Estimating the association between foreign aid for education and education outcomes: Evidence from panel data, 1970-2013

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LIM, Sara

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

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ABSTRACT

Estimating the association between foreign aid for education and education outcomes: Evidence from panel data, 1970-2013

Most aid effectiveness studies have revolved around the relationship between aid and growth. Considering the returns of education to economic growth and quality of life, this research adopts a sector-specific approach to investigate the association between aid for education and educational attainment. The association between aid for education and education outcomes is studied empirically for 169 aid-recipient countries from 1970 to 2013. The findings suggest that higher per capita education aid has a statistically significant association with the increased enrollment rates and completion rate. In contrast, aid for all sectors and a sector other than education as a placebo does not show such association. An additional $1,000 of per capita education aid is significantly associated with a 1% increase in enrollment rates and a 2% increase in the number of students reaching the final grade and the number of primary education graduates. The results are robust to different estimation methods, fixed-effects, and the set of control variables included in the regression estimations.

Keywords: Education sector, Sector-Specific aid, Education outcomes, Development

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1. Introduction

The main purpose of this paper is to investigate the relationship between aid for education and education outcomes with regard to promoting equitable access to education in recipient countries. Educational attainment correlates with enormous benefits in terms of economic growth (Hanushek & Wößmann, 2007) and quality of life (Easterlin, 2001; Ferrer-i-Carbonell, 2005; Oreopoulos & Salvanes, 2011), making the education sector one of the most highly prioritized sectors for aid contribution. The effort to support developing countries in financing their educational development resulted in education aid of US$ 10.1 billion in 2019, representing the second highest percentage, 21 %, of total Organization for Economic Co-operation and Development (OECD) aid for social infrastructure and services (OECD, 2020).

Although a number of literature studies relationship between aid and growth (Collier & Dollar, 2002; Easterly, 2003; Morrissey, 2004; Easterly 2006), some studies document the positive effects of aid for education on enrollment (Michaelowa, 2004; Dreher et al., 2006; Michaelowa & Weber, 2007; Dreher et al., 2008; Riddell & Zarazua, 2016), to the best of my knowledge, a dearth of research exists that examines outcomes other than enrollment rates, which mostly emphasized the aid effects on more significant number than better quality. Departing from the literature examining the general relationship between aid and growth, this research adopts a sector-specific approach to evaluating the association between aid for education and education outcomes. Extending the recent work on aid and education, this paper also considers a number of different education outcomes – namely enrollment rates, completion rates, and repetition rates – as dependent variables. The study employs a fixed-effect model with a robust standard error to manage the empirical challenges, such as the potential endogeneity and country-specific and year-specific characteristics.

The findings show that aid for education is positively associated with the primary enrollment rate, completion rates, and secondary enrollment rates. A $1,000 increase in per capita aid for education is positively associated with enrollment and completion rates by 2 % and 3%, respectively, compared to the previous year. An increase in per capita aid for education also shows a marginal positive association with secondary enrollment rates. To build confidence in the analysis, we also repeat the same analysis using total aid to all sectors as well as aid to a sector other than education as a placebo test. Except for small changes in the primary enrolment rates, the aid for all sectors become no longer significantly associated with completion rates and secondary enrollment. In contrast, using aid in a sector other than education as a placebo test shows no statistically significant associations. To consider some of the mechanisms through which the education aid affects education outcomes, the paper considers the per capita government spending on education as an important control variable and finds a strong positive association with the completion rate. However, this does not weaken the positive association between education aid and education outcomes. The result indicates that an additional $100 of per capita spending increases completion rates by 2% over previous years. This result indirectly suggests that there may be different channels through which foreign aid and national spending for the education sector in recipient countries affect different education outcomes.

This research makes three important contributions to the existing literature. First, it assesses the impact of education aid on educational outcomes using both quantity and quality metrics; the accessibility in education and progress in student learning environment, respectively. In addition to the substantial body of evidence which relies heavily on primary school enrollment to evaluate educational outcomes (Michaelowa, 2004; Dreher et al., 2006; Michaelowa & Weber, 2007; Dreher et al., 2008; Riddell & Zarazua, 2016), this study adds a

set of new estimates on the quality dimension. Second, it uses extended time series for a more significant number of recipient countries. Improving upon the extant panel data analysis, which has traditionally featured many cross-section units but a limited number of periods, both the large N and extensive T employed in the data used for this paper enables more careful handling of heterogeneity between units and the impact of omitted variables, and hence improving the efficiency of econometric estimates. Third, it presents the association between aid for all sectors and education outcomes to show whether overall aid allocation aligns with pursuing a specific target. As the aid for all sectors refers to more broadly defined categories, this process allows the analysis to examine whether the range of sectors could be a matter of concern.

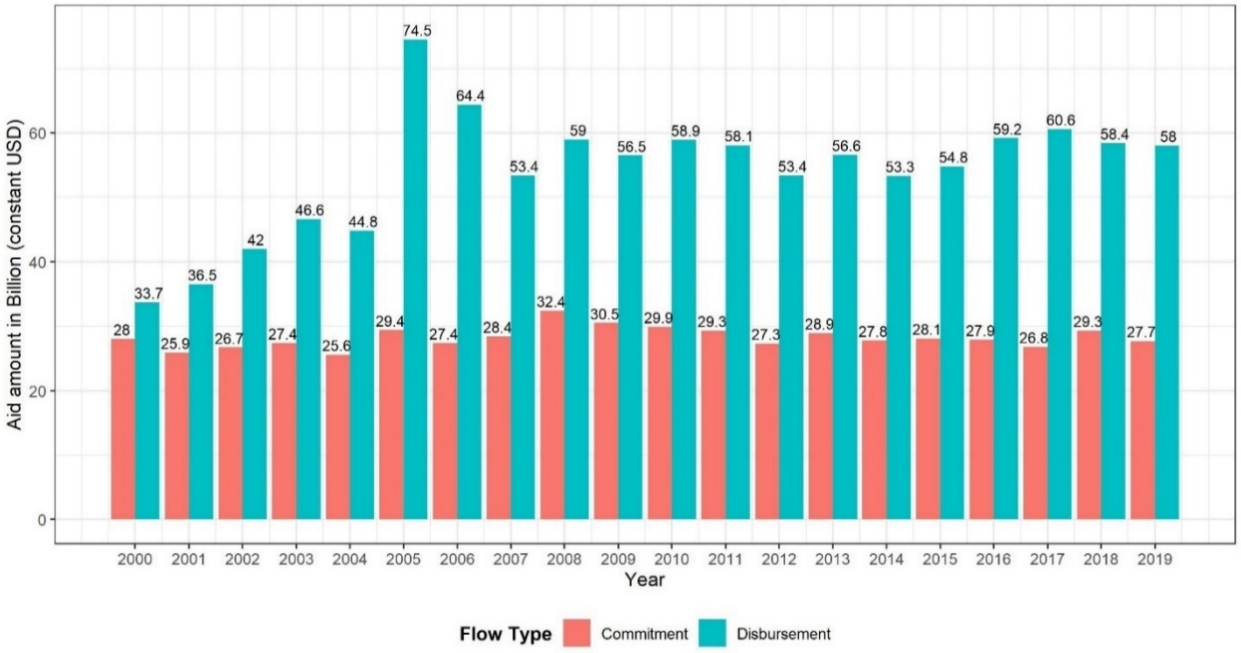
Before discussing the empirical evidence, this study begins with previous findings from aid-effectiveness studies. Next, explaining the motivations for those studies and the reason this research focuses on sector-specific aid, particularly education. A discussion of methodology. The final section reviews the findings and concludes the discussion.

2. Literature Review

2.1. Why Foreign Aid?

Many developing countries still lack resources to finance their development (World Bank, 2018). Growing needs consistently reflect external assistance from more developed countries as a part of the contribution to economic development and welfare (World Bank, 2014). Figure 1 presents the total amount of aid committed and disbursed from 2000 to 2019. Aid committed to education remained between US$25 billion and US$29 billion, with average disbursement steadily increasing through the years. OECD (2020) reports that Overseas Development Assistance (ODA) in 2020 from OECD's Development Assistance Committee (DAC) members represented a 3.5 % increase over 2019. Additional funds to assist developing countries coping with the COVID-19 pandemic backed this increase.

Figure 1: Trend of Overseas Development Assistance by Aid Flow Type



Source: OECD (2019). The amounts shown above are aggregate form of foreign aid regardless of its purpose. The figure is made by the author, using R-Studio.

With the adoption of Agenda 2030 and 17 Sustainable Development Goals, countries began to aim towards a better future for all and design financial flows for the improvement of quality of life (UN/DESA, 2016).

In theory, different channels provide aid to finance-recipient countries to access higher and more sustainable growth paths. However, a large volume of research shares starkly different opinions on aid effectiveness (Howes, 2011; Sachs, 2005; Bauer & Yamey, 1982; Rodrik et al., 2005; Easterly, 2006). According to Howes (2011), the effectiveness of aid falls into four categories: good and large, bad and large, good and small, and bad and small. As Sachs (2005) defines, correctly administered good and large aid has a transforming effect, while good and small aid contributes to a positive marginal impact without significant effects on development (Rodrik et al., 2005). On the other hand, bad and large aid has a significant negative impact (Bauer & Yamey, 1982), while bad and small aid correlates with a negative but minor determinant of growth (Easterly, 2006). Aid may not be an effective tool for growth and development, calling for a reexamination of foreign aid in developing countries.

2.2. Why Sector Specific Aid?

Concerns about the efficacy and effectiveness of development assistance are not new. Most of the discussion on aid effectiveness revolves around the relationship between aid and growth. However, whether aid affects growth (Griffin & Enos, 1970; Mosley, 1980; Boone, 1996), aid has a positive relationship with growth, but with diminishing returns (Durbarry et al., 1998; Dalgaard & Hansen, 2001; Hansen & Tarp, 2001; Dalgaard et al., 2004), or aid has a conditional relationship with growth (Burnside & Dollar, 2000; Collier & Hoeffler, 2002;

Burnside & Dollar, 2004; Easterly et al., 2004) remains inconclusive. Such variations in aid effectiveness led recent studies to explore a new area, namely, that not all aid is alike in its impact on growth (Clemens et al., 2004). They have resulted in several international declarations endorsing sound practice principles to reassess the effectiveness of development assistance (OECD, 2011).

According to Eger et al. (2018), foreign aid can help achieve development goals by focusing on sectors where the recipient countries lag far behind. Despite a substantial volume of research on the overall impact of foreign aid on development, studies employing disaggregated aid data are scarce (Yogo, 2016). Following mainstream economics, previous research attempted to study the relationship between aid and growth in terms of income per capita (Hansen et al., 2000). The economic dimension, however, cannot explain all aspects of development because freedom in social and political presence is part of development (Sen, 1999).

In terms of social and welfare development, analyzing whether to ascribe to aid an increase in quality of life in recipient countries, not just income per capita, is useful (Kosack, 2003). Discussion of the growing need to study aid's effects on areas other than economic growth brings up the sectoral composition of aid. As Nunnenkamp and Dreher (2007) state, sectoral aid has a considerable impact on whether donors contribute to achieving development goals besides the overarching goal of eradicating absolute poverty. Consistent with the earlier literature, Riddell (2008) emphasizes that empirical research frequently fails to bridge the gap between donor rhetoric and reality. Unless targeting aid shifts its focus to areas where we can observe significant effects in the recipient country, higher aid will hardly have the expected effects. The effectiveness and quality of the aid are key to the success of recipient-country

development programs. In this regard, a sectoral approach will minimize the complexity of macro-level assessment (Michaelowa, 2004).

2.3. Why education?

This research empirically explores the relationship between one of the essential sectors for ensuring the quality of life and its target outcome. As Table 1 illustrates, since the early 1990s, sectoral aid for all donors has shifted considerably.

Table 1: Distribution of Aid by All Donors across Sectors, 1993-1995 and 2017-2019 (percent total aid)

Social Infrastructure and services	1993-1995	2017-2019
Education, total	**37.0**	**22.4**
Basic / Primary education	16.6	26.6
Secondary education	4.8	13.3
Post-secondary education	32.2	41.5
Education, level unspecified	46.4	18.6
Health	**14.1**	**14.3**
Health, general	35.6	36.6
Population Policies	**5.3**	**17.5**
Water Supply & Sanitation	**16.6**	**10.9**
Government and Civil Society general	**11.6**	**29.8**
Other social infrastructure & Services	**15.4**	**5.1**

Computed by the author, based on the average of aid granted per social infrastructure and services sector.

Source: CRS, OECD (2020)

In the category of education aid, the aid to basic/primary education climbed by 60.2 %, secondary education increased by 177.08 %, post-secondary education by 28.9 %, and level

unspecified education increased by 105.08 %. Thereafter, in 1993–1995, 16.6 % of aid to education went to basic/primary education, 4.8 % to secondary education, 32.2 % to post-secondary education, and 46.4 % to level unspecified education- The respective shares by sector during 2017–2019 ware 26.6 %, 13.3 %, 41.5 %, and 18.6 %. Overall, Table 1 depicts aid flow growing more specific and defined. Its focus gradually turned to educational continuity to improve and maintain effective student learning environments.

2.4. Why primary education?

While this research recognizes the persistent yet significant gaps in secondary schooling in developing countries (Muralidharan et al., 2017), we focus on primary school accessibility and its learning environment. As primary education in any country is a prerequisite for mastering basic knowledge and skills for further education (Verspoor et al., 1991), children may fall behind in the trajectory of cognitive development if primary education does not take place. Furthermore, failing to obtain primary education may impede a child's ways of thinking and building mental models, as the World Development Report (2015) states. The importance of primary education reasonably predicts that a specific sector approach, such as education, will lead to robust empirical results, despite the drawback of somewhat less detailed data at the sectoral level.

Studies in the literature demonstrate that to some extent, aid for education has contributed to increasing primary education enrollments and primary completion rate. Michaelowa (2004) and Michaelowa and Weber (2007) conducted an early analysis of aid effectiveness in the education sector. They show empirical evidence for a positive relationship

between education aid and primary enrollment and completion rates. Their findings indicate that a 1% increase in education aid as a percentage of GDP raises the primary completion rates by 1.6% every year. According to Dreher et al. (2006), increasing education aid by 1 % of a recipient country's GDP results in the range of a 2.5 to 5 % rise in primary enrollment. Furthermore, Dreher et al. (2008) show that an additional dollar of education aid per capita increases primary school enrollment by approximately 0.3%. A study by Michaelowa and Weber (2008) also provides evidence that education aid positively affects the primary, secondary, and tertiary enrollment levels. In line with previous studies, findings from the literature indicate that the most tangible contribution that aid provides is its support of increased enrollment (Riddell & Zarazua, 2016). According to Birchler and Michaelowa (2016), a 1% increase in education aid raises primary enrollment rates by 0.06%. Yogo (2017) studies the effect of education aid on the primary completion rate in Sub-Sharan Africa explaining that increasing education aid by 1% increases the completion rate by 0.20%.

Summarizing the literature review, the key takeaway from available research is that education aid promotes school enrollment and attendance but offers surprisingly little evidence of learning outcomes. Despite its previous effort to account for the effectiveness of education aid on education outcomes, the existing literature does not show a substantive result beyond expansion in primary education. Although this measure aligns with achieving universal primary education, the existing studies strongly relate to the quantitative impact of aid rather than its qualitative impact.

This research develops the regression model from Dreher et al. (2008) to respond to recent voices favoring a quality-based analysis on aid effectiveness. Dreher et al. (2008) employ per capita aid for education in terms of commitment. They empirically analyze its impact on

education for almost 100 countries from 1970 to 2004. Their result is robust to the GMM specification and implies that an additional dollar of per capita aid to the education sector increases school enrollment by about 0.3%. In this regard, the current study goes above and beyond the previous literature by broadening sample sizes and periods. Focusing on the significant association between aid for education and education outcomes, it also shows that aid for all sectors and national government spending on education also have a unique relationship with education outcomes.

3. Data and Descriptive Statistics

3.1. Data

The analysis required data on aid to education in recipient countries and consequent education outcomes. This research incorporates control variables reflecting recipient country features, such as national educational spending, the style of leadership, level of economic development, and other demographic indicators. Data collected occurred using official websites of relevant international organizations such as the World Bank, United Nations Educational, Scientific and Cultural Organizations (UNESCO), and OECD to assure the reliability of the sources. Data on aid are available from the AidData online databases, covering bilateral and multilateral aid at donor, recipient, purpose, and year level.

In general, data on aid appear in the form of disbursement or commitment. Despite the commitment-data tendency to overestimate the contribution of aid in recipient countries (Dreher et al., 2008) and partially underreport (Michaelowa & Weber 2006), this study uses aid-commitment data because sector-specific aid disbursement is only available from 1990 onward, while data on sector-specific aid commitment is available starting with 1970. Additionally, commitment is worth study because it reflects the donors' decision variables (Neumayer, 2003). This research recognizes the appropriateness of commitment data for measuring long-term impact on target outcomes. The research employs the commitment covering a sample of 169 aid recipient countries from 1970 to 2013.

3.2. Descriptive Statistics

Table 2 summarizes the statistics of variable statistics. The dependent variables are primary enrollment rate, the gross intake rate to the last grade, completion rate, repetition rate, and secondary enrollment rates. Since the net enrollment rate may underestimate the number of students who complete a full term of primary education, the empirical model uses the gross enrolment rates for both primary and secondary enrolment. This research contains the gross intake rate, a proxy for how many students enter the final grade. UNESCO (2018) claims it as an official proxy to estimate how many students can complete primary education. Both the gross intake rates and the completion rate have a lower bound of zero and an upper bound of 100, represented as a percentage of the population. Overall, the higher the rates are, the greater is the number of children and adolescents in the last grade of given education, and, thus, the greater is the number of primary-school graduates. Repetition rate reveals the number of repeaters in a primary level, expressed as a percentage of enrolment in the previous school year, while secondary enrollment rate is the ratio of total enrollment to the population of the age group that officially corresponds to the level of education.

The independent variable in this research is aid commitment for education in per capita terms. It shows the links between aid items and target outcomes in relation to the development agenda. The commitment herein refers to express obligation made of donor countries and international organizations, a pre-arranged deal to offer a specific amount of aid to recipient countries. Thus, our model uses a lagged pattern to capture the time of testing effects on foreign aid in recipient countries. In addition, this study combines aid commitments in all sectors to assess whether total aid commitment shows any impact on education outcomes. The total aid commitment is computed from the disaggregated database on aid commitments. As its range

varies from very specific to more broadly defined categories, the effectiveness of total aid commitment shows whether overall aid allocation has an association with the pursuit of a specific target.

Table 2: Summary Statistics

Variables	Unit	N	Mean	Standard Deviation	Min	Max
Primary enrollment Rate	%	3742	89.91	19.314	2.831	100
Gross Intake Rate	%	3594	76.13	26.108	1.522	100
Repetition Rate	%	3253	9.16	8.793	0.006	44.547
Completion Rate	%	4222	76.77	25.497	1.543	100
Secondary Enrollment Rate	%	4636	57.94	31.597	0	100
Aid Commitment for Education, per capita	US$, logged	4637	12.57	43.311	0.0001	1060.272
Total Aid Commitment, per capita	US$, logged	6181	161.42	379.858	0	11426.08
Aid Commitment for government and civil sector, per capita	US$, logged	3843	8.54	15.829	0	969.192
Government Expenditure to the education sector, per capita	US$, logged	6464	178.06	315.249	0.488	3330.154
GDP per capita	USD	7094	4820.62	8841.674	57.601	86016.14
Population under 15, as a percent of total population	%	7998	35.66	9.922	11.048	51.574
Percent of total population in urban area	%	4008	43.76	22.531	3.236	100
Governance Indicators	Scale (1 to 5)	3044	2.27	0.748	0.05	4.17
Adult Life Expectancy Rate	%	6736	63.75	10.368	18.91	83.15

Note: UNESCO stands for United Nations Educational, Scientific, and Cultural Organizations, while WDI refers to World Development Index, WGI for World Governance Index. Data sources are written in Appendix.

Control variables include the government expenditure on education and the share of children (Dreher et al. 2008; Michaelow &Weber 2008; Minigou, 2016) under 15 years old as a percentage of the total population (Michaelow & Weber 2007, Birchler & Michaelowa, 2016). These serve as relevant variables for national education in recipient countries. GDP per capita and percent of the total population in an urban area (Dreher et al. 2008) are additional variables controlling for the recipient countries' general economic development. To represent population health status in recipient countries, we include adult life expectancy (Kosack, 2003). The governance variable reflects the style of leadership in the recipient countries (Yogo, 2017), expressed as the average value of six dimensions from the World Governance Indicators (WGI), such as voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law and control corruption. The research modifies its range to 0 to 5 scale, from the original scale of -2.5 to 2.5. The higher the value, the better the degree of governance.

Utilizing enrollment rates as a sole indicator of education outcomes creates data limitations (Rober, 2003). Ideally, the outcome variable should also include educational attainment and education quality on top of quantity-based measures such as enrollment rates. Recognizing that the qualitative dimensions of education, such as improved literacy and test scores, are not available for a sufficiently large number of aid-recipient countries over a long time, this research proposes two methods to minimize the distortions that the shortcomings of enrollment-rate data can cause.

First, the empirical model takes completion rates as an additional indicator. It is because the completion rate reflects how many children complete the given level of education. To confirm the credibility of the completion rate, the main model also includes the gross intake rate to the last grade. UNESCO claims it as an official proxy measure of completion rate, reflecting

the total number of new entrants into the final grade of a given level of education as a percentage of the population from the intended entrance age to the last grade of education.

Second, in addition to the completion rate, this research includes such other variables as repetition rate and secondary enrolment rate (Barro & Lee 2001). Clements (2004) uses detailed country studies to show that rising enrollment rates came at the expense of deteriorating quality of education in some countries. Therefore, these additional variables examine whether aid for education has successfully improved the students' learning capacity and led to following the learning environment beyond increasing enrollment.

4. Methodology

The main research question is whether aid for education increases the number of students enrolled and improves the quality of education. To begin the analysis, this study borrows and expands the model Dreher et al. (2008) uses. Using the GMM method, the original model covered 99 countries during 1970–2004 and tested whether an additional dollar of per capita aid to the education sector increases school enrollments. The results showed a 3% increase in enrollment. With the inclusion of a one-year lagged primary enrollment as an independent variable, this model removed the country fixed-effects and minimized the potential misspecification due to reversed causality between aid and education, and omitted variable bias.

Accordingly, this research includes 169 countries during 1970–2013. As the analysis is more likely to encounter heteroskedasticity and serial correlation, the robust standard error is used first, followed by a Hausman test. The results from the Hausman tests enabled the research to reject the null hypothesis ($p < .05$) and choose the fixed-effect model as the main model of the analysis. The fixed-effect model enabled the study to remove the omitted variable bias caused by a relevant but unobserved time-invariant variable. The basic equation takes the following form:

$$\Delta \text{School}_{i,t} = \beta_0 + \beta_1 \Delta \text{aid\_commit}_{i,t} + \beta_2 \Delta \text{aid\_commit}_{i,t-1} + \boldsymbol{\beta} X + a_i + \beta_t + \varepsilon_{i,t}$$

Δ School $_{i,t}$ is any change in education outcome in country i, year t, compared to the previous year;

Δ aid_commit $_{i,t}$ is the difference between per capita aid commitment in year t and t-1 ;

Δ aid_commit $_{i,t-1}$ is the difference between per capita aid commitment in year t-1 and t-2 ;

X represents the vector of control variables,

a_i represents country fixed effects;

β_t represents the time fixed effects;

$\varepsilon_{i,t}$ represents the error term.

a_i and β_t control for the unobserved but time-invariant country-specific and country-invariant time-specific factors, respectively. β_1 and β_2 are the coefficients of interest that measure the association between aid committed in country *i* in year *t* and education outcome in country *i* in year *t*, compared to the previous year. The statistically significant estimates of β_1 and $\beta 2$ represent the significant association between the additional US dollar of aid and the increase in education outcomes compared to previous years.

The key independent variable is aid commitment. Although aid has been typically defined relative to the Gross Domestic Product (GDP) of the recipient countries, this study employs the aid relative to per capita over GDP ratio in assessing the effectiveness of education aid on education outcomes. Dreher et al. (2008) support this; achieving inclusive education entails the number of individuals expected to share the resources. Moreover, the lag effects are intended to reduce concerns regarding the time of testing effects on aid commitment in recipient countries. As a result, instead of a one-year time-lag effect, this research incorporates a three-year time lag effect (*t, t-1, t-2*). The interpretation of the findings will focus on the association between the additional 1,000 dollars increase in aid commitment and the increase in the educational outcomes compared to the previous year.

5. Results

This research first selects all aid data relevant to education sectors. Then, it aggregates them without the specification of aid channels and types. The data for both education aid and total aid are divided by the total population to calculate in per capita term, in a pair of year and recipient. The analysis starts with the regression estimates of the education outcome with the aid for education measured in per capita term. This sector-specific aid model shows the convincing effect of aid as it shows a significantly positive association with the change in education outcome. Column (1), in Table 3, show that the additional $1,000 of per capita education aid is positively associated with 1% increase in primary enrolment rate compared to the previous year. Column (5) estimates show a considerable increase in the secondary enrollment rates by 1.8 % with an additional $1,000 of per capita education aid.

Columns (2) and (4) also explain that the effects of education aid per capita term show a modest increase in gross intake rate to the last grade and completion rate. The result suggests that, compared to the previous year, an additional $1,000 of per capita education aid is significantly associated with a 2 to 3% increase in the number of students reaching the final grade and the number of primary education graduates. While such significance is drawn from past years' increases, the results show that countries like Bolivia would have accomplished a 100% completion rate if they receive an additional $1,000 per capita aid for education. In other words, the 3% of total Bolivians, around 301,457 individuals, who were left behind the formal education system in 2010 would be able to complete primary school in the following years. Furthermore, a 3% growth in completion rate reflects a significant improvement for countries such as Malawi, whose GDP per capita was $345.50 in 2013. It suggests that an additional

$1,000 increase in aid would allow Malawi to achieve the education level of Guatemala, whose GDP per capita marked $3,523 in 2013.

As supported by previous literature (see also Michaelowa 2004, Michaelowa & Weber 2007, Wolf 2007, Dreher et al. 2008), even when national government expenditure is added as a regressor, the association between aid for education and primary school enrollment rates remains positive and significant. For example, Column (1) of Table 4 reports that an additional $1,000 increase in per capita education aid is positively associated with the increase in primary enrollment rates by 1%, compared to the previous year. Also, the remaining indicators, such as gross intake rate, completion rate, and secondary enrolment rates, show a similar measure of positive association. Given the inclusion of the government expenditure, the size of the significant coefficients remains unchanged from Table 3.

Columns (2) and (4) of Table 4 support that government spending in the education sector correlates with the increases in the gross intake rate and completion rate. According to the projections, an additional $100 in per capita government education spending is associated with an increase in the number of students who reach the last grade and graduate from primary school, by 2%.

Table 3: Education outcomes and change in per capita Aid to Education, 1970-2013

Dependent Variable: Changes in…($t-t_1$)	Fixed-Effect Models				
	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for education (t_1-t_2)	0.122*	0.254**	-0.045	0.198*	0.181*
	(0.07)	(0.11)	(0.06)	(0.11)	(0.01)
Change in per capita aid for education ($t-t_1$)	0.225***	0.052	-0.022	0.108	-0.006
	(0.07)	(0.12)	(0.06)	(0.12)	(0.09)
GDP per capita	-0.107	-0.008	0.335	-0.521	1.325**
	(0.44)	(0.78)	(0.38)	(0.81)	(0.60)
Population under 15	-0.061	0.122	0.01	0.108	-0.113
	(0.07)	(0.15)	(0.07)	(0.15)	(0.10)
Urban Population	-0.007	0.087	-0.036	0.067	-0.04
	(0.06)	(0.12)	(0.07)	(0.12)	(0.07)
Governance	0.55	2.126*	-0.34	2.608**	0.854
	(0.59)	(1.17)	(0.55)	(1.20)	(0.79)
Adult Life Expectancy	-0.133**	0.007	0.065	0.004	0.157*
	(0.07)	(0.12)	(0.06)	(0.13)	(0.09)
Observations	1,154	738	683	788	905
R^2	0.016	0.016	0.006	0.014	0.021
Adjusted R^2	-0.127	-0.185	-0.2	-0.184	-0.157
F Statistic	2.332** (df = 7; 1007)	1.422 (df = 7; 612)	0.483 (df = 7; 565)	1.295 (df = 7; 654)	2.307** (df = 7; 765)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: Education outcomes and change in per capita Aid to Education with Government expenditure in education sector, 1970-2013

Dependent Variable: Changes in…($t-t_1$)	Fixed-Effect Models				
	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for education (t_1-t_2)	0.104*	0.262**	-0.04	0.206*	0.185*
	(0.06)	(0.11)	(0.06)	(0.11)	(0.01)
Change in per capita aid for education ($t-t_1$)	0.194***	0.057	-0.023	0.111	-0.012
	(0.06)	(0.12)	(0.06)	(0.12)	(0.09)
Change in per capita Government Expenditure in education sector (t_1-t_2)	0.155	-1.22	-0.443	-1.436	-0.099
	(0.46)	(0.92)	(0.43)	(0.96)	(0.71)
Change in per capita Government Expenditure in education sector ($t-t_1$)	0.365	2.430***	-0.013	2.038**	0.359
	(0.43)	(0.93)	(0.46)	(0.96)	(0.70)
GDP per capita	0.03	0.026	0.433	-0.397	1.158*
	(0.39)	(0.83)	(0.41)	(0.86)	(0.65)
Population under 15	-0.04	0.118	0.017	0.123	-0.118
	(0.06)	(0.16)	(0.08)	(0.16)	(0.10)
Urban Population	-0.052	0.03	-0.032	0.026	-0.02
	(0.05)	(0.13)	(0.07)	(0.13)	(0.08)
Governance	0.313	2.241*	-0.338	2.736**	0.789
	(0.51)	(1.20)	(0.58)	(1.23)	(0.81)
Adult Life Expectancy	-0.124**	0.007	0.066	0.004	0.153*
	(0.06)	(0.12)	(0.06)	(0.13)	(0.09)
Observations	1,112	713	659	762	869
R^2	0.019	0.032	0.008	0.025	0.019
Adjusted R^2	-0.127	-0.176	-0.207	-0.183	-0.16
F Statistic	2.116** (df = 9; 967)	2.132** (df = 9; 586)	0.457 (df = 9; 541)	1.798* (df = 9; 627)	1.574 (df = 9; 734)

Note: *p<0.1; **p<0.05; ***p<0.01

According to Table 4, with the consistent effects of the aid for education, the results suggest the equal effectiveness of education aid and government spending in the education sector. Although the results do not show a significant association between government spending and school enrollments, by looking at Columns (2) and (4), two monetary flows to the education sector show no competition, implying a different channel. Overall, Tables 3 and 4 can derive two main conclusions; the aid for education can be viewed as a more efficient channel to encourage pupils to attend schools, and the government spending as a more efficient channel to encourage students to reach the last grade and graduate successfully.

In addition to the above findings, the aid for education and government expenditure shows no association with the repetition rate. Though both variables present negative patterns, it has an insignificant impact on reducing repetition rate. Such insignificance implies the cracks in the education system that the students leave schools often without acquiring proper reading or writing skills. Repetition rates persist even when enrolment rates rise. It is highly likely to say that a child who starts schooling this year can expect to spend more than two years repeating a primary grade.

Daunting challenges in providing quality education for the growing school-age population can be another reason for persistent repetition rates. While primary school enrolment has risen over the past decade, growth in the number of qualified teachers and education facilities may be slower than the number of students in primary education. This may hamper the inclusive and effective learning environments, thus fail to ensure completion on time and losing a child in the education system when they reach it. While the previous discussions show the success of education for all goals, the repetition rates remain unmanaged. It should be noted

that the repetition rate can be associated with the increase in the early school leaver, the dropouts who could not reach the last grade of primary education.

Similarly, the proportion of the urban population and the population under the age of 15 have no distinctive relationship with growing or improving education outcomes; however, a higher degree of governance has a greater likelihood of better education outcomes. GDP per capita has limited explanatory power on primary enrollment rates and completion rates. The insignificance of GDP per capita in Tables 3 and 4 is consistent with the findings of Michaelowa and Weber (2006) and Dreher et al. (2008). Some may argue that targeted aid intervention works and tends to result in better outcomes (Michaelowa & Weber, 2006; Dreher et al., 2008; Gormance et al., 2005), and there may be several reasons. To name a few, the sustained partnership towards collective goals, the development of sectoral policies, and the establishment of budget management can be rational. However, to examine if sector-specific aid shows a significant association with education outcomes, this research holds further investigation, as shown in Tables 5 and 6.

Table 5 reports the effects of total aid commitment on education outcomes at the level of aid for all sectors. It presents the estimates across different education outcomes that are far from robust. Except for the noticeable changes in primary enrollment rate, the total commitment aid for all sectors, our primary variable of interest, shows tenuous links with education outcomes. For the primary enrollment rate, the level of coefficients is somewhat higher than the results shown in previous Tables. Column (1) shows that an additional $1,000 increase in per capita aid for all sectors has a positive association with a 3% increase in primary enrollment compared to the previous year. However, the relationship between total aid and other education indicators remains unidentified.

Table 5: Education outcomes and change in per capita Aid for All sectors, 1970-2013

Dependent Variable: Changes in…($t-t_1$)	Fixed-Effect Models				
	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for all sectors (t_1-t_2)	0.397***	0.244	0.072	0.131	0.096
	(0.11)	(0.21)	(0.11)	(0.21)	(0.13)
Change in per capita aid for all sectors ($t-t_1$)	0.345***	0.236	-0.03	0.181	0.026
	(0.11)	(0.21)	(0.11)	(0.21)	(0.14)
GDP per capita	0.014	0.264	0.343	-0.302	1.412**
	(0.43)	(0.78)	(0.37)	(0.80)	(0.59)
Population under 15	-0.066	0.074	0.007	0.075	-0.117
	(0.07)	(0.15)	(0.07)	(0.15)	(0.10)
Urban Population	-0.01	0.075	-0.035	0.065	-0.048
	(0.06)	(0.12)	(0.07)	(0.12)	(0.07)
Governance	0.654	2.282*	-0.335	2.815**	0.886
	(0.57)	(1.17)	(0.55)	(1.20)	(0.78)
Adult Life Expectancy	-0.116*	0.039	0.069	0.031	0.162*
	(0.07)	(0.12)	(0.06)	(0.13)	(0.09)
Observations	1,177	750	690	802	921
R^2	0.021	0.012	0.006	0.011	0.02
Adjusted R^2	-0.12	-0.192	-0.199	-0.191	-0.158
F Statistic	3.164*** (df = 7; 1028)	1.033 (df = 7; 621)	0.514 (df = 7; 571)	1.049 (df = 7; 665)	2.321** (df = 7; 778)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Education outcomes and change in per capita Aid for all sectors with Government expenditure in education, 1970-2013

Dependent Variable: Changes in…($t-t_1$)	Fixed-Effect Model				
	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for all sectors (t_1-t_2)	0.269***	0.254	0.076	0.137	0.122
	(0.10)	(0.21)	(0.11)	(0.22)	(0.14)
Change in per capita aid for all sectors ($t-t_1$)	0.207**	0.163	-0.041	0.109	0.03
	(0.09)	(0.22)	(0.11)	(0.22)	(0.14)
Change in per capita Government Expenditure in education sector (t_1-t_2)	0.316	-1.025	-0.514	-1.207	-0.149
	(0.45)	(0.93)	(0.43)	(0.97)	(0.71)
Change in per capita Government Expenditure in education sector ($t-t_1$)	0.391	2.302**	0.02	1.899*	0.324
	(0.42)	(0.94)	(0.45)	(0.97)	(0.70)
GDP per capita	0.079	0.305	0.447	-0.18	1.270**
	(0.38)	(0.82)	(0.40)	(0.85)	(0.64)
Population under 15	-0.046	0.072	0.012	0.089	-0.116
	(0.06)	(0.16)	(0.08)	(0.16)	(0.10)
Urban Population	-0.051	0.022	-0.032	0.025	-0.025
	(0.05)	(0.13)	(0.07)	(0.13)	(0.08)
Governance	0.409	2.429**	-0.32	2.986**	0.847
	(0.50)	(1.20)	(0.57)	(1.23)	(0.81)
Adult Life Expectancy	-0.112**	0.038	0.071	0.031	0.159*
	(0.06)	(0.12)	(0.06)	(0.13)	(0.09)
Observations	1,133	724	665	775	884
R^2	0.018	0.025	0.009	0.02	0.019
Adjusted R^2	-0.128	-0.187	-0.206	-0.191	-0.161
F Statistic	1.958** (df = 9; 986)	1.659* (df = 9; 594)	0.521 (df = 9; 546)	1.430 (df = 9; 637)	1.585 (df = 9; 746)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6 includes the government expenditure as an additional regressor at the level of aid for all sectors. This Table illustrates that government spending has a significant association with the gross intake rate, Column (2), and completion rate, Column (4). As this result is consistent with Table 3, it shows that the association of per capita government spending is unaffected by aid type, either sector-specific or all, but maintains its positive correlation with education outcomes. With total aid being unlikely to affect the interpretation of results, the logarithm of GDP per capita shows a positive association with the secondary enrollment rate in both cases, which is similar to the previous results. A proxy for national governance also positively relates to education outcomes; an additional unit of governance scale is positively associated with more than a 2% increase in gross intake rate and completion rate. Overall, the statistically insignificant association between total aid and education outcomes leads to the significance of the sector-specific approach, which ultimately emphasizes the importance of sectoral aid in meeting specific goals.

As an extension to build confidence in the significant effect of sector-specific aid on target outcomes, this research selects a sector other than education as a placebo sector and tests the association between aid and education outcomes. The placebo sector tests whether the positive association previously measured is due to the sector-specific aid, namely education, or merely due to the use of some specified sector that could have been linked to the education sector or any other public expenditure. Concerning that governance indicator has shown consistent impacts on education outcomes in previous discussions, the model selects governance-relevant aid. By aggregating the 176 types of aids provided under the purpose of government and civil society development, it analyzes its impact on education outcomes. The amount of aid is based on commitment, per capita term, from 1970 to 2013. The unit of

observation is interpreted at aid recipient country level *i* in year *t*, same as the previous discussion.

This model takes the aid for government and civil sector into account by controlling for governance indicators, including voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, and control corruption. Table7 presents evidence that governance-related aid does not statistically significantly associate with enrollment rate and other indicators. The observed effects on primary enrollment rate, gross intake rate, and completion rate evaporate. These findings support the claim that the positive link is valid when sector-specific aid is in hands.

Table 7: Education outcomes and change in per Capita Aid to a Sector other than Education, 1970-2013

Dependent Variable Changes in… ($t-t_1$)	Fixed-Effect Model				
	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for government and civil sector (t_1-t_2)	0.0001	0.006	0.002	0.007	-0.009*
	(0.003)	(0.006)	(0.003)	(0.007)	(0.005)
Change in per capita aid for government and civil sector ($t-t_1$)	0.001	0.0004	0.001	0.0004	-0.005
	(0.002)	(0.004)	(0.002)	(0.004)	(0.003)
Change in per capita Government Expenditure in education sector(t_1-t_2)	0.318	-1.048	-0.48	-1.317	0.137
	(0.451)	(1.007)	(0.473)	(1.023)	(0.635)
Change in per capita Government Expenditure in education sector($t-t_1$)	0.385	2.728***	0.068	2.239**	-0.238
	(0.429)	(1.041)	(0.517)	(1.057)	(0.655)
GDP per capita	-0.026	0.184	0.482	0.002	1.616***
	(0.402)	(0.937)	(0.465)	(0.959)	(0.612)
Population under 15	-0.025	0.019	-0.003	0.066	0.046
	(0.073)	(0.180)	(0.086)	(0.180)	(0.108)
Urban Population	-0.056	0.032	-0.023	0.043	-0.028
	(0.054)	(0.149)	(0.081)	(0.147)	(0.077)
Governance	0.721	2.635*	-0.477	2.996**	0.608
	(0.535)	(1.374)	(0.641)	(1.389)	(0.752)
Adult Life Expectancy	-0.085	0.077	0.09	0.095	0.06
	(0.058)	(0.133)	(0.063)	(0.136)	(0.082)
Observations	947	627	585	652	739
R^2	0.008	0.029	0.009	0.026	0.026
Adjusted R^2	-0.143	-0.19	-0.208	-0.192	-0.162
F Statistic	0.759 (df = 9; 821)	1.678* (df = 9; 511)	0.493 (df = 9; 479)	1.557 (df = 9; 532)	1.816* (df = 9; 619)

Note : *p<0.1; **p<0.05; ***p<0.01

6. Discussion and Conclusion

For the period of 1970–2013, this research empirically assesses the association between sector-specific aid and education outcomes in 169 aid-recipient countries. According to the findings, higher per capita sector-specific aid has a statistically significant association with the increased enrollment rates and completion rate; aid for all sectors does not. This result is robust in controlling the country-specific and year-specific characteristics and reducing the potential endogeneity problems with a fixed-effects model.

The findings suggest that per capita education aid has a modest, yet not negligible, association with enrollment rates. For example, a $1,000 increase in aid has a positive link with a 1% increase in primary enrollment rates compared to the previous year. The positive association between sector-specific aid and target outcomes is consistent with the findings that Dreher et al. (2008) reach. Furthermore, an additional $1,000 increase in aid for education associates with 2% and 1% completion rates and secondary enrollment rates, respectively. However, the evidence is insufficient to conclude that total aid has a substantial association with completion rates and secondary enrollment rates. Instead, sector-specific aid has a significant positive association. Moreover, the findings are consistent with the extension study on probable placebo effects. Overall, sector-specific aid, particularly for the education sector, positively affects all metrics, except the repetition rate.

Another criterion that this research emphasized is the association between the national government expenditure and education outcomes. Findings discussed earlier show the positive link between government spending and the increase in students completing primary school. Regardless of aid types or amounts, government spending has a robust and positive association

with a 2%-3% rise in gross intake rate and completion rates, nearly ten times greater than that aid to education. These findings imply that education aid and government spending in the education sector flow through separate channels, with little or almost no effect on one another. In addition, the result implies that government expenditure is more likely to maintain and manage students in schools effectively. In contrast, aid for education more effectively allows pupils outside of schools to access the formal education system.

On the other hand, neither aid for education nor government spending in the education sector positively relates to the repetition rate. This highlights their limitations regarding raising education quality, implying that students who complete primary education may have had more than two years of schooling may have left school without obtaining basic literacy and numeracy skills. It remains open to discussion. As with any research, there are a number of limitations to this research.

First, a lack of relevant data limits access to indicators for the quality of schools, teachers, and classrooms are limited in developing countries, prompting speculation on the need for more data on test scores as a proxy for objective learning outcomes. Second, the research does not look at the indirect association between aid data and education outcomes. The early model by Dreher et al. (2008) is the basis for the empirical model, and the empirical analysis seeks evidence that the association between aid and educational achievements is significant. Third, since the data is aggregated at the recipient-country level, this research does not capture any potential impact of the donor country dynamics. Future research may address the issue by collecting data at the donor-recipient country level when more data on academic performance is available for developing countries.

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APPENDIX 1

Table A1: List of 169 Aid Recipient Countries

1	Afghanistan	36	Cayman Islands	66	Indonesia
2	Albania	37	Cyprus	67	India
3	United Arab Emirates	38	Czech Republic	68	Iran
4	Argentina	39	Djibouti	69	Iraq
5	Armenia	40	Dominica	70	Israel
6	Australia	41	Dominican Republic	71	Jamaica
7	Azerbaijan	42	Algeria	72	Jordan
8	Burundi	43	Ecuador	73	Kazakhstan
9	Benin	44	Egypt	74	Kenya
10	Burkina Faso	45	Eritrea	75	Kyrgyz Republic
11	Bangladesh	46	Estonia	76	Cambodia
12	Bulgaria	47	Ethiopia	77	Kiribati
13	Bahrain	48	Fiji	78	St. Kitts & Nevis
14	Bahamas	49	Micronesia, Federated States of	79	Kuwait
15	Bosnia-Herzegovina	50	Gabon	80	Laos
16	Belarus	51	Georgia	81	Lebanon
17	Belize	52	Ghana	82	Liberia
18	Bolivia	53	Guinea	83	Libya
19	Brazil	54	Gambia	84	St. Lucia
20	Barbados	55	Guinea-Bissau	85	Sri Lanka
21	Brunei	56	Equatorial Guinea	86	Lesotho
22	Bhutan	57	Greece	70	Israel
23	Botswana	58	Grenada	71	Jamaica
24	Central African Rep.	59	Guatemala	72	Jordan
25	Chile	60	Guyana	73	Kazakhstan
26	China	56	Equatorial Guinea	74	Kenya
27	Cote D'Ivoire	57	Greece	75	Kyrgyz Republic
28	Cameroon	58	Grenada	76	Cambodia
29	Congo, Dem. Rep.	59	Guatemala	77	Kiribati
30	Congo, Rep.	60	Guyana	78	St. Kitts & Nevis
31	Colombia	61	Hong Kong, China	79	Kuwait
32	Comoros	62	Honduras	80	Laos
33	Cape Verde	63	Croatia	81	Lebanon
34	Costa Rica	64	Haiti	82	Liberia
35	Cuba	65	Hungary	83	Libya

84	St. Lucia	103	Mauritius	138	Suriname
85	Sri Lanka	104	Malawi	139	Slovak Republic
86	Lesotho	105	Malaysia	140	Swaziland
70	Israel	106	Namibia	141	Seychelles
71	Jamaica	107	New Caledonia	142	Syria
72	Jordan	108	Niger	143	Turks and Caicos Islands
73	Kazakhstan	109	Nigeria	144	Chad
74	Kenya	110	Nicaragua	145	Togo
75	Kyrgyz Republic	111	Nepal	146	Thailand
76	Cambodia	112	Nauru	147	Tajikistan
77	Kiribati	113	Oman	148	Turkmenistan
78	St. Kitts & Nevis	114	Pakistan	149	Timor-Leste
79	Kuwait	115	Panama	150	Tonga
80	Laos	116	Peru	151	Trinidad & Tobago
81	Lebanon	117	Philippines	152	Tunisia
82	Liberia	118	Palau	153	Turkey
83	Libya	119	Papua New Guinea	154	Tuvalu
84	St. Lucia	120	Poland	155	Tanzania
85	Sri Lanka	121	Portugal	156	Uganda
86	Lesotho	122	Paraguay	157	Ukraine
87	Lithuania	123	Palestinian Adm. Areas	158	Uruguay
88	Latvia	124	Qatar	159	United States
89	Morocco	125	Romania	160	Uzbekistan
90	Moldova	126	Russia	161	St.Vincent & Grenadines
91	Madagascar	127	Rwanda	162	Venezuela
92	Maldives	128	Saudi Arabia	163	Viet Nam
93	Mexico	129	Sudan	164	Vanuatu
94	Marshall Islands	130	Senegal	165	Samoa
95	Macedonia, FYR	131	Singapore	166	Yemen
96	Mali	132	Solomon Islands	167	South Africa
97	Malta	133	Sierra Leone		
98	Myanmar	134	El Salvador	168	Zambia
99	Montenegro	135	Somalia		
100	Mongolia	136	Serbia	169	Zimbabwe
101	Mozambique	137	Sao Tome & Principe		

APPENDIX 2

Table A2: Dependent, Independent and Control Variables with original sources

Variables	Source
Primary enrollment Rate	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Gross Intake Rate	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Repetition Rate	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Completion Rate	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Secondary Enrollment Rate	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Aid Commitment for Education, per capita	AidData
Total Aid Commitment, per capita	AidData
Government Expenditure to the education sector, per capita	World Development Index, Word Bank
GDP per capita	World Development Index, Word Bank
Population under 15, as a percent of total population	World Development Index, Word Bank
Percent of total population in urban area	World Development Index, Word Bank
Governance Indicators	World Governance Index, Word Bank
Adult Life Expectancy	World Development Index, Word Bank

APPENDIX 3

Table A3: Education outcomes and change in aid for education with additional time lag effect (t-3)

Panel (A): Estimated Association between Aid for Education and Education Outcomes with Additional time period					
Fixed-Effect Model					
Dependent Variable Changes in… (**$t-t_1$**)	Primary Enrollment Rate (1)	Gross Intake rate (2)	Repetition Rate (3)	Completion Rate (4)	Secondary Enrollment Rate (5)
Change in per capita aid for Education (t_2-t_3)	0.057 (0.06)	-0.1 (0.12)	-0.046 (0.06)	-0.084 (0.12)	0.019 (0.09)
Change in per capita aid for Education (t_1-t_2)	0.171** (0.07)	0.217 (0.13)	-0.066 (0.07)	0.185 (0.14)	0.13 (0.10)
Change in per capita aid for Education ($t-t_1$)	0.205*** (0.06)	0.004 (0.12)	-0.034 (0.06)	0.046 (0.13)	-0.035 (0.09)
Change in per capita Government Expenditure in education sector(t_2-t_3)	-0.105 (0.41)	0.639 (0.93)	-0.491 (0.45)	0.285 (0.97)	0.928 (0.58)
Change in per capita Government Expenditure in education sector (t_1-t_2)	0.179 (0.47)	-1.131 (0.94)	-0.483 (0.44)	-1.393 (0.97)	-0.011 (0.72)
Change in per capita Government Expenditure in education sector ($t-t_1$)	0.334 (0.43)	2.391** (0.94)	-0.076 (0.46)	2.014** (0.98)	0.346 (0.71)
Observations	1,092	704	651	751	855
R^2	0.023	0.037	0.012	0.031	0.026
Adjusted R^2	-0.127	-0.177	-0.21	-0.184	-0.158
F Statistic	2.012** (df = 11; 946)	2.010** (df = 11; 575)	0.576 (df = 11; 531)	1.772* (df = 11; 614)	1.765* (df = 11; 718)

Note: *p<0.1; **p<0.05; ***p<0.01

APPENDIX 4

Table A4: Education outcomes and change in Aid for all sectors with additional time lag effect (t-3)

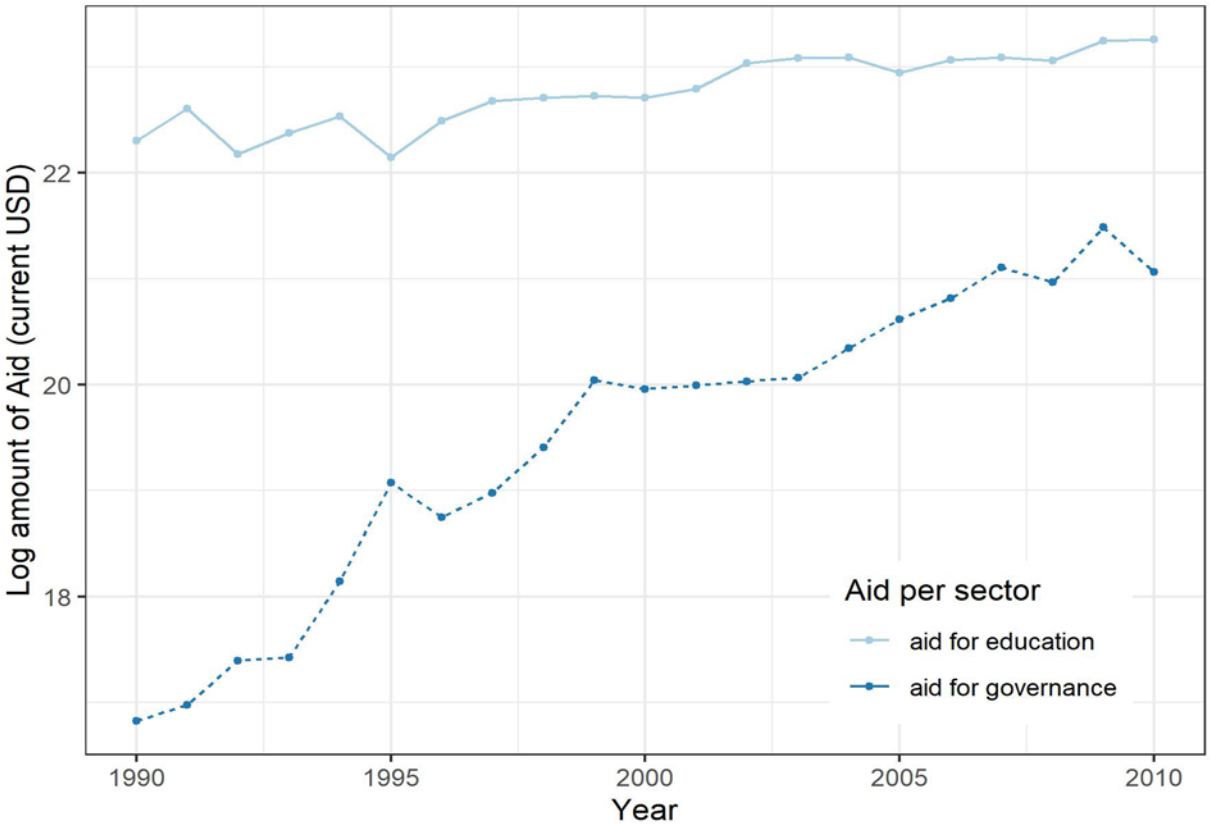
Panel (B): Estimated Association between Aid for All Sectors and Education Outcomes with Additional time period					
Fixed-Effect Model					
Dependent Variable Changes in…. (**$t-t_1$**)	Primary Enrollment Rate	Gross Intake rate	Repetition Rate	Completion Rate	Secondary Enrollment Rate
	(1)	(2)	(3)	(4)	(5)
Change in per capita aid for all sectors (t_2-t_3)	0.064 (0.09)	0.173 (0.22)	0.04 (0.12)	0.24 (0.22)	-0.215 (0.14)
Change in per capita aid for all sectors (t_1-t_2)	0.315*** (0.11)	0.378 (0.25)	0.088 (0.13)	0.29 (0.25)	0.022 (0.16)
Change in per capita aid for all sectors ($t-t_1$)	0.231** (0.10)	0.216 (0.22)	-0.042 (0.12)	0.176 (0.23)	-0.024 (0.14)
Change in per capita Government Expenditure in education sector(t_2-t_3)	-0.018 (0.40)	0.875 (0.94)	-0.515 (0.44)	0.525 (0.97)	0.978* (0.58)
Change in per capita Government Expenditure in education sector (t_1-t_2)	0.354 (0.46)	-0.996 (0.95)	-0.561 (0.44)	-1.166 (0.98)	-0.124 (0.72)
Change in per capita Government Expenditure in education sector ($t-t_1$)	0.379 (0.43)	2.354** (0.94)	-0.028 (0.46)	1.911* (0.98)	0.485 (0.70)
Observations	1,127	721	662	772	880
R^2	0.019	0.027	0.011	0.022	0.026
Adjusted R^2	-0.13	-0.189	-0.208	-0.193	-0.157
F Statistic	1.679* (df = 11; 978)	1.507 (df = 11; 589)	0.566 (df = 11; 541)	1.310 (df = 11; 632)	1.774* (df = 11; 740)

Note: *p<0.1; **p<0.05; ***p<0.01

Recognizing the potential changes in education outcomes due to the three durations (t, t-1, and t-2) of time lag effects, Table A3 and A4 are designed to see if there are any changes in coefficient estimates when we incorporate more time lag effects (t-3). The results from Table A3 show that aid partially explains the primary enrollment rates while the positive association other education outcomes is no longer valid. But per capita government expenditure appears to remain positively associated. The aid with additional time lag shows no relationship with repletion rate and secondary enrollment rate, which are expected to capture the students learning environment. Similar to the findings of Table A3, the results of government expenditure, in Table A4 on education is found to be ore closed related to gross intake rate. Surprisingly the differences between t2-t3 presents no association with education outcomes across different independent variables. Overall, these findings support the following claims: 1) The association between per capita government spending and education outcomes remain significant and 2) the increases in enrollment and education quality are more likely to be significant in short-term.

APPENDIX 5

Figure A1: Time Series Plot of Aid for Education and Governance



Source: AidData (2015). Specifying by line types and color, aid for education and aid for governance are expressed in logarithm. The figure is made by the author, using R-Studio.

Thie Figure A2 illustrates the patterns aid committed to education and governmetn and civil soceity from 1990 to 2010. In order to denote the yearly trennd, we first aggreaget the committed amount, grouped by year and express the amount in logratihm. With the increasing pattern, it explains that the similarity between aid for education and aid for governance. As shown in Table 1, the overall difference between mean and standar deviation of both aid are also small and insignificant.