Universal Primary Education: Does education aid really assist?

Evidence from dynamic panel data

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ABSTRACT

In the following thesis, the impact of aid on education is analyzed empirically using sector-specific disbursement disaggregated data to know to what extent aid contributes in fulfilling one of the Millenium Goals: Universal Primary Education. For analyzing the effectiveness of aid, two different quantitative measures have been used as dependent variable: Net Enrolment Rates and Completion Rates; looking at differential effects in terms of gender. A social-production function explaining these outcomes have been proposed, with aid as an additional supply factor. All countries are pooled together. System-GMM approach has been used, using a 2002-2012 time range. The analysis suggests that aid to primary education per child increases significantly net enrolment with a one year lag and that aid directed to basic education per child increases significantly completion rates. The dimension of the effect is modest.

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1. INTRODUCTION

During the 6th and 8th of September 2000, the Millennium Summit was held in New York City at the United Nations (UN) headquarters. Its purpose was to discuss what the role of the United Nations (UN) was supposed to be in the early 21st century. At this meeting, all 189 UN member states ratified the so-called United Nations Millennium Declaration, in which eight international development goals were established with the foresight to be fulfilled by 2015. These international development goals, denominated as Millennium Development Goals (MDGs), emphasized three different areas (human capital, infrastructure and human rights) to be enhanced, so that the standard of living of many poor country societies could be increased notably with the aid of all signatory members, apart from many international organizations. These were the goals to be followed:

1. To eradicate extreme poverty and hunger.
2. To achieve universal primary education.
3. To promote gender equality and empowering women.
4. To reduce child mortality rates.
5. To improve maternal health.
6. To combat HIV/AIDS, malaria and other diseases.
7. To ensure environmental sustainability.
8. To develop a global partnership for development.

Early in 1970s, UN members already noted that "each economically advanced country will progressively increase its **official development assistance (ODA)** to the developing countries and will exert its best efforts to reach a minimum net amount of 0.7 percent of its gross national product at market prices by the middle of the decade" (UN millennium Project).

The extent by which ODA programs have contributed in fulfilling MDGs varies notably on a country-by-country basis. While in Brazil, four out of the eight MDGs have been already attained and the remaining are very likely to be achieved, in Liberia none of them is even on the track for being successfully achieved. So, it can be said that the heterogeneity of the aid received and the conditions of recipients are crucial in determining the success of the contribution of ODA in the attainment of the MDGs.

The aim of this thesis is to discuss the effectiveness of aid by focusing on the second MDG –i.e. the provision of universal primary education- using updated disbursement data with an annual perspective. In fact, we believe that the analysis for this second MDG is specially interesting as basic education has been noted as a major determinant for long term growth (Dopperhalfer, Sala-i-Martin and Miller, 2003) and can enhance growth through several channels such as increasing productivity and diffusion of knowledge but also, by improving health outcomes, such as lowering fertility and mortality rates (Nelson and Phelps, 1966; Lucas 1988; Romer, 1990; Mankiw, Romer and Weil, 1992; Appiah and McMahon 2002; Asiedu and Nandwa, 2007); so that education can also contribute to the attainment of other MDGs indirectly.

The rest of this thesis is organized as follows: In section 2, a brief review of the existing literature is presented. Section 3 describes the source and nature of the data used to perform the econometric analysis. Throughout section 4, econometric models mostly used in the previous literature are discussed. Section 5 reports the results and, finally, section 6 draws some conclusions.

2. RELATED LITERATURE

In spite of the insufficiency of long series of reliable data for assessing the effectiveness and impact of aid (reliable disbursement data from Creditor Reporting System (CRS) database from OECD), a large number of papers do exist assessing the impact of ODA on growth since the mid 1980s. However, disaggregated analyses assessing the impact of aid in different sectors are much scarcer, also for the educational sector, both at macro and at micro levels.

Evidence from experimental data, such as in Duflo's (2001) and Banerjee et al's (2005) studies, show that aid-financed educational expansions program increase educational attainment and wages for graduates in a substantial manner. In contrast, much more recent macro-level conducted studies, usually find a positive effect of aid on educational outcomes but the magnitude of it is modest and the robustness of the models are questioned as the results tend to be very sensitive to the selection of instrument. Thus, the extent of the estimated effectiveness of aid differs in a substantial manner from studies carried out at the micro level –experimental studies- to those analyzed from a macro perspective.

Michaelowa and Weber (2007) analyze the impact of aid for education in primary net enrolment rates for low and low-middle income countries both in a long-term perspective (structural panel, using five year averages, 1975-2000) and in a short-term annual panel (1993-2000). They conclude that ODA directed to education sector had positive effects on primary enrolment rates, but the extent of the effectiveness of aid did increase substantially if conditions of good political and institutional governance conditions were met, just as claimed by Burnside and Dollar (2000). According to estimates by Michaelowa and Weber (2007) in order to have a 1.6 percent increase in net enrolment rate in primary education, aid allocated to education should increase by at least 200 per cent. The size of the effect of ODA appears to be very sensitive to the estimation method that is about to be used. Structural panel data results show that coefficients on education aid (available in commitments but not in disbursements) vary between -0.23 to 0.15, so the studies appear to be inconclusive.

Dreher et al's (2008) study also concludes that higher per-capita aid increases significantly primary school enrollment while that government spending on education does not. These results are obtained by applying the system Generalized Method of Moments (GMM) proposed by Arellano and Bond (1991) and Blundell and Bond (1998). The interaction of aid with level of democracy of recipient countries seems to be statistically insignificant in this study in contrast with results obtained in the previously mentioned paper.

Gyimah-Brempong and Asiedu (2008) use also Blundell and Bond's System-GMM to estimate the effect of education aid on primary completion and health aid on infant

mortality. They conclude that the effect of education aid (as a percentage of GDP) is positive, large and significant and so they do with education aid per capita; that has a strong positive effect on primary school completion rate, all things equal.

Many of the mentioned studies do not take into account the nature of heterogeneity of aid recipients in terms of the level of development, the source or flow type of the aid itself or the performance of donors (Roodman (2006) proposes an index for assessing donors' performance).

In this direction, Asiedu and Nandwa (2007) conclude that effectiveness of educational aid on growth depends on the level of development of the recipient country as well as the level of education at which aid is being targeted (in terms of primary, secondary or higher).

A later study of Michaelowa and Weber (2008) commissioned by the Education for All Global Monitoring Report, extents their previous analysis on primary, secondary and tertiary educational enrolments in order to assess differences in effectiveness of education aid at different levels of education and different aid purposes. They provide evidence that there is a positive effect of educational ODA at all levels (not significant in primary education) but the size of the estimated effects is rather low. Surprisingly, it is also pointed that national education expenditure does not show any greater impact on education outcomes, coherent with the conclusion also drawn by Dreher et al's (2008) in their research paper.

In relation with the analysis of differences in efficiency in terms of the source of aid, Christensen, Homer and Nielson (2012) –by applying a latent growth model- show that bilateral aid tend to tight aid in a greater manner to corruption and governance levels than multilateral aid does. This result may explain the reason why greater effectiveness of bilateral aid is found in enrollment model.

To date, research papers available focus mainly on the effect of aid allocated to education on enrolment rates (quantitative terms) but do not focus much on its effect on educational outcomes (qualitative terms). This may be due to an existing lack of sufficient data for educational results for developing countries but the focus to be adopted is important. In spite of the scarcity of data in this direction, studies do exist that try to assess the effect of ODA in education qualitative outcomes.

D'Aiglepierre and Wagner (2010) demonstrate a positive and robust impact of aid to primary educational achievements of recipients' country. They show that aid to primary education does significantly improve repetition rates, coverage in primary education and gender equity. As for dealing with the endogeneity of aid, autors suggest the usage of FTI (Fast Track Initiative) year of endorsement.

In a working paper, Michaelowa and Brichler (2013) use SACMEQ (a consortium of 15 education ministries in Southern and Eastern Africa that evaluates the conditions and quality of schooling) program data to analyze the existence of a quantity-quality trade-off. They conclude that aid combined with unequal shares is a sufficient condition for not reaching improvements on education quality and coverage.

3. DATA ISSUES

a) Data on international aid to education.

The Development Assistance Committee (DAC) secretariat is an organ belonging to the OECD, created in 1961, which is in charge of seeking the coordination among donors in their bilateral cooperation programs for development. This board is also in charge of reporting statistics on how aid is flowing and the quantities allocated to different sectors, information available at the so-called CRS database.

CRS (Creditor Reporting System), available at the OECD webpage provides information on aid by sector, donor, recipient country and flow type, with data available in some cases since 1995. Aid is distributed to social services and infrastructure: education, health, population and reproductive health, water supply and sanitation, government and civil society.

In this thesis, we focus on aid channeled to education, in spite of other type of aids directed to other social sectors could have an indirect positive effect in enrolment. For example, aid for health may raise the enrolment of pupils, no matter aid for education, as healthier children might have a higher likelihood to attend college (Michaelowa and Weber, 2007). The main purpose is to analyze to what extent education aid is effective in achieving second MDG (achieving universal primary education) and this is why other particular sectors' aid flows are not considered.

The data on education aid is itself broken into 4 different sub-sectors, which follow the following structure:

(Code 111) Education level Unspecified, Total

(Code 112) Basic education, Total

- *Primary Education.*
- Basic Life Skills for youth & adults.
- Early Childhood education.

(Code 113) Secondary, Total

(Code 114) Post-Secondary education, total

Although, CRS database is probably the most detailed source of data that can be found on development assistance, a number of limitations can be found when dealing with the econometric analysis. In fact, special attention should be given to which is the flow type used: commitments or disbursements. While a commitment is said to be a firm written obligation by a government or official agency, backed by the appropriation or availability of the necessary funds, to provide resources of a specified amount under specified financial terms and conditions and for specified purposes for the benefit of a recipient country or a multilateral agency (OECD definition), disbursement are the transactions of providing

financial resources, in which the two counterparties must record the transaction simultaneously and usually supposes the placing of funds at the recipients' disposal.

The coverage of aid commitment actually disbursed is one of the main problems, as commitments are not always translated into disbursements and, if so, there could be some delays in the actual payments that can bias the outcome of the econometric analysis. Secondly, we should also consider the fact that CRS database does not capture the totality of aid flows to developing countries, as non-DAC donors and multilateral agencies-such as the World Bank- are not included.

While aid commitments data are available since 1995, gross disbursements data can only be found after 2002. The usage of aid commitment should be held cautiously as the size of the effect that can be drawn after the econometric analysis can vary to great extent depending on the flow type used and obviously, data on commitments is supposed to be less reliable.

Another issue that should be taken into account is the difference between grants or loans. While grants are transfers made in cash, goods or services for which no repayment is required, loans do require repayment to be made (ODA loans have a grant element of at least 25 per cent). It shall occur that, as loans require some repayment, funds received could be channeled in a more efficient way.

b) Education and other structural indicators data

For the purpose of measuring the effect of educational ODA in on primary education, some relevant indicators have been drawn from the UNESCO database. In fact, these indicators are also available in the World Bank's World Development Indicator (WDI) database.

In order to estimate the effect of aid on education, we use a social production function; in which aid is included, as an additional explanatory variable. Despite the specification varies from study to study, the common feature is that some demand and supply-factors are included (Dreher et al, 2008; Roberts, 2003). As demand factors, we include per capita income (proxy for household family), adult literacy rate (proxy for family educational status), relative size of school population (% of population aged between 0 and 14 years old) and share of rural population with respect to total population. As supply factors, we consider public spending directed to education, pupil-to-teacher ratio and an indicator that captures the level of economic Governance and qualitative status of public institutions in the recipient country.

With the purpose for controlling the corruption level, we include the so-called Corruption Perception Index (CPI), compiled by Transparency International. This particular score captures how corrupt national public sector is seen to be by analysts, businesspeople and experts from a wide range of nationalities; with values that go from 0 –highly corrupted- to 10 –completely upright-.

Data limitations do exist in terms of qualitative measure of education status that can affect the realization of a detailed study of the effect of ODA in the quality of education. Looking at enrolments (or subsequently, enrolment rates) can give a misleading picture (as we are

just considering the size dimension but would not take into account the performance of the current and past students (it would not take into account the fact that as many children become primary school graduates without becoming literate) (Heyneman and Lee, 2013). So, in fact, there is a lack of an homogeneous measure for the assessment of education system's quality worldwide, as it can be found in the OECD –together with other 24 countries- with the PISA report.

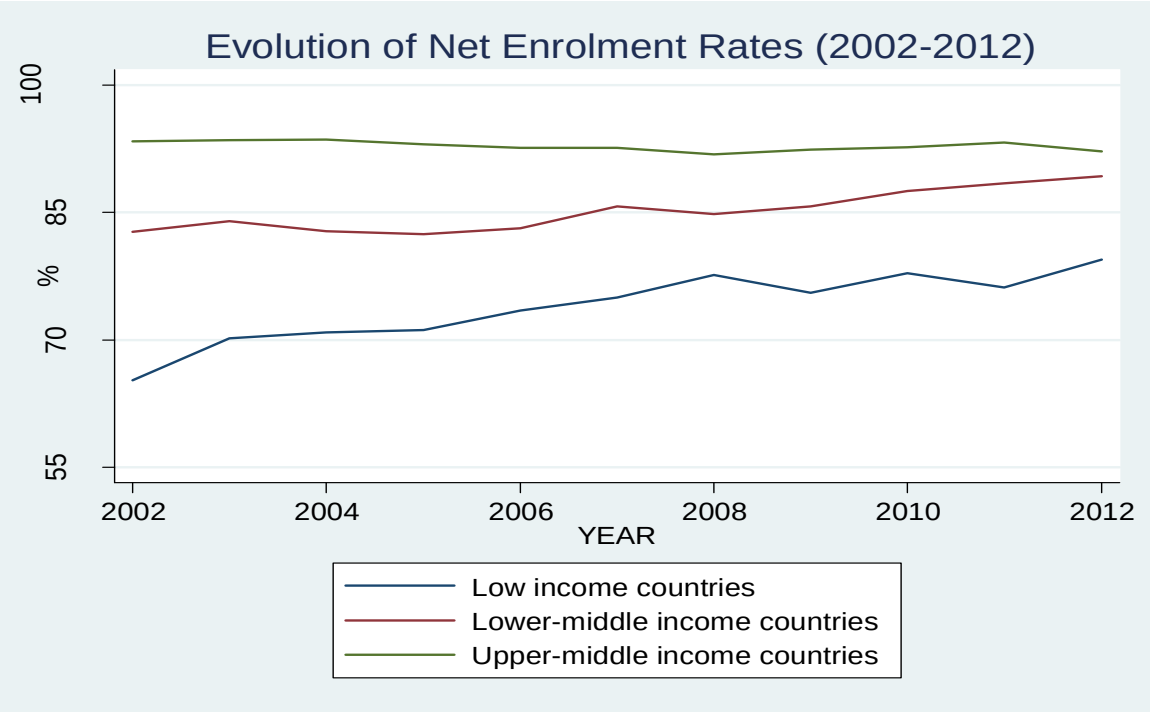
As enrolment can be a limited educational outcome, we can consider as alternative measures the completion rates (despite it is known that the level of requirements for completion can vary across national education system) and to deep in the analysis looking at these indicators separated by gender to know the extent to which aid can contribute in gender parity.

c) A brief overview of the data.

The database used for dealing with the econometric analysis is composed by 214 countries, covering a time-range from 1990 to 2012 (Anguilla, Netherland Antilles, Cook Islands, Falk Islands, Gibraltar, Montserrat, Niue, Naue, Tokelau and Wallis and Futuna are not present as the World Development Indicators were not covered for these concrete countries in the World Bank databank). The specific analysis encompasses the time range 2002-2012 as data on disbursement is only available since 2002 (and, as commented before, using data on commitments could lead us drawing misleading conclusions).

Let us present some graphs showing the trends of both Official Development Assistance to basic education (gross disbursements) received by recipient countries and the Net Enrolment Rate (NER) of those countries over time. Trends are displayed by accounting for different classification of countries in terms of income (World Bank classification)-in order to look at which countries belong to each WB classification, see Appendix 1-. High-income countries are excluded from this initial analysis as Universal Primary Education goal is almost achieved and they are donors rather than recipient countries.

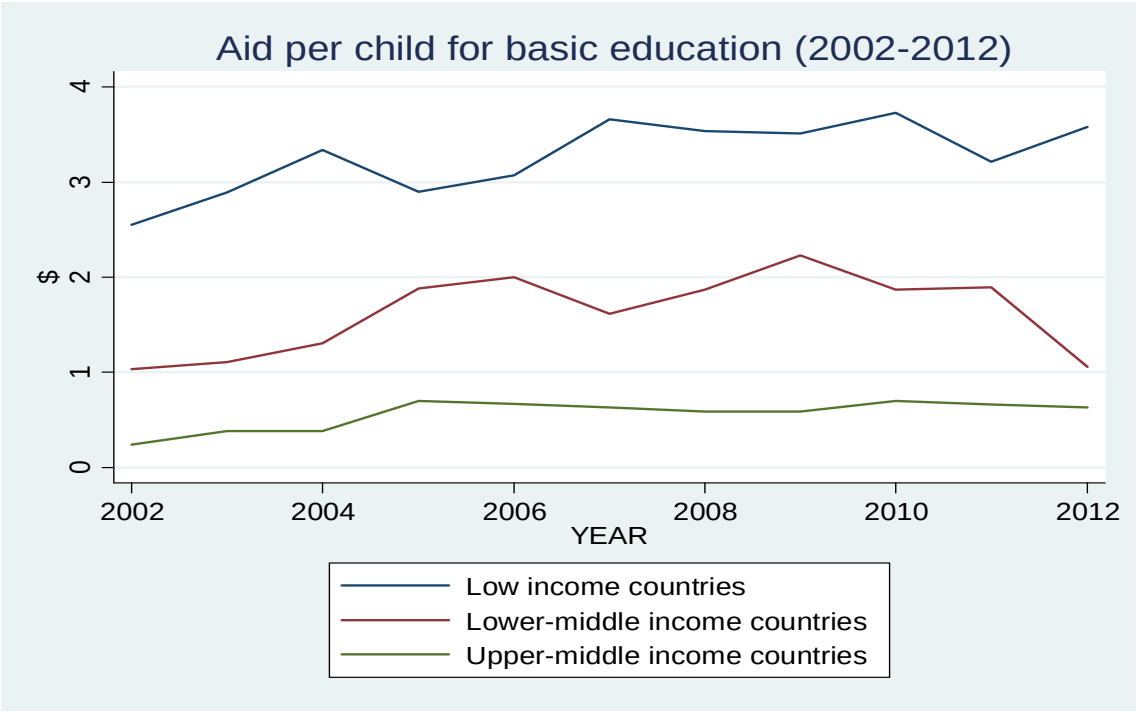
Figure 1: Evolution of Net Enrolment Rate (NER) in primary, by WB classification)



As we can see in Figure 1, Net Enrolments Rates in Primary for low income countries have had a positive and strong evolution over time during the last decade but the extent of the improvement was not large enough even to catch up levels of low-middle income countries in 2002. So, room for improvement exists but it seems that achievement of Universal Primary Education in these countries is going to be hardly achieved by 2015. Low-middle income countries have also obtained some improvement in their figures–even if the size of it is considerably smaller than the one observed in low income countries- and are about to catch up levels of enrolment rates similar to those noted in upper-middle income countries. Lastly, Enrolment Rates remained almost flat for upper-middle income countries over the last decade.

Regarding results observed in Figure 2, we note that, not surprisingly, aid directed to basic education is higher for those countries that have lower development status. In fact, this is coherent with the fact that countries with lower NER –as can be seen in Figure 1- would receive higher amounts of aid –in relative terms- as higher cooperation is needed because national resources are not enough, at their own, for improving education outcomes for basic education

Figure 2: Evolution of Aid per child directed to basic education, by WB classification.



Additional graphs are displayed in Appendix 2 showing the historical evolution between 2002 and 2012 of NER gender parity index -ratio of Net Enrolment Rates for female against males'-, Completion parity index –ratio of completion rate of females' against males'-, Total aid directed to education and cost per pupil.

Summary statistics for the variables that are going to be prospectively used in the later study is also displayed in Appendix 4.

4. METHODOLOGICAL AND ECONOMETRIC ISSUES

A central issue in the econometric analysis for assessing the effect of aid is the problem of endogeneity. It is clear that education aid can affect enrolment rates and/or completion, but the amount of aid received can be highly dependent on the current or expected levels of these education indicators. This bi-directional causation must be addressed properly because if not, the size of the biased estimated parameters would give us a misleading picture. The reason of this bi-directional causality might be that countries are receiving higher amounts of education aid if enrolment rates are low because there is a perceived image that these outcomes cannot be improved with domestic resources at their own.

Though, to properly estimate the size of the effect of aid it is necessary to find some instrumental variables–that in this case, should be correlated with aid but not with the educational outcomes used as dependent variable-. Many are the instruments that had been proposed in the literature: lagged aid as its own instrument (Michaelowa and Weber, 2007), aid to energy sector (Michaelowa and Weber, 2007), FTI endorsement year (D'Aiglenpierre

and Wagner, 2011) or the International Country Risk Guide, the Fraser Index of economic freedom and the mortality rate of children under 5 years (Thiele, Nunnemkamp and Dreher, 2007).

The usage of lagged aid as instrument implies a strong correlation with the initial variable –something that is extremely advantageous- but it can be difficult to argue that aid satisfies the requirement to be an appropriate instrument –i.e. to be uncorrelated with the error term-. In fact, if current aid is influenced by current education outcomes and if educational outcomes are autocorrelated, lagged aid is also indirectly related with current education outcomes and hence, to the error term (Michaelowa and Weber, 2007). This is why second and further order lags of aid have been used and the validity of instruments are tested by the application of Hansen J-test and the Arellano-Bond test for second order autocorrelation, that must be absent for the estimator to be consistent.

Another fact that should be taken into account is the existence of strong evidence of autocorrelation of educational outcomes (in term of enrolment rates and completion rates). Intuitively, it can be thought than there is some degree of persistence in these educational outcomes over time –it is hard to imagine that enrolment rates can change dramatically from one year to another-. In order to deal with autocorrelation –standard errors would be underestimated-, most studies (Michaelowa and Weber, 2007, 2008; Dreher et al, 2008; Asiedu and Gyimah-Brempong, 2008; Michaelowa and Birchler, 2013) use system Generalized Method of Moments (system-GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). System-GMM is increasingly becoming popular for estimation in panels with large number of individuals but limited number of periods in which the dynamic dependent variable depends on its own past-realizations, with independent variables that are not strictly exogenous.

An alternative proposal is the one given by Michaelowa and Birchler (2013) that assess the effect of education aid on the rate of growth of net enrolment rates, as new dependent variable, that is argued to be a way to deal with endogeneity and obtain less biased estimates without the use of instruments.

5. ESTIMATION AND BASE RESULTS

5.1. *Model*

Net Enrolment Rates and Completion rates in primary school are the dependent variable throughout this section, expressed in logs. The main explanatory variable of interest aid to education sector –different measures of aid are used i.e. aid directed to primary education, aid to basic education and total aid to education-. These included in the model contemporaneously and with some lags, as it is expected that aid positively affects NER/Completion rates in primary education with some delay. Contemporaneous and lagged government spending is also included as a remaining important supply factor. These variables are measured relative to the number of children in the particular country –i.e. population under 14-. While in previous existing literature these measures are expressed most often in a per capita basis, aid per child is thought to be a more appropriate measure to assess the relevant size of the prospective target population –that can differ notably

from one country to another depending on their demographic structure- that are going to be affected by aid rather than the size of population as a whole. Other covariates are included in the analysis for the consideration of an educational social production function: per capita GDP, urbanization rate, pupils-to-teachers ratio and the current account balance. Additional control variables have been used for performing the analysis –the ones mentioned in previous section- but the effect of them have turned out to be non-significant –including the Corruption Perception Index-. Lagged dependent variable has been included as an additional explanatory variable to account for persistency and adult literacy rate, often considered, was finally discarded as the number of observations was reduced significantly

Panel data regressions have been used for the estimation of the size of the effect of aid on NER, with 96 countries considered at most –out of the total 204 initially considered in the database-. The lack of the remaining countries is due to the nature of imbalance of the panel. No high-income neither upper-middle income countries have been dropped out of the database.

The equation to be used in the analysis has the following form:

$$lEDUC_{i,t}=\alpha+\rho*lEDUC_{i,t-1}+\beta_1*\text{aid per child}_{i,t}+\beta_2*\text{aid per child}_{i,t-1}+\beta_3*\text{aid per child}_{i,t-2}+BX+\eta_i+u_t+\varepsilon_{i,t}$$

where $lEDUC_{i,t}$ is the log of both Net Enrolment Rate and Completion rates of primary, $lEDUC_{i,t-1}$ is the lag of the dependent variable, aid per child is the per child foreign aid directed to education –can capture, as said, aid directed to primary education, basic education or education as a whole-, X includes both per child government spending and other control factos, η_i represents unobserved country effect, u_t is a time specific unobserved-effect and $\varepsilon_{i,t}$ represents the disturbance term.

5.2. *Results for Net Enrolment Rates.*

Despite neither aid nor government spending on education can be expected to be exogenous to school enrolment –it is supposed to countries with lower enrollment levels to receive higher amounts of aid-, the fixed-effects estimation is applied without consideration of treating endogeneity of those variables; that is presented in column one of table 1.

Estimates reveal a high level of inertia in the primary enrollment rate, as its own lag appears to be highly significant at 1% significance level. The fixed effect estimation lets both contemporaneous and lagged expenditure per child on education insignificant.

Population share under-14 and current account balance turn out to have an insignificant effect in Net Enrollment Rates but pupils-to-teacher ratio appears to be strongly significant –at 1% significance level-, which is highly plausible in a situation of under-supply, enrolments can only be increased by accepting more pupils in each class as noted in Michaelowa and Weber (2007).

TABLE 1: Primary Net Enrollment and Aid per child –to primary, basic education and total education-, 2002-2012

VARIABLES	(1) Log of NER -primary-	(2) Log of NER -primary-	(3) Log of NER -basic education-	(4) Log of NER -total education-
Lagged dependent	0.743***	0.902***	0.890***	0.864***
	(0.0294)	(0.0645)	(0.0671)	(0.0621)
Aid per child	-0.0007	-0.0010	-0.0012	-0.0002
	(0.0006)	(0.0009)	(0.0013)	(0.0002)
Lagged aid per child	0.0003	0.0011**	0.0010	0.0003
	(0.0003)	(0.0005)	(0.0006)	(0.0002)
2nd lagged aid per child	0.0004**	0.0007**	0.0007	9.04e-06
	(0.0002)	(0.0003)	(0.0004)	(0.0001)
Expenditure per child	0.0000	0.0002**	0.0003**	0.0002**
	(0.0000)	(0.0001)	(0.0001)	(0.0001)
Lagged expenditure per child	-0.0000	-0.0003**	-0.0003**	-0.0002**
	(0.0000)	(0.0001)	(0.0001)	(0.0001)
Pupil-teacher ratio, primary	0.0034***	0.0006*	0.0006*	0.0006
	(0.0009)	(0.0003)	(0.0003)	(0.0004)
Urbanization rate	0.0056***	-0.0000	-0.0000	-0.0001
	(0.0016)	(0.0001)	(0.0001)	(0.000128)
Population under-14	-0.0019	-0.0006	-0.0006	-0.0007
	(0.0023)	(0.0004)	(0.0005)	(0.0006)
GDP per capita	0.0020	0.0006	0.0004	0.0014
	(0.0016)	(0.0012)	(0.0013)	(0.0013)
Current account balance	-0.0001	0.0003***	0.0003***	0.0003***
	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Constant	0.764***	0.448	0.485	0.623**
	(0.161)	(0.302)	(0.311)	(0.293)
Observations	394	394	394	394
R-squared	0.763			
Number of Countries	96	96	96	96
Time FE	YES	YES	YES	YES
Method	Fixed Effects	System-GMM	System-GMM	System-GMM
Hansen J-test value		0.259	0.354	0.595
Number of instruments		43	43	43
Diff-in-Hansen test p-value		0.151	0.213	0.159
1st Order Autocorrelation test value		0.013	0.013	0.014
2nd Order Autocorrelation test value		0.322	0.381	0.292

Standard errors in parentheses :*** p<0.01, ** p<0.05, * p<0.1

It can be noted that surprisingly at first sight, GDP per capita does not have a significant positive effect in primary school enrollment. This conclusion is also drawn in many papers already presented in section 2 –such as Michaelowa and Weber (2007) , Dreher et al (2008) or Michaelowa and Birchler (2013)-. As noted in Dreher et al (2008), this fact is given because in panel studies short- and medium-term effects are captured, while in cross-sectional studies pure long-term effects are captured.

Regarding the per child aid directed to primary education, it can be noted that only aid, once lagged 2 periods, becomes significant in having a positive effect in net enrolment rates. This suggests that public authorities need, on average, 2 years to effectively implement aid and, considering the size of the coefficient, it can be said that the effectiveness of it is very modest –consider that, on average, aid per child is never greater than 4$; so that it should be noted that amounts of ODA directed to education should be greatly incremented for Universal Primary Education goal to be achieved-.

In a second step, the problem of potential endogeneity of both aid and public expenditure is about to be treated with the implementation –in columns 2-4- of System-GMM (Generalized Method of Moments) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). Results are obtained with the usage of the STATA estimator designed by Roodman (2005) –i.e. xtabond2- that is applied in a two-step manner including the Windmeijer's finite sample correction. Orthogonal deviations' transformation have been selected rather than first differences' due to the already mentioned nature of unbalance of the panel, as this option enables the maximization of the number of observations used in the regression. Education aid per child and public expenditure on education are treated as endogenous while the remaining covariates are considered strictly exogenous.

Overall, the validity of the results appears to be plausible. The null hypothesis of second order autocorrelation of the differenced residual is never accepted while it is accepted for the first order autocorrelation. Further order correlations would imply that the GMM estimator would be inconsistent but this seems not to be the case. Moreover, all three regressions pass the overidentifying restrictions, even for the GMM type instrument subset, based on the Hansen J-test and the difference-in-Hansen tests' p-values. For both expenditure and aid, first lag differences were excluded from the list of instruments but second and further lags were used, with the sub-option collapse to enable the limitation of the number of instruments.

The difference between columns 2-4 lies on the target of the aid being considered. While in column 2 only education directed to primary education is taken into account, in column 3 aid to basic education and aid to total education in column 4 are considered.

Under these different aid specifications, the qualitative and quantitative nature of covariates do not vary much from one another but it does considerably from the results obtained under fixed-effects specification. First, expenditure in education per child becomes significant, at 5% significance level, both contemporaneously and lagged one year. It should be pointed out that once lagged, the effect of public expenditure becomes negative, even though the effect is small and it vanishes over time.

Moreover, the level of inertia increases substantially –the coefficient on the lagged dependent variable, passes from 0.74 to 0.902-; urbanization rate becomes no longer significant and, surprisingly, current account balance as a percentage of GDP turns out to be strongly significant at 1% significance level. This variable could be, in fact, capturing the overall productivity of the economy that has a positive effect on Net Enrolment Rate; as the higher the productivity of the economy, the higher the efficiency use of their own productive resources, including those belonging to the education sector. Pupils-to-teacher ratio in primary reduces its significance level under System-GMM, which now is 10%. With the usage of total education aid per child, in column 4, aid becomes no longer significant.

Regarding the results of the effect of aid in enrollment rate in primary, it turns out that now both lagged aid and aid lagged twice become significant at 5% when aid is directed to primary education; but it does not when basic education and total education is targeted. The quantitative findings of the estimated effect of aid per child in primary on NER in primary, even if modest, it cannot be said to be negligible. With aid measured in *per child* terms, the GMM specification implies that a 1$ increase in aid –amount in which has been approximately increased during the last decade for low- and low-middle income countries (look at figure 6)-, increases primary school enrolment by approximately 0.108% in one year and 0.07% in two years.

The fixed effect estimation implies a slightly lower effect of aid than the one captured in System GMM. Under fixed effects specification, no significant effect is found once aid is lagged one year and its affects positively by 0.049% approximately in two years time.

5.2.1. *Results for NER by gender.*

Having analyzed the results for NER as a whole, it is interesting to analyze the extent by which effectiveness of aid can differ in improving enrollment rates between men and women. For doing so, the logarithm of net enrolment rates in primary for men and for women are used –data available in WDI databank- as dependent variable and the specification to be considered is the one presented in Table 1 and System-GMM is implemented –it is hardly imaginable that the variables introduced in the educational social production function can change dramatically but perphaps the effect can differ slightly from one another -. Aid per child directed to primary education is included as explanatory variable and aid directed to basic and total education is not used as in the previous section it turned out to be non-significant.

TABLE 2: Net Enrolment Rates (general, men's and women's) and aid directed to primary education, 2002-2012

VARIABLES	(1) Log of NER	(2) Log of NER of male	(3) Log of NER of female
Lagged dependent	0.902***	0.870***	0.920***
	(0.0645)	(0.0984)	(0.0376)
Aid per child, primary	-0.0011	-0.0010	-0.0013
	(0.0009)	(0.0011)	(0.0009)
Lagged aid per child	0.0011**	0.0010**	0.0010**
	(0.0005)	(0.0005)	(0.0004)
2nd lagged aid per child	0.0007**	0.0006*	0.0008***
	(0.0003)	(0.0003)	(0.0003)
Expenditure per child	0.0003**	0.0002	0.0002*
	(0.0001)	(0.0001)	(0.0001)
Lagged expenditure per child	-0.0003**	-0.0002*	-0.0002**
	(0.0001)	(0.0001)	(0.0001)
Pupil-teacher ratio, primary	0.0006*	0.0007	0.0009**
	(0.0003)	(0.0005)	(0.0003)
Urbanization rate	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)
Population under-14	-0.0006	-0.0009	-0.0005
	(0.0004)	(0.0007)	(0.0004)
GDP per capita	0.0006	0.0004	-0.0002
	(0.0012)	(0.0015)	(0.0015)
Current account balance	0.0003***	0.0003**	0.0003***
	(0.0000)	(0.0001)	(0.0001)
Constant	0.448	0.599	0.363**
	(0.302)	(0.460)	(0.181)
Observations	394	351	351
Number of Countries	96	83	83
Time FE	YES	YES	YES
Method	System-GMM	System-GMM	System-GMM
Hansen J-test value	0.259	0.568	0.323
Number of instruments	43	43	43
Diff-in-Hansen test p-value	0.151	0.929	0.786
1st Order Autocorrelation test value	0.013	0.039	0.022
2nd Order Autocorrelation test value	0.322	0.150	0.786

Standard errors in parentheses :*** p<0.01, ** p<0.05, * p<0.1

The validity of the results presented in Table 2 seems to be highly plausible as all specifications pass overidentifying restriction –assessed by the Hansen J-test- with p-values higher than 0.25 -reference value proposed by Roodman (2005) for the results to be considered reliable-. Apart from the Hansen J-test, all three specifications appear to accept the null hypothesis of the Arellano-Bond absence of Second Order Autocorrelation for first-differences but reject the one for First-Order Autocorrelation. This is the reason why first-differences were excluded as instruments but second and further ones were included in the instrument subset.

Regarding the analysis of whether aid has a more pronounced effect in net enrollment rates for women rather than for men, we can look at the difference in the coefficients on aid between column 2 and column 1 –as the set of countries and instruments used in both specifications are just the same-. It can be noted that the effect of lagged aid is slightly stronger for improving men's enrollment rates –not observable in reporting table- but aid lagged two years becomes more significant for women than for men. Anyway, this differential effect of aid in enrolment rates between men and women can be said to be marginal.

Surprisingly, in column 2, it turned out that contemporaneous public expenditure in education is no longer significant in improving enrolment rates for men but the opposite happens when analyzing women's case. The effect of pupils-to-teacher ratio and current account balance is almost identical among them but the inertia of lagged enrolment rates is substantially higher for women than for men.

5.3. *Results for completion rates.*

As previously done when analyzing the results for Net Enrolment Rates, the same procedure has been used for completion rates –that appears to offer a better view of the qualitative status of the educational system-. Initially, fixed-effects estimator has been implemented without controlling for persistence and aid- and public-expenditure endogeneity issues -results are presented in Table 3-column1-.

This initial first approximation reveals highly significant level of inertia –significance level of 1%- but the level of it turns out to be much weaker than the one presented in Net Enrolment Rates –coefficient of the lagged dependent variable under fixed-effect estimation turns out from 0.743 in NER to 0.225 in completion rates-. Aid lagged two years appears to have also a positive and significant effect –at 5% significance level-, while public expenditure in education per child has no longer an effect either contemporaneously nor lagged one year, just as when studying the results obtained when analyzing Net Enrolment Rates. Pupil-to-teachers ratio is again significant –under fixed effect, at 1%- but in contrast, the effect is negative. This is coherent with the idea that the higher the number of pupils under one teacher's control, the lower the performance –in this case in terms of completion- of the students as lower consideration or attention can be channeled to each of the students. Neither GDP per capita nor urbanization-rate have significant effect in the level of completion rates but lagged Net Enrolment Rates does so, positively and in fact in a highly significant way -1% significance level-.

TABLE 3: Primary Completion Rates and Aid per child –to primary, basic education and total education-, 2002-2012

VARIABLES	(1) Completion rate	(2) Completion rate -primary-	(3) Completion rate -basic educ-	(4) Completion rate -total educ-
Lagged dependent	0.225***	0.616***	0.482**	0.429***
	(0.0434)	(0.108)	(0.187)	(0.148)
Aid per child, primary	-0.0006	-0.0021	-0.0007	0.0003
	(0.0011)	(0.0012)	(0.0010)	(0.0005)
Lagged aid per child	0.0009	0.0007	0.0010*	-0.0007
	(0.0006)	(0.0008)	(0.0005)	(0.0008)
2nd lagged aid per child	0.0012**	0.0004	-0.0009	-0.0011
	(0.0005)	(0.0005)	(0.0007)	(0.0008)
Expenditure per child	0.0000	0.0007**	0.0005*	0.0004
	(0.0001)	(0.0003)	(0.0003)	(0.0004)
Lagged expenditure per child	-0.0001	-0.0010***	-0.0006**	-0.0006
	(0.0001)	(0.0004)	(0.0002)	(0.0005)
GDP per capita	-0.0012	0.0075	0.0011	0.0049
	(0.0036)	(0.0049)	(0.0036)	(0.0046)
Pupil-teacher ratio, primary	-0.0040***	-0.0022*	-0.0032	-0.0044**
	(0.0014)	(0.0011)	(0.0020)	(0.0018)
Urbanization rate	0.0046	-0.0002	0.0001	0.0003
	(0.0029)	(0.0005)	(0.0004)	(0.0005)
Lagged primary NER	0.0088***	0.0046***	0.0064**	0.0069***
	(0.0009)	(0.0016)	(0.0025)	(0.0020)
Constant	2.307***	1.392***	1.829***	2.069***
	(0.232)	(0.387)	(0.668)	(0.553)
Observations	391	391	391	391
R-squared	0.622			
Number of Countries	97	97	97	97
Method	Fixed-Effects	System-GMM	System-GMM	System-GMM
TIME FE	YES	YES	YES	YES
Hansen J-test value		0.375	0.552	0.840
Number of instruments		43	41	38
Diff-in-Hansen test p-value		0.094	0.864	0.087
1st Order Autocorrelation test value		0.000	0.005	0.0054
2nd Order Autocorrelation test value		0.401	0.346	0.259

Note: Dependent variable is the log of primary completion rate.

Now, endogeneity and persistence is treated again with the implementation of the two-step orthogonal-differenced System-GMM with Windmeijer's sample-bias correction. The validity of the results appears to be corroborated by the Hansen J-tests –all 3 specifications pass it by far at conventional significance levels- and the second order autocorrelation test's null hypothesis is never rejected, while it happens for first order autocorrelations. Again, expenditure and aid have been considered as endogenous and the remaining covariates are treated as strictly exogenous. Second- and further-order differences of aid and spending have been used as instruments for obtaining robust and unbiased estimators. It must be noted that, even though overall Hansen J-test is never rejected, these estimates should be held cautiously as the difference-in-Hansen test that corroborates the validity of identifying restriction is rejected at 10% significance level. As previously done with the analysis of enrolment rates, different measures of aid are going to be used: aid just directed to primary education in the second, aid directed to basic education in the third and aid to total education in the fourth column.

Once System-GMM is implemented, the qualitative status of the significance of some covariates varies notably. First, it must be noted that the level of inertia increases again substantially –from 0.225 to, at least, 0.429 depending on the measure of aid is used as explanatory variable-; expenditure on education per child becomes significant –under specification in columns 2 and 3 but not in 4- both contemporaneously and once lagged one year. It must be said that, under all specifications, while the contemporaneous effect is positive, the lagged one is always negative and the level of significance is always higher in the case of the lagged expenditure in relation with the contemporaneous one. Second order lag was introduced but it turned out to be non-significant, so it was finally excluded from the equation.

Regarding the results of the remaining covariates; GDP per capita and urbanization rate is never significant; just as the CPI score or Population under-14 (not reported). The coefficient of the lagged Net Enrolment Rate is always positive and strongly significant at 1% under all specifications; and pupils-to-teachers ratio is significant at 5% in column 2 and 10% in column 4 but becomes non-significant in column 3 when aid targeting basic education is introduced rather than primary or total education.

In relation to aid, it must be said that no significant effect have been found when considering aid just targeting primary or education as a whole but, when assessing the effectiveness of aid directed to basic education in completion rates, it is found that aid received two years ago has a positive but modest effect, significant at 10% level. Again, even if the size of the effect is low, it cannot be said to be negligible.

5.3.1. *Results for completion rates by gender.*

Throughout this section, whether aid can contribute in different size to completion rates for men and for women is going to be addressed. For doing so, the same procedure used with enrolment rates is followed. In this particular case, as aid per child to primary education turned out to have a non-significant effect in completion rates but basic education did so, this is the one that have been used as main explanatory variable.

TABLE 4: Completion rates (overall, men's and women's) and aid to basic education per child, 2002-2012

VARIABLES	(1) Log of completion rate	(2) Log of completion rate, male	(3) Log of completion rate, female
Lagged dependent	0.482**	0.618***	0.585***
	(0.187)	(0.133)	(0.135)
Aid per child, basic education	-0.0007	-0.0011	-0.0013
	(0.00104)	(0.0015)	(0.0025)
Lagged aid per child	0.0010*	0.0005	0.0016***
	(0.0005)	(0.0007)	(0.0006)
2nd lagged aid per child	-0.0009	-0.0005	-0.0003
	(0.0007)	(0.0009)	(0.0022)
Expenditure per child	0.0005*	0.0007	0.0007
	(0.0003)	(0.0004)	(0.0005)
Lagged expenditure per child	-0.0006**	-0.0006**	-0.0007
	(0.0002)	(0.0003)	(0.0004)
GDP per capita	0.0011	-0.0030	-0.0027
	(0.0036)	(0.0048)	(0.0055)
Pupil-teacher ratio, primary	-0.0032	-0.0016	-0.0028*
	(0.0020)	(0.0012)	(0.0016)
Urbanization rate	0.00017	0.0003	0.0002
	(0.0004)	(0.0003)	(0.0004)
Lagged NER	0.0065**		
	(0.00249)		
Population under-14	0.0001	0.0000	0.0007
	(0.0008)	(0.0007)	(0.0008)
Lagged NER, male		0.0041***	
		(0.0013)	
Lagged NER, female			0.0060***
			(0.0020)
Constant	1.829***	1.382**	1.382***
	(0.668)	(0.528)	(0.478)
Observations	391	350	350
Number of Countries	97	88	88
TIME FE	YES	YES	YES
Hansen J-test value	0.552	0.649	0.246
Number of instruments	41	32	32
Diff-in-Hansen test p-value	0.864	0.323	0.281
1st Order Autocorrelation test value	0.005	0.003	0.007
2nd Order Autocorrelation test value	0.346	0.829	0.250

The specification used is just the same that it was presented in Table 3 and again, two-step orthogonal differenced System-GMM with Windmeijer's finite sample-bias corrector is implemented. The validity of the results seem plausible, as all specifications pass the overidentifying restriction at conventional levels and only one –the one explaining women's completion rates- does not accept null hypothesis at 25% significance level –but it is very close to it, looking at the Hansen J-test. Furthermore, GMM-style instrument subset also pass the overidentifying restriction and in none of the specification presented above Arellano-Bond test for absence of first-order differenced residuals autocorrelation's null hypothesis is never accepted and is never rejected when applying second-order autocorrelation test for difference residuals. So, it seems that the estimates are valid.

Regarding the results obtained, the level of inertia of completion rates for boys is greater than the one visible in girls' case, just the opposite of what happened with enrollment rates. Surprisingly, when looking at the specification for gender separately, contemporaneous public expenditure to education per child becomes no longer significant, while lagged expenditure continues to be significant and having a negative effect in completion rates. Lagged net enrollment rates are always highly significant -5% when overall completion rates are assessed and 1% when applying gender distinction-. Urbanization rate, GDP per capita and population share under-14 are never significant while pupils-to-teachers ratio is only significant when trying to explain the completion rates for women. This variable seems to have a negative and significant effect at 10% significance level.

Regarding aid, it must be noted that while aid to basic education per child has no significant impact on completion rates for men (neither contemporaneously nor in lagged terms); it does have a significant and positive effect in completion rates for girls once aid is lagged one year. Moreover, it is significant at 1% significance level. So, we can conclude that official development assistance directed to basic education per child has a positive effect in improving gender parity for completion rates.

6. CONCLUSIONS

The effectiveness of sector-specific aid on education has been assessed empirically using a social-production function -just as did Dreher et al (2008)- for at most 96 countries, covering a time range that goes from 2002 to 2012 –as data prior to 2002 suffered from severe underreporting in accordance with OECD-. The extent by which one of the Millenium Development Goals can be assisted by aid is measured by two outcome variables: particularly, net enrollment rates for primary education and completion rates. The results suggest that aid to primary education per child significantly increases primary school enrollment in one- and two-years time and that aid to basic education per child increases substantially girls' completion rates in one year time, while it does not have any significant effect in boys' completion rates. Positive differential effects were also found when talking about the effectiveness of aid in female enrollment rates against boys', but the gap is marginal and cannot even be observable in the reporting table.

These findings are coherent with work previously mentioned in section 2. That is, education-specific aid per child contributes to achieving Universal Primary Education goal

in a significant and non-negligible way but its size is modest. If donors have real commitment in assisting developing countries for achieving the so-desired second Millennium Goal, aid must be dramatically increased and it can also be asserted that no possibility exists in achieving this goal by 2015.

Some caveats should be pointed out. In fact, all countries have been pooled together throughout this thesis. Further research should be done accounting for observed heterogeneity so that helpful advice of the way funds are granted can be offered to donors in order to effectiveness of this particular type of aid can be enhanced. Source of heterogeneity that could be considered can be whether aid comes from multilateral/bilateral source; the level of development of recipient country or whether aid are channeled mainly in form of grants or loans.

Finally, it would be extremely desirable to assess the effect of aid in enhancing the quality of education but no homogeneous global criteria –such as the one presented in OECD and additional 24 countries have with PISA report- nor sufficiently large data is available in this sense. Future research may be able to address this issue or obtain more precise estimations once longer-time series is available.

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APPENDIX 1

Low-income countries ($1,035 or less GNI per capita)

Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Congo Dem. Rep., Eritrea, Ethiopia, Gambia, Guinea-Bissau, Haiti, Kenya, Korea Dem. Rep., Kyrgyz Republic, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Tajikistan, Tanzania, Togo, Uganda, Zimbabwe.

Low-middle income countries ($1,036 to $4,085 GNI per capita)

Armenia, Bhutan, Bolivia, Cameroon, Cabo Verde, Congo Rep., Côte d'Ivoire, Djibouti, Egypt Arab. Rep., El Salvador, Georgia, Ghana, Guatemala, Guyana, Honduras, Indonesia, India, Kiribati, Kosovo, Lao PDR, Lesotho, Mauritania, Micronesia Fed. Sts., Moldova, Mongolia, Morocco, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Paraguay, Phillipines, Samoa, Sao Tomé and Principe, Senegal, Solomon Islands, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Timor-Leste, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Yemen Rep., Zambia.

Upper-middle income countries ($4,086 to $12,615 GNI per capita)

Angola, Albania, Algeria, American Samoa, Argentina, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Fiji, Gabon, Grenade, Hungary, Iran Islamic Republic, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Lybia, Macedonia FYR, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Montenegro, Namibia, Palau, Panama, Peru, Romania, Serbia, Seychelles, South Africa, St. Lucia, St. Vincent and Grenadines, Suriname, Thailand, Tonga, Tunisia, Turkey, Turkmenistan, Tuvalu, Venezuela.

High-income countries ($12,616 or more GNI per capita)

Andorra, Antigua y Barbuda, Aruba, Australia, Austria, The Bahamas, Bahrain, Barbados, Belgium, Bermuda, Brunei Darussalam, Canada, Cayman Islands, Channel Islands, Chile, Croatia, Curacao, Cyprus, Czech Republic, Denmark, Estonia, Equatorial Guinea, Faeroe Islands, France, French Polynesia, Germany, Greece, Greenland, Guam, Hong-Kong SAR, Iceland, Ireland, Isle of Man, Israel, Italy, Japan, Korea Rep., Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Macao SAR, Malta, Monaco, Netherlands, New Caledonia, New Zealand, Northern Mariana Islands, Norway, Oman, Poland, Portugal, Puerto Rico, Qatar, Russian Federation, San Marino, Saudi Arabia, Singapore, Sint Maarten, Slovak Republic, Slovenia, Spain, St. Kitts and Nevis, St. Martin, Sweden, Switzerland, Trinidad and Tobago, Turks and Caicos Islands, United Arab Emirates, United Kingdom, United States, Uruguay, Virgin Islands.

APPENDIX 2

Figure 2: Evolution of NER parity index, 2002-2012, by WB classification

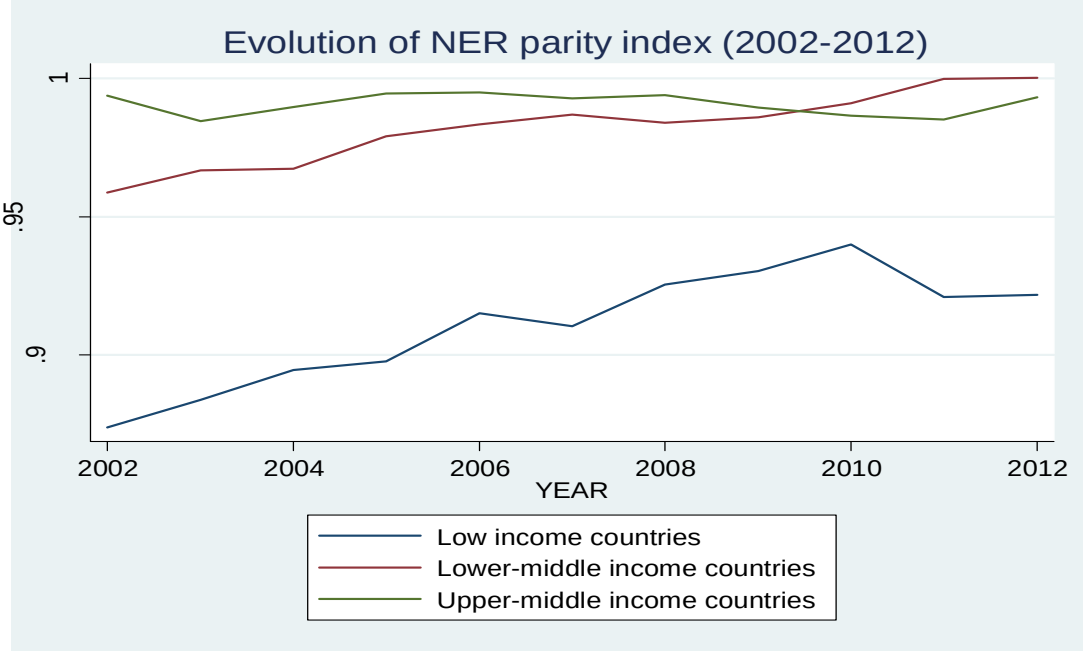


Figure 3: Completion gender parity index, 2002-2012, by WD classification

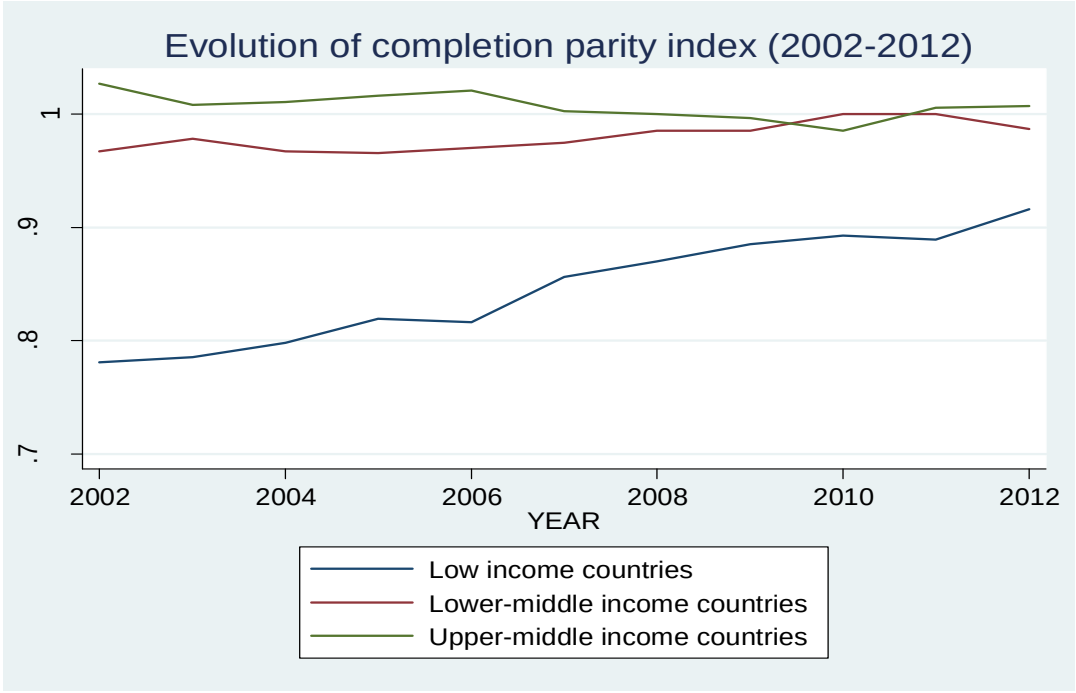


Figure 4: Total aid directed to education, 2002-2012, by WB country classification

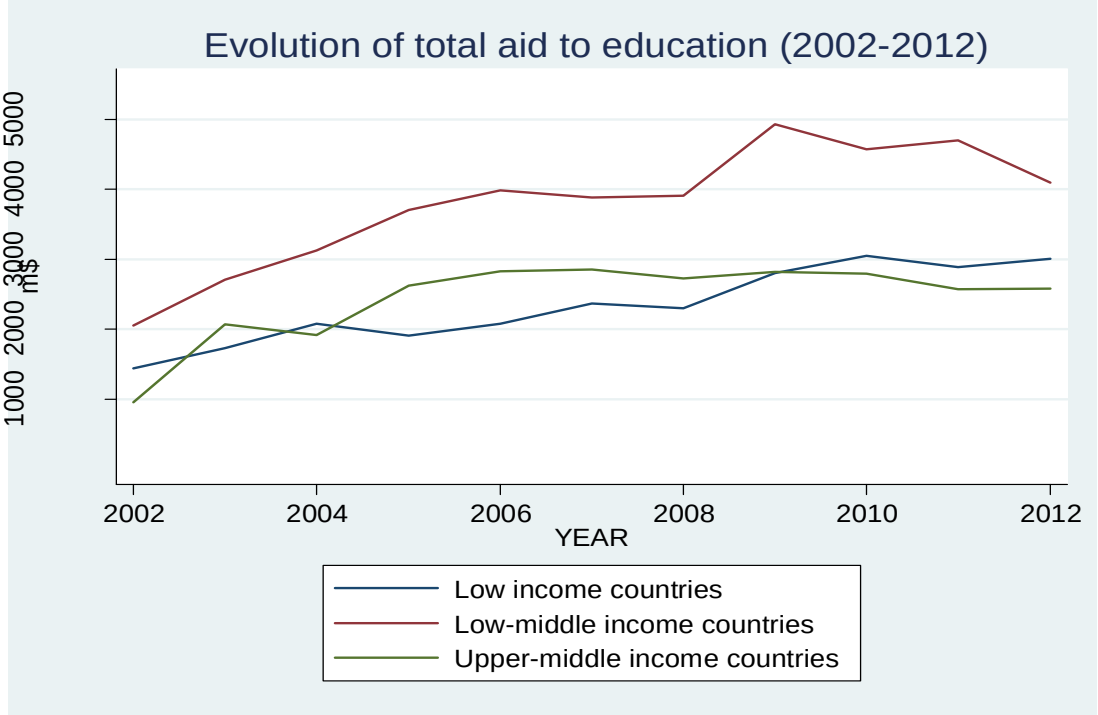


Figure 5: Loans-to-grants ratio for basic education, 2002-2012, by WB country classification

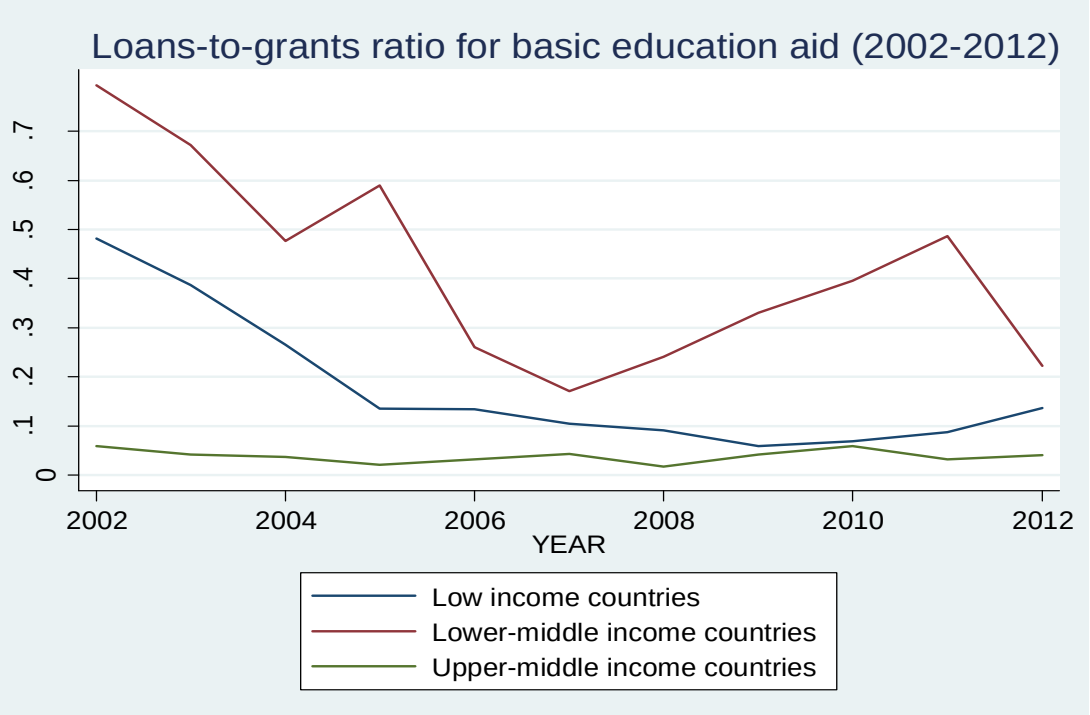
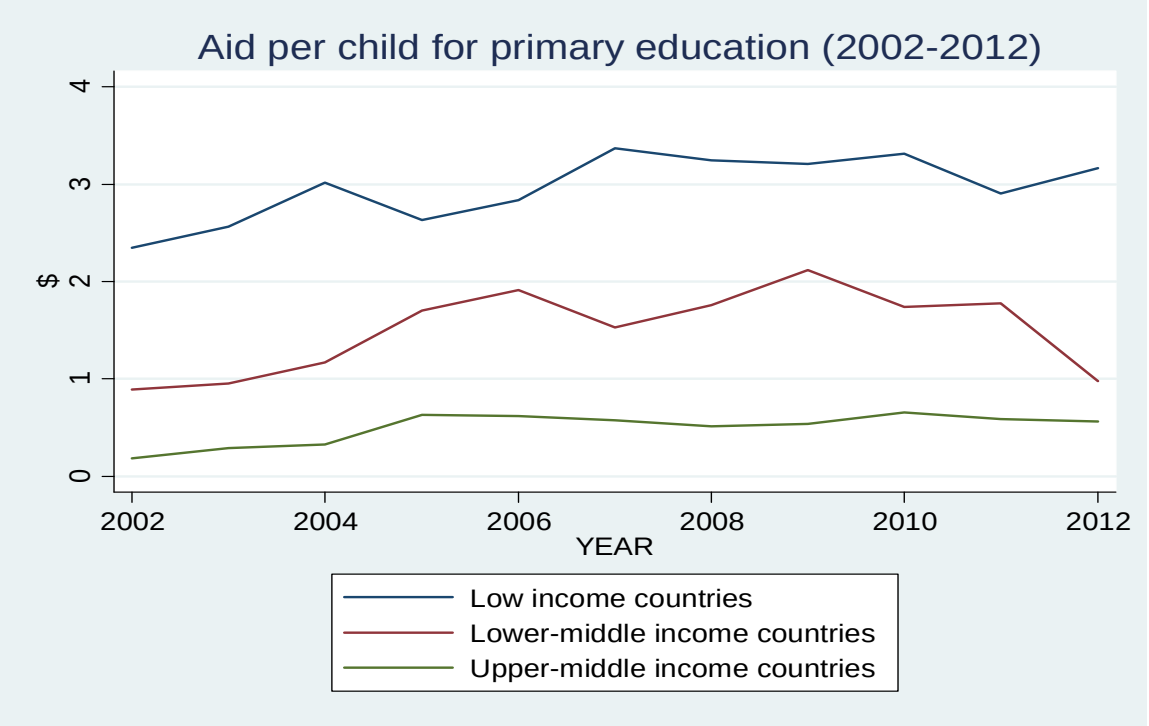


Figure 6: Aid per child directed to primary education, 2002-2012, by WB country classification



APPENDIX 3: Summary of number of observations and coverage (valid observation –not missing values-/total number of countries by classification) of NER by YEAR and WB classification used for calculating graphs' averages

NER in Primary (%)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Low income Countries (N=36)											
Observations	19	20	18	18	19	16	18	17	17	17	14
Coverage	52.78%	55.56%	50.00%	50.00%	52.78%	44.44%	50.00%	47.22%	47.22%	47.22%	38.89%
Low-middle income countries (N=48)											
Observations	30	29	30	35	33	34	34	36	33	31	25
Coverage	62.50%	60.42%	62.50%	72.92%	68.75%	70.83%	70.83%	75.00%	68.75%	64.58%	52.08%
Upper-middle income countries (N=55)											
Observations	35	35	37	37	35	38	35	36	29	32	24
Coverage	63.64%	63.64%	67.27%	67.27%	63.64%	69.09%	63.64%	65.45%	52.73%	58.18%	43.64%

APPENDIX 4: SUMMARY STATISTICS

Variable	Mean	Std. Dev.	Min	Max
Education Outcomes				
Net Enrolment Rate	88.653	12.722	29.343	99.999
Net Enrolment Rate (male)	88.236	12.312	31.781	99.980
Net Enrolment Rate (female)	86.747	14.423	25.689	99.981
Completion Rate	87.914	20.373	21.267	193.263
Completion Rate (male)	88.549	19.231	24.995	190.728
Completion Rate (female)	86.860	22.486	16.578	195.940
Source: World Development Indicators				
Aid *(per child, 2012 US$)*				
Aid per child, primary	4.753	29.479	-0.177	1141.872
Aid per child, basic education	5.208	29.750	0	1141.872
Aid per child, total education	22.592	64.187	0	1149.887
Source: Creditor Reporting System –OECD-, WDI				
Controls				
Public expenditure in education per child	312.215	496.212	0.836	2488.672
Pupil-to-teachers ratio, primary	26.028	14.669	6.133	100.237
Urbanization rate	56.509	24.325	8.698	100
Population rate under-14	29.967	10.709	11.772	49.992
GDP per capita (thousand 2005 US$)	11.449	18.193	0.119	158.802
CPI score *(from 0 –most corrupt- to 10 –less corrupt)*	4.109	2.132	0.8	9.7
Inflation rate (30nual)	6.820	9.100	-32.814	142.478
Openness *(export+import as a % of GDP)*	92.713	52.000	0.309	562.060
Current account balance *(as a % of GDP)*	-2.250	19.593	-65.113	291.402
Literacy rate, adult total (%)	81.498	19.433	21.823	99.998
Source: WDI, Transparency International				

APPENDIX 5: Definitions and Sources

Variable	Description	Source
Net Enrollment Rates	*Ratio of number of children of official school age enrolled in school to number of children of official school age*	World Bank
Primary Completion Rate	*Total number of new entrants in the last grade of primary education, regardless of age, expressed as percentage of the total population of the theoretical entrance age to the last grade of primary*	World Bank
Aid for primary per child	*Aid disbursement by all donors according to CRS purpose Code 1121 divided by the number of people between 0 and 14 years old*	OECD, WB
Aid for basic education per child	*Aid disbursement by all donors according to CRS purpose Code 112 divided by the number of people between 0 and 14 years old. Includes aid to primary, basic life skills and early childhood education*	OECD, WB
Aid for total education per child	*Aid disbursement by all donors according to CRS purpose Code 110 divided by the number of people between 0 and 14 years old*	OECD, WB
Expenditure on education	*Public spending on public education plus subsidies to private education at primary, secondart and tertiary levels. Measured in US$ (constant 2005) per individual between 0 and 14 years old.*	World Bank
GDP per capita	*Total GDP divided by total population (expressed in 2005 constant US$)*	World Bank
Population under-14	*Percentage of total population under 14 years old*	World Bank
Urbanization	*Share of total population living in areas defined as urban in each country*	World Bank
Pupils-to-teachers ratio	*Number of pupils enrolled in primary divided by number of primary school teachers.*	World Bank
CPI score	*Composite index assesing the percepted level of corruption in a country. Constructed by asking businessman, investors and experts. From 0 -most corrupt- to 10 -less corrupt-.*	Transparency International
Inflation	*GDP deflator (annual)*	World Bank
Infant mortality	*Probability that newborn baby will die before reaching 5 years old.*	World Bank
Adult literacy rate	*Percentage of people 15 and older who can, with understanding, write and read a short simple statement on their everyday life*	World Bank
Openness	*Exports plus imports as a % of GDP.*	World Bank
Current account balance	*Difference between the country's exports of goods and services and its imports of goods and services, ignoring all financial transfers, investments and other components; as a % of GDP*	World Bank

APPENDIX 6: Sensitivity Analysis for Net Enrolment Rates

VARIABLES	(1) lNER	(2) lNER	(3) lNER	(4) lNER	(5) lNER	(6) lNER	(7) lNER	(8) lNER	(9) lNER
Lagged dependent	0.874***	0.946***	0.859***	0.848***	0.945***	0.919***	0.906***	0.902***	0.927***
	(0.0618)	(0.0688)	(0.0374)	(0.0432)	(0.0701)	(0.0682)	(0.0705)	(0.0645)	(0.0777)
Aid per child, primary		0.000229	-0.00120	0.000949	-0.00213*	-0.00141	-0.00162	-0.00109	-0.00134
		(0.000253)	(0.00188)	(0.00504)	(0.00123)	(0.00107)	(0.00101)	(0.000885)	(0.000865)
Lagged aid per child, primary		-0.000215	0.000773	-0.000682	0.00153*	0.00146**	0.00153**	0.00108**	0.00111**
		(0.000135)	(0.00109)	(0.00338)	(0.000843)	(0.000714)	(0.000708)	(0.000505)	(0.000487)
2nd lagged aid per child, primary		0.000127	0.000614	0.000148	0.000751*	0.000691**	0.000702**	0.000693**	0.000695**
		(0.000128)	(0.000419)	(0.000531)	(0.000411)	(0.000278)	(0.000303)	(0.000301)	(0.000295)
3rd lagged aid per child, primary		6.76e-05	0.000420	-0.000201	0.000659	0.000430	0.000461		
		(8.43e-05)	(0.000400)	(0.00116)	(0.000627)	(0.000283)	(0.000285)		
Expenditure per child			1.10e-05*	0.000405*	0.000223**	0.000266**	0.000159	0.000259**	0.000145
			(5.85e-06)	(0.000213)	(0.000103)	(0.000117)	(0.000174)	(0.000110)	(0.000127)
Lagged expenditure per child				-0.000398*	-0.000228**	-0.000273**	-0.000216	-0.000274**	-0.000177
				(0.000211)	(0.000103)	(0.000121)	(0.000142)	(0.000115)	(0.000127)
Pupil-teacher ratio, primary					0.000651**	0.000739**	0.000702*	0.000641*	0.000751**
					(0.000325)	(0.000323)	(0.000354)	(0.000327)	(0.000343)
Urbanization rate					-7.64e-05	-7.45e-05	-9.50e-05	-7.08e-05	8.31e-06
					(0.000106)	(0.000102)	(0.000132)	(0.000105)	(0.000127)
Population under-14					-0.000298	-0.000591	-0.000691	-0.000555	-0.000775**
					(0.000407)	(0.000428)	(0.000512)	(0.000430)	(0.000343)
GDP per capita					0.000285	0.000306	0.000352	0.000561	0.00113
					(0.00107)	(0.00128)	(0.00305)	(0.00119)	(0.00107)
Corruption Perception Index					-0.000284				
					(0.00236)				
Inflation, annual					0.000102				
					(0.000231)				
Openness					4.40e-07				
					(2.51e-05)				
Current account balance (% of GDP)					0.000284***	0.000289***	0.000268***	0.000274***	0.000311***
					(5.31e-05)	(5.99e-05)	(7.77e-05)	(6.74e-05)	(5.47e-05)
Lagged GDP per capita							-0.00515		
							(0.00837)		
2nd lagged GDP per capita							0.0170		
							(0.0138)		
3rd lagged GDP per capita							-0.0104		
							(0.00757)		
Infant mortality rate									0.000174
									(0.000488)
Constant	0.569**	0.245	0.636***	0.679***	0.245	0.367	0.431	0.448	0.314
	(0.277)	(0.309)	(0.167)	(0.192)	(0.326)	(0.319)	(0.331)	(0.302)	(0.359)
Observations	1,097	858	539	473	381	394	394	394	379
Number of Countries	167	154	123	110	93	96	96	96	93
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hansen J-test value	0.322	0.853	0.485	0.596	0.309	0.275	0.275	0.259	0.422
Number of instruments	20	22	23	23	46	46	43	43	43
Diff-in-Hansen test p-value	0.832	0.462	0.292	0.352	0.067	0.078	0.088	0.151	0.622
AR1 test value	0.00	0.00	0.034	0.026	0.016	0.016	0.014	0.013	0.031
AR2 test value	0.039	0.270	0.396	0.500	0.380	0.366	0.329	0.322	0.158

Standard errors in parentheses :*** p<0.01, ** p<0.05, * p<0.1

APPENDIX 7: Sensitivity Analysis for Completion Rates

VARIABLES	(1) lCOMP	(3) lCOMP	(4) lCOMP	(5) lCOMP	(6) lCOMP	(7) lCOMP	(8) lCOMP	(9) lCOMP	(10) lCOMP	(11) lCOMP	(12) lCOMP	(13) lCOMP
Lagged dependent	0.954***	0.962***	0.956***	0.608***	0.673***	0.999***	0.760***	0.613***	0.486***	0.612***	0.612***	0.616***
	(0.0339)	(0.0292)	(0.0412)	(0.130)	(0.223)	(0.193)	(0.195)	(0.109)	(0.123)	(0.103)	(0.103)	(0.108)
2nd lagged dependent					0.128	0.116	0.121	0.0909	0.140*	0.0907	0.0907	
					(0.0818)	(0.0713)	(0.0930)	(0.0670)	(0.0740)	(0.0654)	(0.0654)	
Aid per child, primary		0.000794	0.00131	-0.00258	-0.000781	-0.000877	0.000628	-0.00151	-0.00196	-0.00161	-0.00161	-0.00210
		(0.000580)	(0.00266)	(0.00175)	(0.00319)	(0.00196)	(0.00293)	(0.00135)	(0.00128)	(0.00134)	(0.00134)	(0.00129)
Lagged aid per child		-0.000455	-0.000622	0.000100	0.000200	0.000784	0.000155	0.000245	-0.000687	0.000278	0.000278	0.000751
		(0.000303)	(0.00121)	(0.000706)	(0.000668)	(0.000889)	(0.000755)	(0.000687)	(0.00224)	(0.000677)	(0.000677)	(0.000796)
2nd lagged aid per child		-0.000369	-0.000495	0.000582	0.000952*	0.000695	0.00113**	0.000751**	0.000937*	0.000751**	0.000751**	0.000423
		(0.000224)	(0.000641)	(0.000485)	(0.000505)	(0.000938)	(0.000463)	(0.000311)	(0.000518)	(0.000316)	(0.000316)	(0.000485)
3rd lagged aid per child		0.000250	0.000121	-0.000463	-0.000213	-0.000803	1.43e-05					
		(0.000165)	(0.000585)	(0.000610)	(0.000634)	(0.000953)	(0.000660)					
4rd lagged aid per child		0.000407***	0.000415**	-0.000674	-0.000373	0.00150	-0.000677					
		(0.000102)	(0.000159)	(0.00146)	(0.00105)	(0.00180)	(0.00109)					
Expenditure per child				6.28e-05	9.74e-05	0.000146	0.000137	0.000146	-1.89e-05	0.000138	0.000138	0.000714**
				(0.000310)	(0.000384)	(0.000259)	(0.000309)	(0.000209)	(0.000201)	(0.000212)	(0.000212)	(0.000308)
Lagged expenditure per child				-0.000641**	-0.000272	-0.000118	-0.000179	-0.000329*	-0.000355	-0.000328*	-0.000328*	-0.00103***
				(0.000292)	(0.000241)	(0.000300)	(0.000270)	(0.000196)	(0.000233)	(0.000192)	(0.000192)	(0.000375)
GDP per capita			0.0115	0.00706	0.00386	-0.000432	0.00118	0.00463	0.00704	0.00477	0.00477	0.00752
			(0.0247)	(0.00710)	(0.00593)	(0.00575)	(0.00505)	(0.00345)	(0.00533)	(0.00359)	(0.00359)	(0.00486)
Lagged GDP per capita			-0.0173	-0.0168	-0.00455	0.00138	-0.00126					
			(0.0334)	(0.0104)	(0.0132)	(0.0110)	(0.00948)					
2nd lagged GDP per capita			-0.000290	0.0273*	0.00578	-0.00147	0.00119					
			(0.0338)	(0.0156)	(0.0194)	(0.0146)	(0.0101)					
Pupil-teacher ratio, primary				-0.00270**	-0.000226	0.00220	0.000689	-0.00133	-0.00182	-0.00107	-0.00107	-0.00219*
				(0.00132)	(0.00199)	(0.00198)	(0.00165)	(0.00109)	(0.00135)	(0.00101)	(0.00101)	(0.00111)
Urbanization rate				1.40e-05	-7.54e-05	-0.000609	-0.000125	-0.000159	-9.62e-05	-0.000201	-0.000201	-0.000224
				(0.000632)	(0.000346)	(0.000373)	(0.000390)	(0.000355)	(0.000468)	(0.000371)	(0.000371)	(0.000482)
Lagged Primary NER				0.00448**	0.00275	-0.00121	0.00207	0.00397***	0.00517***	0.00398***	0.00398***	0.00464***
				(0.00211)	(0.00239)	(0.00238)	(0.00222)	(0.00129)	(0.00161)	(0.00122)	(0.00122)	(0.00163)
Openness						-2.42e-05						
						(7.74e-05)						
Inflation, annual						-0.000662	-0.000307					
						(0.000687)	(0.000432)					
Current account balance						8.01e-05	0.000138					
						(0.000147)	(0.000242)					
Corruption Perception Index						0.00249						
						(0.00753)						

3rd lagged of GDP per capita			0.00596									
			(0.0175)									
2nd lagged expenditure per child									0.000108			
									(0.000196)			
Population under-14										-0.000435	-0.000435	
										(0.000773)	(0.000773)	
Constant	0.217	0.177	0.207	1.403***	0.673	-0.426	0.347	1.002***	1.286***	1.015***	1.015***	1.392***
	(0.153)	(0.132)	(0.183)	(0.447)	(0.713)	(0.670)	(0.604)	(0.305)	(0.394)	(0.299)	(0.299)	(0.387)
Observations	1,086	723	702	288	268	241	251	364	329	364	364	391
Number of Countries	168	150	148	84	81	73	77	92	90	92	92	97
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hansen J-test value	0.688	0.490	0.189	0.221	0.261	0.618	0.314	0.337	0.371	0.327	0.327	0.375
Number of instruments	20	27	28	38	38	45	45	43	43	43	43	43
Diff-in-Hansen test p-value	0.417	0.466	0.207	0.027	0.665	0.642	0.642	0.359	0.732	0.318	0.318	0.094
AR1 test value	0.00	0.00	0.00	0.003	0.026	0.010	0.015	0.000	0.000	0.000	0.000	0.000
AR2 test value	0.344	0.546	0.722	0.552	0.737	0.975	0.703	0.292	0.292	0.286	0.286	0.401

Standard errors in parentheses :*** p<0.01, ** p<0.05, * p<0.1