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DOES AID FOR EDUCATION EDUCATE CHILDREN? EVIDENCE FROM PANEL DATA

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Abstract

This paper empirically analyzes the impact of aid on education for about 100 countries over the period 1970-2005. We estimate a system of equations to test whether and to what extent the impact of sector-specific aid on educational attainment depends on (i) the extent to which aid adds to overall educational expenditure of the recipient government, (ii) the strength of the link between government expenditure and education, (iii) the quality of institutions in the recipient country, and (iv) whether aid encourages institutional reforms. According to our results, aid significantly increases primary school enrolment. This result is robust to the method of estimation, employing instruments to control for the endogeneity of aid, and the measure of institutional quality employed. The degree of institutional quality, however, has no robust impact on this relationship.

Keywords: Aid effectiveness, Education, Sector-specific aid

JEL-Codes: F35; O11; H52; I22

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I. Introduction

There is a heated debate on whether or not foreign aid is effective in promoting economic development in aid-recipient countries. According to Sen (2006) and Tarp (2006), Easterly's (2006) claim that aid has done "so much ill and so little good" obscures that aid can work if done right. Dalgaard, Hansen and Tarp (2004) find that, overall, aid has been effective indeed. Even recent surveys of the literature on the aid-growth nexus come to sharply opposing conclusions. While Doucouliagos and Paldam (2005) conclude that the aid effectiveness literature has failed to establish that aid works, McGillivray et al. (2005) stress that practically all research published since the late 1990s finds exactly that.

What both camps tend to ignore is that different types of aid are unlikely to have the same economic effects on the recipient countries. In large parts of the literature, it is still common to run panel regressions with aggregate aid flows as a right-hand-side variable. Furthermore, it is open to debate whether any verdict on the effectiveness of aid can be reached at all as long as the analysis is restricted to the aid-growth nexus. Donors have stressed repeatedly that they pursue multiple objectives when granting aid (e.g., Isenman and Ehrenpreis 2003); specific purposes aid is meant to serve according to the policy statements of donors, including the empowerment of the poor through better education, tend to escape analyses narrowly focused on the aid-growth nexus. In any case, as argued by Clemens, Radelet and Bhavnani (2004), longer-term growth effects of aid are difficult, if not impossible to capture; extending the period of observation beyond the typical 4-5 year averages will increasingly blur estimation results by giving rise to more noise.[1]

Against this backdrop, it seems appropriate to pursue a different avenue for assessing the effectiveness of aid. We follow Michaelowa and Weber (2006) and focus on more specific outcome variables, instead of short-term growth effects. One variable where aid might be expected to make a measurable difference is educational attainment. Education figures prominently in the list of Millennium Development Goals (MDGs). For instance, donors have committed themselves to help achieve universal primary education by the year 2015 and to eliminate gender disparity in education. To this end, donors have devoted an increasing share of aid resources to the education sector in recipient countries (Thiele, Nunnenkamp and Dreher 2006). Yet, it is open to debate whether more resources necessarily translate into

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[1] For a different view, see Rajan and Subramanian (2005).

better educational outcomes (Roberts 2003). A careful assessment of the links between aid and education outcomes is needed to clarify the role foreign aid can reasonably be expected to play in achieving universal primary education. If effective in this regard, aid should have longer-term growth effects, which might not be measurable with conventional econometric methods (see, e.g., Pettersson 2006). In addition, even if the link between education and growth turned out to be weak, educational outcome would be important in its own right, as "schooling has a large number of direct beneficial effects beyond raising economic output, such as lower child mortality" Pritchett (2001: 388).[2]

However, which type of aid can reasonably be expected to affect educational attainment? For various types of aid such as emergency relief and project aid for physical infrastructure, this is highly unlikely. Hence, it is important to disaggregate aid data. The composition of aid has changed significantly in recent years towards what the OECD/DAC's Creditor Reporting System labels social-sector aid, which includes aid for education and health. The focus of this paper will be on aid granted to the education sector to investigate the link between aid and educational outcomes.

The link between aid and education has been investigated before, with Michaelowa and Weber (2006) representing the most notable example. However, no previous study simultaneously takes the various pitfalls associated with this question into account (see the literature review in Chapter II). Arguably, the effectiveness of aid with regard to educational attainment depends on (i) how aid is measured, (ii) the extent to which aid for education adds to overall educational expenditure of the recipient government, (iii) the strength of the link between government expenditure and educational outcome variables (which might depend on the quality of institutions in the recipient country), and (iv) whether aid encourages policy reforms that may result in more productive use of foreign and domestic resources.

To address these issues, we estimate a system of equations in which public expenditure, educational outcomes and institutional quality are jointly determined. Educational aid is also allowed to vary endogenously as donors might prefer to allocate their aid in favor of countries that are especially needy and at the same time pursue reasonable policies. Finally, we test whether and to what extent aid is more beneficial to educational outcomes in better institutional environments. Our results show, in a nutshell, that aid

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2 See also Gomanee et al. (2005).

significantly increases primary school enrolment. This result is robust to the method of estimation and the measure of institutional quality. The degree of institutional quality, however, has no robust impact on this relationship.

The structure of the paper is as follows. In Chapter II, we discuss the literature related to our analysis. The data and method of estimation as well as the results are presented in Chapter III. The paper closes with some concluding remarks.

II. Previous Literature

Even though Cassen (1986) and White (1998) called for a disaggregated analysis of aid, the heterogeneous nature of aid has received only limited attention in the empirical literature. Cassen and White focused on the differentiation between project and program aid as well as commodity and technical assistance. They expected the macroeconomic effects of these specific types of aid to differ. Yet, most econometric analyses on the effects of aid continued to employ aggregate aid data. This led a recent survey on the aid-growth link to reiterate the call for a disaggregated analysis by concluding that "it is not surprising that a variable as aggregate as official development assistance does not have a robust effect on growth" (Harms and Lutz, 2005).

Most studies accounting for different types of aid focus on the distinction between project and program aid (or general budget support) or the distinction between grants and loans. Mavrotas (2005) as well as Cordella and Dell'Ariccia (2003) represent examples of the first group.[3] Gupta et al. (2003), Cordella and Ulku (2004) as well as Cohen, Jacquet and Reisen (2006) represent examples of the second group.[4] Dreher, Nunnenkamp and Thiele

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[3] Mavrotas (2005) uses time-series data on project aid, program aid, technical assistance, and food aid to Uganda and finds that different aid categories have different effects on key fiscal variables. For example, in contrast to project aid, program aid is positively related to public investment. According to Cordella and Dell'Ariccia (2003), budget support is less (more) effective than project aid in a local environment of poor (good) macroeconomic policies.

[4] Gupta et al. (2003) show that loans are generally associated with higher domestic resource mobilization, whereas grants have the opposite effect. Odedokun (2004) corroborates the revenue-reducing effect of grants for lower-income recipient countries, though not for higher-income countries. According to Cordella and Ulku (2004), however, the disincentive effects of grants play a minor role in poor and badly governed recipient countries. Cohen, Jacquet and Reisen (2006) argue that in case of capital market failures loans may be superior to grants provided that debt sustainability is maintained.

(2006) account for both project aid versus budget support and grants versus loans in their analysis of US aid.

The sectoral dimension of aid heterogeneity has received less attention. Thiele, Nunnenkamp and Dreher (2006) provide a detailed account of sector-wise aid allocation, but do not assess the effectiveness of aid. Clemens, Radelet and Bhavnani (2004) draw on the same data source, the OECD/DAC's Creditor Reporting System that contains aid commitments on a sectoral basis, to evaluate the economic growth effects of aid categories that can reasonably be expected to have a short-term impact. Their finding that "short-impact aid" exerts a strong and robust effect on growth in the recipient countries is contested by Rajan and Subramanian (2005). Both studies have in common, however, that they subsume various sector-specific aid items under short-impact aid; i.e., they do not account for the heterogeneous nature of aid within this broad category. Furthermore, they do not consider outcome variables other than economic growth.

An empirical literature on the effectiveness of aid to specific sectors, in particular education and health, is just emerging. It builds on previous attempts to estimate the determinants of education and health outcomes. Concerning the education sector, on which we focus in this paper, a number of cross-country regressions have been performed, investigating the impact of public education expenditure and other variables on school attendance (enrolment, completion rates) and educational attainment (youth literacy, test scores). These studies try to reveal the relative strength of (i) demand-side factors such as per capita income (a proxy for household poverty), adult literacy (a proxy for the educational status of parents), the relative size of the school population, and the level of urbanization and (ii) supply-side factors such as the pupils-teacher ratio, the unit costs of education, and public expenditures on education with respect to educational outcomes.

Based on a survey of this literature, Roberts (2003) comes to the conclusion that per capita income tends to be the most powerful driving force of school attendance, whereas supply-side factors, and in particular education expenditure, are statistically insignificant in most instances. Filmer and Pritchett (1999), for example, examine the determinants of grade 5 completion rates among 15-19 year olds in a sample of 35 countries and find that, once per capita income is controlled for, public expenditure on education loses explanatory power. Roberts' own regression analysis corroborates the finding of ineffective expenditures; in contrast to previous studies, however, adult literacy turns out to exercise the strongest effect on both gross enrolment rates and primary completion.

While this bleak picture concerning the ability of government expenditure to raise educational outcomes appears to represent the majority view in the literature, there are some notable exceptions. Gupta et al. (1999) report a robust and significantly positive impact of combined primary and secondary education spending on combined primary and secondary enrolment rates as well as on persistence through grade four. Adult literacy, urbanization and the share of the population under 15 also exert a strong influence on enrolment, but not on completion. Baldacci et al. (2004) come up with the even stronger finding that spending is the only determinant of combined primary and secondary enrolment which remains significant across a number of different econometric specifications.

The simplest way of analyzing how aid affects school attendance is to consider it as an additional explanatory variable in the educational outcome equation. This strategy is pursued by Wolf (2006), who specifies a system of equations for education, health, and access to water and sanitation, in which outcomes depend not only on public expenditure, foreign aid and other control variables in the respective sector, but also on outcomes in the other sectors.[5] Wolf states that "the share of ODA that is provided for education, health and water & sanitation seems to have a positive impact on outcomes in these sectors." This conclusion can be questioned, however, as the sector-specific results are far from robust. In addition, the estimated aid-outcome link may not reflect the true relationship because (i) the endogeneity of aid is not taken into account; (ii) double counting of aid, which may add to the overall education budget, is not avoided; (iii) the link between aid and government expenditure is not addressed; and (iv) the OLS estimates across 113 aid-recipient countries refer to a single year (2002) even though annual aid flows are known to be volatile.

Michaelowa and Weber (2006) perform a dynamic panel analysis of aid effectiveness in the education sector, which is clearly superior to the cross-country approach adopted by Wolf (2006). According to their results, coefficient estimates for the impact of aid on net primary enrolment and completion rates are rather small and sensitive to model specification; under conditions of bad governance, the impact may even be negative. It is open to debate to which extent these findings depend on the instrumentation of aid in the education sector by

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5 The interdependencies of sectoral outcomes turn out to be quite weak, however, casting some doubt on whether the equations necessarily have to be estimated as a system.

aid in the energy sector.[6] As concerns domestic spending on education, Michaelowa and Weber consider only *current* expenditure (which is shown to be at best loosely related to outcomes), in order to minimize double counting of aid. This comes at a cost, however: Non aid-related investment expenditure by national governments, which may have stronger outcome effects than current expenditure, does not enter the analysis. Moreover, as noted by the authors, the assumption that current expenditure is unaffected by aid no longer applies since sector-wide donor approaches have (partly) replaced project aid in education (and other sectors).[7]

While Michaelowa and Weber assume that current education expenditure is unaffected by aid, the aid-expenditure link figures prominently in several papers, most of which, however, apply aggregate rather than sector-specific aid data. Gomanee et al. (2003) construct a pro-poor public expenditure (PPE) index and argue that this index is a key transmission mechanism through which aid may help alleviate poverty. Apart from education expenditure, the index includes health expenditure and some other expenditure items that can reasonably be assumed to be pro-poor. However, it has remained disputed whether and to what extent the poverty-alleviating effects of aid work through the PPE index. Gomanee et al. (2003) find that aid affects poverty *only* through its effect on pro-poor public expenditures. The same authors come to exactly the opposite conclusion for a larger sample of aid-recipient countries considered in a more recent version of their paper (Gomanee et al. 2005). According to Mosley, Hudson and Verschoor (2004), aid has influenced government expenditure in a pro-poor direction, but only in recipient countries with a per-capita income of less than $1450.[8] Pettersson (2006) applies the pro-poor public expenditure index and finds that the effect of aid

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6 Michaelowa and Weber (2006: 12) find "no evidence that the missing link between aid resources and educational outcomes could be due to reverse causation." As detailed below, we apply an alternative instrumentation strategy by drawing on the aid allocation literature. In contrast to Michaelowa and Weber, we find that aid coefficients are biased downwards when we ignore that donors may grant more aid to more needy recipients.

7 For this reason, we pursue a different strategy to avoid double counting, by introducing an expenditure equation with aid as explanatory variable in our system of equations (see below).

8 The explanation given for this threshold, which amounts to just half of the upper limit of the World Bank's classification of lower-middle income countries, is twofold. First, in poorer countries there is less scope for fungibility as aid accounts for a large share of the government budget; accordingly, the possibilities for recipients to shift public resources into other uses are limited. Second, Mosley, Hudson and Verschoor argue that what they dub "new conditionality" is particularly effective in low-income countries because of the high aid share, which gives donors considerable leverage.

on infant mortality primarily operates through this transmission mechanism, thus providing some support to the earlier result of Gomanee et al. (2003).

Pettersson (2006) stands out among these studies in that he uses sector-specific aid data. He provides a mapping between government expenditure (as recorded in the IMF's Government Finance Statistics) and DAC aid categories. For example, education expenditure is matched with aid in education. However, Pettersson (2006: 7) treats sector-specific aid as exogenous, as the primary objective of his study "is not to argue for 'the' true model, but rather to evaluate whether fungibility … (of sector-specific aid) has any real effects."

In terms of model specification, Mosley, Hudson and Verschoor (2004) provide the most reasonable starting point for our subsequent analysis. They take into account that poverty indicators (poverty headcount and infant mortality) are likely to be simultaneously determined, and estimate the structural parameters of a system of poverty, public expenditure and aid equations using a 3SLS estimator. Yet, this approach still leaves important gaps to fill: Mosley et al. follow the tradition of the aid literature to treat institutions (the absence of corruption in their case) as exogenous. This is clearly unwarranted in the light of the recent growth literature (e.g., Acemoglu, Johnson and Robinson 2001), and also contradicts the finding that aid may either lower corruption (Tavares 2003) or give rise to it (Knack 2001). Furthermore, modeling the interaction between institutions and aid may offer additional insights on aid effectiveness. Pritchett (2001), for example, argues that investment in education may have a larger social pay-off once aid-recipient countries improve the local institutional environment. As concerns the specification of the poverty outcome equation in Mosley, Hudson and Verschoor (2004), it is striking that aid does not enter directly. This implies that it is implicitly assumed that aid works only indirectly through pro-poor government expenditure. Finally, the estimates may suffer from the small number of observations (at most 67); if all 46 aid-recipient countries listed in Table A2 were actually included (which remains somewhat dubious), this would essentially boil down to a cross-country analysis with almost no within-country changes over time.

In the subsequent section, we extend the model of Mosley. Hudson and Verschoor (2004) as indicated and follow Pettersson (2006) in applying sector-specific aid in education. By estimating a system of equations and explicitly analyzing different transmission mechanisms, we shed new light on the question of aid effectiveness in the education sector, which has been raised by Michaelowa and Weber (2006).

III. Data, Method, and Results

We employ net primary school enrolment as our dependent variable. This is one of the indicators used to assess progress towards achieving universal primary education ("MDG two").[9] Our main explanatory variables of interest are aid given to the education sector and overall spending on education. Using aid and spending on primary education, which is conceptually superior, would leave us with an insufficient number of observations for estimation. Both development aid and expenditure are measured in percent of GDP, i.e., the variables reflect the amounts made available for education relative to the country's resources.[10]

In selecting other relevant covariates, we closely follow the previous literature. In line with Roberts (2003) and Gupta et al. (1999), we include four variables in addition to development aid and expenditure on education:

- adult literacy,
- per capita GDP,
- share of population under 15 years, and
- share of urban population in total population.

Michaelowa and Weber (2006) consider lagged educational outcomes (net enrolment, primary completion) as an additional right-hand-side variable in order to account for the possible persistence in outcomes. By contrast, our approach assumes that demand-side variables such as adult literacy and per capita GDP adequately capture any path dependencies, which appears to be common practice in the literature (see, e.g., Baldacci et al. 2004; Gupta et al. 1999; Roberts 2003).[11]

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[9] The other major indicator related to "MDG two," primary completion rates, will be employed in the sensitivity analysis below.

[10] An alternative option would be to specify aid and expenditures in per capita terms. Simply taking amounts would obviously be inappropriate as amounts depend on country size.

[11] Note that in some of our specifications the residuals display serial correlation of first order. Modeling the residual as AR(1) process, however, does not qualitatively change the main results of the analysis.

We estimate pooled time-series cross-section (panel data) regressions. The data extend to a maximum of 105 low and middle-income countries.[12] They cover the years 1970-2005, with the exception of school enrolment, which is only available since 1973. As some of our data are not available on a yearly basis, all data are averages over five years. Appendix A lists all variables with their definitions and sources; Appendix B reports summary statistics.[13]

1. Estimating a Single Outcome Equation

The basic equation takes the following form:

$$school_{it} = \alpha + \beta_1 aid_{it} + \beta_2 spending_{it} + \beta_3' X + \eta_i + \varepsilon_{it}, \quad (1)$$

where $school_{it}$ represents school enrolment in country i at year t, aid_{it} is foreign aid given to the education sector, and $spending_{it}$ is expenditure on education. X is the vector of control variables, η_i represents country fixed effects, while ε_{ti} represents the disturbance.

As argued above, aid cannot reasonably be expected to be exogenous to school enrolment. Nevertheless, as a first step, we estimated fixed and random effects models ignoring the potential endogeneity before turning to specifications that allow for endogeneity of some of the regressors.

Columns 1 and 2 of Table 1 report the results. As can be seen, the qualitative results do not depend on the inclusion of random vs. fixed country effects. However, according to the Hausman test, the random effects specification is rejected in favor of the fixed effects model (p=0.009). An F-test also clearly shows that the fixed country effects cannot be omitted (p=0.000).

It turns out that school enrolment rises with adult literacy, the coefficient being significant at the one percent level. This is in line with the results of Roberts (2003) reported

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[12] We excluded high-income countries because they receive no aid. According to the definition of the World Bank, high income countries are those with 2005 GNI per capita exceeding 10,726 US$.

[13] As concerns public spending on education, World Bank (2005) presents data only since 1998. By contrast, the series ranges back to 1970 in earlier issues of the World Development Indicators. We complement recent data from World Bank (2005) with World Bank (2003), even though the data for years reported in both issues deviate for some countries.

in Chapter II. GDP per capita does not have the expected positive impact on school enrolment; the share of population under the age of 15, and the degree of urbanization do also not affect enrolment at conventional levels of significance.

Turning to our variables of interest, the results show a positive impact of aid on school enrolment, with coefficients significant at the one percent level in the fixed effects regression, and at the ten percent level when estimated with random effects. Education expenditures do not affect enrolment significantly, as in much of the previous literature. Note, however, that the inclusion of both expenditure and aid in one equation might imply the double counting of aid, i.e., to some extent the two variables might measure the same effect. We return to this below.

In columns 3 and 4, we replicate the analysis excluding population under the age of 15 and urbanization. We keep per capita GDP in spite of its insignificance due to its theoretical importance. Moreover, the impact of GDP becomes significant at the ten percent level when expenditure on education is excluded from the regression (not shown in the table). The results do not change by the exclusion of the two variables. Again, the random effects specification is rejected in favor of the fixed effects model ($p=0.009$). Most importantly for our analysis, aid still increases enrolment significantly.

Column 5 takes the potential endogeneity of aid and expenditures into account. We employ the GMM estimator as suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). We present results employing the two-step estimator implemented by Roodman (2005) to Stata, including Windmeijer's (2005) finite sample correction. We treat expenditure and aid as endogenous and the additional covariates as strictly exogenous. We report results of the Hansen test on the validity of the instruments used (amounting to a test for the exogeneity of the covariates), and the Arellano-Bond test of second order autocorrelation, which must be absent from the data in order for the estimator to be consistent. Again, the results remain qualitatively unchanged, with the impact of aid being significant at the ten percent level. Both the Hansen test and the Arellano-Bond test accept the specification.

Focusing on the consistent fixed effects and GMM specifications, the coefficient estimated for aid ranges from 5-5.5. This estimate is quantitatively important. Given that aid is measured in percent of GDP, the result implies that additional aid amounting to 1 percent of GDP increases school enrolment by about five percentage points. Average aid given to the

education sector of 0.33 percent of GDP among our sample countries does increase school enrolment by about 1.5 percentage points.

2. Accounting for the Determinants of Aid and Spending

In the following, we work with the reduced model presented in columns 3-5 of Table 1. As a next step, we address the potential endogeneity of aid and expenditures by taking their determinants explicitly into account. We add two equations:

$$aid_{it} = \alpha + \beta_1' X_{aid} + \varepsilon_{it}, \tag{2}$$

$$spending_{it} = \alpha + \beta_1 aid_{it} + \beta_2' X_{spend} + \varepsilon_{it}, \tag{3}$$

with X representing the respective vector of covariates, and spending modeled to directly depend on aid given to the education sector.

Regarding the variables to be included in the X vector, we again follow the previous literature. Mosley, Hudson and Verschoor (2004) propose population size, macro-policy, openness, and infant mortality as determinants of aid.[14] Population controls for the small-country bias of aid. The inflation rate and openness account for the possibility that donors grant more aid to recipients with reasonable economic policies. In addition to infant mortality, we employ GDP per capita as a regressor which reflects the need of recipient countries for aid. Dreher, Ursprung and Sturm (2006) propose the age dependency ratio, central government expenditure (in percent of GDP), and inflation as robust predictors of various government expenditure shares. Public spending is likely to decrease in real terms when inflation accelerates. The share of under 15-year and over 64-year old people relative to total population ("age dependency ratio") controls for demographic factors. The total amount of public expenditures (in percent of GDP) is included to control for the overall size of the state

[14] They also include dummies for former colonies and Islamic countries. We omit these variables as they are invariant over time.

sector; in countries with smaller state sectors, we expect expenditures on education to be relatively low.[15]

Table 2 reports results estimated with Seemingly Unrelated Regressions (SUR). The SUR model permits non-zero covariance between the error terms of the three equations, allowing for an improvement in efficiency of SUR relative to the classical OLS estimator. However, we lose about 80 observations (due to missing variables). Column 1 includes all additional covariates, column 2 only those that are significant at the ten percent level at least (but keeping aid for education). Both specifications suggest that aid is a highly significant determinant of school enrolment. When we allow for the endogeneity of expenditures, enrolment also rises with expenditures according to both regressions. Adult literacy and per capita GDP exert a positive and highly significant influence, which supports the findings of Gupta et al. (1999) and Roberts (2003).

Turning to the determinants of aid, the results show that inflation does not significantly affect inflows. However, donors appear to have favored more open recipient countries. Aid for education (in percent of GDP) significantly rises with smaller population size, smaller per capita GDP, and higher infant mortality. The latter findings are fairly conventional, confirming the small-country bias of aid and its concentration on more needy recipients.

Among the determinants of education expenditures, the size of central government expenditures has a positive impact. Age dependency reduces education spending. However, aid does not increase expenditures. While this may appear surprising, a high degree of fungibility is in line with Pettersson (2006) who concludes that "at least fifty percent of sectoral aid tends to be used somewhere else."

Table 3 replicates the analysis estimating the equations as a system, which constitutes a more efficient way of capturing the interdependency between enrolment, aid and expenditures. In the first stage, 3SLS uses instruments for all endogenous variables. These instruments are the predicted values resulting from a regression of each endogenous variable on all exogenous variables included in the system. By using predicted values of aid and

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15 To capture donor interests, we also included a variable measuring whether a recipient voted in line with the average G7 donor in the UN General Assembly in the same year. However, the coefficient of this variable is completely insignificant, so we do not report the result in the table.

expenditures, we overcome the problem of double counting of aid. This is another reason why we consider estimating a system of equations to be our preferred approach. The second stage consistently estimates the covariance matrix of the equation errors using the residuals from the 2SLS estimation of each equation. In the third stage, GLS estimation employing the covariance matrix estimated in the second stage and the instruments of the endogenous variables is performed.

As can be seen from the table, the previous results remain qualitatively unchanged. Aid increases school enrolment with a coefficient significant at the one percent level. However, its coefficient is substantially greater as compared to Tables 1 and 2. According to the estimate, a 0.1 percentage point increase in aid (i.e., 30 percent of the average ratio of aid for education to GDP) increases enrolment by 3.4 percentage points. In contrast to Michaelowa and Weber (2006) who instrument aid in the education sector by aid in the energy sector, we find that the coefficient of aid increases when allowing for the endogeneity of aid.[16] This is because aid flows are likely to be given to poor countries with low enrolment so that the failure to take the determinants of aid into account produces a downward bias in the coefficient of aid in the enrolment regression. When estimating the equations with 3SLS, expenditure on education again significantly increases enrolment, but this time both economic and statistical significance are markedly higher, which may be due to the fact that the expenditure variable no longer suffers from double counting in the estimates reported in Table 3. The impact of educational aid on public expenditures remains insignificant. As long as the contribution of aid is fully accounted in the statistics on public education expenditures, this corroborates the conclusion that fungibility must be high.[17]

Note that the Sargan test fails to reject the hypothesis that the instruments are uncorrelated with the error term at the one percent level of significance. The instruments also easily pass the threshold of an F-value of about 10 in the first stage expenditures regression (Staiger and Stock 1997). In the aid regression, an F-test of 7.3 indicates potentially weak instruments, although the instruments are jointly significant at the one percent level.

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[16] Similarly, Rajan and Subramanian (2005: 37) show that instrumenting aid increases the size of the aid coefficient in a growth equation.

[17] It is not clear to which extent this assumption is justified. Even insiders such as World Bank staff members do not have systematic information on this issue (Michaelowa and Weber 2006). The levels of fungibility suggested by our results thus have to be regarded as upper bounds of the true fungibility levels.

In summary, there is strong evidence that school enrolment is positively affected by aid. This contrasts with Michaelowa and Weber's (2006) finding of a weak relationship between aid and school attendance, which may be at least partly due to the fact that in their approach the lagged endogenous variable takes up some explanatory power. As concerns transmission mechanisms, the positive impact of aid we find is not via budgetary channels, supporting Gomanee et al. (2005) rather than Pettersson (2006).

3. Accounting for the Determinants of Institutional Quality

Whether and to what extent the impact of foreign aid depends on "sound" institutions has been heatedly debated in the previous literature. While the positive impact of aid on school enrolment holds for the average country and year, investigating whether institutions matter for this relationship might be illuminating. In testing whether aid is more conducive to an improvement in outcome variables when recipient countries are well governed, we face a problem that has largely been ignored in the previous aid literature: the endogeneity of institutions. The seminal contribution of Burnside and Dollar (2000), which triggered the debate on whether or not aid is more effective under good policy conditions, treats the policy variables (openness, inflation, budget surplus) as exogenous.[18] In a subsequent paper, the same authors justify this by claiming that "researchers coming from the left, the right, and the center have all concluded that aid as traditionally practiced has not had systematic, beneficial effects on institutions and policies" (Burnside and Dollar 2004: 4). And indeed, Collier's (1997) verdict that conditionality has failed was hardly disputed until recently. Yet, there is sufficient reason to treat local policies and institutions as endogenous. There are several indications that aid may help improve the local policy and institutional environment. Mosley, Hudson and Verschoor (2004) argue that a new form of conditionality may have the desired effects. All the more surprisingly, however, they treat pro-poor expenditure as endogenous but fail to do so with respect to corruption. According to Tavares (2003), aid has reduced corruption. Likewise, Kalyvitis and Vlachaki (2006) show that aid flows specifically directed

[18] By contrast, Clemens, Radelet and Bhavnani (2004) use instruments for institutional and policy variables, but this does not affect their results significantly.

to support democracy are positively associated with the likelihood of democratic transition in recipient countries.[19]

We address these questions in several steps. First, we assume the exogeneity of institutions and test for a differential impact of aid. Second, we explicitly include institutional quality to our system of equations, allowing for the endogeneity of institutions. Third, we additionally include the interaction between aid and democracy into the system.

Specifically, we add a fourth equation to our system:

$$inst_{it} = \alpha + \beta_1 aid_{it} + \beta_2^{'} X_{inst} + \varepsilon_{it}, \quad (4)$$

with $inst_{it}$ capturing institutional quality. As a proxy for institutional quality, we employ an index constructed with data provided by Freedom House (2004). We subtract the mean value of their political rights and civil liberties indices from 8, so that the resulting index ranges from 1 to 7, with higher values showing greater levels of democracy. While plenty of alternative proxies have been suggested in the previous literature, this variable has the advantage of being available for a huge number of countries, and over most of the years under study. According to Svensson (1999), democratic institutions provide an institutionalized check on governments, encouraging them to use aid more productively. Aid is thus hypothesized to have a greater impact on educational outcomes the greater the degree of democracy.

Column 1 of Table 4 adds democracy and its interaction with aid to the school enrolment equation. Again, we report results from fixed effects, random effects, and GMM estimation. In the last two regressions, foreign aid is no longer individually significant when its interaction with democracy is included. The level of democracy and the interaction itself are also not individually significant at conventional levels. However, the three variables are

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[19] Democracy assistance refers to CRS code 150 (Government and Civil Society); it comprises aid meant by donors to foster democracy and democratic transition and includes sub-items such as legal and judicial development, government administration, strengthening civil society, post-conflict peace building, elections, human rights, demobilization, and free flow of information.

jointly significant at least at the five percent level according to the estimates of columns 1 and 2.[20]

Overall, there is some evidence that the impact of aid on school enrolment indeed depends on democracy in the recipient country, but results have to be interpreted with caution as we do not account for the endogeneity of democracy in Table 4. While the impact of aid on school enrolment is negative in the absence of democracy, the impact becomes positive with rising democracy. In interpreting the coefficients of democracy and aid, we have to keep in mind that the impact of aid depends on the level of democracy and the other way round. We therefore calculate the impact of democracy and aid for three values of these variables – their minimum values, their maximum values, and their means. According to column 1, the impact of a one percentage point increase in aid on school enrolment varies from 4.5-4.7 percentage points. The impact of an increase in democracy by one point varies from 0.57-3.14 percentage points, but remains positive across the range of variables. According to column 3, the corresponding ranges are 2.5-2.9 and, respectively, 0.61-4.53.

In Tables 5 and 6 we take the potential endogeneity of democracy into account (without considering the interaction of democracy and aid; see below on this). We replicate the SUR and systems equations of Tables 2 and 3, including an additional equation for democracy. In selecting the determinants of institutional quality, we follow Barro (1999) and include GDP per capita, years of primary schooling, the gap between male and female years of primary schooling, the rate of urbanization, population size, and a dummy for major oil exporting countries. GDP per capita accounts for the fact that demand for democracy usually increases with income. Better educated societies are also expected to demand more democracy, while bigger gaps between male and female education indicates discrimination, and thus usually a lack of democracy. Higher levels of urbanization reduce communication costs and may thus facilitate the evolution of democratic institutions. Large populations may be more fractionalized, which may in turn hinder democracy. Finally, the literature on the resource curse emphasizes that in many cases oil wealth has weakened institutions. We also include aid for education to allow for the possibility that institutions improve or deteriorate as a consequence of aid (see above).

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[20] Note that the t-statistics have to be interpreted as conditional statistics rather than general ones (Friedrich 1982). The t-statistics therefore indicate whether aid has a statistically significant impact on school enrolment at a particular level of democracy and the other way round.

According to the SUR results of Table 5, aid has indeed significantly affected democracy. At the ten percent level of significance, aid increases democracy, corroborating the finding of Kalyvitis and Vlachaki (2006) on the effects of democracy assistance. Education, too, improves democracy, with a coefficient significant at the five percent level. Also in line with expectations, discrimination significantly decreases democracy, and so do oil exports. Urbanization, population, and per capita GDP do not significantly affect democracy.

Results do not differ much from those reported above when democracy is allowed to be endogenous. In particular, aid still significantly increases enrolment, with a coefficient similar in magnitude to those in Table 2. Expenditures also significantly determine school enrolment according to this specification. A striking exception is that aid has a significantly negative impact on expenditures. This points to fungibility of more than 100 percent, which has previously been found for a number of countries by Pettersson (2006).[21] As can be seen, democracy directly increases school enrolment at the one percent level of significance.

Table 6 reports results estimated with 3SLS. Focusing on our variables of interest, enrolment significantly rises with aid and expenditures. This is true when all explanatory variables are included in the democracy equation (column 1), and when deleting the insignificant regressors (column 2). When estimating the regressions as one system of equations, the impact of aid on enrolment is quantitatively again substantially greater as compared to the SUR regressions, further highlighting the importance of correcting for endogeneity. Democracy has no significant impact on enrolment in both regressions – no indirect effects of aid exist via this channel. Aid again reduces education expenditures at the ten percent level of significance. Given the significant impact of expenditures on school enrolment, we have to take this indirect impact of aid on enrolment into account. According to column 2, an increase in aid by 0.1 percentage points increases school enrolment directly by 5.4 percentage points. At the same time, however, expenditure on education is reduced by 0.057 percentage points, in turn reducing enrolment by 0.52 percentage points (=0.057*9.17).

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[21] For instance, Pettersson finds that every dollar of sectoral aid reduces domestic sectoral spending by almost three dollars in China and the Dominican Republic. Pettersson concedes that the level of fungibility is estimated very imprecisely, depending on model specification, time periods and data differences. His bottom line is that fungibility turns out to be very high, which is also what we tend to find (unless aid goes largely unreported in statistics on public education expenditure; see above).

The overall impact of an increase in aid by 0.1 percentage points is thus reduced to about 4.9 percentage points.

In Table 7, we simultaneously account for endogeneity and the potential impact of the institutional environment on aid effectiveness. In addition to estimating the system with 3SLS as above (in column 1), we present results estimated with 2SLS (column 2). As in Table 4, we include the interaction of aid and democracy to the regression. However, we replace both democracy and education with their predicted values, allowing for their endogeneity to the system. We only report results for school enrolment. Expenditure on education and aid given to the education sector both significantly increase school enrolment according to both specifications. Democracy and its interaction with aid are neither individually nor jointly significant at conventional levels, and the coefficient of democracy even changes from negative to positive when estimated with 2SLS instead of 3SLS. We therefore conclude that, in contrast to the hypothesis derived from Svensson (1999), the impact of aid does not robustly depend on democracy. Rather, aid for education may help achieve universal education even in recipient countries characterized by less advanced democratic institutions.

4. Sensitivity Analysis

This section presents extensions and tests for robustness of the previous results. First, we test whether our results are robust to using (estimated) aid disbursements instead of commitments. Second, we use *total* aid disbursements instead of aid for education.[22] Third, we employ primary completion rates as an alternative educational outcome variable. Finally, we consider different measures of institutional quality instead of the Freedom House index of democracy.

In Table 8 we reproduce the regressions most important to our analysis with estimated aid disbursements. The reason is that commitment data tend to overstate actual aid flows, as part of commitments may not be disbursed. On the other hand, sector-specific commitments go partly unreported in the OECD/DAC's CRS database (Michaelowa and Weber 2006). These measurement problems, working in opposite directions, cannot be resolved as sector-specific disbursement data are not available. However, disbursements of aid for education

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[22] We also tried replicating the analysis using aid granted for *basic* education instead of total aid for education. However, this reduces the number of observations by more than half, leaving us with an insufficient number of observations for meaningful estimation.

may be estimated by multiplying commitments of aid for education with the ratio of total aid disbursements over total aid commitments, following Michaelowa and Weber (2006) as well as Pettersson (2006).[23] Using this estimate as a robustness check, most of the results reported previously remain qualitatively unchanged. Aid given to the education sector is always significant at the ten percent level at least when the interaction with democracy is excluded (columns 1-4). This is true when estimated with the fixed effects estimator and GMM. It is also true when the whole system of equations as presented in Table 3 is included (estimated with SUR and, respectively, 3SLS). Expenditures only have a positive impact on enrolment in our preferred 3SLS estimation, which again can be explained by the absence of double counting.

As before, there is mixed evidence on whether democracy matters for the effect of aid on school enrolment. The aid and democracy variables are jointly significant at the five percent level according to the fixed effects estimations, whereas they are jointly insignificant when estimated by GMM. When treating the interaction term as endogenous and replicating the system reported in Table 7, aid has a positive impact significant at the one percent level, while the positive impact is reduced by democracy, with the three variables being jointly significant at the one percent level, which is in contrast to the specification with commitments.

When using total aid disbursements instead of aid on education only, the impact of aid on enrolment disappears (column 1 of Table 9). This is not surprising, considering that aid for education, even though of rising relative importance, still accounted for just 8.2 percent of total aid in 2002-2004 and that donors pursue multiple objectives when granting aid to recipient countries (Thiele, Nunnenkamp and Dreher 2006).

Columns 3-6 of Table 9 introduce primary completion rates as the dependent variable. Arguably, completion rates represent the best indicator to reveal progress with respect to "MDG two" ("Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling"). However, data on primary completion are available only since 1988, reducing the sample size considerably. Nevertheless, the results

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[23] This procedure (heroically) assumes that the discrepancy between commitments and disbursements is the same across various categories of sector-specific aid. The correlation between commitments and estimated disbursements is 0.74.

are fairly consistent to the previous ones, even though the effect of both aid and expenditures on completion rates is much lower than that on enrolment.

In Table 10, finally, we report the impact of replacing the Freedom House index by other indicators of institutional quality: the Polity IV index of democracy, the political risk index constructed by the International Country Risk Guide, and the Economic Freedom Index provided by the Fraser Institute. For all three indices we have around 180 observations for our system of equations. However, in no equation any of the alternative institutional indicators enters individually significantly. The results also show that the impact of aid and expenditures remains positive and highly significant in all specifications.

IV. Conclusions

This paper empirically analyzed the impact of aid on education for about 100 countries over the period 1970-2005. We estimated a system of equations to test whether and to what extent the impact of sector-specific aid on educational attainment depends on (i) the extent to which aid adds to overall educational expenditure of the recipient government, (ii) the strength of the link between government expenditure and education, (iii) the quality of institutions in the recipient country, and (iv) whether aid encourages institutional reforms. According to our results, aid significantly increases primary school enrolment. This result is robust to the method of estimation, the inclusion of instruments to control for the endogeneity of aid, and the measure of institutional quality employed. The degree of institutional quality, however, has no robust impact on this relationship.

Our findings are in sharp contrast to Easterly's (2006) verdict that foreign aid has done "so little good." At the same time, our analysis underscores the need to disaggregate aid in order to assess its effectiveness. Aid specifically devoted to the education sector of recipient countries can make an important contribution to achieving universal primary education in developing countries. According to our results, this contribution is significantly larger than previous studies suggest (notably, Michaelowa and Weber 2006). Arguably, the effectiveness of aid for education could still be enhanced if donors shifted aid resources within this sector towards basic education. In 2002-2004, basic education accounted for just about one third of total aid for education by all donors (Thiele, Nunnenkamp and Dreher 2006). This is not only in conflict with "MDG two," which would require a stronger concentration on basic

education, but also with findings that social returns to primary education tend to be particularly high in low-income countries (World Bank 1995).

Positive aid effects on educational outcomes in recipient countries notwithstanding, our analysis points to some caveats that donors should keep in mind when giving aid. First of all, in contrast to what donors might expect, aid for education is unlikely to result in more overall spending on education in the recipient country. Rather, we corroborate Pettersson (2006) in that sector-specific aid is highly fungible. Moreover, the finding that aid does not affect educational outcomes through budgetary channels, i.e., its effect on government expenditure for education, casts into doubt the proposal by Mosley, Hudson and Verschoor (2004: F221) to use aid as a means to influence "the orientation of public expenditures towards poverty reduction." At least as concerns education, this "new form of conditionality" does not appear to have worked in the past. Whether the chances for donors to induce recipient governments to adopt a more pro-poor public expenditure mix by conditioning aid have improved recently, with the advent of Poverty Reduction Strategy Papers, is left open to debate.

As long as conditionality does not work, donors should be selective when deciding on the allocation of aid for education, even though it has to be taken into account that aid may exhibit decreasing returns when given in large amounts to a specific group of countries. The most obvious criterion for selectivity is the need of recipients for aid in education, as reflected in particularly low enrolment and completion rates. As shown elsewhere (Thiele, Nunnenkamp and Dreher 2006), the targeting of educational aid according to need leaves much to be desired. The present analysis suggests that another selectivity criterion might be less important than widely believed: The finding that aid for education may help achieve universal primary education even in recipient countries characterized by less advanced democratic institutions speaks against selectivity with respect to democratic values.

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Table 1: School Enrolment, Aid, Expenditures, 1970-2005

	(1)	(2)	(3)	(4)	(5)
Expenditure on education	0.77	0.35	0.79	0.34	0.27
(percent of GDP)	(1.50)	(0.87)	(1.57)	(0.85)	(0.36)
Aid for education	5.05	2.85	5.00	2.57	5.51
(percent of GDP)	(2.84***)	(1.92*)	(2.83***)	(1.76*)	(1.95*)
Literacy rate	0.43	0.56	0.50	0.59	0.64
	(2.81***)	(9.04***)	(6.04***)	(13.01***)	(8.20***)
GDP p.c.	0.0007	0.0003	0.0009	0.0005	0.0003
	(1.13)	(0.89)	(1.62)	(1.45)	(0.58)
Population under 15	-0.21	-0.03			
	(0.82)	(0.20)			
Urbanization	0.04	0.05			
	(0.26)	(0.79)			
Number of countries	101	101	102	102	102
Number of observations	354	354	355	355	355
Method	fixed effects	random effects	fixed effects	random effects	GMM
R squared (within)	0.20	0.19	0.20	0.19	
Hansen test (Prob > chi2)					0.45
Arellano-Bond test (Prob > z)					0.35

Notes:

* denotes significant at 10% level; ** significant at 5% level; ******* significant at 1% level.

Table 2: School Enrolment, Aid, Expenditures, 1970-2005, SUR

	(1)			(2)		
	enrolment	aid	expenditure	enrolment	aid	expenditure
Expenditure on education	1.08			0.76		
(percent of GDP)	(2.32**)			(1.70*)		
Aid for education	6.45			5.52		
(percent of GDP)	(4.08***)			(3.51***)		
Literacy rate	0.60			0.48		
	(7.05***)			(5.70***)		
GDP p.c.	0.0010			0.0013		
	(2.00**)			(2.44**)		
Population		-3.44E-10			-3.62E-10	
		(2.26**)			(2.29**)	
Inflation		0.00				
		(1.12)				
Openness to trade		0.0018			0.0014	
		(2.77***)			(2.13**)	
GDP p.c.		-3.90E-05			-3.90E-05	
		(4.37***)			(4.34***)	
Infant mortality		0.0043			0.0038	
		(5.15***)			(4.61***)	
Government expenditure			0.19			0.19
			(11.38***)			(11.28***)
Age dependency ratio			-1.01			-0.96
			(1.75*)			(1.67*)
Inflation			0.00			
			(1.33)			
Aid for education			0.15			0.09
			(0.63)			(0.39)
Number of countries		97			100	
Number of observations		275			284	
R squared (within)	0.90	0.34	0.32	0.89	0.30	0.31

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 3: School Enrolment, Aid, Expenditures, 1970-2005, 3SLS

	enrolment	aid	expenditure
Expenditure on education	6.24		
(percent of GDP)	(4.20***)		
Aid for education	34.18		
(percent of GDP)	(5.27***)		
Literacy rate	0.32		
	(2.70***)		
GDP p.c.	2.23E-03		
	(2.89***)		
Population		-3.72E-10	
		(2.36**)	
Openness to trade		0.0014	
		(2.03**)	
GDP p.c.		-3.99E-05	
		(4.41***)	
Infant mortality		0.004	
		(4.48***)	
Government expenditure			0.19
			(11.23***)
Age dependency ratio			-1.03
			(1.72*)
Aid for education			0.13
			(0.49)
Number of countries		100	
Number of observations		289	
R squared (within)	0.68	0.30	0.31

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 4: School Enrolment, Aid, Expenditures, Democracy, 1970-2005

	(1)	(2)	(3)
Expenditure on education	0.75	0.30	0.86
(percent of GDP)	(1.47)	(0.76)	(0.71)
Aid for education	4.96	1.65	2.41
(percent of GDP)	(1.73*)	(0.65)	(0.51)
Literacy rate	0.49	0.57	0.63
	(5.83***)	(12.22***)	(6.81***)
GDP p.c.	0.0008	0.0003	-0.0002
	(1.42)	(1.05)	(0.35)
Democracy	0.59	0.76	0.61
	(0.87)	(1.42)	(0.40)
Democracy*Aid	-0.06	0.07	-0.17
	(0.15)	(0.18)	(0.36)
Number of countries	102	101	102
Number of observations	355	355	355
Method	fixed effects	random effects	GMM
R squared (within)	0.20	0.19	
Joint sign. (Prob > F)[a]	0.035	0.151	0.911
Joint sign. (Prob > F)[b]	0.684	0.322	0.846
Hansen test (Prob > chi2)			0.57
Arellano-Bond test (Prob > z)			0.27

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 5: School Enrolment, Aid, Expenditures, Democracy, 1970-2005, SUR

	enrolment	aid	expenditure	democracy
Expenditure on education	1.69			
(percent of GDP)	(2.95***)			
Aid for education	6.61			
(percent of GDP)	(2.81***)			
Literacy rate	0.36			
	(3.37***)			
GDP p.c.	0.002			
	(2.47**)			
Democracy	1.99			
	(2.90***)			
Population		-2.73E-10		
		(2.08**)		
Openness to trade		0.0020		
		(2.89***)		
GDP p.c.		-3.71E-05		
		(3.89***)		
Infant mortality		0.0045		
		(5.30***)		
Government expenditure			0.19	
			(9.53***)	
Age dependency ratio			-0.51	
			(0.78)	
Aid for education			-0.58	
			(2.06**)	
GDP p.c.				0.0000
				(1.03)
Years of primary schooling				0.20
				(2.22**)
Gap between male and female				-1.44
primary schooling				(7.02***)
Urbanization				7.81E-03
				(1.23)
Population				2.06E-10
				(0.38)
Oil exporters, dummy				-0.91
				(2.69***)
Aid for education				0.47
				(1.71*)
Number of countries			62	
Number of observations			188	
R squared (within)	0.88	0.40	0.32	0.44

Notes:

* denotes significant at 10% level; ** significant at 5% level; ******* significant at 1% level.

Table 6: School Enrolment, Aid, Expenditures, Democracy, 1970-2005, 3SLS

	(1)				(2)			
	enrolment	aid	expenditure	democracy	enrolment	aid	expenditure	democracy
Expenditure on education (percent of GDP)	6.25 (4.32***)				9.17 (3.03***)			
Aid for education (percent of GDP)	25.94 (4.49***)				53.95 (2.77***)			
Literacy rate	0.39 (2.73***)				0.58 (2.63***)			
GDP p.c.	0.003 (3.03***)				0.005 (2.33**)			
Democracy	-1.65 (0.75)				-13.11 (1.50)			
Population		-2.80E-10 (2.13**)				-2.79E-10 (2.13**)		
Openness to trade		0.0020 (2.78***)				0.0020 (2.85***)		
GDP p.c.		-3.74E-05 (3.92***)				-3.79E-05 (3.99***)		
Infant mortality		0.14 (5.22***)				0.004 (5.27***)		
Government expenditure			0.19 (9.52***)				0.19 (9.36***)	
Age dependency ratio			-0.52 (0.76)				-0.51 (0.74)	
Aid for education			-0.57 (1.76*)				-0.57 (1.74*)	
GDP p.c.				4.54E-05 (1.08)				
Years of primary schooling				0.20 (2.22**)				0.29 (3.58***)
Gap between male and female primary schooling				-1.43 (7.02***)				-1.54 (8.71***)
Urbanization				8.16E-03 (1.26)				
Population				2.43E-10 (0.45)				
Oil exporters, dummy				-0.92 (2.70***)				-0.66 (2.09**)
Aid for education				0.53 (1.66*)				0.22 (0.76)
Number of countries			62				62	
Number of observations			188				188	
R squared (within)	0.87	0.40	0.32	0.44	0.29	0.40	0.32	0.42

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 7: School Enrolment, Aid, Expenditures, Democracy, 1970-2005

	(1)	(2)
Expenditure on education	7.99	5.16
(percent of GDP)	(3.43***)	(2.59**)
Aid for education	44.77	7.75
(percent of GDP)	(2.94***)	(1.68*)
Literacy rate	0.53	0.43
	(2.84***)	(2.43**)
GDP p.c.	0.0043	0.0019
	(2.62***)	(1.74*)
Democracy	-7.32	3.05
	(1.00)	(0.62)
Democracy*Aid	-0.0113	-0.0126
	(0.85)	(0.99)
Number of countries	62	62
Number of observations	188	188
Method	3SLS	2SLS
R squared (within)	0.56	0.85
Joint sign. (Prob > F)[a]	0.001	0.030
Joint sign. (Prob > F)[b]	0.201	0.537

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

The dependent variable is school enrolment.

School enrolment, expenditure on education, aid for education, democracy, and democracy*aid are endogenous to the system. The specification follows column 2 of Table 6.

Table 8: School Enrolment, Aid Disbursements, Expenditures, Democracy, 1970-2005

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expenditure on education	0.73	0.39	0.70	4.61	0.58	0.23	5.27
(percent of GDP)	(1.43)	(0.46)	(1.57)	(3.01***)	(1.11)	(0.20)	(3.14***)
Aid for education	3.36	4.49	4.15	31.61	2.83	2.15	19.66
(percent of GDP)	(2.60***)	(1.73*)	(3.25***)	(4.89***)	(1.08)	(0.28)	(3.77***)
Literacy rate	0.45	0.61	0.49	0.54	0.41	0.60	0.56
	(4.90***)	(7.81***)	(5.54***)	(4.68***)	(4.38***)	(7.61***)	(3.31***)
GDP p.c.	1.60E-03	7.00E-04	1.80E-03	3.10E-03	1.40E-03	5.00E-04	2.30E-03
	(2.22**)	(1.34)	(2.86***)	(3.27***)	(1.89*)	(1.17)	(2.55**)
Democracy					1.45	-0.59	2.206
					(1.85*)	(0.49)	(0.64)
Democracy*Aid					0.02	-0.18	-0.011
					(0.04)	(0.14)	(1.14)
Number of countries	102	102	100	100	102	102	62
Number of observations	344	344	284	284	344	344	185
Method	fixed effects	GMM	SUR	3SLS	fixed effects	GMM	3SLS
Joint sign. (Prob > F)[a]					0.013	0.858	0.000
Joint sign. (Prob > F)[b]					0.121	0.812	0.485
Hansen test (Prob > chi2)		0.19				0.42	
Arellano-Bond test (Prob > z)		0.24				0.93	
R squared (within)	0.16		0.89	0.67			0.80

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

The dependent variable is school enrolment.

Aid for education is estimated disbursements instead of commitments (see main text). In the SUR and 3SLS regressions, school enrolment, expenditure on education, aid for education, democracy, and democracy*aid are endogenous to the system. The specifications follow column 2 of Table 6.

Table 9: Education, Aid, Expenditures, Democracy, 1970-2005

	(1) school	(2) school	(3) completion	(4) completion
Expenditure on education	5.53	4.57	1.22	4.06
(percent of GDP)	(3.93***)	(3.16***)	(3.10***)	(3.6***)
Aid, total disbursements	-0.23	0.09		
(percent of GDP)	(0.38)	(0.12)		
Aid for education			6.39	23.43
(percent of GDP)			(3.48***)	(1.71*)
Literacy rate	0.50	0.44	0.62	0.74
	(5.10***)	(2.99***)	(4.35***)	(2.42**)
GDP p.c.	6.00E-04	1.60E-03	2.90E-03	3.30E-03
	(0.74)	(1.87*)	(4.25***)	(2.44**)
Democracy		3.69		0.20
		(1.18)		(0.06)
Democracy*Aid		0.178		-0.012
		(0.99)		(1.40)
Number of countries	100	102	95	60
Number of observations	289	188	234	145
Method	3SLS	3SLS	3SLS	3SLS
Joint sign. (Prob > F)[a]		0.048		0.049
Joint sign. (Prob > F)[b]		0.060		0.184
R squared (within)	0.83	0.85	0.95	0.94

Notes:

* denotes significant at 10% level; ** significant at 5% level; ******* significant at 1% level.

Dependent variables are, respectively, school enrolment and primary completion rates. Aid for education refers to commitments.

School enrolment, primary completion rates, expenditure on education, aid, democracy, and democracy*aid are endogenous to the respective system. The specifications follow column 2 of Table 6.

Table 10: School Enrolment, Aid, Expenditures, Institutional Quality, 1970-2005

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure on education	6.08	6.89	6.39	6.29	6.37	6.66
(percent of GDP)	(3.95***)	(4.25***)	(5.04***)	(4.85***)	(4.55***)	(4.63***)
Aid for education	24.16	31.52	21.86	22.67	23.37	30.43
(percent of GDP)	(4.70***)	(4.79***)	(3.89***)	(2.79***)	(4.19***)	(4.63***)
Literacy rate	0.49	0.58	0.14	0.18	0.41	0.46
	(2.70***)	(2.89***)	(0.69)	(0.72)	(2.42**)	(2.55**)
GDP p.c.	2.50E-03	3.20E-03	2.00E-03	2.20E-03	3.20E-03	3.40E-03
	(2.64***)	(3.03***)	(1.57)	(1.32)	(2.88***)	(2.92***)
Polity index	-0.92	-1.48				
	(0.95)	(1.06)				
Polity*Aid		-1.48				
		(1.11)				
Political risk			0.15	0.24		
			(0.76)	(1.10)		
Risk*Aid				0.24		
				(0.92)		
Economic Freedom					-2.32	-0.11
					(1.01)	(0.05)
Freedom*Aid						-0.11
						(2.10**)
Number of countries	61	61	54	54	62	62
Number of observations	183	183	166	166	188	188
Method	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS
Joint sign. (Prob > F)[a]		0.000		0.000		0.000
Joint sign. (Prob > F)[b]		0.103		0.119		0.098
R squared (within)	0.80	0.76	0.78	0.78	0.80	0.77

Notes:

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

The dependent variable is school enrolment.

School enrolment, expenditure on education, aid for education, institutional quality, and quality*aid are endogenous to the system. The specifications follow column 2 of Table 6.

Appendix A: Definitions and Sources

Variable	Description	Source
School enrolment	Net enrolment ratio is the ratio of the number of children of official school age enrolled in school to the population of the corresponding official school age. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music. Based on the International Standard Classification of Education.	World Bank (2005)
Expenditure on education	Public expenditure on education consists of public spending on public education plus subsidies to private education at the primary, secondary, and tertiary levels. In percent of GDP.	World Bank (2003, 2005)
Primary completion rate	Primary completion rate is the number of students successfully completing the last year of (or graduating from) primary school in a given year, divided by the number of children of official graduation age in the population.	World Bank (2005)
Aid for education, commitments	Aid commitments by all donors according to Creditor Reporting System Purpose Code 110; includes basic education, secondary education, post-secondary education, and unspecified level of education. Note that CRS guidelines require sector-specific program assistance and budget support in the form of sector-wide approaches to be subsumed under education when meant to benefit this sector. In per cent of the recipient countries' GDP.	OECD (2006)
Aid for education, estimated disbursements	Committed aid for education multiplied with the ratio of total aid disbursements over total aid commitments; see text for rationale. In percent of the recipient countries' GDP.	OECD (2006)
Aid, total disbursements	Total aid (in all sectors) disbursed by all donors. In percent of the recipient countries' GDP.	OECD (2006)
Age dependency ratio	Age dependency ratio is the ratio of people younger than 15 and older than 64 to those aged 15-64.	World Bank (2005)
Democracy, index	8 - (Political Rights Index + Civil Liberties Index) / 2	Freedom House (2004)
Democracy, Polity IV	Democracy Score from 0-10, with higher values representing greater democracy. Measures the general openness of political institutions.	Marshall and Jaggers (2003)
Economic Freedom	Composite Index of economic freedom. Ranges from 0-10, with higher values reflecting greater freedom.	Gwartney and Lawson (2004)
Gap between male and female	Average years of primary schooling in the male population minus average years of primary schooling in the female population.	Barro and Lee (2000)
GDP p.c.	GDP per capita, PPP (constant 2000 international $).	World Bank (2005)
Government expenditure	General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). In percent of GDP.	World Bank (2005)
Infant mortality	Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.	World Bank (2005)
Inflation	Inflation as measured by the consumer price index.	World Bank (2005)
Literacy rate	Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.	World Bank (2005)
Oil exporters, dummy	Dummy for major oil exporters.	Easterly and Sewadeh (2001)
Openness to trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank (2005)

Appendix A (continued)

Variable	Description	Source
Political risk	Composite index of political risk, comprising 12 components (government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability, bureaucracy quality); minimum (maximium) number of points = 0 (100), with higher number of points indicating lower risk.	ICRG (2005)
Population under 15	Population ages 0 to 14 is the percentage of the total population that is in the age group 0 to 14.	World Bank (2005)
Urbanization	Urban population is the share of the total population living in areas defined as urban in each country.	World Bank (2005)
Years of primary schooling	Average years of primary schooling in the total population	Barro and Lee (2000)

Appendix B: Summary Statistics (estimation sample)

Variable	Mean	Minimum	Maximum	Standard Deviation
School enrolment	82.78	19.82	107.47	17.49
Expenditure on education	3.98	1.16	10.60	1.63
Primary completion rates	81.40	17.67	112.00	22.24
Aid for education, commitments	0.33	0.00	2.47	0.41
Aid for education, estimated disbursements	0.32	-0.01	2.78	0.48
Aid, total disbursements	4.94	-0.02	32.83	6.89
Age dependency ratio	0.75	0.42	1.13	0.18
Democracy, index	4.14	1.00	7.00	1.65
Democracy, Polity IV	4.85	0.00	10.00	3.65
Economic Freedom	5.67	2.90	7.50	0.97
Gap between male and female	0.57	-0.73	1.84	0.55
GDP p.c.	4751	494	16050	3461
Government expenditure	13.57	4.01	32.74	4.82
Infant mortality	54.48	7.50	191.00	39.00
Inflation	47.22	0.04	2096.27	230.27
Literacy rate	74.05	8.60	99.69	21.10
Oil exporters, dummy	0.10	0.00	1.00	0.30
Openness to trade	70.80	15.56	219.24	37.70
Political risk	60.01	28.38	81.85	10.78
Population	54700000	250820	1280000000	184000000
Population under 15	37.61	16.67	50.08	7.70
Urbanization	48.60	4.83	92.63	21.07
Years of primary schooling	3.56	0.45	7.53	1.36