Income Thresholds and Aid Responses

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Abstract. The aid allocation literature has devoted surprisingly little attention to strategic interaction among donors. This study investigates the effects of the World Bank's income threshold for IDA eligibility, and of actual IDA allocations, on the allocations of bilateral donors. Other donors might interpret the World Bank's policies and allocations across recipients as informative signals of where their own aid might be used most effectively. Alternatively, other donors might compensate for reduced IDA allocations by increasing their own aid, particularly where declines in IDA were triggered by crossing an arbitrary income threshold. We show in this paper that the former effect dominates the latter, but we also find some heterogeneity among donors. Using panel data with country fixed effects, we find that aid from the DAC bilateral donor countries – and total aid from all donors reporting to the DAC - is significantly reduced after countries cross the IDA income cutoff, controlling for other determinants of aid including various nonlinear functions of (continuous) per capita income. Allocations by other donors are not sensitive to actual IDA disbursements, only to the IDA income threshold. Because crossing the income cutoff for IDA eligibility significantly reduces aid levels from other donors as well as from the World Bank, government officials in recipient countries may have an incentive to manipulate their national accounts data to understate per capita income when it is near the IDA threshold. Accordingly, we test for "bunching" of observations just below the income threshold, and find no evidence to support data manipulation concerns.

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1. Introduction

Beginning in 1987, a major criterion for eligibility for the World Bank's concessionary IDA loans and grants has been whether or not a country is below a certain threshold on per capita income. The effects of this rule on total aid from all donors are not obvious. Other donors might view crossing this threshold as a signal that countries are in less need of aid, and reinforce the (negative) effects of threshold-crossing on IDA flows by reducing their own aid levels. Alternatively, other donors might view a relatively steep and sudden decline in IDA as an overreaction to crossing of an arbitrary income threshold, and compensate for the decline in IDA flows by increasing their own aid to a recipient that recently exceeded the threshold. We show in this paper that the positive signaling effect dominates any such "crowding out" effects. Using panel data with country fixed effects, we find that aid from the DAC bilateral donor countries is significantly reduced after countries cross the IDA income threshold, controlling for other determinants of aid including a continuous measure of per capita income. These findings prove highly robust to the use of alternative aid measures, and to controlling for continuous variations in GNI per capita via higher-order polynomial functions.

In contrast, other income thresholds with weaker theoretical links to aid flows turn out to have little predictive power for aid flows. These findings on alternative thresholds provide some confidence that our positive estimates for the IDA income threshold are not capturing spurious effects.

When aid from the large group of DAC bilateral donors is disaggregated, Japan and Italy are identified as countries with aid flows that are strongly consistent with those for this group of donors overall. Germany is the largest donor that is inconsistent with the general pattern: it provides significantly higher rather than lower aid when countries exceed the threshold.

Because crossing the income threshold for IDA eligibility significantly reduces aid levels from other donors as well as the World Bank, government officials in recipient countries may have an incentive to manipulate their national accounts data to understate their per capita income levels, as their income levels approach the IDA threshold. Preliminary tests indicate underreporting is likely rare, as there is no evidence of significant "bunching" of observations just below the income threshold.

The remainder of the paper is organized as follows. Section 2 provides a brief review of the relevant aid allocation literature. Section 3 describes the eligibility criteria and graduation policies for IDA and (briefly) for the IMF and regional development banks, focusing on the role of the per capita income threshold. Section 4 describes the data and empirical strategy. Section 5 presents results for the base specification and for various robustness tests. Section 6 tests for manipulation of incomes data. The final section summarizes the findings, and discusses their implications for IDA's graduation policies and for aid effectiveness research.

2. Related Literature

There is a large (mostly empirical) literature on donors' allocation of aid across recipient countries, but it has devoted little attention to strategic interaction among donors. For example, interaction among donors is not addressed by Dollar and Alesina (2000), perhaps the most often-cited study on aid allocations. Ignoring interactions implicitly makes the strong assumption that an exogenous change in one donor's allocations will be fully "additional" for recipients, with no

"crowding out" or "crowding in" effects by other donors. A consensus has emerged in the aid effectiveness literature that when donors earmark aid to sectors, recipient governments partially compensate by shifting the sectoral composition of expenditures from other revenue sources (e.g. Feyzioglu, Swaroop and Zhu, 1998). Hence, aid is partially but not fully fungible across sectors. There is potentially aid fungibility across donors as well, e.g. if donor 2 responds to donor 1's decrease in aid to a particular recipient with a compensating increase.[1] On the other hand, if donors exhibit "herding" behavior as often suggested (Frot and Santiso, 2011), then an increase from one donor might produce a more than 1-for-1 increase in total aid to a recipient.

This study contributes to the modest existing literature on strategic interactions in donor allocations. In one of the few theoretical contributions to this literature, Annen and Moers (2012) construct a model of strategic interaction among bilateral donors in which the objective of each one is to maximize impact relative to other donors. The model predicts that for a relatively large donor, there is strategic complementarity of aid; i.e., the more aid other donors provide to a given recipient, the more aid the large donor will provide. For relatively small donors, in contrast, there is strategic substitutability of aid, as they will maximize their relative impact in recipients that receive less aid in total. These predictions apply regardless of whether donors are trying to maximize their geo-strategic influence with recipients, their commercial access, or the development effectiveness of their aid. Because large donors by definition control more aid this model implies that in the aggregate, donor aid allocations will tend to be complementary.

Frot and Santiso (2011) find evidence of significant donor "herding" as measured by co-movements in aid to recipients over time. Herding is present among bilateral donors, and among all donors, but multilateral donors do not herd among themselves. They note that herding could be produced by similar allocation policies, similar but independent reactions to humanitarian crises or other exogenous events, or by competition among donors. Frot and Santiso identify several significant determinants of herding behavior - including natural disasters and authoritarian political transitions – but conclude that these factors cannot account for most herding. They conjecture that some herding is likely not attributable to "rational" reasons but rather to informational cascades or shifting fashions in the aid industry. Conceivably, some of the unexplained herding in their model could be due to donors' common responses to recipient countries' crossing the IDA income threshold, or to using actual IDA allocations as a signal.

Several studies in aid allocations or aid effectiveness have produced findings that bear on interactions among donors' aid allocation decisions, even where that is not the major focus of the analysis. Kilby's (2005) study on the impact of World Bank lending on regulation includes aid allocation regressions using panel data from 1970 to 2000. His tests rejected the exogeneity of non-World Bank aid (aggregated over all other donors) in the World Bank allocation equation, but did not reject the exogeneity of World Bank aid in the non-World Bank aid allocation equation. In other words, his results suggest that the World Bank acts more as a leader than a follower in determining the global allocation of aid. In Kilby's semi-log specification, each 1 percentage point increase in World Bank aid as a share of GDP is associated with a 0.28% increase in disbursements by other donors as a share of GDP.

Klasen and Davies (2011) discuss a range of possible motivations of bilateral donors that could generate positive ("crowding in") or negative ("crowding out") interdependencies in country allocations. Using panel data for 1988-2007 and correcting for endogeneity of other

[1] Sweden's increase in aid to Nicaragua in the 1980s following U.S. cutbacks in disapproval of the Sandinista government is one example, but the frequency of such cases is unknown.

donors' aid with a GMM approach, they find a small but significant positive effect of other donors' aid on the amount of aid provided to a recipient by a particular donor.

Berthelemy (2006) conducts panel data tests for 22 bilateral DAC donors and 137 recipients for the 1980-99 period, to assess the relative importance of "self-interested" versus "altruistic" donor motives. He includes as regressors total aid from other bilateral donors, and total aid from multilaterals. The latter variable has a positive and significant effect, while other bilateral aid also has a significant coefficient, but one that changes sign from positive in OLS tests to negative when recipient fixed effects are included. Unlike Klasen and Davies (2011), Berthelemy does not attempt to correct for simultaneity of other donors' aid.

Dreher, Nunnenkamp and Ohler (2012) find that countries meeting the U.S. Millenium Challenge Corporation's (MCC) "good governance" eligibility criteria receive more aid from other donors. They conclude that MCC aid has a positive signaling effect, and reasonably conjecture that this signal may be more important for small donors lacking the resources for their own quality-screening systems. Empirically, however, the most salient difference they find is between bilateral and multilateral donors; namely, the link with MCC aid is stronger for the latter. They surmise that multilaterals "are more inclined to accept MCC as a model of performance-based aid allocation." They neglect the fact that many multilaterals have their own performance-based aid systems that pre-date the MCC by many years. Most notably, IDA, the AsDB and AfDB all allocate more aid, other things equal, to countries with higher ratings on the "CPIA" (Country Policy and Institutional Assessments) indexes produced by each of these three development banks. The CPIA ratings are likely positively correlated with the MCC's eligibility criteria, and Dreher, Nunnenkamp and Ohler do not control for them. The simplest and most obvious explanation for their result on multilaterals is that the development banks and MCC are each implementing their own independent performance-based allocation systems that tend to favor similar sets of countries with development-friendly policies and institutions.

Several studies on "donor effort" analyze interactions among donors, but in determining their aggregate provision of aid rather than country allocations. A common finding in this literature is that donors treat other donors' aid as complementary to their own, perhaps due to "peer pressure" effects within the DAC (Mosely, 1985; Round and Odedokun, 2004) that effectively counteract free rider incentives (Olson and Zeckhauser, 1966; also see Mascarenhas and Sandler, 2006).

3. IDA Eligibility and the Income Threshold

Beginning in 1987, a major criterion for IDA eligibility has been whether or not a country is below a certain threshold on per capita income. This "operational cutoff" was established for the purpose of rationing scarce IDA funds. It was originally set at $580, and has been adjusted annually only for inflation. It can therefore be considered exogenous to the allocation decisions of other donors, and to the economic performance and other development outcomes of aid recipients. By 2011, the cutoff had increased to $1195. Appendix 1 lists the countries that crossed the IDA income threshold between 1987 and 2010, and the year(s) in which they crossed.

Income is by no means the only determinant of eligibility for IDA funds. Country creditworthiness is a second criterion. Creditworthiness is defined primarily in terms of whether a country's current debt servicing capacity is consistent with the terms of (non-concessionary) IBRD loans (World Bank, 2010). Graduation from IDA eligibility is delayed for many countries

that have exceeded the income threshold by their lack of creditworthiness-- Bolivia is a prominent recent example. In a few cases, countries have graduated before exceeding the threshold based on their perceived creditworthiness (e.g. China). In at least one case (Indonesia) the presumption of access to capital markets was based partly on the availability of sizeable government revenues from petroleum exports.

Small (below 1.5 million population) island economies are exempted from the income cutoff, on the grounds that they are undiversified and therefore vulnerable to natural disasters and other shocks, and – partly for these reasons – not creditworthy. Three of the countries that surpassed the IDA income threshold in our sample period (Kiribati, Samoa, and Solomon Islands) are small island economies.

Some otherwise IDA-eligible countries are "inactive", either because they are in arrears to IDA (making them technically ineligible for new loans and grants) or for political reasons. When these countries exceed the income cutoff, IDA disbursements obviously remain unchanged (at zero). The presence of these countries – and the small island exceptions – in the data should therefore somewhat weaken any observed effect of the IDA income threshold on aid inflows.

In most cases after a country crosses the income threshold and is considered on track for graduation, IDA disbursements continue for some years. Typically, the terms of IDA loans are gradually hardened so the concessionary element is reduced, IDA lending volumes decline, and a country may be classified for several years as a "blend", i.e. one that borrows from both IDA and from the IBRD (on non-concessionary terms). Once a country has exceeded the cutoff for three consecutive years and is judged to be creditworthy, the loan repayment schedule is accelerated, further reducing net disbursements of aid from IDA, but only with a 3-year lag. The World Bank's own projections of IDA lending volumes are premised on a 5-year lag between crossing the threshold and the cessation of new lending (World Bank, 2010), but in practice this interval is highly variable and uncertain.

For numerous reasons, therefore, IDA aid may not decline precipitously or immediately after a country surpasses the income threshold. Moreover, total aid from all donors may not fall at all, depending on how other donors react to IDA-threshold crossings, or to subsequent reductions in IDA flows. Other donors might change their aid allocations toward threshold crossers in ways that either reinforce or counteract the effects of IDA policies. Total aid may decline by less (or more) than 1 for 1 with declines in IDA aid.

Although IDA is one of the largest donors (and the largest of the multilateral donor agencies), it accounts for only about one-tenth of total ODA in a typical recent year. The African (AfDB) and Asian (AsDB) Development Banks use the IDA threshold in determining eligibility for their aid programs, but IDA, AfDB and AsDB collectively account for only about one seventh of total ODA. Even if the IDA income cutoff were a strong predictor of aid from these three multilaterals, it might be a very weak predictor of total aid, if aid from most other donors (particularly from the large bilaterals like the U.S. and Japan) were insensitive to the threshold.[2] Moreover, other donors might view a relatively steep and sudden decline in IDA as an overreaction to a relatively small and gradual increase in income, and compensate for much of the decline in IDA aid by increasing aid to recipients after they exceed the threshold.

Alternatively, other donors might view crossing the IDA income threshold as a signal that a country is in less need of assistance, and cut their own aid, reinforcing the decline in aid

[2] The Inter-American Development Bank, IMF and U.S. Millennium Challenge Corporation use somewhat higher income thresholds, but they collectively account for a much smaller fraction of total ODA disbursements than IDA, AfDB and AsDB (see Table 17 in OECD, 2012).

from IDA (and from AfDB and AsDB). Moss and Majerowicz (2012) assert – but offer no further details or empirical evidence – that the latter is in fact the more common case:

> …IDA eligibility has implications well beyond IDA itself: it determines and/or signals access to concessional funds and debt restructuring terms by other multilateral and bilateral institutions. Some donors formally peg their assistance to IDA eligibility; others merely use it as an informal indicator of relative poverty in their attempts to target the poorest countries with their aid.

Debt relief under the HIPC (the Heavily Indebted Poor Countries) initiative is restricted to IDA-eligible countries, although "eligible" countries include some such as Bolivia with incomes over the cutoff that have not yet graduated.

Whether other donors' allocation policies tend to reinforce or counteract IDA's policies with respect to threshold crossings is ultimately an empirical question. We show in Section 5 that other donors on balance tend to reinforce the effects of IDA graduation policies on aid levels. The next section describes the data and methods that are used in those tests.

4. Data and Methods

The sample includes all countries that were either IDA eligible at some point during the 1987-2010 period, or that crossed the income threshold during the period. The latter provision serves to include four countries (Peru, Syria, Turkmenistan, and Ukraine) that had incomes below the IDA threshold for one or more periods, but were never classified as IDA eligible during the 1987-2010 period. Although they received no IDA aid during the period, aid to them from other donors may nevertheless be affected when they cross the IDA income threshold.

Following the convention of the literature, we smooth out fluctuations in the annual data by using period averages. Although some studies have used annual data (e.g. Dollar and Levin, 2004), many other studies have grouped observations into 3-year (e.g. Frot and Santiso), 4-year (e.g. Sawada, Yamada and Kurosaki, 2008), or 5-year periods (e.g. Alesina and Dollar, 2000; Dollar and Levin, 2004; Easterly, 2003; Kilby, 2005). We group the 1987 to 2010 annual observations into eight three-year periods, designed to coincide with the three-year IDA replenishment periods. The first period, with data from calendar years 1987-1989, corresponds roughly to IDA8, covering fiscal years 1988-1990 (July 1, 1987 to June 30, 1990). The final period, with data from 2008-2010, roughly corresponds to IDA15 (July 1, 2008 to June 30, 2011). Although IDA eligibility, aid levels and borrowing terms can change from year to year within a replenishment period, the periods have some significance for aid and graduation decisions. The most recent four IDA graduates (Azerbaijan in 2011, and Albania, Indonesia and Montenegro in 2008), and seven of the last eight, graduated at the close of a replenishment period.

For the main ODA variable in the analysis, we follow much of the literature in using net ODA disbursements from the OECD DAC (Development Assistance Committee) website.[3] We also test the robustness of results to using gross disbursements, or net disbursements with debt relief excluded. Missing values for ODA are treated as zeros, following the precedent of

[3] Data are from DAC Table 2a, available at http://stats.oecd.org/Index.aspx?DatasetCode=TABLE2A#.

Arndt, Jones and Tarp (2010: 14).[4] Income and population data are from the World Development Indicators of the World Bank.

Independent variables include the over/under threshold dummy, a continuous measure of (log) GNI per capita, log of population, a political freedoms index (from Freedom House), and the World Bank's CPIA index, measuring the quality of policies and institutions. Other than the threshold variable, these regressors have been included in numerous aid allocation studies (e.g. Dollar and Levin, 2004; Easterly, 2003). We also include period and recipient fixed effects. The latter will capture the net effects of time-invariant variables such as colonial heritage, geographic distance, and classification by IDA as a small island economy, and will partially control for other factors that exhibit modest variation over time such as UN voting affinity with the major donors (Alesina and Dollar, 2000). We acknowledge there are many other variables that appear in one or another study on determinants of aid allocation, but would argue that few if any of them are likely to be correlated with the key regressor of interest – the IDA threshold dummy - particularly as we are also controlling for (continuous) GNI per capita.

The IDA threshold dummy codes each country-period observation for whether its end-year GNI per capita exceeded or fell short of the IDA income cutoff for that year. All independent variables in the analysis, including this threshold dummy, are lagged one three-year period. For more than one half of the countries in the sample, this value is unchanged over the full 1987-2010 period. Several other countries cross the threshold only in the last period; because of the one-period lag, these countries also contribute no variation in the (lagged) threshold dummy. Nevertheless, including these countries improves estimates of the effects of the control variables (income, population, political freedoms, and CPIA), in turn improving estimates for the threshold dummy.

About two thirds of the observed crossings during the period are from below the threshold, while the remaining third are crossings from above due to negative growth in per capita GNI, or to growth that does not keep up with the annual adjustments for inflation in the IDA operational cutoff. Our dummy variable treats crossings in both directions symmetrically, but we acknowledge that average aid responses from donors may be smaller or more delayed for one type of crossing than for the other.

Many countries cross the threshold two, three or even four times (see Appendix A). In six cases where two crossings occur in the same three-year period, our threshold dummy – measured at the end of the period – does not capture the first crossing. This omission likely entails little loss of information, as donors' disbursements will not have had time to respond to a crossing that is followed so closely by another crossing in the opposite direction. In several other instances, a crossing at or near the end of one period is negated by a crossing in the other direction early in the following period. In these cases, donors also have little time to react to the earlier of the two crossings, so inclusion of these cases is likely to dilute the estimated impact of crossing on aid flows. Nevertheless, we prefer to include these short-term crossings rather than exclude them to avoid the perception of making arbitrary coding judgments.

In our main specification, we estimate the following equation:

$$\ln A_{it} = \alpha_i + \beta \ln(y/p)_{\mathrm{i,t-1}} + \gamma x_{i,t-1} + \theta \ln p_{i,t-1} + \delta c_{i,t-1} + \mu_i + \pi_t + u_{it} \qquad (1)$$

[4] When taking the natural log of aid, we first impute an aid value of $1 for all zero values, so they do not drop out of the sample.

Here, *i* indexes countries, and *t* indexes periods. The dependent variable is the log of net ODA disbursements, *y/p* is initial GNI per capita (measured for the final year in the previous three-year period), *x* is the crossing dummy, *p* is population and *c* is CPIA. Country fixed effects are denoted by μ_i and period fixed effects are denoted by π_t. The latter are included to control for inflation, macro shocks and other time-specific trends potentially affecting aid levels measured in current US dollars. Standard errors are clustered at the country level, to allow the error term to be correlated within a country.

5. Results

Table 1 examines how total aid, and aid from different types of donors, differs on average when recipient countries are on either side of the IDA income threshold. Controlling for log of GNI per capita, log of population and other variables, total aid is significantly (at the .05 level) higher when a recipient country is under the IDA income cutoff (equation 1.1). The coefficient of .237 indicates that aid is about 27% higher for countries below the threshold.

Coefficients for per capita GNI and population in equation 1.1 have the expected signs, but are not significant. Because of the inclusion of country fixed effects, these estimates are informed only by variation over time within countries. The coefficient on log of population of less than 1.0 implies that aid per capita falls as population increases, a standard finding in aid allocation studies.

Each 1-point increase on the political freedoms index (scored on a 1-7 scale) is associated with an increase of about 4% in total aid, but this effect is also not significant at conventional levels. Each 1-point increment in the CPIA index (scored on a 1-6 scale) is associated with an increase of about 11% in aid, and this effect is significant at the .05 level. This finding does not necessarily indicate that most donors follow IDA, the AsDB and AfDB in taking CPIA ratings explicitly into account in their allocation decisions; many of them are likely using other policy indicators and governance indicators that are correlated with the CPIA.

The remaining regressions in Table 1 show results for IDA aid and for three other donor groupings. In equation 1.2 the dependent variable is IDA disbursements. The threshold-crossing coefficient is more than three times as large as in equation 1.1 (for all donors), but it is not statistically significant. Political freedoms and the CPIA index are associated with significantly (at the .10 level) higher aid. The quantitative impact of a 1-unit increase in political freedoms is a surprisingly large 54%.

Equation 1.3 reports results for aid from the DAC bilateral donors, which account for about three-fifths of the total ODA recorded by the DAC.[5] Coefficients and significance levels for the IDA threshold dummy and for the CPIA index are very similar to those in equation 1.1. Countires receive about 26% more aid other things equal if they are under the threshold. Aid allocations from the DAC bilaterals thus appear to be influenced by the IDA income threshold, as asserted by Moss and Majerowicz (2012). Results on CPIA are consistent with a view that the allocation policies of many bilaterals have incorporated the World Bank's (1998) message that the development effectiveness of aid is conditional on the quality of policies and institutions.

Aid from all non-DAC bilateral donors that report aid figures to the DAC is only about as large as aid from Denmark or Norway, or only one-fortieth as large as that for all DAC bilaterals.

[5] Note that the DAC bilaterals also account for the bulk of contributions to IDA and other multilateral donors, but in the analyses here those contributions are not included in aid from bilateral donors.

The majority of these non-DAC donors are oil-rich Arab countries, or new donors in Eastern Europe that provided no aid until late in our sample period. Some "emerging donors" (most notably China) do not report aid data to the DAC. With these qualifications, equation 1.3 shows results for this heterogeneous group of donors. None of the regressors are significant, and this is the only donor type in Table 1 with negative coefficients on the threshold dummy and on the CPIA index. In short, aid allocations for this group of donors are the least consistent with World Bank policies.

Equation 1.5 reports results for multilateral donors, excluding IDA, the AfDB, AsDB, and the EU. The EU is classified as a multilateral by the DAC but in many ways behaves more like a bilateral donor (Martens et al., 2002). The AfDB and AsDB, at least in recent years, formally incorporate the IDA threshold and CPIA ratings in their allocation policies.[6] The remaining multilaterals include several UN agencies, several large global funds, the IMF and Inter-American Development Bank. Some of these donors have their own agency-specific income thresholds that differ from IDA's. For this group, the coefficient on the IDA threshold dummy is positive, but small and insignificant (equation 1.5). Aid from this group is the most responsive to per capita income (i.e. "pro-poor"). The income coefficient is significant at the .01 level, and each 10% increase in income is associated with a 4% reduction in aid from multilaterals. Aid increases significantly with political freedoms. The latter's coefficient is more than double its magnitude in the DAC bilateral sample (equation 1.3). Results in equations 1.2-1.5 thus demonstrate that there is substantial heterogeneity among types of donors in the impact of the IDA threshold on aid allocations.

Robustness to polynomial functions of GNI per capita

Apparent threshold effects can be a spurious artifact of failing to control for the appropriate (nonlinear) function of the "running variable," in this case GNI per capita (Lee and Lemieux, 2010). We therefore show in Table 2 the robustness of results on the threshold dummy to specifications including higher-order polynomial functions of GNI per capita. Each row in the table summarizes results from a regression based on equation 1.1, differing only in the functional form of income. To conserve space, each row reports only the coefficient magnitude and test statistic for the threshold dummy, and goodness of fit measures for the model. The first row reports results from equation 1.1, for reference.

The threshold effect turns out to be highly robust to alternative specifications for income. The coefficient magnitude varies only from .193 to .237, and it remains significant at the .05 level in all specifications. Goodness-of-fit measures vary little across specifications, but tend to favor higher-order polynomials: the adjusted R^2 is maximized in a 5^{th}-order polynomial, and the Akaike (AIC) and Bayesian (BIC) information criteria continue to decline as the order increases from 3^{rd} to 6^{th} order.

In remaining tests in this section, we control for log of GNI per capita instead of any particular polynomial function, in part for simplicity, and in part for theoretical reasons. Many multilateral donors (including but not limited to IDA and the regional development banks) have policies that allocate more aid as income per capita declines, and no donor that we are aware of has a non-monotonic aid allocation policy with respect to income. Fortunately it makes little

[6] The AfDB and AsDB each have their own CPIA, but the content and ratings correlate very highly with the World Bank's CPIA.

difference in practice for results on the threshold dummy whether we control for log of GNI per capita or for the 6th-order polynomial favored by the AIC and BIC.

Robustness to alternative aid measures

Most of our tests analyze net ODA disbursements. It appears to be the most commonly-used aid measure in the literature, but others are sometimes used. In equations 3.1 and 3.2 of Table 3, we show that results on the threshold dummy variable are robust to using two other measures. Debt relief is a substantial part of aid for the DAC bilateral group in some periods, so equation 3.1 replicates equation 1.3 but with debt relief excluded from net ODA disbursements. Results for the threshold dummy change very little: its coefficient declines from .235 to .226, implying an aid impact of 25% instead of 26%. The coefficient for CPIA increases from .106 to .130, so the marginal effect of a 1-point increase in CPIA is about 14% instead of 11%. Countries benefiting the most from debt relief tend to have lower CPIA ratings, so the index is more strongly correlated with aid when the latter does not include debt relief.

Equation 3.2 replicates equation 1.1, but substituting gross for net ODA disbursements.[7] The threshold dummy coefficient declines slightly (from .237 to .198) but remains significant at the .05 level. The estimated effect on aid is thus about 22% instead of 27% as in equation 1.1. The coefficient for political freedoms is somewhat larger than in equation 1.1, and falls just short of statistical significance at the .05 level.

Alternative classification thresholds

Moss and Majerowicz (2012) emphasize the IDA eligibility threshold as an informal guide for poverty targeting by bilateral donors, but also suggest that allocations could be influenced by the World Bank's separate income classification system. Specifically, aid might decline when countries cross from "low income" to "lower middle income" status. This income threshold is somewhat lower than the IDA threshold (see values for 2010 in Appendix B): all "low income" but only some "lower middle income" countries are below the IDA threshold. Operationally, the World Bank uses "low income" status only to grant preference to nationals in procurement of goods and services purchased through its aid, not to allocate IDA. Other donors are free of course to make use of the low income designation instead of the IDA threshold in allocating their own aid. However, we hypothesize that in looking to World Bank policies for signals, that bilateral donors will view the IDA threshold as a stronger signal than the low income threshold, precisely because the Bank uses the former but not the latter in allocating IDA.

Equation 3.3 replicates equation 1.1, with the exception of including a dummy for being under the low-income threshold as an additional regressor. Its coefficient estimate is small, insignificant and of the "wrong" sign (-.066). Controlling for this second income threshold, the coefficient on the IDA threshold dummy increases to .265 (implying a marginal effect on aid of 30%), and is significant at the .01 level.

Equation 3.4 replicates 3.3, but substituting for the low-income dummy a different threshold dummy that separates "lower-middle income" from "upper-middle income" countries.[8] Moss and Majerowicz do not suggest that this distinction has implications for aid flows, so it is included here only as a falsification test. If a threshold with no theoretical foundation turns out

[7] Net equals gross minus repayments of loan principal.
[8] All countries that are below the IDA threshold are of course also below this threshold.

to be significant for aid levels, then confidence would be undermined regarding our conclusion that the IDA threshold matters. The coefficient for the lower-middle income dummy in equation 3.4 is positive (aid is higher for lower-middle than for upper-middle income countries), but small (.058) and falls far short of statistical significance.

Finally, equation 3.5 includes the "historical cutoff" for IDA. This cutoff was replaced by the "operational cutoff" in 1987, but its value is still updated annually for inflation by the World Bank, and its reports projecting which countries might graduate from IDA often note not only whether a country exceeds the operational cutoff, but also whether it exceeds the historical cutoff (e.g., World Bank, 2013). It may thus matter informally for IDA aid, and perhaps retain some value as a signal to other donors. In equation 3.5, the coefficient for the historical cutoff dummy is much larger (.181) than for the low and lower-middle income thresholds tested in equations 3.3 and 3.4. However, it is not statistically significant at conventional levels. Moreover, the coefficient for the IDA threshold dummy remains very similar to our base case.

Disaggregating DAC bilaterals

There are vast differences in size among the 22 DAC bilateral donors represented in our data. It is unlikely that aid from this group overall would be significantly affected by the IDA threshold unless some if its larger members accord with this pattern. Table 4 shows results for five of the larger DAC donor countries. The U.S. and Japan each account for about one-seventh of total DAC bilateral aid during the 1987-2010 period. As shown in equation 4.1, neither the IDA threshold nor any other variable in the model is significantly associated with US aid. These findings accord with the view that U.S. aid policies have been driven in large part by geopolitical, commercial and humanitarian concerns that are largely orthogonal to development considerations.

Japan shows a marked contrast with the U.S. in equation 4.2. The coefficient for the IDA threshold dummy is not only positive and significant at the .05 level, but its magnitude is nearly five times as large as for DAC bilaterals as a group (see equation 1.3). Japan's aid also increases significantly with political freedoms (by about 31% for a 1-point increment in the 1-7 scale).

Equations 4.3-4.5 report results for three of the large European donors that together account for nearly one-fifth of DAC bilateral aid. The United Kingdom (equation 4.3) appears to target poverty very strongly, with a negative and highly significant coefficient on GNI per capita. Its threshold dummy coefficient is also very large (.68) and positive, but not significant.

Despite being one of the largest European countries, Italy (equation 4.4) is only a mid-sized donor. It stands out, however, for having by far the largest (2.506), and most highly significant, coefficient on the IDA threshold dummy.

On the other end of the spectrum, Germany (equation 4.5) stands out as the only sizeable donor with a negative and significant coefficient (-.556) on the IDA threshold dummy. Other things equal, it provides less rather than more aid to countries below the threshold. This does not mean it does not target poverty effectively, however, as its coefficient on GNI per capita is negative and significant at the .05 level. Although we cannot confidently infer aid policies from these findings, they are consistent with the possibility that Germany not only targets poor countries for more aid, but that it may be deliberately compensating for perceived over-reactions by other donors to threshold crossings.

Do donors respond to IDA policies or IDA flows?

Conceivably, donors may respond to IDA aid flows in addition to (or instead of) IDA policies. Moreover, if IDA flows are affected by its policies as we would expect, the coefficient on the IDA income threshold dummy may be biased in our regressions if they fail to control for IDA flows. Accordingly, regressions in Table 5 add the log of net IDA disbursements as a regressor. Dependent variables in equations 5.1-5.5 respectively are aid from all DAC bilaterals, Japan, Italy, Germany and the UK.[9]

Results from Table 5 uniformly suggest that donors' allocations are guided more by IDA policies than by actual IDA disbursements. Coefficients for IDA disbursements are not significant at the .10 level in any of the five tests. However, for Japan and Germany these coefficients are positive and at least approach statistical significance, with p-values of .15 and .13 respectively. In both cases, the effect is small: a 1% increase in IDA is estimated to increase aid from Japan and Germany by about .05%.

6. Do Recipients Understate Their GNI?

We have shown that crossing the IDA income threshold has significant and sizeable implications for aid levels. If aid declines by about 20% on average after countries exceed the threshold, controlling for log of per capita GNI and other factors, then governments may have an incentive to understate their income data to remain below the cutoff longer. On the other hand, if governments do not realize the extent to which other donors act on the threshold, the anticipated change in IDA flows alone may be a weaker incentive to understate.

Empirically, if many governments act on this incentive we should observe significant "bunching" of observations just below the IDA income cutoff, relative to the number of observations just above the cutoff value. McCrary (2008) proposes a density test to detect this endogenous bunching that involved running run two separate kernel density regressions below and above the cutoff. If the jump at the cutoff between the two kernel density functions is statistically significant (and has the expected sign), this would support the hypothesis that countries' positions with respect to the cutoff are being manipulated.

We apply this test to our data, including all countries that were ever eligible for IDA between 1987 and 2010, and treating each GNI per capita value in each country-year as an observation. We calculate the distance between per capita GNI and the current IDA cutoff value. If there is no bunching, the density function should cross the cutoff value smoothly, at a distance of 0. If countries purposefully under-report their income to avoid triggering aid declines, we would expected to observe that the density is higher just to the left of the cutoff.

Figure 2 shows the density graphically, with 1,895 observations from 95 countries. The "running variable" depicted on the x-axis is GNI per capita minus the IDA cutoff value. Epanechnikov kernel density function is used, with a bandwidth of 100.

The formal test confirms that the density does not change significantly in the neighborhood of the cutoff. Two separate kernel density regressions are run to the left of the

[9] We do not use total ODA from all donors as a dependent variable, because IDA is a (fairly large) component of it. The U.S. is left out of Table 5 for space reasons to make room for the DAC bilateral group, but the effects of Ida flows on its allocations are extremely small (coefficient = -.002) and insignificant (t-stat = -.04).

cutoff and to the right of the cutoff, with standard errors obtained by bootstrapping. The estimated "jump" in density from left to right is negative (-0.00012) and insignificant (p-value = 0.144). The jump is not only insignificant, but of the opposite sign one would expect if there were bunching associated with attempts to remain below the IDA threshold. These results are quite robust to changes within a reasonable change of bandwidth.

7. Conclusions

In this study we have shown that the IDA income cutoff affects aid from other donors in ways that reinforce rather than counteract IDA allocation policies. Controlling for continuous functions of GNI per capita and other variables, countries can expect a drop in ODA of roughly 20% after exceeding the IDA income threshold. This effect is largely attributable to the DAC bilateral donors: they account for about three-fifths of total ODA, and as a group they are more responsive to the IDA threshold than are non-DAC bilaterals and other multilaterals. These findings prove highly robust to the use of alternative aid measures, and to controlling for continuous variations in GNI per capita via higher-order polynomial functions.

In contrast, other income thresholds with weaker theoretical links to aid flows turn out to have little predictive power for aid flows. These findings on alternative thresholds provide additional reason to believe that our positive estimates for the IDA income threshold are not capturing spurious effects.

We also find evidence of heterogeneity across donor groups and donor countries in the impact of IDA threshold crossings on aid allocations. In disaggregating aid from the large DAC bilaterals, Japan and Italy are identified as countries with aid flows that are strongly consistent with the pattern for this group of donors overall. Germany is the largest donor that provides significantly higher rather than lower aid when countries exceed the threshold, and we can conjecture that it may be attempting to compensate for perceived over-reactions by other donors to threshold crossings. More in-depth case studies of German, Japanese and Italian aid allocation policies would be required to ascertain whether and how they use the IDA income threshold in their decision making.

Our results have implications for IDA graduation policies. Moss and Leo (2012) project a rapid decline in the number of IDA-eligible countries over the next 10 or 12 years, based on income growth projections and on past experience of IDA graduations. However, there appears to be a trend toward more countries delaying official graduation from IDA for longer periods after their incomes exceed the threshold. A proposal for a new "transitional support" aid program for some graduating countries is motivated by concerns over possible pre-mature graduations, where there is a substantial risk that countries may not have access either to IDA or to non-concessionary IBRD loans, or that they may even experience a "reverse" graduation. Our finding that other donors reinforce the effects of threshold-crossing on IDA flows supports a more cautious and gradual approach to IDA graduation. The threshold appears to be a source of herding behavior among donors, and because the threshold is essentially arbitrary, any herding associated with it is likely to produce a less efficient allocation of aid across recipients. From this perspective, changes in IDA policies that further weaken the implications of threshold-crossing for aid flows can reduce volatility and curb herding behavior.

Our findings also have potentially important implications for research on aid effectiveness. Endogeneity of aid is a major concern in this literature, and few if any of the exogenous instruments that have been put forward are widely perceived as being credible

(Clemens et al., 2012). The IDA income threshold is a promising candidate as an instrument for aid: we have shown it has significant explanatory power, and it should be exogenous in most contexts. Aid and development outcomes are both affected by per capita income, but only the former should be directly affected by whether a country's per capita GNI exceeds or falls short of the IDA threshold. The validity of the IDA threshold dummy as an instrument for aid would be in doubt if there were evidence of "bunching." However, we find no indication in the data that governments manipulate their national accounts data to remain below the threshold. The threshold dummy may therefore be both a valid and reasonably powerful instrument for aid inflows in aid effectiveness studies.

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Figure 1: IDA cutoff values from 1987 to 2010

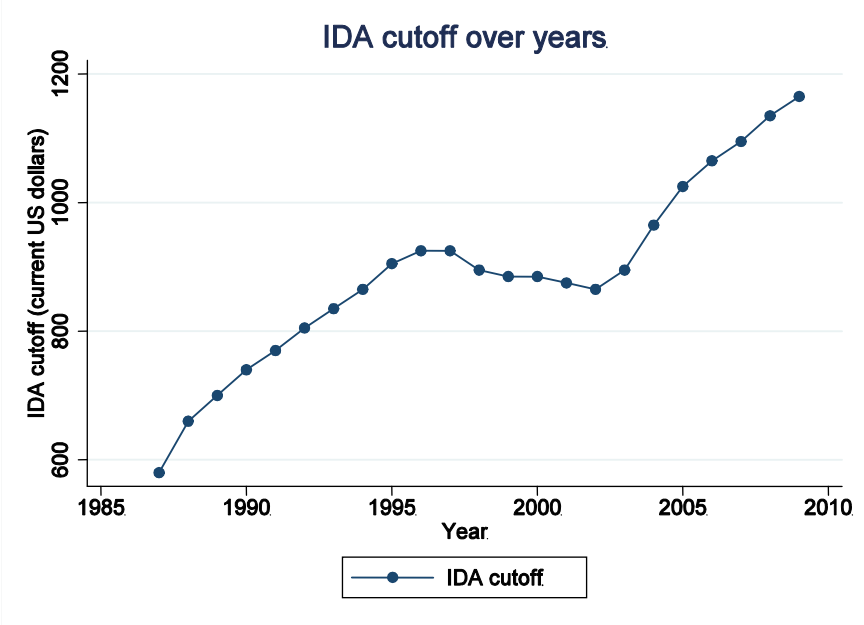

Figure 2

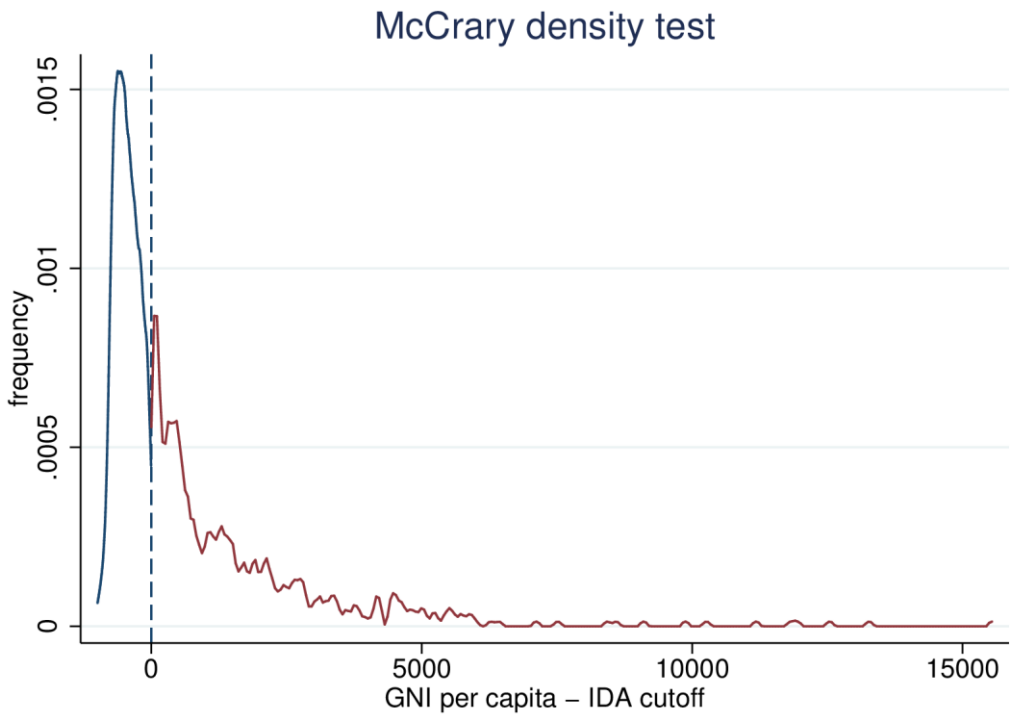
McCrary density test
frequency
0
.0005
.001
.0015
0
5000
10000
15000
GNI per capita – IDA cutoff

Table 1
Basic tests

Equation	1.1	1.2	1.3	1.4	1.5
Donor	All reporting to DAC	IDA	DAC bilaterals	Non-DAC bilaterals	other multilaterals
IDA Threshold	0.237**	0.782	0.235**	-0.842	0.128
	(2.57)	(0.93)	(2.01)	(-0.73)	(0.89)
Log GNI per capita	-0.044	-1.575	0.015	-0.176	-0.414***
	(-0.31)	(-1.31)	(0.10)	(-0.20)	(-2.85)
Log of population	0.146	-5.999	0.443	2.462	0.437
	(0.45)	(-1.24)	(0.86)	(0.58)	(0.64)
Political freedoms	0.039	0.464*	0.041	0.145	0.091**
	(1.54)	(1.81)	(1.09)	(0.47)	(2.11)
CPIA index	0.105**	0.121*	0.106*	-0.434	0.091
	(2.24)	(1.81)	(1.95)	(-1.00)	(1.38)
No. of observations	533	533	533	533	533
No. of recipient countries	93	92	92	92	92
R^2	.93	.72	.92	.45	.78
Adj. R^2	.92	.65	.90	.32	.72

Observations are country-periods, where periods correspond to 3-year IDA replenishment periods. Dependent variable is log of net ODA disbursements. All equations include period and recipient fixed effects. T-statistics, reported in parentheses below point estimates, are based on standard errors adjusted for non-independence of errors within recipient clusters of observations, with *** p<0.01, ** p<0.05, * p<0.1.

Table 2
Robustness to higher-order polynomial functions of GNI per capita

GNI function	IDA threshold		R^2	Adj. R^2	AIC	BIC
	Coeff.	t-stat				
Log GNI per capita	0.237**	2.57	.934	.919	413.93	461.00
Quadratic	0.193**	2.53	.935	.920	410.75	462.09
Cubic	0.202**	2.24	.935	.919	412.69	468.31
Quartic	0.210**	2.14	.935	.919	412.52	468.14
Quintic	0.218**	2.26	.937	.922	394.77	450.39
Sextic	0.226**	2.47	.937	.921	394.56	450.18

Each row summarizes information from one regression equation, controlling for different functions of GNI per capita. Observations are country-periods, where periods correspond to 3-year IDA replenishment periods. Dependent variable is log of net ODA disbursements. All equations also include log of population, political freedoms, the CPIA index, and period and recipient fixed effects. T-statistics, reported in parentheses below point estimates, are based on standard errors adjusted for non-independence of errors within recipient clusters of observations, with *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3
Robustness to alternative aid measures and GNI thresholds

Equation	3.1	3.2	3.3	3.4	3.5
Donor	DAC bilaterals	All donors reporting to DAC			
Aid disbursements Measure	net excl. debt relief	gross	net	Net	Net
IDA Threshold	0.226*	0.198**	0.265***	0.243**	0.218**
	(1.95)	(2.36)	(2.95)	(2.51)	(2.46)
Log GNI per capita	-0.029	-0.027	-0.061	-0.034	-0.001***
	(-0.23)	(-0.21)	(-0.42)	(-0.22)	(-0.01)
Log of population	0.196	0.183	0.140	0.121	0.168
	(0.36)	(0.59)	(0.43)	(0.37)	(0.51)
Political freedoms	0.054	0.043*	0.037	0.039	0.038
	(1.50)	(1.96)	(1.46)	(1.54)	(1.50)
CPIA index	0.130**	0.106**	0.107**	0.104**	0.106**
	(2.54)	(2.44)	(2.29)	(2.22)	(2.28)
Low income			-0.066		
Threshold			(-0.65)		
Lower-middle				0.058	
Income threshold				(0.39)	
Historical (higher)					0.181
IDA threshold					(1.57)
No. of observations	533	533	533	533	533
No. of recipient countries	92	92	92	92	92
R^2	.93	.94	.93	.93	.93
Adj. R^2	.91	.93	.92	.92	.92

Observations are country-periods, where periods correspond to 3-year IDA replenishment periods. Dependent variable is log of ODA disbursements. All equations include period and recipient fixed effects. T-statistics, reported in parentheses below point estimates, are based on standard errors adjusted for non-independence of errors within recipient clusters of observations, with *** p<0.01, ** p<0.05, * p<0.1.

Table 4
Selected DAC bilateral donors

Equation	4.1	4.2	4.3	4.4	4.5
Donor	USA	Japan	UK	Italy	Germany
IDA Threshold	-0.480	1.058**	0.682	2.506***	-0.556**
	(-0.73)	(2.02)	(0.70)	(3.20)	(-2.12)
Log GNI per capita	0.998	0.298	-1.916***	-0.827	-0.922**
	(1.32)	(0.70)	(-3.00)	(-1.03)	(-2.14)
Log of population	-3.249	0.415	2.141	-5.609**	1.308
	(-1.05)	(0.27)	(1.10)	(-2.16)	(0.71)
Political freedoms	-0.023	0.268*	-0.011	-0.173	0.080
	(-0.16)	(1.95)	(0.19)	(-0.85)	(1.02)
CPIA index	-0.208	0.055	0.305	0.170	0.189
	(-0.60)	(0.30)	(1.51)	(0.52)	(1.62)
No. of observations	533	533	533	533	533
No. of recipient countries	92	92	92	92	92
R^2	.70	.48	.74	.68	.86
Adj. R^2	.63	.36	.67	.61	.82

Observations are country-periods, where periods correspond to 3-year IDA replenishment periods. Dependent variable is log of net ODA disbursements for indicated donor. All equations include period and recipient fixed effects. T-statistics, reported in parentheses below point estimates, are based on standard errors adjusted for non-independence of errors within recipient clusters of observations, with *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5
Do donors respond to IDA rules or IDA flows?

Equation	5.1	5.2	5.3	5.4	5.5
Donor	DAC bilaterals	Japan	Italy	Germany	UK
IDA Threshold	0.239**	1.017*	2.510***	-0.591**	0.668
	(2.06)	(1.92)	(3.21)	(-2.27)	(0.68)
Log GNI per capita	0.008	0.367	-0.834	-0.861**	-1.892***
	(0.05)	(0.87)	(-1.04)	(-2.32)	(-3.03)
Log of population	0.395	0.882	-5.656**	1.718	2.300
	(0.77)	(0.57)	(-2.20)	(0.90)	(1.17)
Political freedoms	0.045	0.229*	-0.169	0.046	-0.025
	(1.26)	(1.66)	(-0.85)	(0.65)	(-0.19)
CPIA index	0.115*	-0.036	0.179	0.109	0.274
	(1.79)	(-0.17)	(0.52)	(0.90)	(1.35)
Log of net IDA	-0.006	0.054	-0.005	0.047	0.018
disbursements	(-0.56)	(1.46)	(-0.08)	(1.53)	(0.55)
No. of observations	533	533	533	533	533
No. of recipient countries	92	92	92	92	92
R^2	.92	.49	.68	.86	.74
Adj. R^2	.90	.36	.61	.83	.67

Observations are country-periods, where periods correspond to 3-year IDA replenishment periods. Dependent variable is log of net ODA disbursements. All equations include period and recipient fixed effects. T-statistics, reported in parentheses below point estimates, are based on standard errors adjusted for non-independence of errors within recipient clusters of observations, with *** p<0.01, ** p<0.05, * p<0.1.

Appendix A: Threshold Crossings

Country	Year	Crossing from above	Crossing from below
Albania	1990	**1**	0
	1999	0	**1**
Angola	1992	**1**	0
	2005	0	**1**
Armenia	2003	0	**1**
Azerbaijan	2005	0	**1**
Bhutan	2004	0	**1**
Bolivia	1991	**1**	0
	1997	0	**1**
	2004	1	0
	2005	0	1
Bosnia	1997	0	**1**
Cameroon	1994	**1**	0
	2008	0	**1**
China	2000	0	**1**
Congo, Rep.	1994	**1**	0
	2006	0	**1**
Cote d'Ivoire	1991	**1**	0
Djibouti	1993	**1**	0
	2007	0	**1**
Egypt, Arab Rep.	1991	**1**	0
	1995	0	**1**
Equatorial Guinea	1998	0	**1**
	1999	1	0
	2000	0	1
Georgia	2003	0	**1**
Ghana	2009	0	**1**
Guyana	1999	0	**1**
	2004	1	0
	2005	0	1
Honduras	1990	**1**	0
	2000	0	**1**
India	2010	0	**1**
Indonesia	1994	0	1
	1998	**1**	0
	2004	0	**1**
Kiribati	1988	0	1
	1989	1	0
	1992	0	**1**
Moldova	2007	0	**1**
Mongolia	1992	**1**	0
	2006	0	**1**
Nicaragua	1989	**1**	0
Nigeria	2008	0	1
	2009	1	0
Papua New Guinea	1998	**1**	0
	2009	0	**1**
Peru	1989	1	0
	1990	0	1
Philippines	1990	**1**	0
	1994	0	**1**
Samoa	1994	1	0
	1995	0	1
Senegal	1991	**1**	0
Solomon Islands	1995	0	**1**
	1996	1	0
	1997	0	1
	2002	**1**	0
Sri Lanka	2003	0	**1**
Sudan	1990	**1**	0
	2008	0	**1**
Syrian Arab Republic	1996	1	0
	1998	0	1
Timor-Leste	2006	0	**1**
Turkmenistan	2002	0	**1**
Ukraine	1996	**1**	0
	2003	0	**1**
Uzbekistan	2010	0	**1**
Zimbabwe	1992	**1**	0

Appendix B: 2010 threshold values (current USD)

Threshold	2010 Value	Obs. under	Obs. Over
IDA operational cutoff	1175	384	149
Low income	1005	317	216
Lower-middle income	3975	488	45
IDA historical cutoff	1915	420	113