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DO INTERNATIONAL FLOWS INCREASE ENROLLMENT RATES?

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This study examines the influence of foreign direct investment (FDI), overseas development aid (ODA), and remittances on the enrollment of girls and boys in 103 countries over the years 1970–2011. The results suggest that remittances have a contemporaneous robust significant influence on enrollment, with the positive effect being slightly higher for girls than for boys. FDI and ODA have an influence on the enrollment of girls and boys only after a significant time lag. The results also suggest that the impact of remittances on enrollment is increased through income and a well-developed financial sector; FDI through better institutions and a well-developed financial sector; and ODA through better government policy.

Keywords: ODA, FDI, Remittances, Enrollment of Girls, Enrollment of Boys

1. INTRODUCTION

A more educated society has higher rates of economic growth [Barro (1991); Mankiw et al. (1992)] and thus a greater ability of government to alleviate poverty. The inflow of foreign funds can make education more affordable by providing an additional source of finance to households and governments in poorer countries. There are a number of mechanisms through which foreign flows could influence the education of children in developing nations. If households are financially constrained, foreign inflows, by eliminating household liquidity constraints, will increase the chances of a child attending school. Similarly, if governments are liquidity-constrained, foreign inflows, by supplementing domestic savings, could increase funding for public expenditure programs and consequently provision of public services. These flows could also reduce risk, acting as an insurance hedge against income shocks at both the household and country levels. With the advent of globalization, there has been heightened interest on the impact of foreign flows on developing economies as a whole. However, we have only a limited understanding of the influence of these flows on the education of girls and boys in these nations. Therefore the objective of the present study is to investigate the effects of these flows on the education of girls and boys.

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This study contributes to the literature in several ways. One, the present study examines specifically the influence of overseas development aid (ODA), foreign direct investment (FDI), and remittance flows on the secondary enrollment of girls and boys. Although studies have investigated the effect of one or two of these flows on education, they have not investigated the effect of all of these flows on the enrollment of girls and boys. This is because the channels through which these flows operate to influence outcome variables are not homogenous. Although all three types of flows have the potential to increase productivity and economic growth through educational outcomes, they differ in nature [Ghosh (2006)]. ODA is an official flow transacted by source and host governments; FDI is the decision of a foreign firm to set up in a host country by establishing a subsidiary; and remittances are private transfers received by households. Accordingly, ODA has the potential to increase educational outcomes by increasing educational facilities such as the number of schools and schoolteachers, whereas remittances have the potential to increase educational outcomes by increasing household income and access to finance. The influence of FDI on enrollment is less clear. The net effect of FDI on education depends on the level of education required by multinational (MNC) subsidiaries.[1] If the level of education needed to work in the local subsidiary is relatively high, it could have a positive effect on the demand for education and hence enrollment [Nunnenkamp (2002); Bloomstrom and Kokko (2003); Li and Liu (2005); Egger et al. (2010)]. If, on the other hand, the level of schooling required to work in the local subsidiary is relatively low, FDI inflows could have a negative effect on the demand for schooling by increasing the demand for employment. MNCs could also function as separate enclaves, in which technologies do not have much in common with those of local firms. In this situation, there is little scope for FDI leading to increased education [Bloomstrom and Kokko (2003)].

Two, enrollment is disaggregated by gender for the overall estimates and estimates by region, as the impact of these flows can be different at a gender-disaggregated level. Where there are gender differences in access to education, girls could be disadvantaged, particularly in low-income nations. A number of studies have shown that gender inequality in education can have a negative impact on macroeconomic variables such as economic growth [Shultz (1994); Dollar and Gatti (1999); Klasen (2002)], child mortality [Klasen and Wink (2002)], and fertility [Basu (2002); Abu-Ghaida and Klasen (2004)]. The education of girls has been shown to be an important foundation for creating the next generation of human capital, because mothers play an important role in determining the education and health of their children [Schultz (2002); Abu-Ghaida and Klasen (2004)]. Progress in achieving the Millennium Development Goals (MDGs) of universal access to education and gender equality in education has been constrained by poverty in regions such as sub-Saharan Africa and South Asia. Therefore, it is important to examine whether these flows have differential effects on the enrollment of girls and boys.

Three, the empirical estimation is carried out at a region-disaggregated level, given that the distribution of these flows is not homogenous across regions. ODA is the most important source of external finance for sub-Saharan Africa. The major

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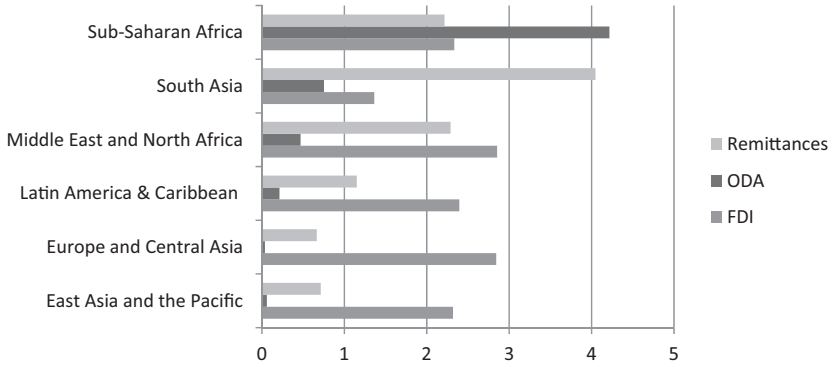


FIGURE 1. Regional distribution of ODA, FDI, and remittances as % of GDP in 2010. *Source*: World Development Indicators (2012).

recipient region of world remittance flows is South Asia. Regions that attract the most FDI flows are Europe and Central Asia and the Middle East and North Africa, followed by East Asia and the Pacific and Latin America and the Caribbean (see Figure 1). Human capital and resource endowments are major drivers of FDI. Regions with higher stocks of human capital and resources appear to attract larger volumes of FDI.

Finally, given that FDI and ODA can take time to influence enrollment through the supply side, estimation is also carried out by lagging FDI and ODA and examining their effects on enrollment. A cross section of 103 low- and middle-income nations is used for the empirical analysis. The estimation is carried out for girls and boys simultaneously within a seemingly unrelated regression (SUR) panel regression framework controlling for country fixed effects. Results are tested for robustness in a number of ways: in addition to panel SUR estimation, endogeneity is controlled for by using system GMM. Additional control variables and several interaction terms are also used.

The rest of this paper is structured as follows. Section 2 discusses the literature. Section 3 examines the data and presents the empirical strategy. Section 4 presents the results, and Section 5 concludes.

2. FOREIGN FLOWS AND EDUCATION: THE LITERATURE

For developing economies, foreign flows have the potential to promote growth and development. However, heavy reliance on these flows could also lead to severe adverse consequences in the event of a negative shock. Evidence has shown that remittances, by reducing credit constraints, in general have had a positive effect on education. Milligan and Bohara (2007) find evidence of a positive impact of remittances on child schooling and a fall in child labor in Nepal. Similar conclusions are reached by Calero et al. (2009) for Ecuador. Calero et al. find that an increase in enrollment and fall in child labor are more pronounced for girls from rural areas.

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Using data from El Salvador, Acosta (2006) observes that girls and boys under 15 years of age from remittance-receiving households are more likely to attend school than those from nonrecipient households. Also employing data from El Salvador, Edwards et al. (2003) conclude that remittances have a positive impact on school retention and attendance rates. Borraz (2005), in a study of Mexico, finds evidence of a small but positive effect of remittances on schooling. Hanson and Woodruff (2003), also in a study of Mexico, find that children from migrant households have a greater number of years of education. Mansuri (2006) finds evidence of a significant positive effect of migration on human capital accumulation in Pakistan, particularly in the case of girls. Similarly, Yang (2006), in a study of the Philippines, concludes that a positive shock arising from the appreciation of a foreign currency against the Philippine peso causes remittance-receiving households to channel more funds to human capital accumulation, leading to increased school retention rates among children.

The effects of FDI on child schooling are less unambiguous, with some studies suggesting that the effectiveness of FDI depends on the level of human capital in the host country. Employing cross-sectional data for the period 1960–2000 for 87 countries, Egger et al. (2010) examine the relationship between market integration, as measured by net FDI inflows, and higher education and growth. They observe that net FDI inflows encourage individuals to attain higher education levels, increasing the marginal productivity of skilled to unskilled workers, contributing to higher growth. Similarly, Nunnenkamp (2002) shows that FDI has a positive impact on human capital, as measured by the level of schooling for 38 developing nations. Gittens (2006), however, argues that the economic impact of FDI depends on the selected sample of countries. For a sample of developing countries, Gittens shows that FDI has a positive impact on the accumulation of human capital as proxied by primary and secondary school enrollment, but no influence on tertiary education. Borensztein et al. (1998) find that FDI promotes growth in countries that have a minimum threshold of human capital to absorb the transfer of technology. Li and Liu (2005), similarly, conclude that FDI promotes growth not only directly but also indirectly through its interaction with human capital in developing nations. This is supported by Kokko (1994), who argues that positive spillover effects of foreign investment on home country firms are larger the higher the educational level of the labor force, the greater the competition, and the lower the entry requirements for foreign entrants. Kumar (2003) finds that openness and education promote productivity growth, but that there is a negative effect of this growth on human capital accumulation.

Although a number of studies have been carried out on the effects of development aid on growth [Burnside and Dollar (2000), Doucouliagos and Paldam (2008), Lensink and Morrissey (2000)], aid and poverty [Collier and Dollar (2004); Mosley et al. (2004)], the literature on the influence of aid on education is sparse. Dreher et al. (2008) examine the impact of aid on education for approximately 100 countries over 1970–2004. They find that higher per capita aid levels for education significantly increase primary school enrollment. Evidence on the effects of aid

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on various outcome variables have been mixed. Boone (1996) finds no evidence of aid contributing to growth or investment in a sample of developing economies. Similarly, Rajan and Subramanian (2007) do not find evidence of a robust relationship between aid and growth; they attribute this result to the weakening of governance by aid flows in the receiving country. Nowak-Lehmann et al. (2012) argue that aid in general has an insignificant or a negative significant impact on per capita income in countries with different levels of human development. They also find that aid has a marginal positive effect on investment but a negative effect on domestic savings. Doucouliagos and Paldam (2008), in a meta-analysis of the effectiveness of aid, conclude that the effect of aid on growth is positive but not statistically significant. Studies also show that the success of achieving developmental objectives through aid depends to a great extent of the effectiveness of public expenditure programs [Roberts (2003)] and institutional structure and policies in place in recipient countries [Burnside and Dollar (2000)]. Lensink and Morrissey (2000) and Arellano et al. (2009) argue that the instability of aid flows can adversely affect the effectiveness of aid.

There is no consensus in the literature on the effects of foreign flows on education and other outcomes variables. The point of departure of the present study is its investigation of the individual effects of all of these flows on education, taking into account that they can affect education through different channels. The study additionally conducts the estimation at a region-disaggregated level, accounting for the fact that the distribution of these flows is not homogenous across regions. With the exception of a few studies on remittances, the impact of these flows on enrollment has not been disaggregated by gender. Hence, enrollment is further disaggregated by gender for the overall estimates and estimates by region, as these flows can have different effects at a gender-disaggregated level.

3. DATA

Panel data covering the period 1970–2011 for 103 countries are used in the empirical analysis. The data cover a cross section of low- and middle-income economies from sub-Saharan Africa, East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, and South Asia. The high-income OECD countries are excluded from the empirical analysis because they are donors rather than recipients of aid, and remittance-outflow rather than -inflow nations. Additionally, these countries have achieved the MDG goals of education for all at the primary and secondary levels and gender parity in primary and secondary education. Because many countries have made significant strides in advancing toward the goal of primary education for all, the dependent variablea in the present study are the secondary enrollments rate of girls and boys. The independent variables of interest are ODA,[2] FDI, and remittances. The estimation is carried out by using these variables measured both in per-pupil terms[3] [Dreher et al. (2008) use per capita values] and as a proportion of GDP [Lensink and White (1999); Burnside and Dollar (2000)].

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Other control variables are chosen on the basis of the literature. Per capita income is used to measure the level of development of a country. As a number of studies emphasize the importance of policy, the M2/GDP ratio is used as a proxy for monetary policy and financial sector development [Burnside and Dollar (2000)], government expenditure on education to GDP to measure the effectiveness of public expenditure programs [Roberts (2003)], trade openness to GDP to measure trade policy [Burnside and Dollar (2000)], and the Polity IV index from Marshall and Jaggers (2010) to measure the quality of institutions. Given that high fertility rates can constrain the school attendance of girls [Basu (2002); Abu-Ghaida and Klasen (2004)], the fertility rate is also included as a control variable in the empirical analysis that follows.

A number of other variables are interacted with the international flows to see if they increase or reduce the effectiveness of these flows on education. The corruption measure from Transparency International (TI) is used. Here the estimate of corruption ranges from 0 (totally corrupt) to 10 (not corrupt). To simplify the interpretation of empirical results, the measures of corruption have been reversed, so that 0 stands for not corrupt and 10 for totally corrupt on the TI measure. To capture the possibility that high levels of corruption can change the composition of FDI and ODA away from education, the corruption index is interacted with FDI and ODA. Country characteristics including population density, the percentage of urban population, and the labor force participation rates (LFPRs) of females and males between 15 and 24 years can change the effect of FDI and ODA on enrollment. High population density could reduce the effectiveness of aid flows, and also increase employment rather than enrollment due to FDI inflows. Similarly, a high LFPR of females and males between the ages of 15 and 24 could reduce the effect of FDI on enrollment. An increase in urbanization could increase or decrease the effect of FDI on education, depending on whether urbanization led to an increase in demand for education or employment. Finally, government expenditures on other sectors, including health, infrastructure, and defense, are interacted with ODA in an attempt to see if there is a crowding-out of ODA from education into these sectors. Except for the Polity IV index and the corruption index, all other data have been obtained from the World Development Indicators.

The majority of empirical studies have estimated the enrollment rates for girls and boys separately. This study employs a seemingly unrelated regression analysis with error components to estimate the enrollment of girls and boys simultaneously. This permits more efficient estimates than using OLS to estimate the equations separately. The panel SUR has the advantage of correcting for heteroskedasticity related to the period and also for correlation within cross sections.

The panel data model takes the form

$$y_{it} = \gamma F_{it} + \beta \boldsymbol{x}_{it} + a\mu_i + \eta_t + \upsilon_{it}, \tag{1}$$

where y_{it} is the enrollment ratio for girls and boys for country i in period t. F_{it} is the foreign flow for country i in period t All other control variables mentioned earlier

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are captured by the vector $\boldsymbol{x}_{it}$. μ_i represents a set of country dummy variables. η_t, is a fixed time effect. The random error term υ_{it} is the sum of a country error component shared by all in country i and an error component that is unique to girls and boys in country i. The variables have been converted into logarithmic form for the empirical estimation.

The explanatory variables in the model are not strictly exogenous. An approach that allows controlling for the joint endogeneity of explanatory variables through the use of internal instruments is the Arellano–Bover (1995)–Blundell Bond (1998) system GMM estimator. This approach uses both lagged level observations as instruments for differenced variables and lagged differenced observations as instruments for level variables, making them exogenous to fixed effects. Here the levels equation,

$$y_{it} = \gamma y_{it-1} + x_{it}\beta + \mu_i + \eta_t + u_{it}, \quad \textbf{(2)}$$

is combined with a first difference equation,

$$y_{it} - y_{it-1} = \gamma(y_{it-1} - \mathrm{y}_{it-2}) + \beta(x_{it} - x_{it-1}) + \eta_t + (u_{it} - u_{it-1}). \quad \textbf{(3)}$$

The equation in levels, (2), is instrumented with lagged first differences of the variables, whereas the equation in first differences, (3), is instrumented with lagged levels of the variables. The variable definitions are the same as for equation (1), with lagged values of the variables now entering the equation. Assuming that (i) the error terms are not serially correlated, (ii) the explanatory variables are weakly exogenous (that is, the explanatory variables, in particular FDI, ODA, and remittances, are uncorrelated with the future realization of the error terms), and (iii) there is no correlation between changes in the right-hand-side variables and the country-specific effects, the following moment conditions can be applied to obtain unbiased estimates of the regressors [see Roodman (2009), Aggarwal et al. (2011)]:

$$\begin{aligned}
&\mathrm{E}[y_{it-s}(u_{it} - u_{it-1})] = 0;\ \mathrm{E}[x_{it-s}(u_{it} - u_{it-1})] = 0,\\
&\quad \times \text{where } i = 1, \ldots, n, t = 3, \ldots, T, \text{ and } s \geq 2;\\
&\quad \times \mathrm{E}[\Delta y_{it-s}(\mu_i + u_{it})] = 0;\ E[\Delta x_{it-s}(\mu_i + u_{it})] = 0, \text{ for } s = 1.
\end{aligned}$$

Testing the validity of the moments conditions is important for ensuring that the GMM estimates are robust. Accordingly, two diagnostic tests are carried out on the system GMM estimates, a Hansen test for overidentifying restrictions and the Arellano–Bond test for second-order serial correlation in the first-differenced residuals. A problem encountered with the system GMM estimator is that too many instruments can lead to a finite sample bias by overfitting the endogenous variables and reducing the power of the Hansen test [see Roodman (2009)]. Following Roodman (2009), results are also presented for system GMM in Tables 1, 2, and 3 in Section 4, with the collapsed instrument matrix using one lag for the system GMM estimators.

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4. RESULTS

The preliminary estimation is carried out by regressing the log of enrollment ratios on the log of per pupil FDI, ODA, and remittances. The results are reported on Table 1. Columns (1) and (2) report results for the panel SUR estimation. In order to correct for any endogeneity bias that may be present in the model, the model is also estimated with system GMM as mentioned. Columns (3) and (4) report results for system GMM without collapsing the instrument matrix, and columns (5) and (6) presents results from collapsing the instrument matrix and using one lag of each instrument. The coefficients on FDI per pupil are positive, but not statistically significant, in all columns under both SUR and system GMM estimation, and the signs on the coefficients on ODA per pupil are negative. The coefficient on ODA per pupil is negative and statistically significant at the 10% level in column (1). The coefficients on remittances per pupil are positive and statistically significant in all columns. Columns (1) and (2), for example, indicate that a 1% increase in remittances per pupil will lead to a 0.23% increase in the enrollment ratio of girls and a 0.12% increase in the enrollment ratio of boys. A test of the hypothesis that the coefficient for remittances is equal for the two outcome variables, enrollment rates of girls and boys, yields a chi-squared statistic of 65, rejecting the hypothesis that the two coefficients are equal.[4] FDI and ODA per pupil do not seem to have a robust significant effect on the enrollment of girls or boys, whereas remittances have a robust and positive effect on the enrollment of boys and girls, with the impact being slightly higher for girls. In the system GMM estimates, columns (3)–(6), the lagged values of the dependent variables are all statistically significant, reflecting a high degree of persistence in the variables. In all specifications, the Hansen test for overidentifying restrictions and the Arellano–Bond test for second-order serial correlation in the first-differenced residuals confirm that the moments conditions cannot be rejected.

Table 2 incorporates a number of control variables into the model. Per capita income is incorporated into the model to capture the level of development of a country. Given the emphasis of studies on institutions and policy, the ratios of trade, M2, and government expenditure to GDP are included to capture trade policy, monetary and fiscal policy, and the Polity IV index to capture institutions. FDI per pupil continues to have a positive but not a robust effect on the enrollment of boys or girls. The coefficients on ODA per pupil are negative in all columns and statistically significant in column (1). Remittances per pupil continue to have a robust and positive effect on the enrollment of boys and girls. Once again, the coefficient on the enrollment rate for girls is slightly higher than that on the enrollment rare for boys. In column (1), a 1% increase in remittances per pupil will increase the secondary enrollment rate of girls by 0.23%, and in column (2), the secondary enrollment rate of boys by 0.20%. The coefficients on per capita income are statistically significant in all columns, and the coefficients on trade are statistically significant under the panel SUR estimation method in columns (1)–(2). The coefficients on government expenditure on education are statistically

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TABLE 1. Dependent variable: Secondary enrollment ratio

	Panel SUR		System GMM		System GMM with collapsed instruments	
Independent variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI	0.115	0.110	0.110	0.116	0.114	0.111
	(0.057)**	(0.108)	(0.050)**	(0.060)**	(0.043)***	(0.110)
ODA	−0.016	−0.015	−0.017	−0.015	−0.018	−0.021
	(0.008)*	(0.014)	(0.008)	(0.015)	(0.019)	(0.025)
Remittances	0.225	0.115	0.220	0.192	0.198	0.124
	(0.078)***	(0.039)***	(0.088)***	(0.050)***	(0.045)***	(0.058)**
Lag of dependent variable	—	—	0.672	0.610	0.550	0.587
			(0.203)***	(0.110)***	(0.091)***	(0.093)***
Hansen test for overidentifying restriction: *p* value	—	—	0.20	0.28	0.14	0.15
Arellano–Bond test for second-order autocorrelation: *p* value	—	—	0.31	0.23	0.21	0.20
Observations	1,472	1,472	1,278	1,278	1,278	1,278
Instruments	—	—	781	781	82	82

Note: Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

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TABLE 2. With additional control variables Dependent variable: secondary enrollment ratio

	Panel SUR		System GMM		System GMM with collapsed instruments	
Independent variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI	0.121	0.111	0.107	0.102	0.106	0.110
	(0.130)	(0.106)	(0.047)**	(0.045)**	(0.116)	(0.106)
ODA	−0.010	−0.014	−0.012	−0.011	−0.012	−0.019
	(0.005)**	(0.016)	(0.014)	(0.012)	(0.010)	(0.018)
Remittances	0.230	0.204	0.208	0.201	0.210	0.204
	(0.061)***	(0.081)***	(0.064)**	(0.077)***	(0.072)***	(0.100)**
Per capita income	0.112	0.107	0.105	0.124	0.109	0.213
	(0.035)***	(0.033)***	(0.012)***	(0.024)***	(0.015)**	(0.073)***
Trade	0.134	0.311	0.132	0.143	0.105	0.215
	(0.052)***	(0.074)***	(0.147)	(0.125)	(0.101)	(0.241)
Govt. expenditure on education	0.402	0.389	0.102	0.142	−0.148	0.108
	(0.141)***	(0.146)***	(0.103)	(0.154)	(0.141)	(0.111)
Money supply	0.032	0.142	0.134	0.162	0.145	0.022
	(0.015)**	(0.149)	(0.166)	(0.075)**	(0.181)	(0.011)**
Fertility	−0.212	—	−0.110	—	−0.121	—
	(0.080)***		(0.041)***		(0.056)**	
Polity	0.006	0.006	0.004	0.006	0.004	0.006
	(0.004)*	(0.003)*	(0.003)	(0.005)	(0.002)**	(0.002)***
Lag of dependent variable	—	—	0.615	0.519	0.567	0.610
			(0.098)***	(0.064)***	(0.082)***	(0.140)***
Hansen test for overidentifying restriction: *p* value	—	—	0.29	0.31	0.20	0.19
Arellano–Bond test for second-order autocorrelation: *p* value	—	—	0.22	0.17	0.20	0.15
Observations	1,163	1,163	1,025	1,025	1,025	1,025
Instruments	—	—	740	739	87	86

Note: Dependent variable: secondary enrollment ratio. Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

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TABLE 3. Replacing foreign flows per pupil with ratios to GDP

Independent variable	Panel SUR		System GMM		System GMM with collapsed instruments	
	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI	0.163	0.235	0.311	0.045	0.150	0.232
	(0.148)	(0.049)***	(0.037)***	(0.119)	(0.198)	(0.040)***
ODA	−0.140	−0.027	−0.056	−0.081	−0.180	−0.114
	(0.081)*	(0.039)	(0.034)*	(0.072)	(0.094)*	(0.136)
Remittances	0.212	0.177	0.335	0.209	0.321	0.240
	(0.040)***	(0.075)**	(0.109)***	().020)***	(0.028)***	(0.025)***
Lag of dependent variable	—	—	0.621	0.543	0.560	0.655
			(0.130)***	(0.094)***	(0.098)***	(0.116)***
Hansen test for overidentifying restriction: *p* value	—	—	0.17	0.21	0.15	0.18
Arellano–Bond test for second-order autocorrelation: *p* value	—	—	0.18	0.20	0.16	0.17
Observations	1,472	1,472	1,278	1,278	1,278	1,278
Instruments	—	—	781	781	83	83

Note: Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

significant only in columns (1) and (2) and the coefficients on money supply are significant in columns (1), (4), and (6). Fertility has a significant negative effect on the enrollment rate of girls at the 5% and 1% levels and the coefficient on the polity index is significant in all columns, with the exception of columns (3) and (4).

Many studies use the ratio of FDI, ODA, and remittances to GDP, rather than per capita or per pupil values—for example, Lensink and White (1999), Burnside and Dollar (2000), Rajan and Subramanian (2007). Therefore, the estimation in Table 1 is replicated by replacing ODA, FDI, and remittances per pupil by FDI, ODA, and remittances to GDP, converted into logarithmic form.[5] The results are reported in Table 3. The results are similar to those obtained in Table 1, but ODA gains statistical significance in a greater number of cases. The coefficients on ODA to GDP, however, once again do not have the expected positive sign. In columns (1), (3), and (5), the coefficients on ODA to GDP are negative and statistically significant, suggesting that the negative impact of aid on the enrollment of girls is greater than that on the enrollment of boys. Remittances to GDP continue to have a statistically significant positive effect on the enrollment of girls and boys. The results suggest that remittances to GDP have a greater positive effect on the enrollment of girls than on that of boys. In columns (1) and (2), a 1% increase in remittances leads to a 0.21% increase in the enrollment of girls and a 0.18% increase in the enrollment of boys.

Studies suggest that international flows can increase educational outcomes through several channels. Studies suggest that success in achieving developmental objectives through aid depends to a great extent of the effectiveness of public expenditure programs [Roberts (2003)] and institutional structure and policies in place in recipient countries [Burnside and Dollar (2000)]. Studies also show that the higher the level of development in the host country, the larger the positive spillover effects of FDI. Similarly, remittances have the potential to improve educational outcomes by increasing household income and access to finance. Remittances have been found to promote economic growth in developing economies by enhancing financial sector development; see Giuliano and Ruiz-Arranz (2009) and Cooray (2012). In order to account for these effects, a number of interaction terms are incorporated into the model. The results are reported in Table 4. Although FDI has a positive influence on enrollment, this direct effect is not robust. The coefficients on ODA turn positive in some cases; however, ODA does not have a robust or significantly positive effect on enrollment. Remittances continue to have a positive and robust effect on the enrollment of girls and boys. Per capita income and the polity variables have a positive and significant effect on enrollment. The interaction terms between per capita income and FDI do not show a robust significant effect across all columns. The interaction term between ODA and per capita income is not statistically significant, whereas the term on remittances $\times$ per capita income is statistically significant across the equations. There is support for the argument that the effect of remittances on enrollment is increased through income. The interaction terms polity $\times$ FDI are statistically

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significant in columns (1) and (2) and the interaction term polity × ODA in column (1). Note that the interaction terms M2 × FDI and M2 × remittances are statistically significant in both columns (3) and (4), suggesting that the effects of FDI and remittances on enrollment are strengthened through a well-developed financial sector. This is reasonable considering that the transfer of foreign funds would depend on the existence of a well-functioning financial sector.[6] Similarly, the interactions government expenditure on education × FDI and government expenditure on education × ODA are statistically significant in columns (5) and (6), implying that the effects of ODA and FDI on enrollment are increased through the effectiveness of government spending programs on education and government policy. This conclusion is consistent with the view of Roberts (2003), who argues that the success of achieving developmental objectives through aid depends to a great degree of the effectiveness of public expenditure programs.

The effects of foreign flows on per capita income are not homogenous across countries—see Nair-Reichert and Weinhold (2001). Accordingly, the model is estimated by disaggregating the sample by region to account for regional heterogeneity. The results are reported in Table 5. Countries are grouped into regions using the World Bank classification. The results are interesting. FDI has a positive significant effect on female enrollment in East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, and the Middle East and North Africa. Note that in Figure 1, of the three types of flows, FDI inflows into these four regions were the largest. FDI does not have a statistically significant effect on male or female enrollment in sub-Saharan Africa or South Asia. Remittances have a positive significant effect on male and female enrollment in all regions. Per capita income has a statistically significant effect on enrollment in all regions, and the polity index is statistically significant in all regions with the exception of the Middle East and North Africa. ODA has a positive and significant effect on male and female enrollment in Eastern Europe and Central Asia, a negative significant effect at the 10% on male and female enrollment in sub-Saharan Africa and South Asia and a negative but not significant effect in the other regions.

FDI and ODA are not directly received by households. Therefore it is reasonable to expect a longer delay in achieving increases in enrollment through FDI and ODA. Therefore, the estimation in Table 4 is replicated by regressing enrollment on FDI and ODA lagged by five periods. From one to five lags were individually trialed for FDI and ODA. FDI and ODA gained statistical significance when lagged by five periods; therefore, the results are reported in Table 6 for a five-period lag. The coefficients on FDI to GDP are positive and statistically significant in all columns, and ODA to GDP gains marginal statistical significance at the 10% level when lagged by five periods. The results suggest that it takes time for FDI and ODA to impact enrollment. The conclusions with regard to the interaction terms remain the same as for their contemporaneous values when these variables are lagged by five periods. The impact of remittances on enrollment is enhanced by a higher level of per capita income and a well-developed financial sector, whereas the effect of FDI on enrollment is increased by better institutions and a well-developed

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TABLE 4. With policy and policy interaction terms: Panel SUR estimation

Independent variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI	0.014	0.015	0.121	0.190	0.162	0.109
	(0.003)***	(0.004)***	(0.112)	(0.031)***	(0.111)	(0.105)
ODA	−0.004	0.012	0.048	0.042	−0.264	0.010
	(0.005)	(0.015)	(0.041)	(0.032)	(0.101)	(0.040)
Remittances	0.360	0.281	0.135	0.062	0.290	0.241
	(0.050)***	(0.040)***	(0.041)***	(0.028)***	(0.042)***	(0.045)***
Per capita income	0.013	0.010	0.011	0.016	0.009	0.007
	(0.001)***	(0.001)***	(0.001)***	(0.003)***	(0.004)***	(0.0004)***
Fertility	−0.134	—	−0.126	—	−0.115	—
	(0.043)***		(0.046)***		(0.036)***	
Per capita income × FDI	0.169	0.142	0.125	0.174	0.125	0.143
	(0.097)*	(0.075)**	(0.053)*	(0.167)	(0.097)	(0.116)
Per capita income × ODA	0.012	0.092	0.032	0.142	0.142	0.132
	(0.011)	(0.113)	(0.126)	(0.198)	(0.132)	(0.115)
Per capita income × remittances	0.134	0.095	0.126	0.085	0.132	0.091
	(0.064)**	(0.048)**	(0.067)**	(0.039)**	(0.083)*	(0.058)*
Polity	0.050	0.055	—	—	—	—
	(0.027)***	(0.021)***				
Polity × FDI	0.048	0.026	—	—	—	—
	(0.003)***	(0.003)***				
Polity × ODA	0.053	0.004	—	—	—	—
	(0.010)***	(0.011)				
Polity × remittances	0.035	0.030	—	—	—	—
	(0.027)	(0.025)				
M2	—	—	0.428	0.494	—	—
			(0.075)***	(0.105)***		
M2 × FDI	—	—	0.029	0.047	—	—
			(0.002)***	(0.003)***		
M2 × ODA	—	—	0.006	0.014	—	—
			(0.006)***	(0.010)		
M2 × remittances	—	—	0.008	0.003	—	—
			(0.001)***	(0.001)***		
Govt. expenditure on education	—	—	—	—	0.100	0.172
					(0.025)***	(0.033)***
Govt. expenditure on education × FDI	—	—	—	—	0.019	0.005
					(0.003)***	(0.002)***
Govt. expenditure on education × ODA	—	—	—	—	0.073	0.073
					(0.025)***	(0.025)***
Govt. expenditure on education × Remittances	—	—	—	—	0.005	0.019
					(0.028)	(0.012)
Observations	1,230	1,230	1,429	1,429	1,375	1,375

Note: Dependent variable: log secondary enrollment ratio. Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

financial sector. Similarly, the effect of ODA on enrollment is strengthened with greater effectiveness in government expenditure programs on education.

As remittances are received directly by households, remittances appear to have a positive and direct impact on educational outcomes. Educational outcomes with

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TABLE 5. Region disaggregated panel SUR estimation

Independent variable	Sub-Saharan Africa		East Asia and the Pacific		Eastern Europe and Central Asia	
	Female	Male	Female	Male	Female	Male
FDI	0.054	0.121	0.078	−0.040	0.154	0.010
	(0.051)	(0.133)	(0.034)**	(0.044)	(0.041)**	(0.120)
ODA	−0.188	−0.119	−0.034	−0.040	0.138	0.156
	(0.008)*	(0.056)*	(0.050)	(0.034)	(0.071)*	(0.080)**
Remittances	0.067	0.143	0.124	0.083	0.237	0.168
	(0.002)***	(0.077)*	(0.071)*	(0.051)*	(0.020)***	(0.037)***
Per capita income	0.021	0.018	0.021	0.021	0.009	0.008
	(0.0002)***	(0.002)***	(0.002)***	(0.002)***	(0.0003)***	(0.003)***
Polity	0.005	0.058	0.063	0.034	0.080	0.040
	(0.002)***	(0.004)***	(0.034)*	(0.021)*	(0.032)***	(0.018)***
Observations	485	485	207	207	144	144

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TABLE 5. Continued

Independent variable	Latin America and the Caribbean		Middle East and North Africa		South Asia	
	Female	Male	Female	Male	Female	Male
FDI	0.129	0.082	0.430	0.166	0.093	0.119
	(0.064)**	(0.063)	(0.155)***	(0.297)	(0.071)	(0.121)
ODA	−0.124	−0.120	−0.033	−0.080	−0.246	−0.130
	(0.098)	(0.097)	(0.051)	(0.071)	(0.141)*	(0.070)*
Remittances	0.182	0.256	0.122	0.273	0.218	0.235
	(0.090)**	(0.052)***	(0.012)***	(0.056)***	(0.022)***	(0.030)***
Per capita income	0.004	0.002	0.002	0.009	0.015	0.014
	(0.002)*	(0.001)**	(0.0006)***	(0.001)***	(0.001)***	(0.001)***
Polity	0.090	0.053	0.015	0.021	0.021	0.082
	(0.047)**	(0.024)**	(0.013)	(0.014)	(0.010)**	(0.017)***
Observations	296	296	152	152	121	121

Note: Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

TABLE 6. FDI and ODA lagged by 5 periods, dependent variable: Secondary enrollment ratio

Independent variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI_{t-5}	0.010	0.012	0.018	0.190	0.165	0.108
	(0.005)*	(0.006)*	(0.008)**	(0.031)*	(0.031)***	(0.050)**
ODA_{t-5}	0.004	0.010	0.009	0.012	0.062	0.010
	(0.002)*	(0.005)*	(0.005)*	(0.007)*	(0.030)*	(0.005)*
Remittances	0.250	0.221	0.142	0.112	0.261	0.202
	(0.080)***	(0.011)**	(0.041)**	(0.031)***	(0.011)***	(0.085)***
Per capita income	0.010	0.012	0.014	0.012	0.015	0.011
	(0.004)***	(0.006)**	(0.006)***	(0.004)***	(0.007)***	(0.0005)**
Fertility	−0.110	—	−0.116	—	−0.112	—
	(0.053)**		(0.036)***		(0.041)***	
Per capita income × FDI_{t-5}	0.127	0.131	0.124	0.118	0.120	0.114
	(0.090)	(0.065)**	(0.121)	(0.121)	(0.101)	(0.110)
Per capita income × ODA_{t-5}	0.010	0.041	0.020	0.090	0.140	0.110
	(0.011)	(0.106)	(0.121)	(0.118)	(0.070)*	(0.111)
Per capita income × remittances	0.120	0.035	0.120	0.064	0.012	0.017
	(0.044)**	(0.018)**	(0.061)*	(0.032)**	(0.006)*	(0.008)**
Polity	0.009	0.010	—	—	—	—
	(0.004)**	(0.005)**				
Polity × FDI_{t-5}	0.021	0.020	—	—	—	—
	(0.004)***	(0.009)***				
Polity × ODA_{t-5}	0.042	0.006	—	—	—	—
	(0.010)***	(0.010)				
Polity × remittances	0.010	0.020	—	—	—	—
	(0.021)	(0.021)				
M2	—	—	0.321	0.310	—	—
			(0.063)***	(0.115)***		
M2 × FDI_{t-5}	—	—	0.019	0.017	—	—
			(0.027)***	(0.018)***		
M2 × ODA_{t-5}	—	—	0.004	0.013	—	—
			(0.006)	(0.012)		
M2 × remittances	—	—	0.006	0.004	—	—
			(0.002)***	(0.001)***		
Govt. expenditure on education	—	—	—	—	0.119	0.154
					(0.019)***	(0.042)***
Govt. expenditure on education × FDI_{t-5}	—	—	—	—	0.020	0.010
					(0.008)***	(0.004)***
Govt. expenditure on education × ODA_{t-5}	—	—	—	—	0.037	0.045
					(0.015)***	(0.020)**
Govt. expenditure on education × remittances	—	—	—	—	0.009	0.012
					(0.012)	(0.010)
Observations	830	830	856	856	841	841

Note: Dependent variable: secondary enrollment ratio. Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

regard to ODA and FDI, however, appear to be much more complicated. A number of additional interaction terms are trialed in order to see if international flows enhance educational outcomes through other channels. High levels of corruption can transfer ODA and FDI flows away from sectors such as education into more

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TABLE 7. With additional interaction terms

Independent variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
FDI_{t-5}	0.019	0.013	0.024	0.178	0.135	0.103
	(0.009)**	(0.007)*	(0.012)*	(0.073)**	(0.046)***	(0.048)**
ODA_{t-5}	0.009	0.012	0.012	0.019	0.075	0.014
	(0.004)**	(0.006)*	(0.006)*	(0.008)**	(0.036)**	(0.007)**
Remittances	0.242	0.201	0.251	0.230	0.242	0.213
	(0.091)***	(0.056)***	(0.061)***	(0.052)***	(0.103)***	(0.094)***
Per capita income	0.108	0.118	0.314	0.012	0.132	0.142
	(0.031)***	(0.017)***	(0.136)***	(0.004)***	(0.057)***	(0.015)***
Corruption × FDI_t	−0.009	−0.010	—	—	—	—
	(0.003)***	(0.005)**				
Corruption × ODA_t	−0.011	−0.008	—	—	—	—
	(0.004)***	(0.004)**				
Population density × FDI_t	—	—	0.014	0.061	—	—
			(0.111)	(0.104)		
Population density × ODA_t	—	—	0.026	0.034	—	—
			(0.023)	(0.029)		
LFPR × FDI_t	—	—	−0.146	−0.184	—	—
			(0.069)**	(0.091)**		
Urbanization × FDI_t	—	—	0.136	0.174	—	—
			(0.124)	(0.157)		
Government expenditure on health × ODA_t	—	—	—	—	−0.016	−0.014
					(0.008)*	(0.007)*
Government expenditure on infrastructure × ODA_t	—	—	—	—	0.134	0.121
					(0.142)	(0.111)
Govt. military expenditure × ODA_t	—	—	—	—	−0.034	−0.040
					(0.015)**	(0.020)*
Observations	508	508	856	856	841	841

Note: Dependent variable: secondary enrollment ratio. Standard errors reported in parentheses.
***,**,* Significant at the 1%, 5%, and 10% levels, respectively.

lucrative sectors [Mauro (1998); Wei (2000)]. In order to capture this, corruption is interacted with FDI and ODA. Similarly, a high population density could reduce the effectiveness of ODA and FDI flows on education. Therefore, population density is interacted with ODA and FDI. A high labor force participation rate (LFPR) of females and males between 15 and 24 years could reduce the impact of FDI flows on education by increasing the demand for employment, particularly if the level of schooling required to work in the local subsidiary is relatively low. The LFPR is therefore interacted with FDI. An increase in urbanization could increase or decrease the influence of FDI flows on education depending on whether urbanization leads to an increase in demand for education or employment. To capture substitution effects in aid flows between other sectors, including health, infrastructure, and defense, and education, ODA is interacted with government expenditure on health, infrastructure, and defense.

Results for these additional interaction terms are reported on Table 7. Columns (1) and (2) report estimates with interaction terms for corruption × FDI and corruption × ODA. The results suggest that corruption reduces the effects of both

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FDI and ODA on enrollment, consistent with the findings of Mauro (1998) and Wei (2000), among others. The interaction terms of FDI and ODA with country-specific features are reported in columns (3) and (4). Note that the interaction term between the LFPR of females and males between 15 and 24 and contemporaneous FDI is negative, suggesting that in the shorter term, there is a higher demand for labor due to FDI. The fact that this is the LFPR of those between 15 and 24 suggests that the initial demand by MNC subsidiaries is for low-skilled labor (those who have not completed secondary education), resulting in lower enrollment. However, the positively signed coefficients on FDI over the longer term suggest that this effect is reversed as the benefits of FDI spill over to host countries, generating an increase in enrollment. Results for the interaction terms between ODA and government expenditure on health, government expenditure on infrastructure, and government expenditure on defense are reported in columns (5) and (6). The results indicate that high government expenditures on health and a high defense budget reduce the effect of ODA on education in the short term. However, the statistically significant (at the 10% level) lagged coefficients on ODA suggest that over the longer term, this effect is reversed. Aid that promotes health and security is likely to increase the demand for education and growth over the longer term.

5. CONCLUSIONS

This study investigates the influence of FDI, ODA, and remittances flows on the enrollment of girls and boys. The results suggest that remittances have a robust contemporaneous direct and positive influence on the enrollment of both boys and girls, with the positive effect being slightly higher for girls than for boys. Remittances also have a positive indirect effect on education through their interaction with per capita income and the financial sector. FDI and ODA have a robust statistically significant influence on the enrollment of girls and boys only after a significant time lag. ODA has a positive effect on enrollment through its interaction with government expenditure at both the aggregate and region-disaggregated levels, suggesting the importance of the effectiveness of government policy for ODA flows to positively impact upon education. There is some evidence of crowding out of ODA from education into health and defense expenditures in the short term. Over the longer term, however, ODA has a positive effect on education. Aid that increases the health and security of a nation is likely to influence education and growth over the longer term. There is also some evidence of an increase in employment because of FDI flows in the shorter term that appears to be reversed over the longer term. This perhaps is due to the spillovers generated by FDI over the longer term, which requires a better educated labor force. FDI has a positive effect on enrollment through its interaction with government expenditure, the financial sector, and the Polity Index at the aggregate and region-disaggregated levels, illustrating the importance of the effectiveness of public policy, financial sector development, and institutions for FDI to have positive spillover effects on

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education. The results also suggest that corruption adversely affects the influence of both ODA and FDI on education.

The results of the present study suggest that remittances, by easing household income constraints, have the potential to allow improvements in education, particularly in the case of girls. It is reasonable to expect a longer delay for FDI and ODA to achieve increases in education. The results indicate that ODA and FDI inflows alone will not produce outcomes unless accompanied by effective host government policies and strong institutions. Given that in regions such as sub-Saharan Africa, South Asia, and the Middle East and North Africa, enrollment rates are relatively lower than in other regions and that there is a gender disparity in education in favor of boys, establishing effective policy environments for ODA and FDI inflows, by making aid flows conditional upon effective public service delivery programs, could hasten achieving the MDG goal of gender equality in education and increasing enrollment overall. This in turn, would increase the absorptive capacity of aid and FDI flows and increase educational outcomes.

NOTES

1. I wish to thank an associate editor who pointed this out to me.

2. As ODA makes more funds available for public service delivery, which can increase enrollment [for example, evidence of increased enrollment due to improvements in roads is found by Khandker (2009); increased enrollment due to better health by Alderman et al. (2001)], total aid rather than ODA for education alone is used in the empirical analysis. This also permits maintaining consistency with the other two flows, because it is not possible to separate FDI and remittance flows that are channeled into education specifically. Aid for education was also trialed, and the conclusions on enrollment were the same as for total aid.

3. In the present study, per pupil rather than per capita values are used because the objective of the study is to investigate how these flows affect the enrollment of students rather than the overall population. I wish to thank a referee who pointed this out to me.

4. A test of the hypothesis that the coefficient for remittances is equal for the two outcome variables, enrollment rates of girls and boys yielded chi-squared statistics in the range of 35 and 65 in all estimations, rejecting the hypothesis that the two coefficients are equal.

5. Note the remainder of the analysis is carried out using the ratios of FDI, ODA, and remittances to GDP.

6. That remittances influence per capita income through the financial sector is supported by the findings of Giuliano and Ruiz-Arranz (2009) and Cooray (2012). Similarly, Hermes and Lensink (2003) argue that well-developed financial systems in host nations are an important prerequisite for FDI to have a positive influence on economic growth.

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