

Chapter 31 Aid and Taxation

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31.1 Introduction

The principal aim of this chapter is to demonstrate that there is no robust or consistent relationship between aid, in total or whether disaggregated into grants and loans, and tax revenue. We demonstrate that although we can replicate the negative coefficient on aid variables in a tax revenue regression that is often claimed to show that aid reduces tax effort (Gupta et al, 2004; Benedek et al, 2012) this is not a robust finding. Specifically, we show that significance of coefficients on the aid variables can be eliminated by altering the specification or estimator or by introducing lags to aid or by altering the sample. Furthermore, changing the analysis from using annual observations to using sub-period averaged data one can obtain results that suggest a positive effect of aid on tax revenue (Clist and Morrissey, 2011; Morrissey et al, 2014) but these results also are not very robust. We conclude that no general claims that aid reduces (or increases) tax effort are credible; although it is easy to find associations between aid and tax in the data, these are inherently fragile and can often be explained by structural characteristics of the countries (factors associated with low tax are also associated with high aid). There is no reason to assert that aid has any consistent effect on tax effort.

The previous literature used IMF Government Finance Statistics (GFS), sometimes supplemented with internal IMF data, but these are known to suffer from missing data, mixed data from different sources (with different definitions of tax) and are inconsistent in how resource revenues are treated. In contrast, we employ recent cross-country data on tax revenue in developing countries drawn from the new International Centre for Tax and Development Government Revenue Dataset (ICTD GRD), see Prichard, Cobham and Goodall (2014). While the ICTD GRD merges data from various sources it contains more than 20% more observations for developing countries and is more accurate through careful

data merging using consistent definitions and distinguishing between tax and non-tax revenue.

This chapter should not be interpreted as suggesting in any way that aid is not relevant to tax or fiscal policy (it may be interpreted as implying that the amount of aid has no consistent effect on the level of tax revenue). Insofar as aid receipts are a known and observed source of revenue to recipient governments it is likely that expectations of aid influence government tax and borrowing decisions. Nevertheless, there can be no presumption regarding the magnitude or even direction of such effects, especially because donors endeavour to introduce a link, that they can monitor, between aid given directly to a government and public expenditure by that government (see Clist et al, 2012). In general, aid finances some elements of spending and the government finances the rest. In association with aid, such as through technical assistance or conditionality, donors support and promote policy and administrative reforms that can have important effects on tax and fiscal policy (see Prichard et al, 2012). It is the nature of the relationship and policy dialogue between donors and recipients that influences tax policy, not the volume of aid.

The specific focus on aid and taxation notwithstanding, our analysis has important lessons for any attempt to infer the effects of aid on indicators of economic performance using cross-country growth regressions: the methodology is not fit for purpose because the data are characterised by heterogeneity across countries. There is no simple general relationship. This is a rather obvious point because aid is multifaceted and varied; each of the many donors gives different types of aid in different amounts, with differing procedures and to serve varying motivations. Similarly, the structures and characteristics of economies and policy actions of governments vary so, for example, how a particular constellation of characteristics including aid relate to overall tax revenue (or growth) in one country may not be similar or even comparable to another country. We believe that even if this is an obvious argument it is too often ignored and therefore deserves emphasis.

There is also a methodological implication for how researchers can assess evidence on the effects of aid. Our approach is simple: start with an established paper (Gupta et al, 2004) that makes an explicit claim (aid reduces tax effort, especially if in the form of grants), analyse the data to demonstrate that we can reproduce their result, and then show how easily the result can be made to ‘disappear’ (i.e. show that significance is not robust). By implication, the ‘alternative’ result in the literature of a positive effect of aid on tax since the mid-1980s (Clist and Morrissey, 2011) is equally subject to the same criticism

and may not be robust. This is achieved by nothing more complicated than altering specification or estimation method; any result that permits inferring a general effect must be robust to such exercises in replication, but results for aid and tax do not withstand such scrutiny.

Section 31.2 provides a brief overview of the existing literature using cross-country regression analysis to test for the effect of aid on tax revenue and discusses reasons why we should not expect a consistent relationship between aid and tax revenue. We restrict attention to this cross-country or ‘large N’ literature for compactness and do not consider literature on the effect of donor programmes on tax policy (reviewed in Prichard et al, 2012) or country studies of the fiscal effects of aid (reviewed in Morrissey, 2014). Section 31.3 outlines the econometric approaches adopted in the literature and presents our results. Section 31.4 concludes with a brief discussion of implications.

31.2 Existing Views on Aid and Taxation

There has been much discussion as to whether aid is a substitute for or complement to domestically raised revenue. The prevailing argument in the empirical literature is that aid discourages tax collection because the security provided by ‘easy’ revenue from donors reduces the urgency for collecting domestic revenue (Brautigam and Knack, 2004; Gupta et al, 2004). An alternative view is that aid can support domestic revenue mobilization because the revenue security and donor support for reform encourages recipient governments to undertake more risky policy and investment decisions than they would usually take if they were solely reliant on domestic resources. Gupta (2007) and Brun et al (2009) find evidence of a positive relationship, in the latter case contingent on a strong institutional environment. Clist and Morrissey (2011) find evidence of a structural break so that since the late 1980s aid has been associated with increases in tax revenue. This result is attributed to the possible effects of policy reforms for both improved tax effort and increases in the tax base. A number of studies find no robust relationship between aid and tax revenues (Teera and Hudson, 2004), especially when more flexible econometric techniques, such as panel time series and group fixed effects estimators, are used (Carter, 2013).

In considering how aid, or more importantly donor influence, relates to tax mobilization the capacity building and transfer of knowledge from donors through technical assistance should not be neglected (Goldsmith, 2011). Aid-financed donor projects have the potential

to strengthen weak tax institutions, improve the formulation of tax policy and design of legislation and address capacity constraints in administration and enforcement agencies (Moore, 2014). However, such administrative and institutional reforms are difficult to design and implement and the evidence on their effectiveness is mixed at best (Andrews, 2013). Reform efforts and outcomes are inherently country-specific so it is probable that the same is true for the relationship between aid and tax.

A legitimate generalisation is that largely unobserved country-specific factors are the principal determinants of tax ratios. Aid may be a factor, although how government fiscal behaviour is influenced depends at least as much on the relationship with donors as the volume of aid. The political economy literature argues that agents do not like paying taxes so if governments can cover expenditure with aid they have less need to expend political effort in collecting unpopular taxes. Although aid does not cover all expenditure it may reduce the incentive for tax effort. While such a political cost in raising taxes exists, there is also a political cost in aid dependence. It is reasonable to assume that governments make a decision assessing the political cost of aid against that of increasing taxes. It is not obvious that always means they will chose less tax effort.

Consider three types of political costs associated with aid and tax: bureaucracy, accountability and autonomy. The bureaucratic costs refer to costs of tax administration compared to the costs of officials from various ministries interacting with donors. The latter is more a function of the number of donors than the amount of aid (and even if donors that provide more aid are more demanding of time from officials they may also provide more technical assistance for tax reform). Furthermore, as donors apply more and changing requirements on monitoring aid they are increasing aid costs to government. Over the last decade or so many low income aid recipients have implemented tax administration and fiscal reforms (Moore, 2014) so the bureaucratic costs of taxation have probably been reduced. Furthermore, these reforms often relate to improving the efficiency of tax collection, such as autonomous revenue authorities (Baskaran *et al*, 2015), so tax ratios can increase without increasing tax rates. In terms of bureaucratic costs the trend is likely to favour taxes over aid.

The costs of accountability refer to whom and what extent the government has to account for how it uses revenue and are likely to be greater for aid. Donors exert effort to monitor use and to ensure the government can account for the use of aid (as the donor agency is accountable to its own constituency). They also attach policy reform conditions,

often relating to public financial management or tax administration; effort has to be expended by the government in negotiating with donors and it is not costless to avoid complying with conditionality. In contrast, accountability to taxpayers is very weak in the low income countries that are the major recipients of aid. Furthermore, governments may face greater constraints on how they can use aid than for other sources of revenue. Comparing aid to resource (oil) revenues, Altincekic and Bearce (2014) provide empirical support for the argument that, because aid is less fungible and subject to conditionality, governments are less able to use aid to fund repression or appeasement (so there is no political aid curse). The costs of accountability are likely to be higher for aid than for taxation, at least where the tax system is weak and revenues are relatively low, i.e. in those countries where aid receipts are likely to be high.

Considering an autonomous government as one that can make independent decisions and policy choices there is a benefit from autonomy, so the costs of autonomy lie in its absence. Governments dislike being overly dependent on aid if this requires them to cede some policy influence to donors; even limited conditionality is a constraint on policy action. Increasing domestic revenue enhances autonomy, which will appeal to many governments, especially those that are accountable to domestic constituencies. To the extent that governments dislike ceding autonomy to foreign influences they will have a preference for increasing taxes relative to aid.

This line of argument implies an increasing tendency for governments to prefer to increase domestic revenue than accept aid because the political costs of aid are higher. To the extent that low income countries continue to rely on aid it is in part because they are constrained in their ability to raise sufficient domestic revenue to finance the level of expenditure that generates political gains. This implies that a focus on the amount of aid is misleading as it is the fiscal and administrative reforms promoted by donors and supported through aid that will have an impact of tax performance. However, the cross-country literature has tended to focus on the amount of aid, and this is the main reason we expect the findings not to be robust.

Perhaps the paper that is considered the greatest proponent of the negative relationship between the amount of aid and tax effort is Gupta et al (2004). Using a panel data set of 107 developing countries over the period 1970-2000 for their empirical analysis, they find evidence of a negative relationship between aid and tax revenue and also argue that the composition of aid matters, with loans, which need to be repaid, encouraging collection,

but grants discouraging tax effort. Clist and Morrissey (2011) replicate the Gupta et al (2004) findings but argue that this is due to a misspecification of the relationship of interest. Specifically, Gupta et al (2004) model a contemporaneous correlation between aid and tax collection. However, in a given year, higher aid, especially grants, is likely to be associated across countries with lower tax/GDP because the poorest countries tend to have lower tax/GDP ratios and tend to receive more aid, particularly in the form of grant. This is because other country characteristics determine both low tax and high aid, not because aid influences tax effort. Clist and Morrissey (2011) argue that lagging aid by one or two years when using annual data does not fully account for this endogeneity, particularly as tax/GDP ratios tend to exhibit persistence (at least over short periods).

To allow for an effect of aid on tax effort one must consider what lags are appropriate for aid received to affect behaviour. The behaviour of policymakers, tax administrations and enforcement agencies change only slowly. Although the anticipation of aid may create an incentive to reduce tax effort, it seems at least equally likely that policies associated with aid (conditionality and technical assistance) will have effects on tax revenue (on rates, bases or collection). Clist and Morrissey (2011) find that since the mid-1980s low-income aid recipients have managed to increase tax ratios, suggesting that the policies associated with aid may have supported increasing tax/GDP ratios. However, some policies associated with aid tend to reduce tax revenue; economic liberalization has typically been a component of conditional lending (aid increases) and such reform episodes, especially in trade policy, are generally associated with tax revenue reductions (Baunsgaard and Keen, 2005; Aizenman and Jinjarak, 2009). In this way, aid conditionality may actually generate a negative association between aid/GDP and tax/GDP ratios in the short-run. This helps to explain why some studies find a negative correlation between aid and tax ratios, but this is not due to a behavioural effect of aid reducing tax effort. The controls that are generally included in tax effort studies to proxy for the tax base (such as agriculture and industry shares in the economy, income per capita, imports and exports) cannot adequately account for these policy effects. In simple terms, aid is likely to shape tax performance through multiple channels - behavioural effects, conditionality, policy and technical assistance - and these country-specific effects may move in different directions, are difficult to distinguish from each other and thus confound empirical analysis.

Responding to the challenges of Clist and Morrissey (2011), Benedek et al (2012) replicated and expanded the initial Gupta et al (2004) study using a more recent (1980-

2009) and comprehensive tax revenue dataset for 118 countries. They also explored the robustness of the results (considering income groups, regional groups, controls for institutions), finding that the results are robust across samples, although the negative impact of aid on tax effort appears greater in weak institutional environments. Benedek et al (2012) base their claim that the negative result is robust on the use of a Generalised Method of Moments (GMM) estimator. Although GMM estimators are popular because of the potential to address certain endogeneity problems, Carter (2013) argues that the required conditions are unlikely to be satisfied given the nature of the relationship between aid and taxation. Clist (2014) shows that the IMF data combines different sources and changes in sources between years often generate large apparent changes in tax/GDP (but these are changes in measure, not in actual tax). These are then built in to the instruments used in GMM so the results in Benedek et al (2012) are unlikely to be as robust as they claim. Furthermore, they do not address the principal concern raised by Clist and Morrissey (2011) that because any effect of aid on tax effort is behavioural it will take a considerable number of years to affect tax effort and any effects will vary across countries (and over time). For these reasons we do not use GMM, but do employ estimators comparable to Gupta et al (2004).

31.3 Revisiting the Relationship with New Data

The analysis reported here employs an annual panel dataset for comparability with Gupta et al (2004). Covering the period 1980-2010, the sample consists of data for 89 developing countries: 46 from sub-Saharan Africa (SSA), 22 from Asia and the Pacific (AsiaPac) and 21 from Latin America and the Caribbean (LAC) (see Appendix Table 31.A1).¹ The tax revenue variable is taken from the ICTD GRD and is only available with sufficient coverage from 1980.² Most of the ICTD data is sourced from GFS, individual country

¹ We only include countries for which the GRD data is classed as ‘good’ quality and for which aid was at least 0.5% of GDP on average over the period (to exclude negligible recipients). Unlike Benedek et al (2012) we exclude countries from the Middle East and North Africa given the very low levels of aid received, if any, over the time period and European transition economies and those established from the former Yugoslavia given that they have quite different characteristics to developing countries. Some former Soviet Union countries are included where there are revenue and aid data (usually from 1990) and listed under the AsiaPac heading.

² This dataset was constructed to address missing data, data reliability, and differences across sources in definitions and recording of revenue variables and clearly separating revenues from

IMF Article IV reports and the respective country's own national budget. Control variables are compiled from the World Bank's World Development Indicators and data on net aid, grants and loans as a percentage of GDP are sourced from the OECD-DAC. A list of the data sources and summary statistics are provided in Appendix Tables 31.A2 and 31.A3 respectively.

Figure 31.1 illustrates the evolution of tax/GDP ratios in the sample over the period 1980-2010, with the dispersion by countries plotted for 3-5 year averages and the simple average across the sample for each year (the 'meanrev' line). This shows a gentle decline in the mean ratio until the late 1990s, then an increase but remarkably little growth in the average over the entire period, highlighting a general persistence. A similar pattern is observed for the dispersion excluding outliers. The outliers are typically small Pacific island states and Botswana displaying higher rates than other countries. There is some evidence for a general increase in the tax/GDP ratio since about 1998.

Figures 31.1 to 31.3 about here

Figure 31.2 presents the corresponding dispersion of the net aid to GDP ratio and again outliers are mostly Pacific islands (which given their very small populations and almost complete dependence on aid generate net aid to GDP ratios in excess of 50%) and post-conflict states such as Liberia and the Democratic Republic of Congo. The extent of outliers has declined since the late 1980s. Average net aid to GDP has remained relatively constant over the period, although there was a minor peak in the early 1990s; to some extent this is a mirror image of tax/GDP, confirming the hypothesis of a 'natural' negative contemporaneous correlation. Figure 31.3 serves to make the important point that loans, as a share of aid, are very low; always less than one per cent of GDP on average and generally negligible since the mid-1990s. Grants are by far the most important component of aid, especially for lower income countries.

Figures 31.4 to 31.6 about here

Figure 31.4 shows that the weak contemporaneous relationship between aid and tax is largely due to outliers (the correlation is merely -0.03). As illustrated in Figure 31.5 a similar contemporaneous relationship is evident between grants and tax (but the correlation is only -0.02). Figure 31.6 shows effectively no relationship between loans and tax

natural resource exploration. It is available from www.ictd.org with documentation (Prichard, Cobham and Goodall, 2014).

(correlation -0.01). Simply by looking at the scatter plots one would not anticipate a significant effect of aid on tax for the sample.

The analysis estimates the standard tax structure equation (31.1) following Gupta et al (2004) and Clist and Morrissey (2011). We use the limited set of controls that are standard in the literature but test robustness to the inclusion of additional explanatory variables (see Table 31.3 and discussion).

$$\ln\left(\frac{tax}{GDP}\right) = \beta_0 + \beta_1 GDPpc + \beta_2 AGR + \beta_3 IND + \beta_4 M + \beta_5 X + \beta_6 aid + \beta_7 aid^2 + \varepsilon \quad (31.1)$$

The dependent variable is the natural log of the tax/GDP ratio (as the ratio itself is not normally distributed). The level of income (*GDPpc*), share of industry in the economy (*IND*) and trade/GDP ratios for imports (*M*) and exports (*X*) are all expected to be positively associated with tax/GDP,³ whereas the share of agriculture (*AGR*) is expected to be negative reflecting the difficulty in taxing small producers. In the analyses aid is also disaggregated into grants and loans, accounting for a non-linear effect with the inclusion of an aid squared term. This aims to capture the possibility that above a certain threshold additional increases in aid may have a more detrimental effect on tax revenue (in terms of the discussion in section 31.2, highly aid dependent countries may have no desire or ability to exercise the political calculus in favour of raising taxes). Whilst a relatively parsimonious model is pursued here, a number of other variables have been included in the literature. In sensitivity analysis we include additional proxy measures of variables that have often been significant (and are also included in Gupta et al, 2004): whether or not the country is an oil producer (*oil*); the rate of inflation (*inf*) to capture macroeconomic instability; and the degree of corruption (*icrg*) as an indicator of institutional quality.

One of the major challenges to the empirical analysis of the relationship between aid and tax revenues is the quality and availability of data, in particular that of general

³ Although Gupta et al (2004) combine exports and imports in a single openness variable we follow Clist and Morrissey (2011) and include them separately as they may have distinct effects. Imports proxy for tariff revenue and most countries reduced tariffs, often significantly, during the period. Although some countries still tax exports, most eliminated major export taxes in the 1980s so exports are not inherently sources of revenue (a positive coefficient would suggest that the export sector supports economic activity that generates revenue).

government and tax revenues. As Prichard et al (2014) note, there is a high degree of selection bias in the revenue data sets that are available with missing data in resource-rich countries, conflict states and those with poor relationships with international finance institutions (IFIs) being under-represented. Whilst attempts have been made to address these shortcomings in this analysis through the use of a newly compiled and cleaned dataset from ICTD, missing observations remain a concern, and acknowledgement is made of the fact that various sources of data have been accessed for its compilation.

From an econometric perspective, addressing the potential endogeneity between aid and taxation is a central theme in the literature and also a source of critique (Carter, 2013). This dual causality arises from the fact that aid volume, as well as the aid mix, may be affected by the expenditure, taxation and domestic financing decisions of a recipient government. More generally, poor countries that attract aid also tend to have a weak tax base, hence low tax ratios; aid flows are typically higher to countries that have more difficulty in raising domestic revenues because such countries tend to be poorer. Authors typically tackle this endogeneity by lagging aid by periods of various lengths and we adopt that approach for comparability with Gupta et al (2004).⁴ However, any lag length implies an assumption of the timeline for which aid is likely to affect tax effort behaviour and this is likely to be highly contingent on the donor-recipient relationship, the associated policies and other country-specific factors (Prichard et al, 2012). Our strategy is to experiment with various lag lengths; as developing countries, especially low-income countries, have limited ability to alter tax revenue in the short to medium term (Keen and Simone, 2004; Morrissey, 2014) longer lags are more appropriate to capture embedded behaviour due to aid.

Note that if the true endogeneity is that recipient revenue performance influences donor aid allocation the use of lags is sufficient, but if the underlying problem is that structural characteristics determine both (low) revenue and (high) aid the use of lags alone may not be sufficient because characteristics change slowly. For example, countries that have a narrow production structure (given endowments) and depend on a narrow range of commodities for export earnings may have trade deficits that attract aid financing and low

⁴ Brun et al (2009) use an instrumental variable approach and results are not noticeably different to employing lags.

tax revenues given the disincentive effect of taxing too heavily the few potentially dynamic (export) sectors of the economy.

Econometric Results

The basic findings of Gupta et al (2004) and Benedek et al (2012) are assessed through replication of their core specification using the new dataset with pooled ordinary least squares (OLS) and panel fixed effects (FE) estimators applied to annual data to estimate equation (31.1). We then extend the analysis to consider alternative estimators and additional variables. In recognition of the presence of serial correlation in the error terms given the use of annual data, feasible generalised least squares (FGLS) and panel corrected standard errors (PCSE) estimators are also employed. As these estimators are sufficient to demonstrate that the results are not robust, we do not employ the GMM technique used in Benedek et al (2012).⁵

Table 31.1 reports the results of a pooled OLS estimation using the annual dataset. If the aid variables are not lagged net aid has a negative and significant coefficient, whilst the coefficients on grants and loans have a positive and negative sign respectively, but are statistically insignificant. Once a 5-year (or 3-year, not reported) lag is introduced, the coefficient on loans remains insignificant but results for grants become statistically significant. The same pattern of results is true for the longer 10-year lag, and the magnitude of the positive coefficient on grants increases. The controls are significant (except for GDPpc) and coefficients are very stable; the F statistic of joint significance is statistically significant and the overall explanatory power of the model (R^2) is sufficient. As poorer countries have larger shares of agriculture, controlling for the negative effect of AGR tax ratios tend to fall as per capita income rises. Additionally, there is a negative effect of *IND* on tax ratios (so industry is not operating as the tax base that would be expected). The effect of imports is positive and significant, consistent with the importance of tariff revenue and may also proxy for economic activity (growth associated with increasing demand for imports). The negative coefficient on exports suggests this may proxy for the adverse effect of economic instability (as captured by export volatility), and

⁵ The GMM approach is useful to allow for endogeneity if unobserved country-specific effects also vary over time, albeit at a cost of requiring additional assumptions. Typically, GMM is employed to test the robustness of OLS and/or FE estimates rather than an alternative estimator when these are found not to be robust, as in the case here. Carter (2012) shows that GMM is not necessarily robust.

may also capture the difficulty of taxing resource exports (noting that resource revenues are excluded from the tax measure).⁶ We wait until after all results before interpreting these controls.

Tables 31.1 and 31.2 about here

For the control variables, the OLS results are in line with Gupta et al (2004), but the aid variables are inconsistent. Table 31.2 presents results using a Fixed Effects (FE) estimator. The only noticeable change for the controls is that exports are insignificant in almost all specifications (suggesting the country-specific effect may capture export volatility). Significant coefficient estimates remain for the aid variables, but at lower levels of statistical significance and magnitudes. As the FE estimator has the merit of allowing for heterogeneity (unobserved country-specific effects) these results alone should caution against inferring any general effect of aid on tax revenue.

Following Gupta et al (2004) and Benedek et al (2012) we also include a number of additional variables: inflation (*inf*) represents macroeconomic instability; the institutional environment is captured by a measure of corruption (*icrg*); and a dummy variable for whether the country is an oil producer (*oil*).⁷ Table 31.3 presents the results: the aid variables are statistically insignificant. Inflation has a negative and significant coefficient in line with expectations. The measure of corruption is positive in line with how the variable is constructed, with higher values representing less corruption, i.e. a better institutional environment, but is statistically insignificant.⁸ The oil dummy is negative and statistically significant (the negative coefficient on exports become significant). If the aid variables are lagged in this specification *Loans* remain statistically insignificant, however *Grants* are positive, statistically significant and quadratic in effect (results available on request).

Table 31.3 about here

⁶ Although the coefficients appear to offset each other (cautioning against combining both in an openness measure) note that imports are typically a larger share of GDP than exports.

⁷ Oil producers are: Angola, Argentina, Brazil, Brunei, Chad, China, Colombia, Congo Rep., Gabon, India, Indonesia, Iran, Kazakhstan, Libya, Malaysia, Mexico, Nigeria, South Africa, Sudan, Trinidad and Tobago, Turkmenistan and Venezuela.

⁸ Gupta et al (2004) rescale the ICRG corruption measure such that higher values indicate weaker institutions, thus the negative coefficient they find is contrary to the results presented here.

The annual nature of our data raises a potential problem of serial or auto-correlation, i.e. that the errors generated are not independent of each other over time. To address group-wise heterogeneity and contemporaneous correlation, following Gupta et al (2004) we use a panel corrected standard errors (PSCE) model.⁹ This yields similar results to the FE estimates although the coefficient on *Grants* is statistically significant, with a positive coefficient (final column of Table 31.3).

As another way to address group-wise heterogeneity, contemporaneous correlation and serial correlation, we employ a feasible generalised least-squares (FGLS) estimator with both a common AR(1) correlation coefficient and panel specific AR(1) process. The aid variables are statistically insignificant in all lagged specifications and when the additional variables are included; when contemporaneous aid is used only *Grants* has a positive and significant coefficient (results available on request). Table 31.4 reports FGLS estimates for samples comprising only countries in the lowest quartile or lowest 50% classified by ICRG, i.e. countries with below average institutional quality, as in Gupta et al (2004) and Benedek et al (2012). Note that the controls become insignificant or only very weakly significant. The aid variables are all insignificant except grants lagged five (but not 10) years. The negative association between grants and tax is apparent in countries with low institutional quality; as long lags eliminate this significance it cannot be interpreted as clear evidence that grants reduce tax effort. The relatively long persistence in tax ratios imply that it is just as plausible that these results reflect the coincidence of low income, low tax ratios and poor institutional quality with relatively high grants receipts.¹⁰

Tables 31.4 and 31.5 about here

The estimates presented here used annual observations from the ICTD GRD. Morrissey et al (2014) use the same data but organize it into a 4-year sub-period averaged panel (to smooth volatility and reflect the relatively persistent nature of the data). Table 31.5 provides some of their basic results. In the case of no lags the aid variables are all insignificant whereas with a one period lag the coefficients on aid and grants (with the

⁹ Within STATA the PCSE estimates linear cross-sectional time-series models where parameters are estimated by OLS or Prais-Winsten regression. When computing the standard errors and variance-covariance estimates, it assumes that the disturbances are by default heterogeneous and contemporaneous correlated across panels.

¹⁰ We also estimated for sub-samples classified into regions (Africa, LAC and AsiaPac) but aid variables were all insignificant, and by decade (1980s, 1990s and 2000s) where aid variables were mostly insignificant and in the cases where grants was significant the coefficient was positive (results available on request).

latter only weakly significant) are positive (the negative squared terms suggest a diminishing effect). However, when they employ FGLS or split the sample into regions or decades the significant results for aid are mostly eliminated. Even using period averaged data the results are not robust.

31.4 Conclusions: Why Aid is not a Determinant of Tax Revenue

Using a new source of tax revenue data in an annual panel we are able to replicate some of the basic results of Gupta et al (2004) and Benedek et al (2012), namely that net aid has a negative coefficient on tax revenues (but only using pooled OLS). When disaggregating aid we cannot reproduce their results; we find a positive rather than negative effect of grants when significant, while loans are almost always insignificant. This pattern of results generally holds whether using pooled OLS or other estimators (FE, RE, FGLS and PCSE). Including additional control variables highlights the lack of robustness of these results: in most cases the coefficients on aid variables are insignificant. Using four-year averaged panel data Morrissey et al (2014) also find no consistent robust relationship between aid, in total or when separating grants and loans, and tax performance. Where they do find significant coefficients these are positive for net aid and for grants, whereas for loans they are generally negative. The fragility of coefficient estimates on aid variables in a tax/GDP ratio equation justifies the conclusion that there is no robust or general relationship across countries. Certainly, there is no basis to infer that aid has any causal effect on tax revenue or tax effort.

The structure of the economy is an important determinant of tax revenues, but for the standard variables results are not very robust. Countries with a higher share of agriculture in GDP have lower tax ratios; this reflects the acknowledged difficulties in taxing smallholder agriculture but is also likely to proxy for poor countries (the agriculture variable was only insignificant when we estimated for countries with below average quality of institutions, generally poorer countries). The share of industry in GDP was generally significant with a negative effect, which may suggest that this is not a good proxy for the private sector tax base, perhaps because multinationals and large companies have sophisticated tax management schemes. There appears to be no direct relationship between per capita GDP (the proxy for the level of development of the country) and tax ratio, as even after controlling for sector structure the coefficient on *GDPpc* is statistically

insignificant. The negative coefficient on *GPDpc* may be attributable to relatively high income but low tax countries such as in East Asia. The effect of imports is positive when significant, consistent with the importance of tariff revenue and possibly also a proxy for economic activity (when inflation was used to capture economic instability imports became insignificant, and was also insignificant in the low institutional quality subsample). The coefficient on exports was negative when significant, including when an oil dummy was included; this may reflect the adverse effect of volatile export earnings on economic activity and/or the difficulty of taxing the natural resource sector, given the importance of primary commodity exports for many low-income developing countries.

The replication-type analysis conducted here is not an attempt to summarise empirical findings in the literature, but rather aims to show that the results are fragile and insufficiently robust to permit any general inferences. This is one approach to assessing the evidence. Alternative approaches such as meta-regression analysis (MRA) are intended to summarise empirical results from many studies (see Doucouliagos and Paldam, 2008 and chapter in this volume). The MRA approach is not appropriate in our case because there are too few sets of results to study and cross-country studies fail to capture inherent heterogeneity. Although there are now a number of aid-tax studies and all present many econometric results, there are relatively few directly comparable results using the same estimation method (and we have shown results are very sensitive to method). Although MRA is very robust when various studies estimate the same model in the same way, so the differences are primarily in sample and controls, it is not as useful in the presence of within sample heterogeneity and alternative models and estimators; in such cases the various studies are not ‘comparing like with like’ so the interpretation of the coefficient on the variable of interest varies and MRA estimates may be fragile (Mekasha and Tarp, 2013). Given the nature of the aid-tax relationship our approach of replication and sensitivity analysis is appropriate.

Our principal conclusion is that there is no general effect of aid amounts on tax effort as the relationship between aid (more strictly donors) and tax revenue varies across countries and over time and this fundamental heterogeneity renders cross-country econometric analysis uninformative. There is no robust general or average effect and we cannot draw broad inferences (and certainly not causal inferences). The deeply inconclusive literature on aid effectiveness is another example of heterogeneity so that cross country regressions are not resilient to replication. Herzer and Morrissey (2013)

argue that the heterogeneous nature of the relationship arises because the effect of aid on GDP depends on a trade-off that is country specific: aid has a direct positive effect through financing investment but an indirect effect through aggregate productivity that can be negative (positive) if aid exacerbates (mitigates) growth-retarding factors such as poor governance. Using data for 59 developing countries over 1971-2003 they estimate country specific aid-output coefficients. On average these are negative, although in about a third of cases they are positive, but smaller than the positive investment-output coefficients; insofar as aid is used to finance investment the overall effect on output is likely to be positive. Similarly, observing a tendency for a negative association between aid and tax across countries does not imply that aid has a negative effect on revenue.

Although we make no claim that it is robust, our most common result is for a positive association between grants and tax revenue. This is at least consistent with donors supporting improvements in tax administration and with the argument in section 38.2 that the political calculus may encourage governments to prefer to increase domestic revenue than accept aid because the political costs of aid are higher. It is the characteristics associated with being a poor country that generate the observed correlation between high aid and low tax, because the same characteristics are associated with low tax. As countries experience economic growth and move from low to middle income status one typically observes a corresponding increase in tax revenues (as the tax base expands) and a decline in aid (as need diminishes).

Donors can support a transition to increasing domestic revenue and promoting autonomous domestically accountable governments through appropriate technical assistance for the design and implementation of tax administration and policy reforms, such as establishing independent revenue authorities, and increasing tax collection efficiency. This will help to reduce the bureaucratic costs of taxation. Donors should also recognise the revenue implications of policy reforms and assist governments in planning for adverse effects of reforms that may reduce revenue (such as trade liberalization). Governments are more likely to exert tax effort if they are persuaded that it promotes autonomy; they may even be willing to promote domestic accountability, if only because accountability to taxpayers is easier to manage than relations with donors. Focussing on the amount of aid is misleading as it is the fiscal and administrative reforms promoted by donors and supported through aid that will have an impact of tax performance.

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Figure 31.1: Tax Revenue (% GDP), 1980-2010

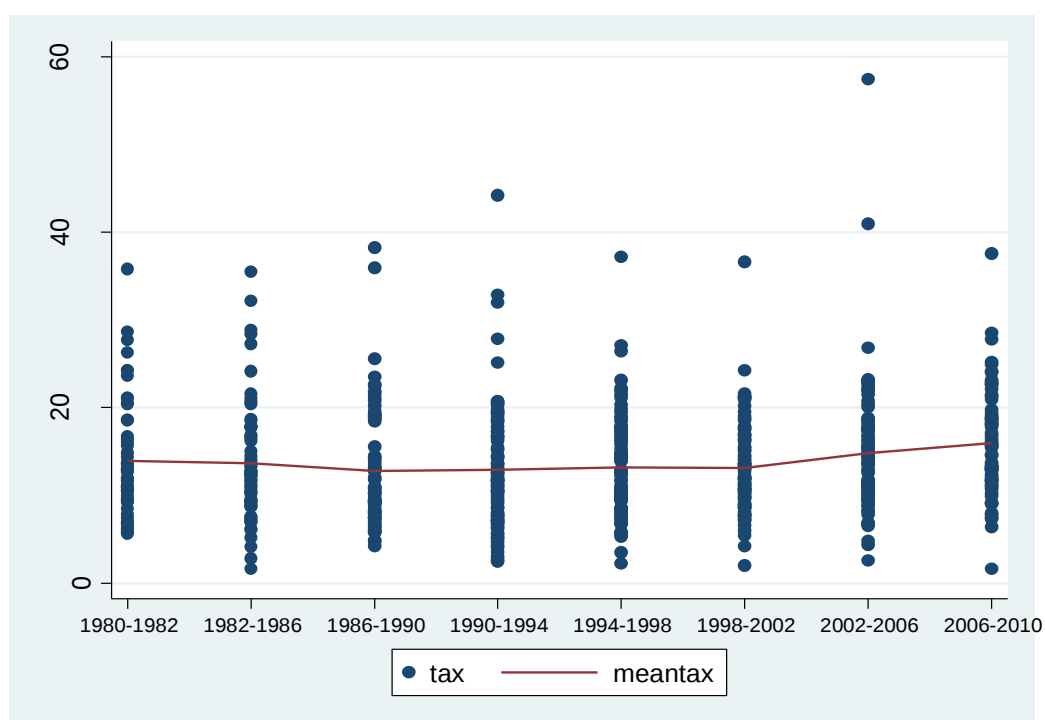


Figure 31.2: Net Aid (% GDP), 1980-2010

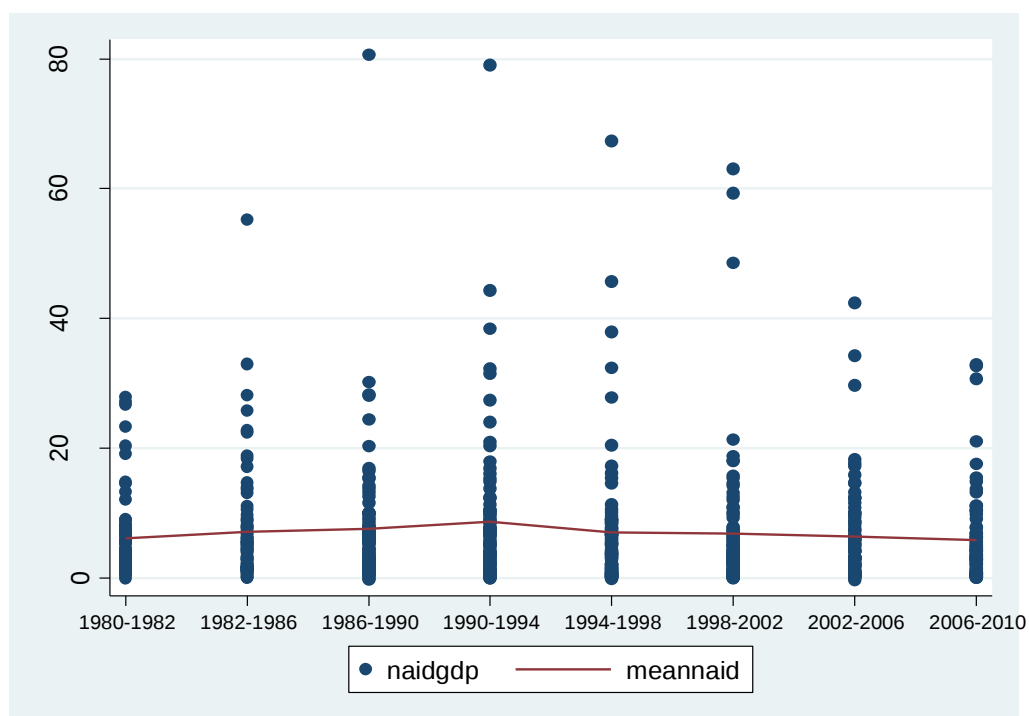


Figure 31.3: Mean Aid (% GDP), 1980-2010

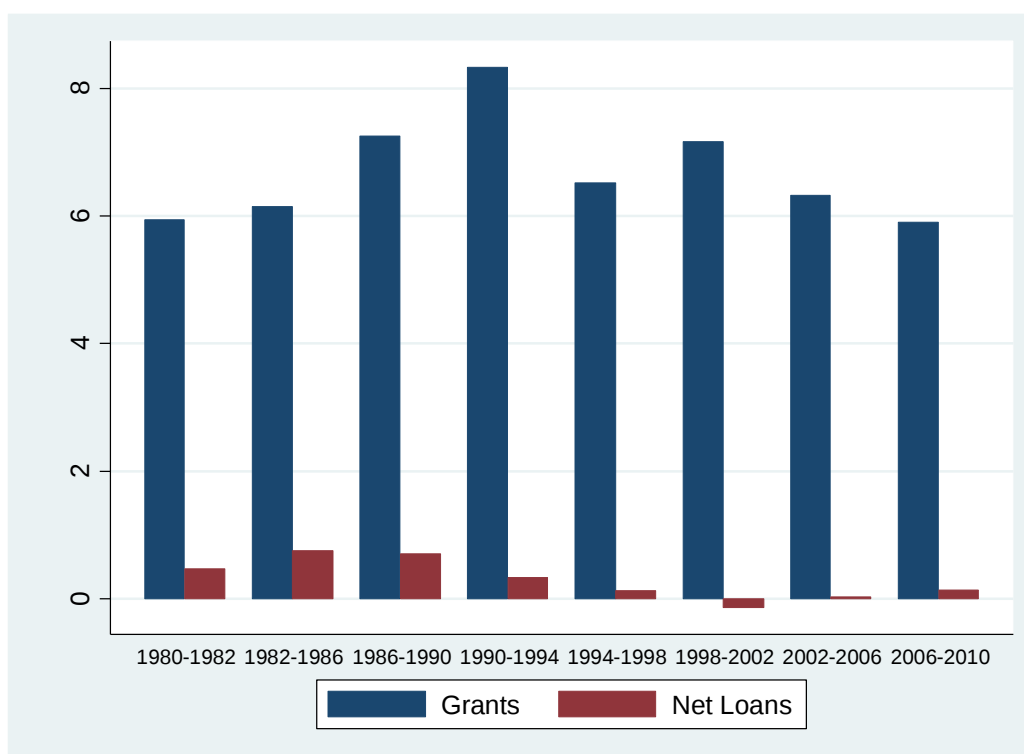
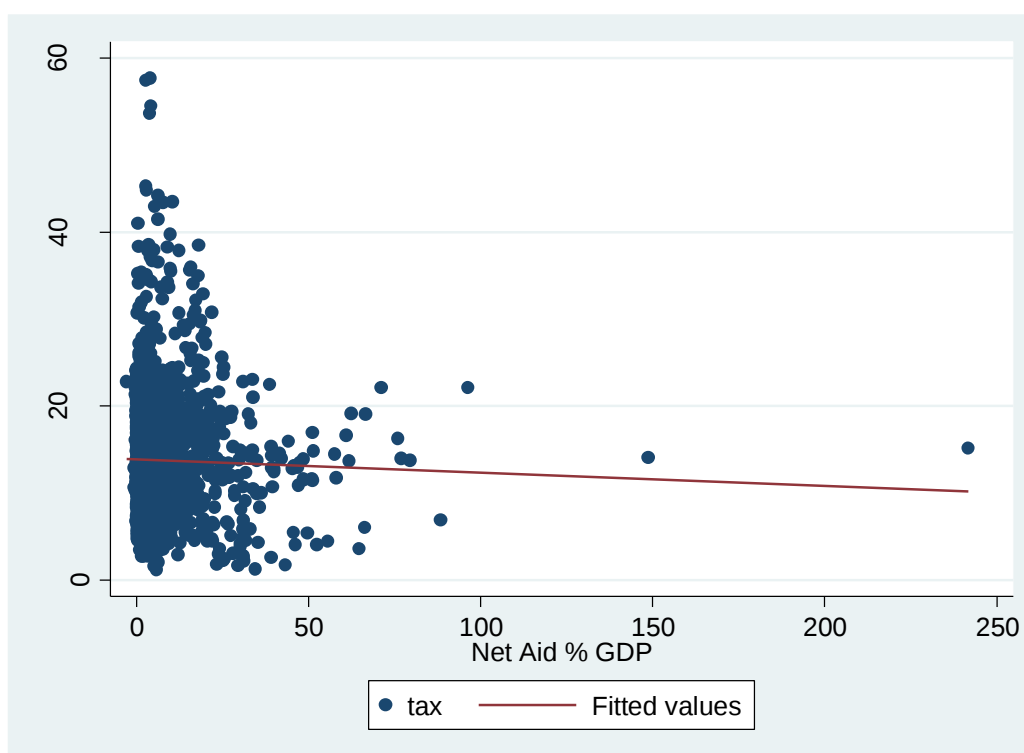
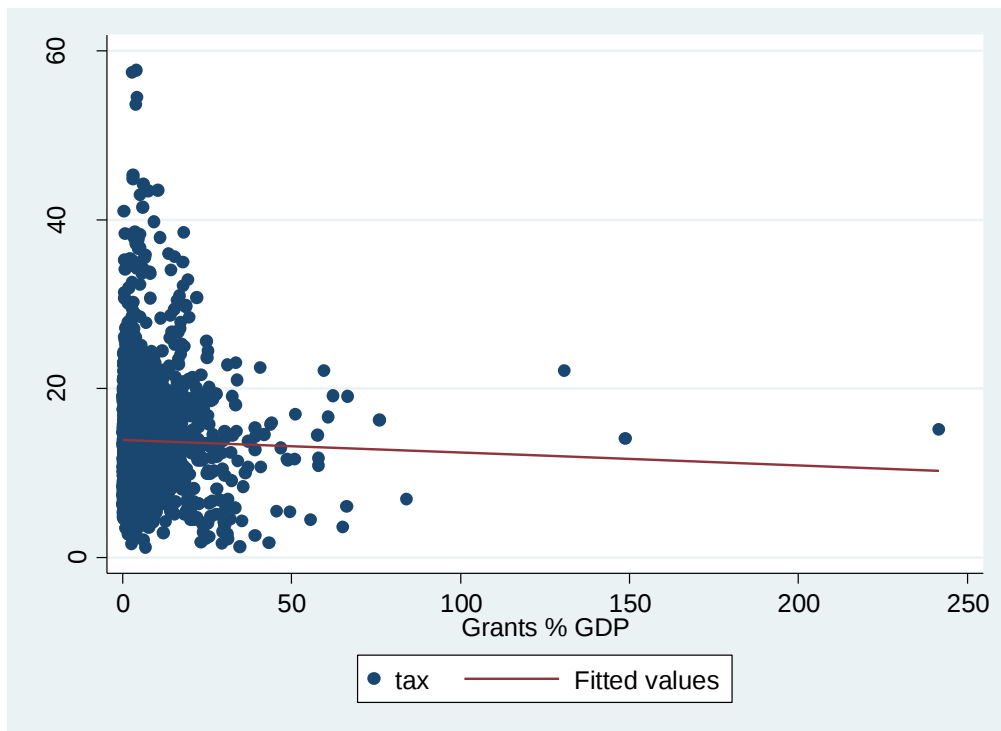


Figure 31.4: Tax and Net Aid (% of GDP), 1980-2010



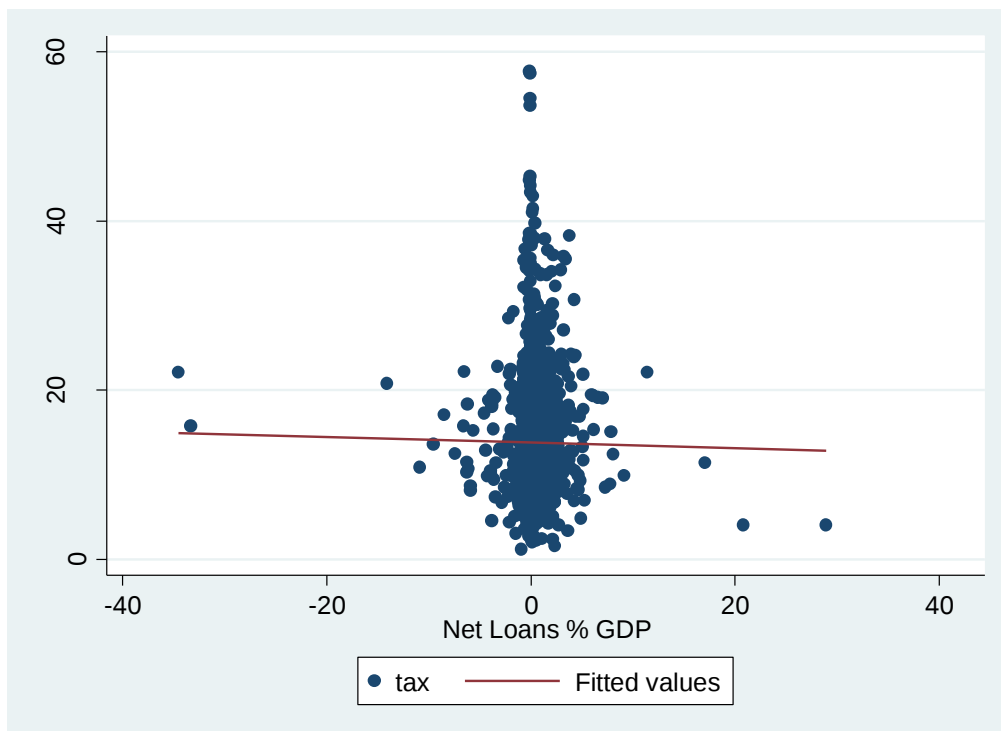
Notes: Outliers - Palau (1994) 241.68; Palau (1995) 148.76

Figure 31.5: Tax and Grants (% of GDP), 1980-2010



Notes: Outliers - Palau (1994) 241.68; Palau (1995) 148.76; Liberia (2008) 130.84

Figure 31.6: Tax and Net Loans (% of GDP), 1980-2010



Notes: Outliers - Liberia (2008) -34.5; Guyana (1991) -33.31

Table 31.1: Pooled OLS, Annual Panel

	Aid not lagged		Aid $t-5$	Aid $t-10$
<i>GDPpc</i>	7.000 ^{e-6} (0.19)	5.800 ^{e-6} (1.42)	2.100 ^{e-6} (0.52)	2.000 ^{e-6} (0.50)
<i>AGR</i>	-0.013 (14.46)***	-0.013 (14.53)***	-0.014 (16.49)***	-0.014 (15.01)***
<i>IND</i>	-0.008 (7.76)***	-0.008 (7.35)***	-0.008 (7.47)***	-0.007 (6.84)***
<i>M</i>	0.010 (12.53)***	0.010 (13.13)***	0.010 (12.99)***	0.010 (13.08)***
<i>X</i>	-0.002 (2.75)***	-0.003 (3.74)***	-0.003 (3.45)***	-0.003 (4.00)***
<i>Aid</i>	-0.007 (4.16)***			
<i>Aid</i> ²	0.000 (2.20)**			
<i>Loans</i>		-0.000 (0.09)	-0.002 (0.66)	-0.002 (0.29)
<i>Loans</i> ²		-0.000 (0.29)	0.000 (1.60)	-0.000 (1.23)
<i>Grants</i>		0.005 (1.07)	0.007 (1.74)*	0.019 (3.61)***
<i>Grants</i> ²		-0.000 (1.65)*	-0.000 (1.38)	-0.001 (2.49)**
<i>_cons</i>	2.700 (50.83)***	2.652 (46.64)***	2.696 (47.59)***	2.636 (44.71)***
<i>F</i>	175.32	141.50	146.93	155.16
<i>P</i>	0.00	0.00	0.00	0.00
<i>R</i> ²	0.41	0.43	0.45	0.47
<i>N</i>	2,039	1,944	1,897	1,784

Notes: Dependent variable is $\ln(\text{tax revenue/gdp})$; OLS estimator with robust standard errors: * denotes statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Test of joint significance of variables (F), associated p-value (P); R^2 is the coefficient of determination; N the number of observations. Results for Grants and Loans (second column) similar if each entered separately. Results for lagged aid are similar with $t-3$ (lagged three years) except Loans insignificant.

Table 31.2: Panel FE Estimators, Annual Panel

	Aid not lagged		Aid $t-5$	Aid $t-10$
<i>GDPpc</i>	-3.000 ^{e-6} (0.72)	2.500 ^{e-6} (0.59)	5.400 ^{e-6} (1.28)	1.160 ^{e-6} (2.60)***
<i>AGR</i>	-0.015 (14.60)***	-0.013 (13.36)***	-0.015 (14.70)***	-0.015 (14.45)***
<i>IND</i>	-0.008 (7.32)***	-0.006 (6.08)***	-0.005 (4.53)***	-0.003 (2.34)**
<i>M</i>	0.002 (3.78)***	0.003 (5.60)***	0.002 (4.08)***	0.002 (3.76)***
<i>X</i>	-0.001 (1.23)	-0.001 (1.90)*	-0.001 (1.43)	-0.000 (0.42)
<i>Aid</i>	-0.002 (1.96)*			
<i>Aid</i> ²	0.000 (1.00)			
<i>Loans</i>		0.004 (1.43)	0.001 (0.34)	-0.005 (1.35)
<i>Loans</i> ²		0.000 (0.18)	0.000 (0.28)	0.000 (0.32)
<i>Grants</i>		0.000 (0.11)	0.004 (1.81)*	0.007 (3.17)***
<i>Grants</i> ²		-0.000 (1.77)*	-0.000 (0.31)	-0.000 (2.89)***
_cons	3.019 (60.46)***	2.909 (56.55)***	2.916 (55.88)***	2.831 (51.05)***
<i>F</i>	36.77	29.24	32.84	37.10
<i>P</i>	0.00	0.00	0.00	0.00
<i>R</i> ²	0.12	0.12	0.14	0.16
<i>N</i>	2,039	1,944	1,897	1,784

Notes: As for Table 31.1 except estimated using panel fixed effects (FE) favoured over random effects (RE); all aid variables also insignificant using random effects with lagged aid. Test of joint significance of variables (F/χ^2). Results for Grants and Loans (second column) similar if each entered separately except Grants significant and negative. Results for aid $t-3$ are similar to $t-5$.

Table 31.3: Annual Panel, Additional Regressors and PCSE

	Panel RE estimator		PCSE $t-5$
<i>GDPpc</i>	4.500e ⁻⁶ (1.08)	2.420e ⁻⁵ (2.69)***	2.21e ⁻⁶ (0.33)
<i>AGR</i>	-0.014 (14.28)***	-0.013 (10.73)***	-0.014 (15.73)***
<i>IND</i>	-0.007 (7.06)***	-0.003 (1.93)*	-0.008 (7.52)***
<i>M</i>	0.004 (6.62)***	0.008 (8.77)***	0.010 (13.85)***
<i>X</i>	-0.001 (1.66)*	-0.003 (2.80)***	-0.003 (3.41)***
<i>Loans</i>	0.004 (1.40)	0.003 (1.04)	-0.002 (0.59)
<i>Loans</i> ²	0.000 (0.25)	0.000 (0.11)	0.000 (1.11)
<i>Grants</i>	0.000 (0.18)	-0.004 (1.59)	0.007 (2.79)***
<i>Grants</i> ²	-0.000 (1.96)**	0.000 (0.44)	-0.000 (3.17)***
<i>Inf</i>		-0.000 (5.86)***	
<i>ICRG</i>		0.038 (0.81)	
<i>Oil</i>		-0.382 (2.90)***	
<i>_cons</i>	2.895 (48.93)***	2.576 (17.37)***	2.696 (48.14)***
<i>Chi</i> ²	330.38	390.09	1,457.32
<i>P</i>	0.00	0.00	0.00
<i>R</i> ²	.	.	0.45
<i>N</i>	1,944	1,154	1,897

Notes: As for Table 31.2 except estimated using panel Random Effects (RE), given nature of additional variables (all aid variables insignificant using FE), or panel corrected standard errors (PCSE) model in final column (almost identical results for aid $t-3$ or not lagged).

Table 31.4: Accounting for Institutional Quality (FGLS estimator)

	Bottom 25% on ICRG		Bottom 50% on ICRG	
	Aid _{<i>t</i>-5}	Aid _{<i>t</i>-10}	Aid _{<i>t</i>-5}	Aid _{<i>t</i>-10}
<i>GDPpc</i>	-3.178e ⁻⁴ (1.20)	-4.637e ⁻⁴ (1.77)*	-2.620e ⁻⁴ (1.71)*	-2.890 e ⁻⁴ (1.89)*
<i>AGR</i>	0.001 (0.03)	0.001 (0.04)	-0.005 (0.40)	-0.003 (0.22)
<i>IND</i>	0.045 (1.09)	0.055 (1.29)	0.035 (1.81)*	0.039 (1.88)*
<i>M</i>	-0.008 (0.52)	-0.011 (0.77)	-0.005 (0.64)	-0.006 (0.68)
<i>X</i>	-0.004 (0.28)	-0.003 (0.21)	0.003 (0.39)	0.001 (0.13)
<i>Loans</i>	-0.015 (0.43)	-0.103 (0.78)	-0.016 (0.92)	-0.032 (1.00)
<i>Loans</i> ²	0.000 (0.43)	0.010 (0.39)	0.000 (0.89)	0.001 (0.55)
<i>Grants</i>	-0.053 (0.73)	-0.186 (1.12)	-0.045 (1.79)*	-0.059 (0.96)
<i>Grants</i> ²	0.001 (0.72)	0.006 (0.90)	0.000 (1.53)	0.001 (0.34)
_cons	2.972 (1.53)	3.481 (1.72)*	2.546 (2.94)***	2.618 (2.80)***
Chi2	3.05	4.82	14.13	16.10
P	0.00	0.00	0.00	0.00
N	221	217	528	514

Notes: As for Table 31.1 except estimated using estimated using a feasible generalised least squares (FGLS) estimator with panel-specific AR(1) process; sample split by ICRG ranking.

Table 31.5: Sub-period Averaged Panel, 1980-2010

	Aid not lagged		Aid lagged one period	
<i>GDPpc</i>	0.001 (0.26)	0.002 (0.58)	0.005 (1.00)	0.005 (1.18)
<i>AGR</i>	-0.012 (7.18)***	-0.012 (7.11)***	-0.013 (6.96)***	-0.012 (6.97)***
<i>IND</i>	-0.007 (4.23)***	-0.007 (4.21)***	-0.005 (3.16)***	-0.006 (3.35)***
<i>M</i>	0.002 (2.37)**	0.003 (2.91)***	0.003 (2.62)***	0.003 (2.86)***
<i>X</i>	-0.001 (0.89)	-0.002 (1.46)	-0.002 (1.38)	-0.002 (1.50)
<i>Aid</i>	0.268 (0.82)		0.698 (2.20)**	
<i>Aid</i> ²	-0.723 (1.51)		-1.014 (2.10)**	
<i>Loans</i>		-0.793 (0.95)		-0.588 (0.75)
<i>Loans</i> ²		-6.369 (0.42)		18.800 (1.42)
<i>Grants</i>		0.381 (1.09)		0.585 (1.72)*
<i>Grants</i> ²		-1.109 (1.93)*		-1.012 (1.79)*
_cons	-1.699 (21.46)***	-1.729 (22.04)***	-1.758 (21.29)***	-1.776 (22.00)***
<i>F</i>	9.89	8.39	9.81	7.91
<i>P</i>	0.00	0.00	0.00	0.00
<i>R</i> ²	0.10	0.11	0.11	0.11
<i>N</i>	725	752	665	687

Notes: As for Table 31.2 except FE with panel of 4-year averages. Results for Grants and Loans (second and fourth columns) similar if each entered separately.

Source: Morrissey et al (2014), Tables 1 and 2.

Appendix Table 31.A1: Sample Country List

Sub-Saharan Africa (SSA)	Asia and the Pacific (AsiaPac)	Latin America and the Caribbean (LAC)
1. Angola 2. Benin 3. Botswana 4. Burkina Faso 5. Burundi 6. Cameroon 7. Cape Verde 8. Central African Republic 9. Chad 10. Comoros 11. Congo, Dem. Rep. 12. Congo, Rep. 13. Côte d'Ivoire 14. Djibouti 15. Equatorial Guinea 16. Eritrea 17. Ethiopia 18. Gabon 19. Gambia, The 20. Ghana 21. Guinea 22. Guinea-Bissau 23. Kenya 24. Lesotho 25. Liberia 26. Madagascar 27. Malawi 28. Maldives 29. Mali 30. Mauritius 31. Mozambique 32. Namibia 33. Niger 34. Nigeria 35. Rwanda 36. São Tomé and Príncipe 37. Senegal 38. Seychelles 39. Sierra Leone 40. Sudan 41. Swaziland 42. Tanzania 43. Togo 44. Uganda 45. Zambia 46. Zimbabwe	1. Afghanistan 2. Bangladesh 3. Bhutan 4. Cambodia 5. Fiji 6. Indonesia 7. Kiribati 8. Kyrgyz Republic 9. Lao PDR 10. Myanmar 11. Nepal 12. Pakistan 13. Palau 14. Papua New Guinea 15. Philippines 16. Samoa 17. Solomon Islands 18. Sri Lanka 19. Tajikistan 20. Timor-Leste 21. Tonga 22. Vanuatu	1. Antigua and Barbuda 2. Belize 3. Bolivia 4. Costa Rica 5. Dominica 6. Dominican Republic 7. Ecuador 8. El Salvador 9. Grenada 10. Guatemala 11. Guyana 12. Haiti 13. Honduras 14. Jamaica 15. Nicaragua 16. Panama 17. Paraguay 18. Peru 19. St. Kitts and Nevis 20. St. Lucia 21. St. Vincent and the Grenadines

Appendix Table 31.A2: Variable Descriptions and Sources

Variable Name	Variable Description	Data Source
<i>Tax</i>	Tax revenue excluding grants, % of GDP	ICTD GRD database
<i>AGR</i>	Share of agriculture (value added), % of GDP	World Bank, World Development Indicators (WDI)
<i>IND</i>	Share of industry (value added), % of GDP	World Bank, WDI
<i>GDPpc</i>	GDP per capita, current US\$	World Bank, WDI
<i>Imports</i>	Value of total imports, % of GDP	World Bank, WDI
<i>Exports</i>	Value of total exports, % of GDP	World Bank, WDI
<i>Aid</i>	Net aid (excluding repayments on principal), % of GDP	OECD-DAC and author's calculations
<i>Grants</i>	Grants, % of GDP	OECD-DAC and author's calculations
<i>Loans</i>	Net loans (excluding repayments), % of GDP	OECD-DAC and author's calculations
<i>oil</i>	Crude oil producer, dummy variable	CIA World Factbook and Gupta et al (2004)
<i>inflation</i>	Inflation rate, year-on-year %	IMF, World Economic Outlook Database
<i>icrg</i>	Corruption index, ascending scale 0-6	International Country Risk Guide but taken from Gupta et al (2004) and averaged over the period 1985-1996.

Appendix Table 31.A3: Descriptive Statistics (Annual Panel)

	N	mean	sd	Min	Max
<i>Tax</i>	2291	13.71	6.62	1.16	57.71
<i>AGR</i>	2441	25.48	15.11	1.50	94.00
<i>IND</i>	2437	25.28	12.27	1.90	95.70
<i>GDPpc</i>	2584	1497.24	2122.73	64.35	27816.50
<i>Imports</i>	2517	46.40	24.64	0.12	209.02
<i>Exports</i>	2514	34.15	21.54	0.18	166.36
<i>Aid</i>	2529	6.98	10.78	-2.85	241.68
<i>Grants</i>	2546	6.83	10.29	0.001	241.68
<i>Loans</i>	2428	0.28	2.04	-34.54	42.89
<i>inflation</i>	2641	54.11	563.44	-72.73	23760.49
<i>icrg</i>	1571	2.55	0.91	0.28	5.00

Notes: Annual data, 1980-2010; all variables as ratios of GDP except per capita GDP; sd denotes standard deviation. Extremes are: *GDPpc* min – Liberia, 1995; *GDPpc* max – Equatorial Guinea, 2008; *imports* min – Maldives, 1981; *exports* max – Myanmar, 2003; *naidgdp* max – Palau, 1994; *inflation* min – Zimbabwe, 2007; *inflation* max – Congo DRC, 1994.