  | 6.9    | 2.5            | 0.3           | -2.2       |
| Malawi                   | 1960      | 1964 | 8.0                     | 49.6  | 41.6   | ..             | 11.5          | ..         |
| Malawi                   | 1985      | 1989 | 15.6                    | 34.9  | 19.3   | 4.6            | 2.8           | -1.9       |
| Mali                     | 1972      | 1974 | 10.0                    | 24.9  | 14.9   | 4.6            | 10.8          | 6.2        |

|                               | Year      |      | Aid (as percent of GDP) |      |        | GDP growth     |               |            |
|-------------------------------|-----------|------|-------------------------|------|--------|----------------|---------------|------------|
|                               | Beginning | End  | Beginning               | End  | Change | Before episode | After episode | Difference |
| Mali                          | 1983      | 1985 | 19.7                    | 39.6 | 19.9   | -1.8           | 2.7           | 4.5        |
| Marshall Islands              | 1991      | 1994 | 0.3                     | 42.0 | 41.7   | 3.4            | -8.7          | -12.0      |
| Mauritania                    | 1972      | 1974 | 6.0                     | 31.9 | 25.9   | 4.0            | 1.1           | -2.8       |
| Mauritania                    | 1966      | 1968 | 5.8                     | 15.6 | 9.9    | 14.3           | 5.6           | -8.7       |
| Mauritania                    | 2000      | 2002 | 15.0                    | 24.1 | 9.1    | 4.0            | 5.4           | 1.3        |
| Micronesia, Fed. Sts.         | 1991      | 1994 | 0.3                     | 49.9 | 49.7   | 3.5            | -3.7          | -7.1       |
| Mongolia                      | 1990      | 1992 | 0.8                     | 8.0  | 7.2    | 2.4            | 1.8           | -0.5       |
| Mozambique                    | 1981      | 1988 | 12.4                    | 63.3 | 50.9   | 2.5            | 3.8           | 1.3        |
| Nicaragua                     | 1978      | 1980 | 2.3                     | 12.9 | 10.6   | 2.3            | 2.6           | 0.3        |
| Nicaragua                     | 1989      | 1991 | 12.2                    | 35.3 | 23.1   | -5.9           | 0.9           | 6.8        |
| Niger                         | 1972      | 1974 | 10.3                    | 28.4 | 18.1   | 1.5            | 1.7           | 0.1        |
| Niger                         | 1980      | 1982 | 14.3                    | 24.2 | 9.9    | 6.1            | -6.4          | -12.4      |
| Pakistan                      | 1961      | 1963 | 12.8                    | 22.5 | 9.8    | 3.0            | 8.2           | 5.2        |
| Papua New Guinea              | 1973      | 1975 | 25.1                    | 31.1 | 5.9    | 6.1            | 1.8           | -4.3       |
| Rwanda                        | 1989      | 1991 | 17.9                    | 25.6 | 7.7    | 1.8            | -20.2         | -22.0      |
| Samoa                         | 1989      | 1991 | 15.4                    | 27.1 | 11.8   | 0.7            | 0.8           | 0.1        |
| Senegal                       | 1972      | 1974 | 6.4                     | 14.9 | 8.5    | 4.4            | 4.9           | 0.5        |
| Serbia                        | 1998      | 2000 | 0.5                     | 7.5  | 7.0    | 7.1            | 3.9           | -3.2       |
| Seychelles                    | 1969      | 1971 | 6.7                     | 27.0 | 20.3   | 3.1            | 5.9           | 2.7        |
| Sierra Leone                  | 1990      | 1994 | 7.3                     | 36.8 | 29.5   | -0.9           | -5.9          | -4.9       |
| Sierra Leone                  | 1999      | 2001 | 14.6                    | 58.0 | 43.4   | -8.0           | 13.9          | 21.9       |
| Solomon Islands               | 1967      | 1969 | 65.9                    | 88.5 | 22.7   | ..             | -7.3          | ..         |
| Solomon Islands               | 2002      | 2005 | 16.3                    | 64.5 | 48.2   | -8.4           | 8.2           | 16.6       |
| St. Vincent and the Grenadine | 1973      | 1975 | 0.4                     | 21.9 | 21.5   | 6.8            | 7.7           | 1.0        |
| Swaziland                     | 1976      | 1978 | 7.6                     | 20.3 | 12.6   | 6.4            | 10.2          | 3.8        |
| Syrian Arab Republic          | 1972      | 1974 | 3.0                     | 29.2 | 26.1   | 9.8            | 9.6           | -0.2       |
| Timor-Leste                   | 2005      | 2007 | 54.3                    | 71.2 | 16.9   | 3.5            | ..            | ..         |
| Togo                          | 1960      | 1964 | 0.2                     | 19.6 | 19.4   | ..             | 10.0          | ..         |
| Togo                          | 1981      | 1983 | 10.5                    | 21.5 | 11.0   | 2.9            | 4.3           | 1.5        |
| Togo                          | 1976      | 1978 | 13.8                    | 20.3 | 6.6    | 1.8            | 2.9           | 1.1        |
| Tonga                         | 1988      | 1990 | 16.5                    | 24.0 | 7.5    | 1.2            | 3.1           | 1.9        |
| Tonga                         | 1991      | 1993 | 14.6                    | 21.0 | 6.4    | 1.2            | 3.1           | 1.9        |
| Uganda                        | 1986      | 1990 | 14.0                    | 26.4 | 12.4   | -1.3           | 5.5           | 6.8        |
| Zambia                        | 1965      | 1967 | 1.8                     | 9.1  | 7.3    | 10.7           | 1.6           | -9.1       |
| Zambia                        | 1998      | 2000 | 6.0                     | 13.5 | 7.5    | 2.8            | 4.2           | 1.5        |

**Table 2: OLS estimation**

|              | <b>Baseline</b>     |                     |                      |                     |                       |                      |                       |                       |
|--------------|---------------------|---------------------|----------------------|---------------------|-----------------------|----------------------|-----------------------|-----------------------|
|              | (1)                 | (2)                 | (3)                  | (4)                 | (5)                   | (6)                  | (7)                   | (8)                   |
| aidchange    | 0.199**<br>(0.0845) | 0.348*<br>(0.176)   | 0.205**<br>(0.0864)  | 0.322*<br>(0.159)   | 0.259**<br>(0.115)    | 0.220**<br>(0.103)   | 0.345**<br>(0.135)    | 0.455**<br>(0.192)    |
| deltainfl    |                     | -0.0323<br>(0.0502) |                      | -0.0178<br>(0.0456) |                       | 0.00803<br>(0.0270)  | 0.0326<br>(0.0319)    | -0.00384<br>(0.0465)  |
| deltabal     |                     | 0.167<br>(0.249)    |                      | 0.0300<br>(0.231)   |                       |                      |                       | 0.0499<br>(0.229)     |
| deltaki      |                     | 0.416<br>(0.492)    |                      | 0.832*<br>(0.474)   |                       |                      |                       | 0.773<br>(0.471)      |
| deltaopen    |                     |                     | -0.188**<br>(0.0780) | -0.316**<br>(0.129) | -0.179**<br>(0.0792)  | -0.169**<br>(0.0744) | -0.164**<br>(0.0736)  | -0.309**<br>(0.128)   |
| aidopen      |                     |                     |                      |                     | -0.00119<br>(0.00167) |                      | -0.00174<br>(0.00123) | -0.00204<br>(0.00169) |
| Observations | 80                  | 26                  | 68                   | 26                  | 68                    | 42                   | 42                    | 26                    |
| R-squared    | 0.066               | 0.244               | 0.166                | 0.418               | 0.173                 | 0.255                | 0.293                 | 0.459                 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: Change in GDP growth between episodes

**Table 3: Robustness check, 2SLS estimation**

|                    | Baseline          |                     |                   |                     |                        |                    |                        |                       |
|--------------------|-------------------|---------------------|-------------------|---------------------|------------------------|--------------------|------------------------|-----------------------|
|                    | (1)               | (2)                 | (3)               | (4)                 | (5)                    | (6)                | (7)                    | (8)                   |
| aidchange          | -0.257<br>(0.230) | 0.571<br>(0.684)    | 0.357<br>(0.312)  | 0.822<br>(0.660)    | 0.162<br>(0.293)       | 0.591*<br>(0.336)  | 0.685**<br>(0.344)     | 0.443<br>(0.353)      |
| deltainfl          |                   | -0.0125<br>(0.0767) |                   | 0.0251<br>(0.0885)  |                        | 0.0799<br>(0.0710) | 0.0988<br>(0.0717)     | -0.00496<br>(0.0508)  |
| deltabal           |                   | 0.129<br>(0.197)    |                   | -0.0442<br>(0.218)  |                        |                    |                        | 0.0505<br>(0.193)     |
| deltaki            |                   | 0.448<br>(0.315)    |                   | 0.868*<br>(0.448)   |                        |                    |                        | 0.774*<br>(0.425)     |
| deltaopen          |                   |                     | -0.171<br>(0.110) | -0.289**<br>(0.140) | -0.192*<br>(0.108)     | -0.205*<br>(0.113) | -0.175**<br>(0.0744)   | -0.309**<br>(0.136)   |
| aidopen            |                   |                     |                   |                     | -0.000268<br>(0.00170) |                    | -0.00378*<br>(0.00226) | -0.00197<br>(0.00216) |
| Observations       | 80                | 26                  | 68                | 26                  | 68                     | 42                 | 42                     | 26                    |
| R-squared          | -0.282            | 0.186               | 0.127             | 0.129               | 0.164                  | 0.128              | 0.172                  | 0.459                 |
| (Uncentered) R-sq. | -0.246            | 0.187               | 0.145             | 0.130               | 0.182                  | 0.156              | 0.181                  | 0.459                 |
| Hansen (p-value)   | 0.129             | 0.330               | 0.205             | 0.313               | 0.140                  | 0.287              | 0.169                  | 0.225                 |
| Shea partial       | 0.0294            | 0.0671              | 0.0196            | 0.0749              | 0.0456                 | 0.1263             | 0.1314                 | 0.1492                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: Change in GDP growth between episodes

**Table 4: Robustness check, 2SLS estimation with period dummies**

|                    | Baseline          |                     |                   |                     |                       |                     |                       |                       |
|--------------------|-------------------|---------------------|-------------------|---------------------|-----------------------|---------------------|-----------------------|-----------------------|
|                    | (1)               | (2)                 | (3)               | (4)                 | (5)                   | (6)                 | (7)                   | (8)                   |
| aidchange          | -0.267<br>(0.275) | 0.353<br>(0.389)    | 0.137<br>(0.290)  | 0.646<br>(0.430)    | 0.0419<br>(0.286)     | 0.583*<br>(0.314)   | 0.586*<br>(0.310)     | 0.329<br>(0.304)      |
| deltainfl          |                   | -0.0223<br>(0.0543) |                   | 0.0130<br>(0.0633)  |                       | 0.0842<br>(0.0649)  | 0.0838<br>(0.0629)    | -0.0123<br>(0.0384)   |
| deltabal           |                   | 0.165<br>(0.161)    |                   | -0.00125<br>(0.194) |                       |                     |                       | 0.0872<br>(0.156)     |
| deltaki            |                   | 0.670*<br>(6.645)   |                   | 0.982**<br>(6.625)  |                       |                     |                       | 0.914**<br>(6.430)    |
| deltaopen          |                   |                     | -0.166<br>(0.105) | -0.287**<br>(0.138) | -0.175*<br>(0.104)    | -0.168*<br>(0.0950) | -0.151**<br>(0.0724)  | -0.306**<br>(0.136)   |
| aidopen            |                   |                     |                   |                     | 0.000780<br>(0.00192) |                     | -0.00306<br>(0.00211) | -0.00161<br>(0.00201) |
| Observations       | 80                | 26                  | 68                | 26                  | 68                    | 42                  | 42                    | 26                    |
| R-squared          | -0.174            | 0.353               | 0.194             | 0.333               | 0.169                 | 0.099               | 0.281                 | 0.532                 |
| (Uncentered) R-sq. | -0.141            | 0.353               | 0.211             | 0.333               | 0.187                 | 0.109               | 0.289                 | 0.533                 |
| Hansen (p-value)   | 0.224             | 0.442               | 0.194             | 0.369               | 0.232                 | 0.673               | 0.307                 | 0.376                 |
| Shea partial       | 0.0445            | 0.103               | 0.0278            | 0.1152              | 0.0553                | 0.1271              | 0.154                 | 0.2812                |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Dependent variable: Change in GDP growth between episodes

**Table 5: First stage results**

|              | Baseline<br>(1)      | Baseline with period dummies<br>(2) |
|--------------|----------------------|-------------------------------------|
| deltaopen    | 0.0522<br>(.1203)    | 0.0170<br>(0.105)                   |
| deltainfl    | -0.194***<br>(0.041) | -0.182***<br>(0.0426)               |
| engfrac      | 10.64**<br>(1.766)   | 10.87*<br>(7.149)                   |
| eurfrac      | -8.145<br>(3.157)    | -7.501<br>(6.408)                   |
| latitude     | 0.211**<br>(0.0859)  | 0.200**<br>(0.0749)                 |
| Observations | 42                   | 42                                  |
| R-squared    | 0.602                | 0.655                               |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

