Effectiveness of foreign aid in Small Island Developing States

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May 2011

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Abstract

Small Island Developing States (SIDS) are usually left out in the aid effectiveness literature, despite being among the poorest and top receivers of foreign aid. This paper tests the main conditionality models of the literature and specifies a new model that best fit the data for 37 SIDS. The general finding is that aid has a positive and significant effect on growth. However, we do not find supporting evidence for the good policies conditionality or the existence of diminishing returns. Instead, we find that aid works best in the presence of sufficiently good governmental and social institutions.

Keywords: Foreign aid, Small Island Developing States, Aid effectiveness.
JEL classification: O11, O19

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1. Introduction

Over the last several decades, Small Island Developing States (SIDS) have tended to receive much more development aid, relative to size, than other developing countries. Whether this is due to their small size, increased need due to vulnerability, or strong geographical ties to various donor countries, these countries regularly rank among the world's largest relative aid recipients. In 2008, they made up almost half of the world's top 20 recipients of Official Development Assistance (ODA) as a percentage of GNI, with several well in excess of 30 per cent.[1] Despite this, growth remains low in many of these countries, and development is poor.

Although the aid effectiveness literature is increasingly comprehensive, SIDS are largely absent from most studies, due largely to a simple lack of comprehensive and reliable data. These omissions lead one to question whether the relationships found in the literature hold true in these countries. This is further brought into question by these countries' defining characteristics, which make them a distinct and substantively different subset of the world's developing countries, allowing for the possibility that they may also differ in terms of drivers of growth and aid effectiveness. The aim of this paper is to analyse the effectiveness of development aid in Small Island Developing States by building upon the empirical techniques used in the existing literature and applying them to a SIDS dataset.[2]

The importance of understanding aid effectiveness is clear. Strong results indicating success or failure of development aid, or the conditions under which it can be successful or wasteful, will help in optimizing both the quantity and quality of aid spending. Global ODA spending, the measure of aid generally used by the literature, exceeded 128 billion US dollars in 2008, and is generally increasing over time. On the other hand, relative aid levels are not

increasing, with many countries, and the developed world as a whole, falling well short of the 0.7 per cent of GDP commitment made by developed nations at various times in recent decades. Both the large absolute sums, and the small relative amounts, are politically contentious, and a lack of clear results regarding aid effectiveness is surely one of the major obstacles to rectifying this.

In keeping with the traditions of the existing literature, we focus on the effects of Official Development Assistance (ODA) on growth rates of real per capita GDP. ODA is defined broadly by the OECD Development Assistance Committee as aid meeting certain conditions and with the goal of 'the promotion of the economic development and welfare of developing countries'.[3] While clearly such a narrow dependent variable is an imperfect measure of the success of ODA, we are unfortunately restricted to its use as long as there does not exist a measure, or set of measures, that fully encompass and accurately gauge the outcomes of development aid, and for which data are available.[4] As such, we must be careful in framing the results accordingly, rather than attempting to draw the grand conclusions that some previous papers have suggested.

Our empirical analysis yields interesting findings. Most importantly, we find that ODA appears to have a significant and positive effect on growth, although this is not robust to all specifications and tests. We also find that ODA appears to be more effective in the presence of high quality public institutions and political structures. This result differs from much of the literature, but is generally found to be quite robust within our dataset. We also note that we find little, if any, evidence for other prominent results, including diminishing returns to aid, and increased effectiveness when combined with economic indicators indicative of 'good' government policy.

The remainder of this paper is as follows. Section 2 will give a brief survey of the existing aid effectiveness literature, and Section 3 will outline our data selection and empirical methods. The heart of the paper is the application of prominent aid-growth models to the SIDS dataset, results of which are found in Section 4, along with the development of a preferred specification and general results. Finally, we discuss several brief conclusions drawn from the results of these models.

2. Existing Literature

The Aid-Growth Literature

The body of literature dealing with aid effectiveness is large and growing, particularly over the last decade. Several studies provide comprehensive reviews of the literature, including Doucouliagos and Paldam (2006, 2009, 2010) and Hansen and Tarp (2000). Here, we focus only on the literature most relevant to this study, namely the so called (and closely related) 'Direct Growth' and 'Conditional Growth' families (Doucouliagos and Paldam; 2006, 2009, 2010).

As these names suggest, the former focuses on testing the effect of aid on growth directly, rather than by testing its effect on savings and investment as in earlier works, while the latter tests for particular circumstances or recipient country characteristics that determine the effectiveness of aid. The basis of direct growth models is generally estimation of a growth equation of the form

$$g_{it} = \alpha + \mu h_{it} + \sum \gamma_j x_{jit} + u_{it}$$

where g_{it} is the dependent variable, generally per capita GDP growth in country i and time t, α is a constant or fixed effect, h_{it} is aid as a percentage of GNI, and x_j represents any number of other variables thought to drive growth, indexed by j. The coefficients to be estimated are given by α, μ and γ. Closely related are the conditional growth models, which add a condition variable, given by z_{it} with coefficient δ, and an interaction term, simply aid multiplied by the condition variable giving $h_{it}z_{it}$ with coefficient ω, as follows:

$$g_{it} = \alpha + \mu h_{it} + \delta z_{it} + \omega h_{it} z_{it} + \sum \gamma_j x_{jit} + u_{it}$$

While direct growth models determine aid effectiveness with significant results of the μ coefficient, conditionality models additionally look for significance in the ω coefficient, which suggests aid is more or less effective when the condition variable z_{it} is large. It is these two model types that we focus on in this review and adapt in the following sections for our own analysis of aid effectiveness.

Rajan and Subramanian (2008) identify variables common to a number of more prominent papers: initial level of per capita income, measures of institutional and policy quality, financial depth or development (generally measured by ratio of money supply M2 to GDP), inflation, a measure of ethnolinguistic fractionalization, assassinations (as a proxy for political and social stability), and ratio of government budget balance to GDP. If not already included as part of a combined policy variable, openness to trade is also generally used, often along with regional dummies, population and population growth rates, and human capital measures such as schooling rates.

The first major addition to this basic model is the so called 'medicine model' approach, which includes an aid squared variable, to determine whether there are increasing or decreasing returns to aid.[5] The general finding is that while aid has a positive effect, it has decreasing returns, and an upper threshold above which additional aid is not beneficial. Wagner (2008) extends this model, using nonlinear estimation to find both lower and upper thresholds, between which aid is most effective. Despite such prominence in the literature, however, Doucouliagos and Paldam's (2009) meta-analysis finds that there is no real evidence for the significance of the aid-squared term, be it positive or negative, particularly when taking into account a prevalent publication bias, which they find significantly biases results towards negative aid-squared coefficients.

Two more variables that have been used extensively as conditions for the effectiveness of aid, sometimes together, are those measuring governmental policy and those measuring institutional quality. For use in this manner, Burnside and Dollar (2000) derives a variable representing 'good' economic policy (a weighted mean of inflation, budget balance, and openness to trade), finding that the aid coefficient is insignificant, while the aid * policy interaction coefficient is positive and significant, leading to the conclusion that aid is generally ineffective in bad policy environments, but effective in good policy environments. Elegant and intuitively appealing, with strong policy implications, these results have been the focus of much policy debate, political rhetoric, and repeated development and retesting.

A decade after its initial publication, the policy conditionality model is still being tested with varying results, most notably by Easterly, Levine, and Roodman (2004), as well as Hansen, Tarp, and Dalgaard (2000; 2001; 2004), Dayton-Johnson and Hoddinott (2003), and others.[6] While Burnside and Dollar (2004; 2004b) have defended the hypothesis, Doucouliagos and

Paldam (2010) find in meta-analysis that while there is a clear negative relationship between coefficients of aid and aid * policy, but overall evidence for the good policy model is weak, with only a quarter of papers finding a positive and significant aid * policy coefficient. Further, the papers that do support the hypothesis in this way are seen to tend towards smaller sample sizes and thus higher variance and less trustworthy results (Doucouliagos and Paldam, 2010).

Other variables which have been used as conditions include exogenous vulnerability to climactic, economic, and demographic shocks (Guillaumont and Chauvet, 2001), political instability (Chauvet and Guillaumont, 2004), democratization (Kosack, 2003), and savings (Teboul and Moustier, 2001), although none are used in this study, generally due to lack of suitable data.

A number of papers have included a measure of favourable geography, including Chervin and van Wijnbergen (2010), Bosworth and Collins (2003), Clemens, Radelet and Bhavnani (2004), Sachs (2001; 2003), and Dalgaard, Hansen and Tarp (2004), each finding geography to be significant either on its own or as a condition for aid effectiveness. However, while the preferred geographical measures - percentage of land in the tropics, and number of frost days per year - may have significant implications for growth in SIDS, they are unusable here, with the former effectively being a dummy variable taking the value of one for Bahrain and the Bahamas, and the latter unavailable for our dataset.

Other notable areas of testing, beyond the scope of this paper, include comparing nongovernmental and bilateral aid (Masud and Yontcheva; 2005) and comparing tied and untied aid (Jelovac and Vandeninden, 2008; Cordella and Dell'Ariccia, 2007; Hefeker, 2005;

Miquel-Florensa, 2007). Burnside and Dollar (2000), Collier and Dollar (2001), and Kenny (2006), amongst others, go beyond testing aid effectiveness to determine guidelines for optimal aid allocation. Moe (2008), McGillivray and Noorbakhsh (2004), Williamson (2007), Kosack (2003) and Gomanee, Girma, and Morrissey (2003) provide examples of the growing use of HDI and other non-GDP welfare indicators as the dependent variable. Finally, and perhaps most interestingly with regards to future study, is Wagner's (2008) use of partially nonlinear estimation techniques which give detailed insights into the changing effects of aid at differing levels.

Small Island Developing States in the Literature

The literature surrounding aid effectiveness in Small Island Developing States has, until recently, been near non-existent.[7] Most closely related to this paper is a recent study by Feeny and McGillivray (2010), which also extends some of the general methods of the aid effectiveness literature to Small Island Developing States, and finds that aid is somewhat effective but with diminishing returns. We test their result with a larger data set and alternate methods bridging gaps to the existing literature in areas where they have diverged. Our significantly different results outline some of the weaknesses in the methods of the aid-growth literature, such as apparent sensitivity to choices of data and econometric techniques. Such comparisons have formed the basis and driven the development of the aid-growth literature, and allow for richer and more instructive results.

3. Data and Econometric Techniques

3.1 Data

Many of the major decisions regarding data, including the dimensions of the panel, are made by data availability. The full set covers the years 1980 to 2008 and the 37 SIDS which have

both received ODA over this period and for which enough reliable data is available for their inclusion. We use annual series and 4-year aggregates where appropriate.[8] One criticism we wish to make of the existing literature is the method with which countries are selected. While it is clearly an admirable goal to include only countries below some wealth or development threshold, for those are the countries in whose development we are most interested, it appears that much of the literature makes this selection based only on current wealth. This generally excludes countries that were at one time as poor as some included countries, but whose growth moved them above the current threshold. Removing the 'success stories' in such a way can significantly alter our results. To combat this, we include in the full set all country-years in which ODA was received, and test using both the full set and sets including only country-years for which per capita GDP is below some threshold.[9]

We include countries for which data is available (and appropriate) for all or part of the time period, and as such our panel is somewhat unbalanced.[10] The full list of included SIDS is available in Table A1 in the appendix. Further data and variable choices are generally made by availability and an interest in comparability with existing literature. Many of our data are sourced from the World Bank's World Development Indicators, with a full list of sources given in Table A2 in the appendix.

In some cases, for both testing purposes and necessity, we diverge from the literature, such as the availability-forced exclusion of budget surplus from the Burnside and Dollar (2000) style policy variable. Similarly, we use total trade as a percentage of GDP in place of the Sachs-Warner coefficient, which appears to have fallen out of use. While these changes are not ideal from a comparability standpoint, there is no satisfactory alternative given data availability.

In keeping with much of the later literature, we have shied away from many self-constructed policy and institution variables which have been discarded in favour of increasingly available catch-all variables, such as those created for the World Bank by Kaufmann, Kraay, and Zoido (referred to here as KKZ, 1999). The arithmetic mean of the six KKZ variables has become of increasing use in the literature, as a broad measure of the quality of public institutions. We also use the constituent parts individually where appropriate, often as replacements for similar but unavailable variables. In particular, the KKZ Political Stability and Absence of Violence measure makes an acceptable replacement for a measure of assassinations that is widely used but unavailable for many of our countries.[11] Similarly, KKZ Voice and Accountability provides a suitably similar replacement for measures of democracy used in some studies. The World Bank's Country Policy and Institutional Assessment (CPIA) variables, while attractive, are unavailable for too many of our countries and periods to be of use.

One important note is the manner in which we treat variables such as KKZ and linguistic fractionalization, which have short histories and are not available annually. Here we keep with standard practice, which has been to use the earliest available value as a proxy for earlier missing values, justified on the basis that the real values of these variables do not change much over time. For linguistic fractionalization, which is only available as time-invariant cross-sectional data, this means treating it as a constant. While we continue these practices out of necessity, it is worth nothing that it is not ideal, particularly given the collinearity effects it causes. This is particularly noticeable in fixed effects and GMM estimations, from which these variables often need to be excluded. Table A2 provides a full list of variables used, their interpretations, and sources.

3.2 Econometric Techniques

We follow the literature to estimate the linear model of the general form outlined in the previous section, with real per capita GDP growth as the dependant variable. In keeping with early aid effectiveness studies, the first method used is Ordinary Least Squares. Due to the potential for endogeneity amongst important variables, we also use 2-Stage Least Squares at times, although it has generally proven difficult to find suitable instruments with countries for which data is so porous. As in much of the literature, our results do not differ in any meaningful way between these two methods, and as such we often do not report the latter.

We have also used panel regressions using country and period dummies, as much of the recent literature has found this preferable to the previous two methods. The drawback of this method is the necessary exclusion of variables for which our data do not vary over time, such as linguistic fractionalization.

Finally, GMM estimation is used as an increasingly preferred regression technique, as discussed in multiple works by David Roodman (2004; 2006; 2007; 2008). Within Roodman's xtabond2 framework for Stata, we use the two-step efficient, dynamic system GMM estimator, with small sample size and Windmeijer correction options to reduce downward bias in coefficient estimates that can otherwise occur.[12]

Our approach is to test the specifications of a number of prominent papers using the new, Small Island Developing State dataset, and the closest available variables and econometric methods. We then find a preferred specification that best explains the variations in the data and draw appropriate conclusions.

4. Results

Policy Conditionality

The first model we test is that of Burnside and Dollar (2000), using 4-year periods and OLS, to investigate the hypothesis that aid is only significant in good policy environments.[13] The specification of the model can be seen in the results in Table 1. We use as close an approximation as possible to the Burnside and Dollar specification as the data allows. We use the KKZ Stability variable in place of the unavailable assassinations variable, exclude the assassinations * ethnic fractionalization interaction, use the full KKZ mean as an institutional quality measure, and of course replace the Sub-Saharan Africa and East Asia dummies with our own – in this case Pacific and Caribbean dummies.

The first step is an OLS regression on all non-aid variables, the coefficients of which are used to determine the weightings of the constituent parts in creating a policy variable.[14] Due to data unavailability, the budget surplus variable is omitted, and we create the policy index using just inflation, trade, and a constant. The policy index is thus given by

$$BD\ Policy = 4.96 - 0.021 * Inflation + 0.020 * Trade$$

The first term is the estimated constant (significant at ten per cent), allowing us to interpret this Burnside and Dollar policy index as the expected growth given inflation and openness.

We then reintroduce aid and its interactions, including with the newly created policy variable. The results of these regressions are shown in Table 1, along with those of Burnside and Dollar (2000) and Easterly, Levine and Roodman (2004), who re-test the exact specification using a larger dataset. In general, the results do not support the hypothesis that aid is only effective in good policy environments. In regression (1) our results are broadly similar to Easterly, Levine and Roodman (2004), in that only institutional quality and policy have a

positive and significant effect on growth. The other variables found significant by Burnside and Dollar were not found to be robust to the larger Easterly, Levine and Roodman dataset, and these results continue here as we repeat their finding of a general lack of support for the policy conditionality of aid effectiveness. We also repeat these regressions with a dataset including only low-income countries,[15] but these results yield no new findings and are not reported.

The Medicine Model

Here we use the Hansen and Tarp (2000) model, which builds on Burnside and Dollar's framework to include squared aid variables and interactions. The model is otherwise similar, although each of the constituent parts of the BD Policy variable are now included separately in the final regression. While the budget surplus variable is unavailable for the SIDS dataset, a measure of government consumption is added which is available. The results are presented as regression (2).

The main difference between our results and Hansen and Tarp is that again we do not find aid to be significant, either by itself or in squared or interactive terms. As before, institutional quality (KKZ Mean) appears to be the greatest and most significant driver of growth. Perhaps due to their inclusion as individual variables rather than part of an index, the policy variables are now also insignificant, although with the exception of financial depth (M2) they enter with the same sign as in Hansen and Tarp's estimates.

Conditioning on Institutions

Collier and Dollar (2001) uses quality of institutions as a condition. While they use the International Country Risk Guide (ICRGE) as a measure of institutional quality, these data

are prohibitively expensive, and as such we continue with the KKZ institutional measure. Further, they use the CPIA mean as a measure of policy quality but due to lack of data, we use the Burnside and Dollar policy variable.

The main result of this model, shown in Regression 3, is weak significance of aid both by itself and in its interaction with the KKZ variable. This is our first indication that aid may be having positive benefits, with the latter implying aid is more effective when combined with good institutions. With these results seemingly sensitive to the specification of the model, it is unclear at this stage what is driving them, providing additional impetus for further investigation. Interestingly, the KKZ variable itself is now insignificant, an effect which is discussed later in this paper.

Table 1: Literature Specifications

Variables	BD	ELR	(1)	HT	(2)	CD	(3)
Log GDP per Capita	-0.60	-0.40	-0.323	-0.136	0.123	0.49	-0.096
Linguistic Frac	-0.42	-0.01	-1.378*				
Assassinations/KKZ Stab	-0.45*	-0.37	0.481				
Ethnic * Assassinations	0.79*	0.18					
Institutions/KKZ Mean	0.69**	0.31*	1.085**	0.675**	2.493***	0.52***	1.176
M2 (Lagged)	0.012	0.00	-0.010	0.014	-0.014		
Openness / Trade				1.466	0.055	-0.22	0.017**
Inflation				-1.338**	-0.045	-0.12	-0.043**
Budget Surplus				7.415			
Govt. Consumption				-3.832	-0.100**	-0.01	-0.077**
BD Policy	0.71**	1.22**	0.906**			0.38*	
BD Policy^2				0.083	-0.130		
Sub-Saharan Africa	-1.87**	-1.68**				-0.59	
East Asia	1.31**	1.18*				3.27***	
Pacific			-1.280				-1.046
Caribbean			-0.157				0.618
ODA	-0.021	0.20	-0.041	0.166**	0.073	-0.32	0.353*
ODA^2				-0.003*	0.001	-0.01	-0.007
ODA * BD Policy	0.19**	-0.15	0.009	-0.004	-0.008	0.33***	-0.036
ODA * Institutions/KKZ						-0.10**	0.090*
R^2	0.36	0.33	0.27	0.38	0.33	0.36	0.32
Adjusted R^2			0.22		0.27		0.25
Observations	275	345	159	243	171	302	178

*, **, *** Indicate significance at 10%, 5% and 1% levels. BD = Burnside and Dollar (2000). ELR = Easterly, Levine and Roodman (2004). HT = Hansen and Tarp (2000). CD = Collier and Dollar (2001).

Budget surplus in HT is actually budget deficit, meaning signs are reversed.

In CD, Institutions/KKZ Mean is replaced by the ICRGE measure of institutions, and BD Policy is replaced by the CPIA Mean. CD also includes regional dummies for South Asia (2.44***), Middle East/North Africa 1.78***) and Europe/Central Asia (-0.48), not included for space reasons. CD and (3) also both include period dummies.

Trade, Govt Consumption, Budget Surplus and M2 given as % of GDP, ODA as % GNI.

Feeny and McGillivray specification

We next test the specifications used by Feeny and McGillivray (2010), which uses a SIDS dataset covering the years 1980 to 2004. Notable additions to the previous specifications are the introduction of a measure of the effect of natural disasters, which takes the value of one in periods in which more than ten percent of the population are affected by disasters such as floods and earthquakes, and zero otherwise; and two fragility variables, which take the value of 1 if the country is in the bottom two CPIA quintiles for the first, and the bottom CPIA quintile for the second, and zero otherwise. The disaster variable is easily constructed, but the fragility variables were made available to the authors on a confidential basis by the World Bank, and cannot be constructed for enough of our countries using publicly available data. As the fragility variables are not central to the model, we proceed without them.

The authors first use a fixed effects model with an annual dataset, experimenting with contemporaneous and lagged variables. This is different from the 4-year and 5-year period norms of the literature, and our results show that it may significantly affect their results. Their second set of regressions use 4-year aggregated periods in a two-step GMM estimation, which we also use.

In keeping with the traditions set out by Easterly, Levine and Roodman (2004), we also test using both our full dataset and again using a dataset restricted only to Feeny and McGillivray's listed countries and periods.[16] We note that the major difference between our full dataset and the dataset restricted to Feeny and McGillivray's countries appears to be that the former includes all country-year observations in which the country received ODA, rather than those that fall below some current income threshold, as well as including some countries

below the threshold but still excluded from their dataset. Table 2 shows results for the fixed effects (4 - 6) and GMM (7, 8) regressions.

Regressions 4 and 5 test two annual data specifications differing only in their lag structures, with regressions marked ‘a’ and ‘b’ utilizing the full dataset and restricted dataset respectively. Regression 6 seeks to bridge the gap to the literature by using the norm of 4-year periods, removing the need for lagged variables, and focusing the analysis on long run rather than short run (and potentially cyclical) relationships.

We first note that the signs and magnitudes of the variables are broadly similar across each of these regressions and the Feeny and McGillivray counterparts, suggesting genuine relationships, but that they differ in their significance. Differences between regressions using the unrestricted and restricted datasets show the sensitivity to country and period choices. Given this, and our inability to accurately recreate the Feeny and McGillivray dataset, it is no surprise that we have been unable to recreate their results as hoped.

The results are instructive, however. In particular, we note that the lag structure appears to greatly affect the significance of all lagged variables. Each policy variable becomes less significant when lagged in our annual data regressions, whereas Feeny and McGillivray see the same effect on trade, while inflation gains in significance. The aid variables also have differing results – significant when contemporaneous but much less so when lagged in our regressions, but insignificant when contemporaneous and significant when twice lagged for Feeny and McGillivray. In each case the results do not support Feeny and McGillivray’s findings, and we can conclude only that there is much sensitivity to the lag structure.

It is partly for this reason, and the desire to focus more on long run growth effects, that much of the literature uses 4-year periods. We note that doing so in Regression 6 yields results with a much higher explanatory power, and results that much better echo those of the previous models: institutional quality and policy appear to be significant drivers of growth, while aid and aid^2 are more sensitive to the specification.

Regression 7 uses the two-step GMM estimator discussed previously, also used in FM3. Again these results are unable to support those of Feeny and McGillivray, with aid and aid^2 found to be insignificant, and the sign and magnitude of the former also sensitive to the dataset.

Overall, we cannot confirm the results of the Feeny and McGillivray estimations, even when restricting the dataset to those countries and periods included in their dataset.[17] Using the fixed effect regressions, we do find the expected support for policy and institutional variables as significant drivers of growth, but aid appears to be dependent on the specification. As the results of the annual data models appear so sensitive to changes in the data set, and the explanatory power of these models are so low, it is unclear what exactly is driving the results, and we cannot claim a high level of confidence in them. As such, we proceed in favour of using aggregated, rather than annual, data.

Table 2: Feeny and McGillivray Specifications

Variables	FM1	(4a)	(4b)	FM3	(5a)	(5b)	(6)	FM4	(7a)	(7b)
Constant	-2.511	-0.137	-2.611	-2.213	2.154	-3.550*	3.973**	-3.208	1.067	1.674
Institutions/KKZ Mean	0.398	2.598***	4.105***	0.665	2.193**	3.337*	4.278**	8.499*	2.912	2.800
Disaster	-1.866	-1.125*	-1.466*	-1.473	-0.984	-1.268	-0.304	-1.152	-0.218	-0.327
Ethnolinguistic Frac								-0.177	-3.933	-0.889
M2	-0.017	-0.075***	-0.071***	-0.012	-0.065***	-0.055***	-0.064***	-0.077	0.015	-0.018
Trade	0.049***	0.021***	0.016*				0.023**	0.055	0.005	0.015
Inflation	-0.003	-0.026***	-0.023**				-0.033*	0.027	-0.022	-0.043
Trade (Lagged)				0.005	0.024***	0.010				
Inflation (Lagged)				0.003**	-0.015	-0.012				
ODA	0.0098	0.155**	0.179**				0.102	0.377**	0.123	-0.019
ODA^2	-0.002	-0.002*	-0.002**				-0.000	-0.005**	0.001	0.001
ODA (Lagged 1 period)				-0.139	0.061	0.055				
ODA^2 (Lagged 1 period)				0.002	-0.000	-0.000				
ODA (Lagged 2 periods)				0.223**	0.142*	0.193*				
ODA^2 (Lagged 2 periods)				-0.003***	-0.000	-0.000				
R^2	---	0.11	0.16	---	0.09	0.09	0.23	--	--	--
Observations	569	787	545	561	743	509	190	124	190	153

*, **, *** Indicate significance at 10%, 5% and 1% levels. Regressions (4), (5), and (6) use a FE Panel estimation, (7) uses GMM as described in text. All regressions use non-reported period dummies. FM = Feeny and McGillivray (2010), Regressions 1, 3 and 4. Trade, M2 given as % of GDP, ODA as % GNI

Towards a preferred specification: The Basic Model

Having tested the results of several prominent models, here we seek to combine their contributions to create a model that best explains the relationship between growth and foreign aid in SIDS. To do so, we first test numerous specifications, both new and taken from the literature, to determine which non-aid variables best explain growth in the dataset, and combine them to create a basic model.[18] We then test the effectiveness of aid and its conditions by adding them to the basic model and observing the results. For comparability with past papers, we predominantly rely on OLS estimation, although fixed effects and GMM results are also reported for the final results.

The major variables, common to almost all other papers, are generally well behaved in these regressions, and the results shown in regression (8a – 8g) of Table 3 are representative of these behaviours. The coefficient on log of GDP is generally negative, suggesting a convergence effect, while the coefficients on the policy variables are also as expected, with trade positive, while inflation, government consumption, and M2 all negative. Trade is generally significant, with inflation also significant but less so. A new policy index, created using the same method as Burnside and Dollar (2000) but combining all four of these variables, adds a small amount to the predictive power of the model, and is generally more significant (and enters with a greater coefficient) than the Burnside and Dollar variable, suggesting it is a better measure of 'good' policy for this dataset.

It is the institutional quality variables, in particular KKZ Mean and its constituent parts that appear to have the most consistently significant effect on growth. This effect is always positive and generally quite large. Using the constituent measures of KKZ, rather than the mean, adds little to the model except to note that they all enter with positive coefficients.

Attempts to incorporate a measure of volatility of aid, inspired by Guillaumont (2009), and Bulir and Hamann (2003; 2007), did not add significantly to the model. In general the coefficient was negative, as expected, but never significant. Incorporating life expectancy, population, domestic credit as a percentage of GDP, and migrant stock as a percentage of population (as a proxy for openness and knowledge transfer) all had no significant effect on the model.

We also modify the disaster variable so that it measures the percentage of the population affected by disasters in any given year, rather than a dummy taking the value of one when this measure is above ten per cent.[19] Surprisingly, neither form is a significant driver of growth, nor adds to the predictive power of the model. In some cases it enters positively, a result that leads to its exclusion, as there is no clear theoretical basis for this.

The Pacific dummy also adds to the model somewhat, showing growth rates up to two per cent lower than the rest of the sample, while the other regional dummies add nothing and are thus excluded. The significance of the Pacific dummy disappears with the inclusion of linguistic fractionalization, however, suggesting they each capture some of the same effects. Including just linguistic fractionalization results in a similarly negative coefficient. This appears to reflect slow growth in highly fractionalized Pacific countries such as Papua New Guinea, Vanuatu, and the Solomon Islands, contrasted with high growth in non-Pacific countries with low fractionalization such as the Seychelles, St Kitts and Nevis, and St Vincent and the Grenadines. As the linguistic fractionalization variable is a constant, and thus unavailable in the fixed effects models, both are included in the basic model and excluded where needed.

These general results provide the basis for a model to which we can add aid and its interactions to determine their effectiveness. This basic model, with aid variables excluded, is presented in Regression 8a on Table 3.

Table 3: Preferred Specification, OLS

Variables	**(8a)**	**(8b)**	**(8c)**	**(8d)**	**(8e)**	**(8f)**	**(8g)**
Initial GDP	-0.651*	-0.139	-0.046	-0.130	-0.026	-0.170	0.537
KKZ Mean	2.604***	2.399***	2.392***	2.380***	1.711**	1.710**	
Linguistic Frac	-1.269*	-1.29*	-1.161	-1.264*	-0.685	-0.657	-0.384
Inflation	-0.024	-0.027*	-0.026*	-0.027*	-0.028*	-0.027*	-0.030*
M2	-0.017	-0.017	-0.017	-0.016	-0.019	-0.018	-0.010
Trade	0.015***	0.014**	0.014**	0.014**	0.015***	0.015**	0.017**
Govt Consumption	-0.026	-0.047	-0.056	-0.048	-0.070*	-0.071	-0.097**
Pacific Dummy	-0.631	-0.612	-0.698	-0.606	-1.066	-1.060	-1.299*
ODA		0.059*	0.099	0.056	0.098***	0.096**	0.120***
ODA^2			-0.001				
ODA * Policy				0.002		0.018	-0.002
ODA * KKZ Mean					0.098**	0.098**	0.135***
R^2	0.34	0.35	0.35	0.35	0.37	0.37	0.35
Adjusted R^2	0.28	0.29	0.28	0.28	0.30	0.30	0.28
Observations	171	171	171	171	171	171	171

*, **, *** Indicate significance at 10%, 5% and 1% levels. Trade, Govt Consumption, M2 given as % of GDP, ODA as % GNI. Period dummies not reported.

Towards a preferred specification: Including Aid and its Interactions

We next add the aid and interaction variables successively (regressions 8b – 8g, Table 3). We note that aid is significant when included by itself, but loses significance when the squared term is introduced, suggesting some interference between the variables, presumably caused by their correlation[20]. Because of this, and due to the fact we have found little evidence for the medicine model, we exclude the aid squared variable.[21] Aid, then, is generally found to have a positive and significant effect on growth in this model. The interaction of aid and policy is insignificant, supporting the same finding in Easterly, Levine and Roodman (2004) and Hansen and Tarp (2000), and contrasting that of Burnside and Dollar (2000). These results are supported by the fixed effects estimations, although the GMM regressions are more volatile and find less significance for all variables.[22]

Beyond aid itself, clearly the most significant result, and the most significant driver of growth, is the quality of political and social institutions, measured by the KKZ variable. The coefficient on the variable by itself is always large, positive, and significant, as is its interaction with aid. The positive coefficient on the interaction term suggests that aid is more effective when combined with good institutions, as was found when testing the Collier and Dollar (2001) model. Given the constituent parts of KKZ, there is a clear interpretation for this result. Interestingly, Collier and Dollar's initial results found a negative coefficient on the interaction of aid and institutions, with a positive coefficient on the interaction of aid and policy. Again, greater data availability, particularly of other variables such as the ICRGE measure of institutional quality and the CPIA measures of policy, would likely help to shed light on these differing results.

Overall, this model represented by regressions 8e – 8g appear to fit the SIDS dataset more satisfactorily than those taken from the literature, resulting in much great R^2 values. Although adjusted R^2 values are generally not reported in the literature, they too are much greater for these preferred specifications, in most cases exceeding the unadjusted R^2 values of the previous models.

5. Conclusions

This paper extends the methods used in existing literature to test the statistical evidence of the effect of aid on growth in Small Island Developing States. In general, we are able to satisfactorily reproduce a number of the major models from the literature, with few divergences when necessary, and create a preferred specification that appears to better fit the SIDS dataset and shed some light on aid effectiveness in these countries.

Our results on aid are encouraging. We find in a number of models, including our preferred specification, that aid has a significant and positive effect on growth. We also find that aid appears to be more effective when combined with high quality institutions and social infrastructure, such as the rule of law, government effectiveness and accountability, and political stability and the absence of violence, which is a relatively clear result with a strong intuitive basis. On the other hand, we depart from part of the literature in finding no evidence that aid is more effective when combined with 'good' governmental policy, as defined by low inflation, high openness to trade, low government consumption, and low financial depth. We also find no substantial support for the so-called medicine model of aid effectiveness, and indeed exclude it from later regressions.

These differences suggest that the conditionality and overall effectiveness of Official Development Assistance differs significantly between the Small Island Developing States and the general, all-inclusive datasets used in previous studies. For donors, particularly those such as New Zealand and Australia, who primarily focus their development aid on countries within our dataset, this could have strong implications. The results may suggest optimal reallocation of aid to those countries with strong institutions, and perhaps the use of aid to incentivize development of these institutions in countries where they are weak, in order to increase both aid effectiveness and the direct growth effects of strong institutions.

These results show the underlying importance of considering distinct groups of countries, or even individual countries, when making investigations of this nature. While many studies find strong results over large datasets, these results cannot necessarily be generalized to all countries, whether included in the study or not. This shows a need for expansion of the aid effectiveness literature not just to new models and larger datasets, but also to smaller and more specific datasets. Different countries, and groups of countries with unifying characteristics, evidently have different drivers of growth and reactions to development aid, with strong implications for optimal aid spending and allocation. These results for Small Island Developing States clearly exemplify this idea.

Appendix

Table A1: Countries and Summary Data

	ODA / GNI				Growth of GDP per capita				ODA / GNI		GDP/Cap		Corr
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	1980	2008	1980	2008	
Antigua and Barbuda	1.72	1.47	0.22	7.38	4.23	4.68	-6.68	15.07	5.05	0.72	3757	11651	0.2206
Aruba	2.17	1.88	-0.54	7.88	4.36	7.95	-19.98	20.15	2.47	-0.54	6769	18505	0.6597
The Bahamas	0.14	0.13	0.02	0.57	1.18	4.29	-11.18	11.81	0.16	0.08	15152	18264	0.4855
Bahrain	1.83	1.80	-0.08	6.08	1.58	4.67	-10.78	9.28	5.28	0.54	11479	16968	-0.2892
Barbados	0.42	0.57	-0.09	1.81	0.88	3.95	-5.55	8.90	1.66	0.02	7812	10432	-0.0449
Belize	4.96	2.99	0.79	11.00	3.13	4.61	-4.06	12.14	7.52	2.11	1981	3691	0.1750
Cape Verde	27.41	10.63	12.66	49.64	3.74	3.11	-2.32	10.15	43.63	14.72	624	1739	-0.0647
Comoros	20.03	10.87	5.92	41.59	0.63	3.01	-7.84	6.26	34.84	7.01	405	370	0.0611
Cuba	0.20	0.04	0.11	0.32	1.67	7.15	-15.37	19.09	0.23	0.21	2406	4370	0.0085
Dominica	11.71	6.21	4.06	29.65	4.65	3.68	-4.01	13.25	29.65	6.18	1839	4433	0.5108
Dominican Republic	1.06	0.95	-0.02	4.38	2.44	3.85	-7.37	9.07	1.94	0.35	1777	3623	-0.4343
Fiji	2.68	0.87	1.28	4.92	1.10	4.37	-8.38	7.96	3.03	1.28	1838	2276	0.0821
Grenada	7.53	6.90	1.96	30.19	3.28	4.88	-6.74	12.48	4.73	5.22	1870	4787	0.2174
Guinea-Bissau	45.58	14.62	22.78	78.71	-0.25	8.05	-29.63	15.31	55.46	29.53	137	142	-0.0513
Guyana	18.54	13.07	6.32	61.17	1.70	4.86	-13.23	8.11	7.44	14.46	804	1104	0.3219
Haiti	10.14	5.94	5.03	31.39	-1.92	3.82	-13.69	7.75	7.59	13.53	657	385	0.0578
Jamaica	3.10	2.86	-0.26	9.20	0.90	3.28	-6.99	8.61	5.11	0.57	2720	3824	-0.0233
Kiribati	25.85	12.26	10.99	50.06	-0.51	9.89	-45.57	15.74	50.06	13.47	720	779	-0.4119
Maldives	10.29	7.62	3.22	41.05	6.75	14.30	-8.46	76.76	41.05	4.49	560	3437	-0.2185

Table A1: Countries and Summary Data (cont.)

	ODA / GNI				Growth of GDP per capita				ODA / GNI		GDP/Cap		Corr
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	1980	2008	1980	2008	
Marshall Islands	35.48	14.73	0.29	56.98	0.46	5.99	-15.82	13.94	0.29	28.96	1940	2159	-0.2726
Mauritius	1.80	1.49	-0.25	5.29	3.76	3.56	-11.42	8.81	2.97	1.16	1573	4839	0.0563
Micronesia, Fed. States of	37.19	13.55	0.24	57.51	0.94	4.31	-6.92	13.40	0.24	34.50	1669	2035	-0.3438
New Caledonia	13.19	3.49	8.70	22.08	0.78	6.56	-7.65	32.11	16.74	8.91	9908	11346	0.0025
Palau	45.30	59.36	0.01	242.29	0.19	4.99	-14.40	8.05	0.01	23.48	5899	6312	0.4867
Papua New Guinea	9.22	2.85	3.84	13.91	0.20	4.98	-6.47	15.15	13.09	3.84	650	681	-0.2602
Samoa	18.62	7.58	7.03	35.07	2.29	3.14	-5.08	6.51	19.46	7.03	1127	1925	-0.5376
São Tomé and Príncipe	33.76	19.21	4.42	91.58	-0.26	4.65	-12.20	9.67	4.42	26.49	917	876	0.1832
Seychelles	5.90	4.50	0.91	15.14	1.57	5.18	-9.24	10.66	15.14	1.47	4532	8092	-0.1113
Singapore	0.07	0.08	-0.01	0.30	4.58	3.96	-5.00	10.67	0.12	0.01	9043	30031	0.1446
Solomon Islands	22.69	11.84	7.45	47.77	0.39	9.72	-16.56	37.85	41.29	40.68	1387	1140	0.1053
St Kitts and Nevis	4.63	3.37	0.01	13.27	4.00	4.13	-2.32	12.97	13.27	8.26	2934	8794	0.3129
St Lucia	4.23	2.46	-2.92	9.25	3.05	7.12	-12.32	21.79	6.58	2.10	2121	4988	-0.0281
St Vincent and the Grenadines	6.87	4.47	1.00	18.70	3.80	3.66	-3.04	13.92	16.33	4.79	1362	4440	-0.0509
Suriname	6.05	4.99	0.39	20.07	0.02	4.85	-14.77	8.58	9.31	3.71	2536	2623	-0.0196
Tonga	17.93	6.27	7.13	28.69	2.03	2.56	-2.71	7.31	26.06	7.28	1253	2034	0.3038
Trinidad and Tobago	0.17	0.22	-0.10	0.76	1.96	5.67	-10.83	14.04	0.07	0.05	6925	10909	-0.2621
Vanuatu	21.01	9.88	10.38	45.88	0.49	5.09	-13.77	11.21	45.88	14.95	1092	1539	-0.2097

GDP/cap is per capita GDP in Constant 2000 $US. Corr is simple correlation between ODI / GNI and Growth of GDP per Capita. Growth and ODA / GNI given as percentages. In some cases, 2008 or 1980 data is unavailable, in which case the closest available year is used.

Table A2: Variable Descriptions

Variables	Description	Source	Mean	Std Dev	Min	Max
Growth	Per capita GDP growth, in constant local currency.	World Bank World Development Indicators (WDI), UNstats (UN), Penn World Tables (PWT)	1.851	5.041	-16.564	21.794
Aid, ODA	Net Official Development Assistance Received, as % of GNI.	WDI	11.664	13.420	-2.920	67.330
Initial GDP	Per capita GDP at the beginning of each period, in 2000 US$. (Logarithm used in regressions).	WDI, PWT, UN	3771	3925	139	20359
Linguistic Fractionalization	Probability two people selected at random are of different ethnolinguistic groups.	Lewis, M.P. Ethnologue Ethnologue.com	0.355	0.356	0.000	0.990
Disaster	Population affected by disasters, as defined by the WHO Emergencies and Natural Disaster Database, as % of total population from WDI. (Note: can exceed 1 as multiple disasters summated for each period)	WHO, WDI	0.022	0.108	0.000	153.302
Institutions						
KKZ Mean	Kauffman, Kraay, Zoido (KKZ) mean of 6 measures of institutional quality.	World Bank World Governance Indicators (WGI)	0.084	0.536	-1.586	1.524
KKZ Stab	KKZ Political Stability and Absence of Violence	WGI	0.500	0.674	-1.960	1.479
KKZ Voice	KKZ Voice and Accountability	WGI	0.374	0.749	-2.186	1.457
KKZ Govt	KKZ Government Effectiveness	WGI	-0.150	0.708	-2.506	2.598
KKZ Reg	KKZ Regulatory Quality	WGI	-0.121	0.683	-2.659	1.656
KKZ Law	KKZ Rule of Law	WGI	-0.075	0.745	-1.883	1.710
KKZ Corr	KKZ Control of Corruption	WGI	-0.023	0.699	-1.738	2.231
ICRGE	International Country Risk Guide political, economic and financial risk ratings, used by several studies.	Unavailable				
Assassinations	Various measures of political and civil unrest.	Unavailable				

Table A2: Variable Descriptions, cont.

Variables	Description	Source	Mean	Std Dev	Min	Max
Policy						
M2	Money and quasi money (M2), as % of GDP. Proxy for financial depth/development.	WDI, International Financial Statistics	54.471	26.811	11.880	145.435
Trade	Value of Exports + Imports, as % of GDP. Alternative to various 'openness' variables, such as the unavailable Sash-Warner coefficient.	WDI, PWT, IMFStats	111.506	52.194	6.780	398.954
Inflation	CPI Inflation, annual %.	WDI, IMF World Economic Outlooks	9.139	19.138	-11.449	368.478
Budget Surplus	Govt budget surplus, as % of GDP.	Unavailable	-1.707	5.633	-14.963	21.229
Govt. Consumption	General Govt final consumption expenditure, as % of GDP.	WDI	19.826	8.332	3.219	83.159
BD Policy (initial)	Burnside and Dollar style policy variable, constructed as coefficient-weighted mean of trade, inflation, and a constant, as described in the text.	Constructed	7.069	1.149	2.320	12.122
BD Policy (new)	Burnside and Dollar style policy variable, constructed as coefficient-weighted mean of trade, inflation, govt. consumption, M2 and a constant, as described in the text.	Constructed	1.601	1.835	-3.762	10.240
CPIA Mean	World Bank Country Policy and Institutions Assessment ranking. Mean of 16 measures, used in several studies.					
Unreported						
Population	Total population (thousands)	WDI	1338	2588	15.969	11200
Life expectancy	Life expectancy at birth.	WDI	66.8	6.9	40.6	78.7

Notes: All data represents annual data, except those for BD Policy which is only calculated for 4-year data. Those country-years determined as outliers by the Hadi method for aid and per capita growth are excluded. Because of the summation of multiple disasters in some country-years, the disaster variable can exceed 100% of the population. This maximum is an extreme outlier.

Table A3: Burnside and Dollar Policy Variable Regression

Variables	**BD(2000)**		**A1**
Initial GDP	-0.65	Initial GDP	-0.492
Ethnolinguistic Frac	-0.58	Linguistic Fractionalization	-1.423*
Assassinations	-0.44*	KKZ Stab	0.568
Ethnic x Assassinations	0.81*		
Institutional Quality	0.64**	KKZ Mean	1.037
M2 (Lagged)	0.015	M2 (Lagged)	-0.010
Budget Surplus	6.85**		
Inflation	-1.40**	Inflation	-0.021
Openness (Sachs-Warner)	2.16**	Trade	0.020***
Sub-Saharan Africa	-1.53**	Pacific	-1.192*
East Asia	0.89	Caribbean	-0.102
R^2	0.35		0.27
Adjusted R^2			0.22
Observations	275		159

*, **, *** indicate significance at 10%, 5% and 1% levels respectively.

Constant not reported. Trade, Govt Consumption, Budget Surplus and M2 given as % of GDP, ODA as % GNI.

Table A4: Preferred Specification, FE and GMM

Variables	(A2a)	(A2b)	(A2c)	(A2d)	(A3a)	(A3b)	(A3c)	(A3d)
Initial GDP	-0.613	-0.337	-0.404	0.356	-1.276	-1.913	-0.442	0.364
KKZ Mean	3.261*	2.418	2.718*		3.366	4.300	0.250	
Linguistic Frac.								
Inflation	-0.045**	-0.038**	-0.045**	-0.040*	-0.056	-0.045	-0.080	-0.041
M2	-0.056**	-0.045**	-0.053**	-0.042	-0.024	-0.072	-0.076	-0.074
Trade	0.037**	0.039**	0.035**	0.029*	0.019	0.035	0.062	0.032
Govt Consumption	-0.101	-0.096	-0.104	-0.098*	-0.112	0.026	-0.150	-0.209
Pacific Dummy					1.341	-1.737	-2.974	0.079
ODA	0.137**	0.133**	0.154**	0.167**	0.032	0.091	0.265	0.143
ODA^2								
ODA * Policy	-0.019		-0.018	-0.009	0.016		-0.031	-0.013
ODA * KKZ Mean		0.084**	0.079	0.146		0.080	0.261	0.158
Prob > chi-squared / F	0.0000	0.000	0.000	0.000	0.051	0.007	0.000	0.000
R^2	.24	.29	.28	.36				
Observations	171	171	171	171	171	171	171	171

*, **, *** Indicate significance at 10%, 5% and 1% levels. Trade, Govt Consumption, M2 given as % of GDP, ODA as % GNI.
Period dummies not reported.

Table A5: Preferred Specification, OLS (including ODA^2)

Variables	(8a)	(8b)	(8c)	(8d)	(8e)	(8f)	(8g)
Initial GDP	-0.651*	-0.139	-0.046	-0.040	-0.166	-0.155	0.247
KKZ Mean	2.604***	2.399***	2.392***	2.391***	1.558*	1.554*	
Linguistic Frac	-1.269*	-1.29*	-1.161	-1.141	-0.778	-0.737	-0.545
Inflation	-0.024	-0.027*	-0.026*	-0.026	-0.029**	-0.029*	-0.032**
M2	-0.017	-0.017	-0.017	-0.016	-0.019	-0.018	-0.011
Trade	0.015***	0.014**	0.014**	0.014**	0.016***	0.015**	0.017**
Govt Consumption	-0.026	-0.047	-0.056	-0.057**	-0.059	-0.061	-0.077*
Pacific Dummy	-0.631	-0.612	-0.698	-0.693	-1.020	-1.010	-1.188*
ODA		0.059*	0.099	0.098	0.035	0.032	0.018
ODA^2			-0.001	0.001	0.002	0.003	0.003
ODA * Policy				-0.001		0.002	-0.004
ODA * KKZ Mean					0.121**	0.121**	0.167***
R^2	0.34	0.35	0.35	0.35	0.37	0.37	0.36
Adjusted R^2	0.28	0.29	0.28	0.28	0.30	0.30	0.28
Observations	171	171	171	171	171	171	171

*, **, *** Indicate significance at 10%, 5% and 1% levels. Trade, Govt Consumption, M2 given as % of GDP, ODA as % GNI.
Period dummies not reported.

Notes

[1] All aid data are taken from the World Bank World Development Indicators and SourceOECD databases. See Table A1 for summary aid data.
[2] A full list of countries to be used can be found in Table A1.
[3] ODA must be official aid intended for development purposes, and includes pure donations as well as loans with a grant element of at least 25%, at a fixed discount rate of 10%. It includes debt relief plans, which reduces the accuracy of the data for analyses such as this by adding a delay between receipt of funds and appearance in ODA statistics. It does not exclude tied aid nor aid in the form of technical co-operation. By definition, it is only received by countries meeting certain DAC 'least developed' criteria, but in some cases we include the equivalent, Official Aid, for countries who have recently been removed from the list of such least developed countries.
[4] While a panel of existing indicators such as the UNDP's Human Development Index, life expectancy, infant mortality, educational rates, measures of human rights, and so on, would be of some use in an analysis such as this, the stock of such data for these countries is so porous that any analysis would be econometrically weak.
[5] See Hadjimichael et al (2005), Lesink and White (2001), Dalgaard and Hansen (2001), Hansen and Tarp (2000; 2001), Dalgaard, Hansen and Tarp (2004), Feeny and McGillivray (2010), Collier and Dollar (2002), Clemens, Radalet and Bhavnani (2004), and incorporated in a slightly modified form into Burnside and Dollar (2000; 2004; and their extensions) and Murphy and Tresp (2006), among others.
[6] See also Guillaumont and Chauvet (2004), Murphy and Tresp (2006); Roodman (2004; 2008), Feeny and McGillivray (2010), and Rajan and Subramanian (2005; 2008).
[7] Exceptions include Pavlov and Sugden (2006), and Rao, Sharma and Singh (2007), however the former focuses on just seven Pacific countries, while the later develops a growth model that is too divergent from the core aid effectiveness literature to provide any sort of results comparability.
[8] For robustness, we tested the effects of aggregating using a moving average, rather than the traditional method, as well as with periods of various lengths. None of these results were particularly instructive, and as such we keep with the usual methods used in the literature, where the norm is 4-year periods.
[9] One result of this is the inclusion of countries such as Singapore, which are generally now considered anything but 'developing', however this is necessary to remove the bias mentioned, and only years in which they were listed as ODA recipients are included.
[10] We also exclude country-years for which the data is a significant outlier, as determined by the Hadi method for multivariate samples using our aid and growth variables. These 13 outliers include events such as Kiribati's 1980 post-independence adjustment of high aid and extremely high negative growth, years of extremely high aid and low growth in 1994-1998 post-independence Palau, and Guinea-Bissau's 1998 attempted coup and civil war. Outliers are also excluded from 4-year aggregations.
[11] In fact, the KKZ Stability variable may be a better measure of what the assassinations variable intends to capture.
[12] This is designed to be appropriate for small T, large N panels with linear functional relationships; inclusion of variables which are endogenous, particularly through correlation with their own past and future values; use of a dependent variable that is potentially correlated with its past values; inclusion of fixed individual effects; and possible presence of heteroskedasticity and autocorrelation within individuals.
[13] Burnside and Dollar also use 2SLS, but note little difference in its results. I also test using both methods, using the same instruments as Burnside and Dollar, with the exception of the unavailable arms imports variable. As our results are also unaffected, we do not report these extra regressions.
[14] Full results of this regression are reported in Table A3 of the appendix.
This is later re-estimated when using different time-horizons and aggregation methods, but the full regressions are not re-reported.
[15] Defined here as having per capita GDP less than US$10,000 (Constant 2000 Dollars) in any given period
[16] When restricted to their listed countries and periods, the dataset still has more observations than their full dataset. Without access to their dataset, we are unable to see where the gaps are, and thus unable to remove those observances. While this is clearly not ideal, and likely accounts for many of the differences between their results and my 'restricted' dataset results, there is no way around this and I must proceed with the restricted dataset as is.
[17] Again it is important to emphasize that our restricted dataset is not identical to Feeny and McGillivray's. See note 17.
[18] For space reasons we present only the final model, without the numerous intermediate test specifications.

[19] Due to simple summation of number affected in the case of multiple disasters, there are several data-points that have a percentage slightly above 100.
[20] Roodman (2008) explores this issue at length, arguing that proliferation of interaction variables, particularly the aid squared term, causes multicollinearity and can, in some cases, magnify endogeneity effects and lead to invalid results.
[21] For comparison, the results including the aid-squared variable are in Table A5 in the appendix. We note the decreased significance of aid whenever aid squared is included.
[22]These results are presented in Appendix Table A4, with Regression A2 representing fixed effects regressions and A3 representing the two-step GMM regressions.
Interactions with other variables, such as the disaster variable, population, per capita GDP, life expectancy, KKZ Voice and Accountability, and the Pacific Dummy are insignificant and sensitive to specification, and thus these tests are not reported.

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