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How Aid Helps Achieve MDGs in Africa: The Case of Primary Education

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Abstract

Since 2000, Official Development Assistance has played a crucial role in efforts to achieve the global MDGs. This is especially true in Sub-Saharan Africa (SSA), the world's largest recipient of foreign aid. This paper assesses the effectiveness of aid in achieving universal primary education in Sub-Saharan Africa. The impact of aid is assessed for a sample of 35 SSA countries from 2000-2010. The results suggest that higher aid for education significantly increases primary education completion rates. This result is robust to the use of various methods of estimation, the inclusion of instruments to account for the endogeneity of aid, and the set of control variables included in regressions.

Jel Codes: F35, O11, H55, I22

Key Words: Education aid, MDGs, Universal primary education, Sub-Saharan Africa

Résumé

Depuis les années 2000, l'Aide Publique au Développement a joué un rôle crucial dans les efforts visant à atteindre les objectifs du millénaire pour le développement (OMD). C'est principalement le cas de l'Afrique Sub-Saharienne (ASS) qui est la région qui bénéficie le plus de l'aide publique au développement. Le présent article évalue l'efficacité de l'aide dans l'atteinte des OMD en ASS. L'impact de l'aide est évalué pour un échantillon de 34 pays sur la période 2000-2010. Les résultats issus de l'analyse suggèrent qu'un accroissement de l'aide à l'éducation augmente significativement le taux d'achèvement du primaire. Ce résultat est robuste à l'usage de méthodes d'estimation visant à contrôler l'endogénéité, l'usage de divers variables de contrôle et une mesure alternative des performances en matière d'éducation.

Mots Clés : Aide à l'éducation, OMD, Education primaire universelle, Afrique Sub-Saharienne

1. Introduction

At the Millennium Summit in September 2000, world leaders adopted the United Nations Millennium Declaration, committing to the reduction of extreme poverty by 2015 through a set of eight Millennium Development Goals (MDGs). The second of these goals is the achievement of universal primary education by 2015 to ensure that children around the world will be able to complete a full course of primary schooling.

Since 2000, Official Development Assistance (ODA) has played a crucial role in efforts to achieve the MDGs. This is especially true in Sub-Saharan Africa (SSA), the world's largest recipient of foreign aid. This paper assesses the effectiveness of aid and its efficient use in achieving universal primary education in Sub-Saharan Africa from 2000-2010.

Official Development Assistance has dramatically increased in recent years, from US$73.1 billion in the mid-1990s to US$118 billion in 2012 (2011 dollars; OECD, 2014). For SSA, ODA increased from US$27.4 billion in 2004 to US$42.7 billion in 2013. Aid for education is used to fund various activities and programs, including building classrooms, training and hiring teachers, and funding scholarships. According to the UN (2014), recent increases in aid to education in SSA have been followed by a rise in the adjusted net enrolment rate in primary education. Primary school enrolment rates in the region increased by 18 percentage points between 2000 and 2012. Despite this major improvement, however, only three out of five pupils complete primary school (UN, 2014). Since high dropout rates are a major impediment to universal primary education, this latter fact brings the effectiveness of aid in general, and aid to education in particular, into question. We address this question by analyzing panel data from 35 SSA countries from 2000-2010[1].

While there is an extensive literature on the effect of foreign aid on development at the macro level, studies using disaggregated aid data are very scarce. However, several recent papers based on very different methodologies found that education aid has a positive effect on school enrolment (Michaelowa and Weber, 2007; Dreher et al, 2008; Christensen et al, 2011; Riddell, 2012). Nevertheless, this literature suffers from three main limitations. The papers mentioned make extensive use of school enrolment as a measure of education outcomes. Although this measure is in line with the second MDG, it fails to take into account the dropout rate, which can be a major hurdle to the achievement of primary education for all. In addition, to the best of our knowledge, there is no study focusing on the specific case of Sub-Saharan Africa, which is the major recipient of foreign development assistance. Finally, the identification strategy employed in most of the papers cited relies on the Generalized method of moment in a dynamic setting. Although this approach does properly handle the issue of endogeneity, it could be

[1] Note that the choice of the period is dictated by data availability, as data are not available after 2011 for almost all the countries in the sample. Furthermore, aid to education rose steadily starting in 2000, with a peak in 2010, and then declined by 7 percent between 2010 and 2011. We do not want our estimates to be affected by this sudden decline.

interesting to assess whether the findings are robust to the traditional instrumental variable method, which relies on a set of exclusion restrictions.

Accordingly, the objective of this paper is to assess the effectiveness of aid in the achievement of universal primary education in SSA. Unlike the existing literature[2], we contrast the findings using both the primary completion rate and the school enrolment rate. A high level of enrolment does not necessarily mean that all those who have attended school have completed the basic education level. Consequently, rising school enrolment might come at the expense of quality. Considering the high rate of dropout in SSA, using the primary completion rate can be seen as informal and very tentative way of assessing the effectiveness of aid with regard to the quality of education.

For the empirical test, we first check the robustness of the expected correlation between aid and education to various panel data estimators, including pooled OLS, fixed effect, and random effect. The paper then deals with the issue of the endogeneity of aid by resorting to an instrumental variable approach. As pointed out in various studies, the allocation of foreign aid may be driven by political, economic, and geostrategic considerations which could be unobservable in some cases; therefore, the orthogonality assumption may no longer hold. In addition, aid to education could be measured with errors, leading to a potential underestimation of its true effect. Consequently, we use the instrumental variable technique in order to tackle the potential endogeneity of aid. We expect the instrumental variable estimates to be higher in magnitude compared to the baseline model.

We take advantage of the existing migration literature by using the GDP per capita of the host country as a source of exogenous variation for foreign aid (Combes & Ebeke, 2011; Combes et al, 2014; Bermeo & Leblang, 2014)[3]. Aid is instrumented by the log of GDP per capita in migrant destination countries weighted by the bilateral migration share. As shown by Bermeo & Leblang (2014), the size of the immigrant population from a recipient country residing in a donor country is an important determinant of dyadic aid commitments, for several reasons. First, donors may use aid to help development in migrants' countries of origin and thus reduce the flow of immigration. In addition, migrants already residing in donor countries may mobilize to lobby for additional aid to their home countries.

Our findings show that aid to education has been effective in increasing primary completion rates in Sub-Saharan Africa. However, the effect remains small when looking at the broader goal of achieving universal primary education. The rest of the paper is as follows: Section 2 gives a summary of previous studies. The econometric model and data are described in Section 3. Section 4 discusses the results on aid effectiveness. Section 5 concludes.

[2] See, for instance, Christensen (2011) and Ridell (2012).

[3] Note that the first two studies use this instrument as a source of exogenous variation of remittances. The third shows that migration is a robust predictor of foreign aid. To the best of our knowledge, we are the first to use this variable as an instrument for aid. We thank Christian Ebeke for providing data on the instrument.

2. Summary of Previous Studies

The literature on the effect of aid for education remains very scarce, especially when education is used as outcome of interest. In this section, we review the most recent papers that have addressed the effect of aid either on school enrolment or on primary school completion rates.

For several decades, foreign aid has been used to fulfill developing countries' basic social needs, especially in the sectors of education and health. In Sub-Saharan Africa, aid for education is mainly used to build classrooms, fund teacher training, and provide instructional materials and scholarships. Over the last decade, an increasing body of literature has assessed the effect of aid on education outcomes in developing countries. These studies can be divided into two main groups. The first group concerns macro analysis based on international data on aid and education. The second group is made up of micro impact evaluation studies, the majority of which utilize randomised control trials.

The pioneer paper of Michaelowa and Weber (2007) analyzes the effect of education aid on school enrolment rates at the primary, secondary, and tertiary level. Using various estimators (OLS, GMM, & 2SLS) from 1975-2004, they found small positive correlations between education aid and school enrolments. Dreher et al (2008) use total aid commitment to education to explain the net primary enrolment rate in developing countries from 1970-2004. Using the Generalized Method of Moment (GMM) in a dynamic panel data setting, they find that higher per capita aid significantly increases the primary school enrolment rate. The observed effect ranges between 2.5 percent and 5 percent for each 1 percent increase in education aid. In contrast to other studies, however, they find no evidence that aid works by increasing government spending on education. Likewise, D'Aiglepierre and Wagner (2010) use data on aid commitments from 1999-2007 and find a strong positive effect on school enrolment rates and gender parity. They also find a negative effect on repetition rate (the percentage of people who are in the same class for two consecutive years). This positive effect is confirmed by the recent papers of Christensen et al (2011) and Riddell (2012). Christensen et al (2011) analyze the effect of aid to primary education on school enrolment using a sample of 100 developing countries from 1995-2008. Using latent growth regression, they show that compared to multilateral aid, bilateral aid is significantly more effective in improving school enrolment. According to the authors, this finding suggests that bilateral donors are more likely to control the use of allocated funds. Riddell (2012) undertakes a review of the main findings concerning aid and education outcomes and concludes that most of the studies have found a positive effect of education aid on school enrolment. However, he reports that few studies addressed the issue of educational quality.

In addition to the macro studies presented here, various impact evaluations have been undertaken in order to assess the effect of education programs on learning. This type of study is usually funded by NGOs in order to evaluate the impact of aid projects. Selected programs include scholarships for female students, teacher training, and conditional cash transfers. In this line, Ferreira et al (2009) analyzes the effect of scholarships allocated to poor female students on school attendance and learning in Cambodia.

They find that allocating scholarships to poor female students increases school attendance, but has no effect on learning. A similar finding is obtained by Kremer and Miguel (2004), who show that deworming treatments in Kenyan schools increase school attendance but have had no effect on learning. In contrast, the study undertaken by Barrera-Osorio et al (2008) suggests that conditional cash transfers in education increase school attendance, school enrolment and graduation rates. Other randomized control trials focus mainly on the effect of training and incentives on learning. For example, Duflo and Hanna (2005) show that increasing teacher incentives leads to better learning achievements.

Overall, the foregoing papers indicate a positive relationship between education aid and school enrolment and/or school attendance but do not support the hypothesis that aid has a positive effect on learning. However, these papers do not address the specificity of sub-Saharan African countries. Moreover, most of the studies use school enrolment rates as the dependent variable, which may not be appropriate in cases where high dropout rates exist in primary schools. Our study tries to address this gap in the literature.

3. Econometric Model and Data

Following Aiglepierre and Wagner (2010) and Michaelowa and Weber (2007), our baseline specification is as follows:

$$pcr_{it} = \gamma_0 + \gamma_1 Aidedu_{it} + X'_{it}\beta + \mu_i + \varepsilon_{it} \qquad (1)$$

In specification (1), pcr_{it} is the logarithm of the primary completion rate for country i at time t. It measures the percentage of pupils completing the last year of primary education. This indicator has been chosen for two main reasons. First, choosing primary education instead of other levels of education is consistent with the second target of the Millennium Development Goals, which is achieving universal primary education by 2015. Second, unlike the school enrolment rate which is commonly used in the literature, this measure takes into account pupils dropped out of school before completing primary level. The use of school enrolment rate alone could be misleading, especially in cases where there exists a high dropout rate. In addition, as suggested by Clement (2004), rising enrollment rates may come at the cost of deteriorating educational quality.

As pointed out by (Dreher et al, 2008), aid can have little effect on primary school completion rates in recipient countries with an existing completion rate close to 100 percent. Following Fielding et al (2005), we deal with this problem by using a Logit transformation of our dependent variable[4]. Our interest variable is $Aidedu$ and represents the total aid disbursement for education in percentage of GDP. It captures the aid disbursement for primary education, basic life skills for youths and adults, and early childhood education. We use this measure in our baseline model because we assume that aid is not fungible and that it is more likely that the amount of aid intended to primary education might be used

[4] However, since it may bias the estimates downward and does not qualitatively affect the results, we report this result only as robustness check (See Table A.2 in Appendix).

for other educational purposes. In this baseline regression, we always compare multi-sector aid and sector-specific aid because donors may have supported educational projects through aid that is not picked up in sector-specific data. To check for robustness, we also make use of aid for primary education. In the literature, aid is often defined relative to the GDP of the recipient country. However, aid per capita helps account for the number of people among whom the resources devoted to education must be shared (Dreher et al, 2008). In this vein, we use aid per capita in specifications as a robustness check.

Data are drawn from the African Development Indicators (2012). Explanatory variables include saving in percentage of GDP, foreign direct investment, teacher-pupil ratio, GDP per capita, governance measured by the control of corruption and governance effectiveness, and democracy captured by the polity IV index[5]. One could also include public spending on education; however, it is likely that a large part of education spending in SSA is funded by aid. Moreover, using public spending on education would lead to an insufficient number of observation for estimation[6]. Thus, we control for the spending effect using GDP per capita.

While including governance and democracy, we control for potential mismanagement of foreign aid and institutional quality. In the same vein, we add the teacher-pupil ratio to control for the potential effect of class size on primary completion rates; a low number of teachers per pupils may discourage pupils from attending school and could therefore lower the primary completion rate. Savings enters the model to control for the fact that aid could made more effective in a context where savings are very low. Data on governance are taken from the World Governance Indicators of the World Bank. The polity IV variable comes from the polity project of the Center for Systematic Peace. The rest of the control variables are drawn from the World Development Indicators of the World Bank. Data are collected for 35 sub-Saharan African countries from 2000-2010[7]. Table A.1 (in Appendix) provides the descriptive statistics of the variables used in the regression.

4. Assessing the Effectiveness of Foreign Aid

4.1. Preliminary Evidence on Aid Effectiveness

We start our empirical investigation by contrasting the state of primary education in 2000 with that in 2010, ten years after the MDGs were adopted. Figure 1 portrays the distribution of the primary completion rate across various regions of the world. Two main messages emerge from this figure. First, some progress was made between 2000 and 2010; the primary completion rate grew from barely 50 percent in 2000 to 65 percent in 2010. Second, however, despite this improvement, sub-Saharan Africa still lags behind the rest of the world.

[5] It is worth mentioning that teacher-pupil ratio and governance measures are not included in the baseline model, but as additional controls in robustness checks.
[6] Note that previous studies, including Dreher et al (2008), did not find any effect of public spending on education.
[7] The list of countries is presented in the Appendix.

Figure 2 displays the evolution of foreign development assistance to education over the same period. The figure shows a steady increase of both aid to general, unspecified levels of education and aid to basic education. This finding suggests a correlation between aid to education and primary completion rates. At the same time, however, it raises the issue of causality. To determine this relationship more clearly, we begin by contrasting the results of various panel data estimators. In order to substantiate the choice of the appropriate estimator, we successively run the poolability test and the Hausman test. The poolability test checks for the homogeneity assumption over the coefficients and checks whether the same coefficient applies to all individuals or whether there are some unobserved, country-specific effects. The test is a standard Fisher test, based on the comparison between the null model where all observations are stacked together and country-by-country estimations. The Hausman test allows us to choose between the fixed effect model and the random effect model. Under the null hypothesis, both estimators are consistent, but the random effect estimator is more efficient. Under the alternative, only the fixed effect estimator is consistent. Table 1 provides the results for both tests, along with three estimation methods, namely pooled OLS (columns 2 & 3), FE estimator (columns 4 & 5), and RE estimator (columns 6 & 7). Concerning the poolability test, the null hypothesis that data can be pooled is rejected at the 1 percent level. Similarly, the P-value of the Hausman test is below 10 percent, suggesting that the fixed effect model is preferable to the random effect model. Consequently, our discussions of the results are based on the fixed effect model. We report the results using both the total amount of aid and aid to education. The fixed effect model shows that in both cases, aid positively affects the primary completion rate. However, the magnitude of the multi-sector aid effect is higher than that of aid to education. A 1 percent increase in aid to education leads to a 0.05 percent increase in the primary completion rate, while the magnitude of effects stands at 0.07 percent for global aid. We interpret this finding as proof of the fungibility of global aid and the existence of spillover effects from other sectors, such as health. Thereafter, we improve our baseline specification while adding the square of aid to account for potential non-linearity in the effect of aid. The results reported in Table 2 do not strongly support the hypothesis of a non-linear relationship between aid and primary education. Although the results suggest that at a high level of aid, the marginal effect on primary education is small, there is no threshold above which the effect appears to be negative.

Table 1: Aid to Education and Primary Completion Rate, OLS Estimates

Dependent Variable:	**Pooled OLS**		**OLS Fixed Effects**	
Log(Primary completion rate)				
Log(Aid in % of GDP)	0.0565*		0.0753**	
	(0.0338)		(0.0360)	
Log(Aid to education% of GDP)		0.0360**		0.0535**
		(0.0153)		(0.0207)
Saving in % of GDP	0.00712***	0.00683***	-0.00660**	-0.00544**
	(0.00194)	(0.00205)	(0.00266)	(0.00221)
FDI in % of GDP	0.00486	0.00540*	-0.000206	-0.000244
	(0.00308)	(0.00313)	(0.00205)	(0.00202)
Log(GDP per capita)	0.289***	0.240***	1.153***	1.155***
	(0.0383)	(0.0305)	(0.298)	(0.253)
Democracy index-Polity4	0.00773*	0.00761*	0.0160	0.0101
	(0.00397)	(0.00394)	(0.0170)	(0.0145)
Constant	2.205***	2.626***	-2.649	-2.495
	(0.171)	(0.127)	(1.773)	(1.521)
Observations	246	203	246	203
F-Test	55.98	46.60	7.963	8.415
Adjusted R squared	0.383	0.381	0.454	0.417
Poolability test				50.50
Number of countries			35	35

Note: Robust standard errors are in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 2: Aid to Education and Primary Completion Rate, Nonlinear Effect

Dependent Variable:	**Pooled OLS**		**Fixed effect**		**Random effect**	
Log(Primary completion rate)						
Log(Aid in % of GDP)	0.165**		0.371***		0.346***	
	(0.0707)		(0.103)		(0.0966)	
Log(Aid in % of GDP) squared	0.0203*		0.0548***		0.0424***	
	(0.0105)		(0.0153)		(0.0146)	
Log(Aid to education% of GDP)		0.0844		0.175***		0.147**
		(0.0732)		(0.0635)		(0.0661)
Log(Aid to education% of GDP) squared		0.00349		0.00926**		0.00594
		(0.00453)		(0.00384)		(0.00391)
savegdp	0.00747***	0.00681***	-0.00690**	-0.00559**	-0.00523*	-0.00342
	(0.00193)	(0.00205)	(0.00284)	(0.00219)	(0.00305)	(0.00234)
fdigdp	0.00379	0.00526*	-0.000965	-0.000194	-0.00157	-0.00170
	(0.00300)	(0.00312)	(0.00270)	(0.00220)	(0.00289)	(0.00166)
lgdppc	0.282***	0.237***	1.185***	1.177***	0.625***	0.496***
	(0.0363)	(0.0293)	(0.295)	(0.253)	(0.131)	(0.0980)
rcpolity	0.00592	0.00684	0.00660	0.00902	0.0161*	0.0186**
	(0.00413)	(0.00430)	(0.0122)	(0.0137)	(0.00851)	(0.00761)
Constant	2.373***	2.801***	-2.483	-2.246	0.812	1.725***
	(0.179)	(0.264)	(1.771)	(1.504)	(0.747)	(0.596)
Observations	246	203	246	203	246	203
Adjusted R squared	0.400	0.398	0.511	0.447	0.46	0.374
Number of countries	35	35	35	35	35	35

Note: Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

4.2 Instrumental Variable Estimates

Estimating equation (1) with OLS leads to inconsistent estimates if foreign aid is correlated with an unobserved component that may potentially explain the primary completion rate. For instance, countries with poor educational performance could receive more aid. In this case, the effect of aid will be underestimated. To address this issue, we use an instrumental variable approach which relies on the choice of an exogenous instrument for aid. The novelty of our approach is that we test an instrumental variable which has not yet been used in the aid literature, but which is currently used to infer the causal effect of remittances. Specifically, the instrument tested is the GDP per capita of migrants' host countries weighted by the share of bilateral migrations (Ebeke & Combes, 2011; Combes et al, 2014). The instrument is computed as follows:

$$gdp_{it}^{*} = \sum_{j} \; gdp_{jt} \times \omega_{ij\tau} \qquad (2)$$

In equation (2), gdp_{it}^{*} represents the real GDP per capita of the destination country j, and $\omega_{ij\tau}$ the bilateral migration share measured as the number of migrants of country i living in country j divided by the number of migrants from country i living abroad during each decade τ. Data on this instrument are drawn from Combes et al (2014)[8].

While this instrument has never been used as an exogenous source of variation for aid, several arguments justify this choice. First, our instrument assumes that the conjuncture in donor countries is very much correlated with the amount of aid. As shown by Fuchs et al (2013), aid decreases when macroeconomic conditions deteriorate in donor countries. Second, the literature often uses geographical and cultural distance between donors and recipients as an instrumental variable to assess the causal effect of aid (Tavarez, 2003; Rajan & Subramanian, 2008). Since migrants are more likely to move to the country with which they share historical and cultural links, our instrumentation strategy is consistent with the existing literature. Moreover, as shown by Bermeo and Leblang (2014), it is likely that the size of the immigrant population from a recipient country residing in a donor country is a powerful determinant of that donor country's aid commitments. Bermeo and Leblang argue that donors use foreign aid to increase development in targeted sending areas and thus to decrease the demand for entry into donor countries. Along the same lines, migrants already residing in donor countries often mobilize to lobby for additional aid to their homeland.

The results of the IV regressions are presented in Table 3. The first and third columns report the first stage estimates and show that our instrument is strongly and positively associated with both measures of foreign aid. The instruments are significant at the 1 percent level in the first stage regression. Moreover, the F-test statistic is always above the Rule of Thumb of 10 proposed by Staiger and Stock (1997).

[8] Also see Combes et al (2014) for more detailed description of computation of this instrument.

Table 3 points to a positive and significant effect of aid on education at the 1 percent level. A 1 percent increase in aid to education leads to a 0.20 percent increase of the primary completion rate. However, as seen in the simple OLS estimation, the magnitude of global aid's effect is much higher. Moreover, the coefficient of aid in the 2SLS model is higher compared to the OLS model, suggesting that not taking into account the endogeneity of foreign aid may lead to an underestimation of its effect. To put this finding into perspective, the current amount of aid disbursement will need to more than double to reach a primary completion rate of close to 90 percent[9]. Our findings are consistent with previous studies which use school enrolment as a dependent variable (see Dreher et al, 2008; Christensen et al, 2011).

Table 3: Aid to Education and Primary Completion Rate, 2SLS Estimates

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**
Log(Primary completion rate)	First step		First step	
Saving in % of GDP	0.005	-0.010***	-0.001	-0.006***
	(0.005)	(0.003)	(0.007)	(0.002)
FDI in % of GDP	0.007	-0.005	0.017	-0.004
	(0.008)	(0.005)	(0.012)	(0.004)
Log(GDP per capita)	-0.301	0.851***	-1.724*	1.037***
	(0.261)	(0.162)	(0.907)	(0.202)
Democracy index-Polity4	0.049**	-0.019	0.026	-0.000
	(0.025)	(0.014)	(0.041)	(0.010)
Log(GDP per capita host countries)	0.939***		2.220***	
	(0.182)		(0.496)	
Log(Aid in % of GDP)		0.504***		
		(0.111)		
Log(Aid to education% of GDP)				0.201***
				(0.055)
Number of observations	215	215	173	173
No of countries		29		28
F-stat for weak ident.		26.577		20.028
Shea R2		0.124		0.155

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In order to check for the robustness of the results, we carried out various tests. First, although the time dimension is small compared to the individual dimension in our model, we run a new regression using data averaged over five years. This is to ensure that the previous results are not driven by business cycle effects and measurement errors. The estimates are reported in Table 4. The effect of aid remains significant at the 10 percent level, and the magnitude of the effect of education aid increases slightly

[9] Specifically, doubling the current amount of aid will increase the primary completion rate from 65 percent to 78 percent.

while that of global aid decreases in the same way. Second, we add more controls into the model, including governance and the pupil-to-teacher ratio, and we include aid to primary education as a dependent variable. In this case, the effect of aid is still significant at the 1 percent level, but the magnitude of the effect substantially decreases. One notable fact is that the effect of aid to primary education is higher than that of total education aid. Table 5 shows that a 1 percent increase in aid to primary education induces a 0.22 percent rise in the primary completion rate. In a third robustness check, we run a regression using aid per capita. The results are reported in Table 6 and suggest a strong positive effect of aid on primary education. Finally, similar to previous studies, we use net school enrolment as a dependent variable. The OLS and 2SLS results are reported respectively in Table 7 and Table 8. According to these estimates, the positive effect of education aid remains very strong. However, the magnitude of the effect is smaller and almost divided by two. Specifically, a 1 percent increase in aid to education increases school enrolment by 13 percentage points; the magnitude of this effect is far below the 0.20 percent obtained when primary completion is used as the dependent variable. This result is a bit surprising because we would expect a lower effect, as school enrolment does not account for high dropout rates.

Overall, both OLS and IV estimates suggest that education aid has a positive and significant effect on primary education. This effect is robust to various specifications, measures of aid, and primary education.

Table 4: Robustness Check, 2SLS with Five Year Average Data

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**
Log(Primary completion rate)	First step		First step	
Saving in % of GDP	-0.004	-0.004	-0.013	-0.003
	(0.014)	(0.013)	(0.028)	(0.010)
FDI in % of GDP	0.042*	-0.016	0.002	0.004
	(0.024)	(0.024)	(0.054)	(0.020)
Log(GDP per capita)	0.020	0.638	-2.112	1.196***
	(0.584)	(0.529)	(1.888)	(0.343)
Democracy index-Polity4	0.010	-0.016	0.035	-0.021
	(0.045)	(0.032)	(0.094)	(0.027)
Log(GDP per capita host countries)	1.097***		2.089**	
	(0.337)		(0.883)	
Log(Aid in % of GDP)		0.494*		
		(0.269)		
Log(Aid to education% of GDP)				0.260*
				(0.146)
Number of observations	54	54	54	54
No of countries		27		27
F-stat for weak ident.		10.599		5.598
Shea R2		0.272		0.209

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Robustness Check, 2SLS with Additional Controls

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**
Log(Primary completion rate)	First step		First step	
Saving in % of GDP	0.007	-0.008***	0.007	-0.006***
	(0.008)	(0.003)	(0.009)	(0.002)
FDI in % of GDP	0.015	-0.005	0.015	-0.004
	(0.011)	(0.004)	(0.013)	(0.004)
Log(GDP per capita)	-1.926***	1.306***	-2.525***	1.189***
	(0.642)	(0.164)	(0.944)	(0.205)
Democracy index-Polity4	0.024	-0.002	0.029	0.001
	(0.039)	(0.013)	(0.053)	(0.015)
Governance effectiveness	1.012***	0.041	1.099**	0.008
	(0.362)	(0.119)	(0.467)	(0.128)
Control of Corruption	-0.561*	0.009	-0.647*	0.019
	(0.292)	(0.097)	(0.338)	(0.095)
Pupil to teacher ratio	0.020*	-0.001	0.020	-0.001
	(0.012)	(0.004)	(0.014)	(0.004)
Log(GDP per capita host countries)	2.473***		2.841***	
	(0.374)		(0.462)	
Log(Aid to primary education in % of GDP)		0.229***		
		(0.048)		
Log(Aid to education% of GDP)				0.187***
				(0.044)
N	176	176	157	157
No of countries		27		27
F-stat for weak ident.		43.657		37.762
Shea R2		0.236		0.236

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Robustness Check, 2SLS with Aid per Capita

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**
Log(Primary completion rate)	**First step**		**First step**	
Saving in % of GDP	-0.000	-0.006***	0.000	-0.007***
	(0.007)	(0.002)	(0.006)	(0.002)
FDI in % of GDP	0.017	-0.004	0.013	-0.005
	(0.012)	(0.004)	(0.010)	(0.004)
Log(GDP per capita)	-0.742	0.841***	-0.275	0.854***
	(0.906)	(0.223)	(0.598)	(0.219)
Democracy index-Polity4	0.026	-0.000	0.042	-0.008
	(0.041)	(0.010)	(0.032)	(0.012)
Log(GDP per capita host countries)	2.211***		1.441***	
	(0.495)		(0.339)	
Log(Aid to education per capita)		0.202***		
		(0.055)		
Log(Aid to primary education per capita)				0.321***
				(0.088)
N	173	173	218	218
No of countries		28		29
F-stat for weak ident.		19.977		18.030
Shea R2		0.154		0.099

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Robustness Check, Using School Enrolment as Dependent Variable

Dependent Variable:	**Pooled OLS**		**OLS Fixed Effects**		**OLS Random Effects**	
Log(School enrolment)						
Log(Aid in % of GDP)	0.0811***		0.0683*		0.0998***	
	(0.0258)		(0.0394)		(0.0343)	
Log(Aid to education% of GDP)		0.00469		0.0464**		0.0525***
		(0.0128)		(0.0188)		(0.0172)
Saving in % of GDP	0.00167**	0.00106	-0.00141	-0.000616	-0.00108	-0.000598
	(0.000843)	(0.000703)	(0.00145)	(0.00109)	(0.00138)	(0.00110)
FDI in % of GDP	-0.00311*	-0.00355*	-0.000900	-0.000126	-0.00134	-0.00138
	(0.00165)	(0.00195)	(0.00190)	(0.00214)	(0.00177)	(0.00175)
Log(GDP per capita)	0.159***	0.0708***	0.594***	0.583***	0.340***	0.292***
	(0.0304)	(0.0247)	(0.177)	(0.171)	(0.0914)	(0.0813)
Democracy index-Polity4	-0.00349	-0.00109	0.0162	0.0205	0.0142	0.0174*
	(0.00279)	(0.00277)	(0.0126)	(0.0154)	(0.00909)	(0.0104)
Constant	3.770***	4.186***	1.157	1.348	2.751***	3.131***
	(0.145)	(0.115)	(1.081)	(1.064)	(0.503)	(0.500)
Observations	249	211	249	211	249	211
F-Test/Wald-Test	13.05	7.403	4.944	5.306	19.13	21.93
Adjusted R squared	0.105	0.0469	0.392	0.366	0.097	0.045
Poolability test	55.93	59.42				
Hausman test			22.19	25.28		
Fraction of the variance due to RE					.85	.88
Number of countries	35	35	35	35	35	35

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Robustness Check, 2SLS Using School Enrolment as Dependent Variable

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**
Log(School enrolment)	First step		First step	
Saving in % of GDP	-0.006*	-0.000	-0.009	0.000
	(0.003)	(0.002)	(0.006)	(0.001)
FDI in % of GDP	0.004	-0.003	0.014	-0.002
	(0.008)	(0.003)	(0.013)	(0.002)
Log(GDP per capita)	-0.011	0.319***	-1.510*	0.505***
	(0.248)	(0.101)	(0.823)	(0.116)
Democracy index-Polity4	0.030*	0.004	-0.022	0.019
	(0.016)	(0.006)	(0.073)	(0.013)
Log(GDP per capita host countries)	1.073***		2.095***	
	(0.182)		(0.467)	
Log(Aid in % of GDP)		0.282***		
		(0.055)		
Log(Aid to education% of GDP)				0.134***
				(0.033)
Number of observations	248	248	211	211
No of countries		30.000		29.000
F-stat for weak ident.		34.881		20.119
Shea R2		0.120		0.114

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5. Conclusion

The issue of aid effectiveness has always been a major concern in international development. While some studies find no correlation between aid and economic growth, others observe that aid has helped enhance some factors of growth in Africa and that more could be done if aid resources were allocated to pro-poor sectors.

In this paper, we assess the effectiveness of sector-specific aid for 35 SSA countries from 2000-2010, with the education MDG as a target. The results suggest that higher aid to education significantly increases primary school completion rates. Specifically, a 1 percent increase in aid to education raises the primary completion rate by 0.20 percentage points. However, this effect remains small; at this rate, it will require more than doubling the current amount of aid to reach the goal of universal primary education. Our result is robust to the use of various methods of estimation, the inclusion of instruments to account for the endogeneity of aid, and the set of control variables included in the regressions. These results follow the findings of previous studies, according to which aid is effective in building human capital in developing countries.

Our findings imply that increasing aid devoted to education should be encouraged and that if global leaders want to meet the MDGs, the current level of disbursement should be at least doubled. This is especially relevant for SSA, where aid for basic education declined by 7 percent between 2010 and 2011.

References

Aiglepierre, R., and L. Wagner. 2010. "Aid and Universal Primary Education." CERDI, Etudes et Documents, E 2010.22.

Bermeo, S. and D. Leblang. 2014. "Migration and Foreign Aid." Duke University, forthcoming. Available at http://fds.duke.edu/db/attachment/2633.

Christensen, Z., D. Homer, and D.L. Nielson. 2011. "Dodging Adverse Selection: How DonorType and Governance Condition Aid's Effects on School Enrolment." *World Development* 39:2044-2053.

Clemens, M. A. 2004. "The Long Walk to School: International Education Goals in Historical Perspective." Center for Global Development Working Paper 37. Washington DC: Center for Global Development.

Combes, J.L., and C. Ebeke. 2011. "Remittances and Household Consumption Instability in Developing Countries." *World Development* 39: 1076–1089.

Combes, J.L. et al. 2014. "Remittances and Working Poverty." *Journal of Development Studies* 50(10).

Dreher, A., P. Nunnenkamp, and R. Thiele. 2008. "Does Aid for Education Educate Children? Evidence from Panel Data." *World Bank Economic Review* 22(2): 291-314.

Fielding, D., M. McGillivray, and S. Torres. 2005. "Synergies between Health, Wealth, Education, Fertility and Aid: Implications for Achieving the Millennium Development Goals." Helsinki: World Institute for Development Economics Research. Available at www.wider.unu.edu/research/2004-2005/2004-2005-1/mdg-papers/fielding-mcgillivray-torres-160805.pdf.

Fuchs, A., A. A. Dreher, and P. Nunnenkamp. 2014. "Determinants of Donors Generosity: A Survey of Aid Literature." *World Development* 56:172-199.

Michaelowa, K., and A. Weber. 2007. "Aid Effectiveness in the Education Sector: A Dynamic Panel Analysis." In S. Lahiri (ed.), *Theory and Practice of Foreign Aid*. Amsterdam: Elsevier.

Rajan, R.G., and A. Subramanian. 2008. "Aid and Growth: What Does the Cross-country Evidence Really Show?" *The Review of Economics and Statistics* 90(4): 643–665.

Riddell, A. 2012. 'The Effectiveness of Foreign Aid to Education: What Can Be Learned?" WIDER Working Paper 2012/75. Helsinki: UNU-WIDER.

Staiger, D., and J. H. Stock. 1997. "Instrumental Variables Regression with Weak Instruments." *Econometrica* 65(3): 557–86.

Tavarez, J. 2003. "Does Foreign Aide Corrupt?" *Economics Letters* 79: 99-106.

Appendix

Table A1: Descriptive Statistics

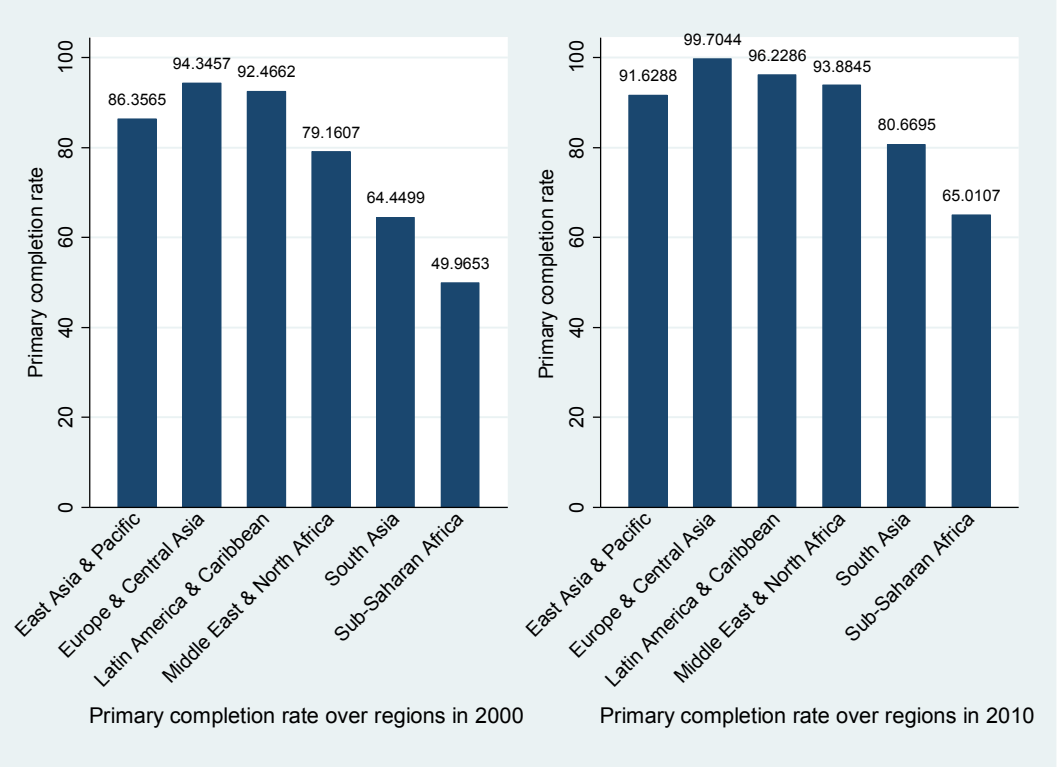
Variable	Obs	Mean	Std. Dev.	Min	Max
Primary school enrolment net rate	157	71.70235	15.3538	34.0096	96.94916
Primary completion rate	157	57.15931	18.6187	19.99717	102.2704
Aid in % of GDP	155	17.15925	21.82607	0.4125504	222.6818
Aid to primary education in % of GDP	157	0.5542791	0.5121493	0.0004156	2.428168
Aid to education% of GDP	157	0.5477999	0.4976255	0.0004156	2.421705
Log(GDP per capita host countries)	157	9.368681	0.9442343	7.478229	10.6151
Saving in % of GDP	157	15.7828	11.77537	-40.215	56.11615
FDI in % of GDP	157	4.889647	6.735664	-4.302265	46.8288
GDP per capita	157	637.0532	825.9532	83.09156	4160.078
Democracy index-Polity4	157	1.872611	5.168601	-9	8
Governance effectiveness	157	-0.6230389	.5100728	-1.773713	0.7272455
Control of Corruption	157	-0.509133	.5127171	-1.430168	1.249669
Pupil to teacher ratio	157	46.18039	12.02089	19.26821	82.79789

Table A2: List of Countries

Country	Observations
Benin	7
Botswana	8
Burkina Faso	10
Burundi	9
Cameroon	9
Central African Republic	7
Chad	9
Congo, Dem. Rep.	4
Congo, Rep.	7
Ethiopia	10
Gabon	1
Gambia, The	7
Ghana	10
Guinea	10
Guinea-Bissau	2
Kenya	2
Lesotho	10
Liberia	2
Madagascar	6
Malawi	10
Mali	10
Mauritania	6
Mozambique	9
Namibia	9
Niger	6
Nigeria	5
Rwanda	6
Senegal	9
Sudan	7
Swaziland	8
Tanzania	7
Togo	5
Uganda	8
Zambia	8
Zimbabwe	3

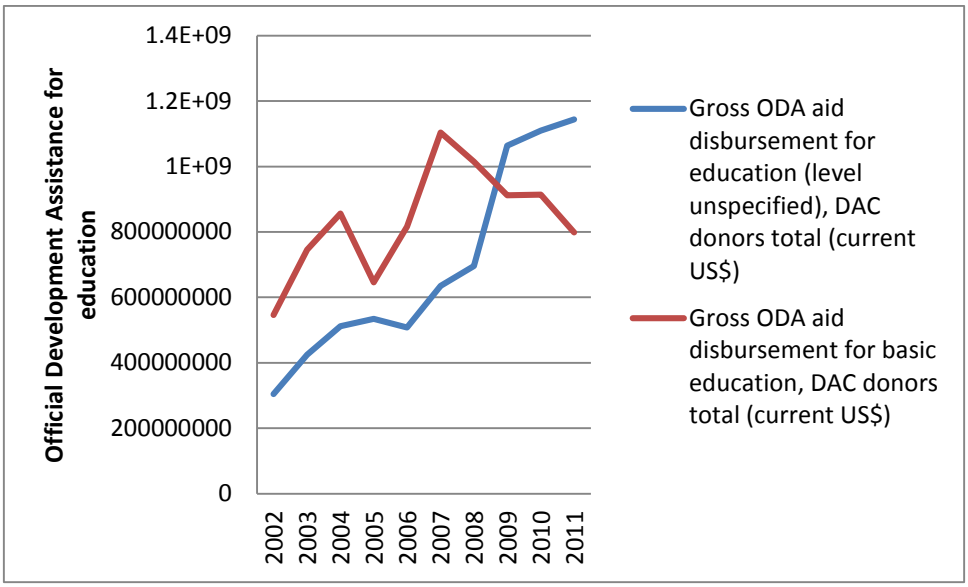
Figures

Figure 1: Primary Completion Rate over Regions, 2000-2010



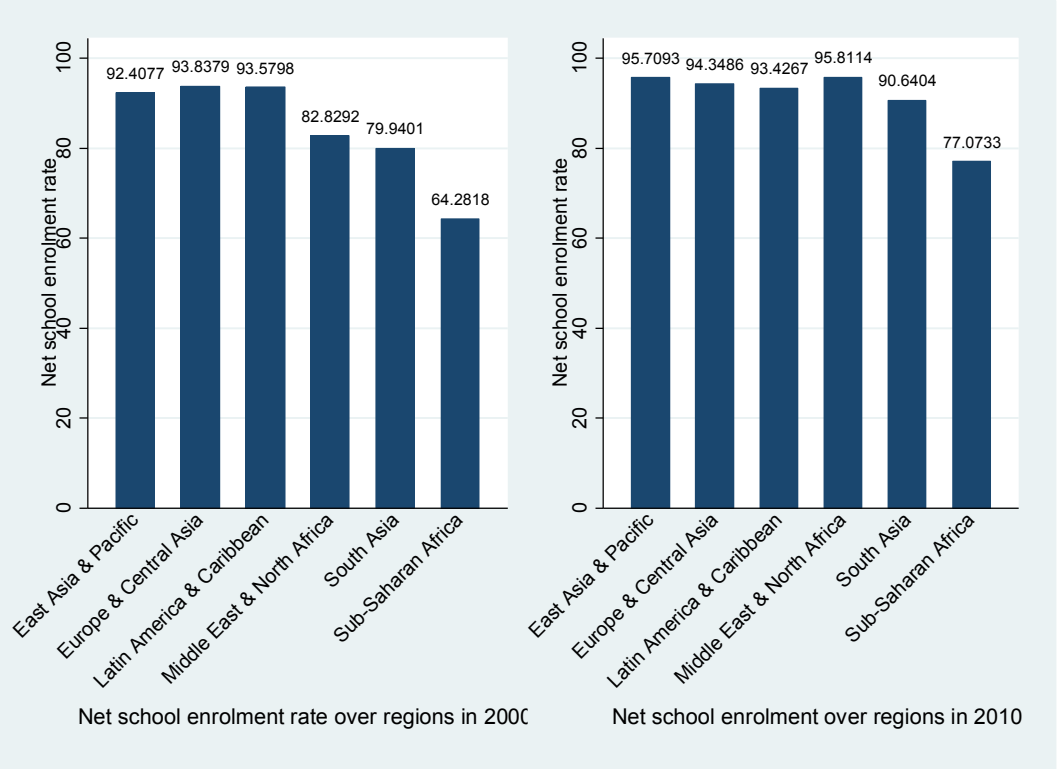
Source : Author's calculations

Figure 2: ODA Disbursement, 2000-2010



Source: Author's calculations

Figure 3: School Enrolment Rate over Regions, 2000-2010



Source: Author's calculations

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