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Does Aid for Education Attract Foreign Investors? An Empirical Analysis for Latin America

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Abstract:
We address the question of whether foreign aid helps attract foreign direct investment (FDI). This could be achieved if well targeted aid removed critical impediments to higher FDI inflows. In particular, test the hypothesis that aid for education is an effective means to increase FDI flows to host countries in Latin America where schooling and education appears to be inadequate from the viewpoint of foreign investors. We employ panel data techniques covering 21 Latin American countries over the period from 1984 to 2008. We find that aid for education has a statistically significant positive effect on FDI. This effect is robust to potential outliers, sample selection, alternative specifications and different estimation methods.

Keywords: foreign aid, foreign direct investment, aid effectiveness, human capital.

JEL classification: E24, F21, F35, O15, O19

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1. INTRODUCTION

While the effectiveness of foreign aid in promoting economic growth in the recipient countries is controversially debated,[1] there appears to be a broad consensus that foreign direct investment (FDI) inflows bring many benefits to host countries. According to the so-called Monterrey Consensus achieved at the UN summit on Financing for Development in 2002, "foreign direct investment … is especially important for its potential to transfer knowledge and technology, create jobs, boost overall productivity, enhance competitiveness and entrepreneurship, and ultimately eradicate poverty through economic growth and development. A central challenge, therefore, is to create the necessary domestic and international conditions to facilitate direct investment flows" (United Nations 2003: 9, paragraph 20).

Consequently, policymakers around the world have liberalized regulations and offered incentives to attract FDI inflows.[2] Yet FDI continues to be highly concentrated in a few host countries, while various developing countries hardly participated in the FDI boom. The distribution of FDI is skewed even within relatively advanced regions such as Latin America. Some countries, notably Chile and Panama, hosted outstandingly high FDI stocks, relative to GDP, in the mid-1980s already and still belonged to the top group 25 years later (Figure 1). In sharp contrast, countries such as Cuba and Venezuela ranked at the bottom at both points in time. Other Latin American countries changed their position considerably during this period: While Guatemala suffered a steep decline, neighbouring Honduras and Nicaragua jumped from poor rankings in the mid-1980s to close the top in recent years.

[Figure 1 about here]

[1] See Doucouliagos and Paldam (2009) for a survey on the "sad results of 40 years of research" on aid effectiveness. In a similar vein, Temple (2010: 4445) concludes that "the available evidence is generally too fragile to bear much weight, even though it has improved over time." The recent results of Nowak-Lehmann et al. (2012) suggest that aid generally has an insignificant impact on economic growth. By contrast, McGillivray et al. (2006) offer an optimistic account of previous research.

[2] For details, see UNCTAD (2010).

This raises the question of whether the international community could support the diffusion of FDI-related benefits by using aid as a means to ease access to FDI. Theoretically, foreign aid has ambiguous effects on FDI (Harms and Lutz 2006; Kimura and Todo 2010). On the one hand, aid may increase the productivity of private capital by improving the supply of complementary factors of production (Selaya and Sunesen 2012). On the other hand, aid could have adverse effects on FDI by giving rise to rent-seeking (e.g., Economides et al. 2008) and by crowding out foreign investment in the tradable goods sector (Beladi and Oladi 2007).[3] Yet a widely cited OECD report called on donors to improve "the synergies between FDI flows and ODA" (OECD 2002: 30). Beerfeltz (2011: 417), the under-secretary in the German Ministry for Economic Cooperation and Development, declared that German development aid shall "motivate companies to make more direct investments in our [development cooperation] partner countries."

This could be achieved if well targeted foreign aid removed critical impediments to higher FDI inflows, for instance by improving the endowment of host countries with sufficiently skilled labour on which foreign direct investors draw. However, the few previous studies on the aid-FDI nexus have typically employed aggregate aid data. This approach fails to capture the specific needs of host countries as well as the heterogeneous nature of aid. By contrast, our analysis focusses on host countries in one particular region, Latin America, and aid in one particular category, education.

Our central hypothesis is that aid for education is an effective means to increase FDI flows to host countries where schooling and qualification can reasonably be considered inadequate from the viewpoint of foreign direct investors. This appears to be the case in large parts of Latin America, as we describe in more detail in Section 2. At the same time, the recent literature suggests that analysing disaggregated aid and its impact on narrowly defined outcome variables offers a more promising way to assess the effectiveness of aid, compared to earlier studies on the economic growth effects of aggregate aid. In particular, it has been found that aid for education improved

[3] Beladi and Oladi (2007) show theoretically that aid could crowd out foreign private investment if the tradable goods sector is more capital intensive than non-traded public consumption goods that aid helps produce.

educational outcome variables such as enrolment rates (Dreher et al. 2008) as well as completion rates, repetition rates, and gender parity (D'Aiglepierre and Wagner 2010). This provides an important channel through which aid for education could have promoted FDI in Latin America.

We employ panel data techniques covering 21 Latin American countries over the period from 1984 to 2008. We find that aid for education has a statistically significant positive effect on FDI. This effect is robust to potential outliers, sample selection, alternative specifications and different estimation methods. Before presenting our results in detail in Section 3, we discuss the relevant literature in Section 2. Section 4 concludes.

2. ANALYTICAL BACKGROUND AND RELATED EMPIRICAL EVIDENCE

Previous literature offers several building blocks on which our central hypothesis on the effects of aid for education on FDI flows to Latin American countries rests. First, we refer to North-South models of FDI suggesting that a sufficiently qualified workforce is an important pull factor as foreign direct investors rely on relatively skilled labour in developing host countries. Second, we draw on comparative evaluations and surveys revealing that education and schooling constitute relatively weak competitive spots that may erode Latin America's position in the worldwide competition for FDI. Third, we relate to recent contributions to the aid effectiveness literature which indicate that aid may help improve educational outcomes. Finally, we review the small existing empirical literature on the link between aid and FDI which has largely left unaddressed the effects of sector-specific aid, notably aid for education, on FDI inflows.

Foreign firms in developing host countries are generally found to pay higher wages than local firms (Lipsey 2002). At the same time, the FDI-related wage premium is typically higher for more skilled workers. In the Latin American context, Mexico has received particular attention in this regard (e.g., Aitken et al. 1996; Feenstra and Hanson 1997).[4] Hanson (2003) concludes from a survey of the earlier literature that FDI has increased the relative demand for skilled labour in

[4] However, higher FDI-related wage premia for better skilled workers have also been observed in Asian host countries such as Indonesia (Lipsey and Sjöholm 2004).

Mexico. The observation that FDI draws on relatively skilled labour in developing host countries supports the theoretical predictions of North-South models of FDI. In particular, Feenstra and Hanson (1997) argue that FDI may increase the skill premia not only in the advanced source countries of FDI (by offshoring the relatively unskilled labour intensive lines of production), but also in the less advanced host country. FDI-related activities tend to be relatively skilled labour intensive in the host country, even though they are relatively unskilled labour intensive by the standards of the source country.

According to Aghion and Howitt (1998: chapter 8), FDI-induced skill premia in the host countries could be a temporary phenomenon. By triggering a "transition to a new technological paradigm" (Aghion and Howitt 1998: 262) FDI raises the demand for more skilled labour. In particular, the skill premium increases as long as domestic firms are struggling to absorb new technologies and the transition results in high demand for skills that are in short supply. The supply of the required skills is expected to improve over time to the extent that firms manage the transition to the new technological paradigm and workers acquire the necessary skills.

The theoretical reasoning of Feenstra and Hanson (1997) as well as Aghion and Howitt (1998) suggests that education and worker qualification in the host countries represent important pull factors of FDI and ensure smoother technological transitions. Indeed, empirical studies consider the endowment of host countries with human skills to be an important determinant of FDI (e.g., Noorbakhsh et al. 2001; Nunnenkamp and Spatz 2002). Insufficient education and worker qualification could discourage FDI inflows and impair transition processes particularly in middle-income countries where local governance structures and essential physical infrastructure are no longer binding constraints. Comparative evaluations and surveys on schooling, education and qualification indicate that various Latin American host countries may fall into this category.

The World Bank's World Business Environment Survey (WBES) uses a uniform questionnaire to compare the severity of constraints by "listening to firms" (World Bank 2003: 1).

According to this survey, more than half of the firms rated education in Latin America to be "slightly bad," "bad," or "very bad" (World Bank 2003: 64). This share was higher than in any other region, including Africa. At the same time, the share of firms rating public services in Latin America to be bad was lower in most other fields (notably infrastructure and utilities) than in education. The Global Competitiveness Report of the World Economic Forum provides a more detailed ranking with respect to several educational indicators (Figure 2). As can be seen, our Latin American sample countries are hardly represented in the top tercile of all 144 countries included in this report. While various Latin American countries occupy the middle range in terms of school enrolment ratios, most of them cluster at the bottom with respect to quality aspects of education. The OECD's Programme for International Student Assessment (PISA) underscores the poor quality of education. Eight of our Latin American sample countries participated in the PISA round of 2009.[5] Their performance in terms of reading, science and math proficiency was considerably below the median, and most of the Latin American countries ended up in the lowest quartile in all three dimensions.[6]

[Figure 2 about here]

According to data from UNESCO, public expenditure on education (in % of GDP) varies considerably within Latin America.[7] However, Michaelowa and Weber (2007) find no compelling evidence that higher domestic expenditure on education improves outcomes in terms of school enrolment and completion rates. They conclude that "this confirms parts of the educational development literature which suggests that inefficiencies in national education expenditure are so

[5] Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, and Uruguay. For detailed results, see "education" under: http://www.oecd.org/statistics (accessed: October 2012).
[6] Chile and Uruguay performed slightly better.
[7] It should be noted that Latin American countries do not generally underperform in terms of public expenditure on education compared to selected countries in other regions with expenditure shares of about five per cent in recent years (e.g., Germany, Hungary, Rep. of Korea, and South Africa). Cuba reported outstandingly high expenditure shares of 12-14 per cent in 2007-2009. Argentina, Brazil, Costa Rica, and Mexico are close to the five per cent benchmark. On the other hand, countries with expenditure shares below three per cent include the Dominican Republic and Peru. For details, see: http://stats.uis.unesco.org/unesco/TableViewer/document.aspx?ReportId=143&IF_Language=eng (accessed: October 2012).

important that results are only loosely related to financial inputs" (Michaelowa and Weber 2007: 381). Likewise, domestic expenditure on education has insignificant effects on educational outcome variables considered by Dreher et al. (2008) as well as d'Anglepierre and Wagner (2010).

In striking contrast to domestic expenditure, foreign aid for education appears to be effective in improving educational outcome variables. Michaelowa and Weber (2007) find that aid for education increases primary education, even though the impact of aid is rather small and conditional on local governance. Likewise, Dreher et al. (2008) show that higher per-capita aid for education significantly increases primary school enrolment. This result proves to be robust to the method of estimation, the use of instruments to control for the endogeneity of aid, and the set of control variables included in the estimations. D'Anglepierre and Wagner (2010) focus on aid for primary education and consider a broader spectrum of educational outcome variables, including completion and repetition rates as well as gender parity. Aid in this particular category proves to be strongly effective.

Taken together, these strands of the literature invite the hypothesis that aid for education helps attract FDI inflows, notably to where schooling and education appears to be deficient as in large parts of Latin America. Our focus on aid with the explicit purpose of removing educational bottlenecks in the recipient countries deviates from previous studies on the links between aid and FDI. Almost all of these studies apply aggregate aid data, starting with Papanek (1973) who observed a statistically insignificant correlation between aid and FDI across countries in the 1950s and 1960s. While Papanek (1973: 123) rejected the view that "aid is biased in favour of the countries which are hospitable to (and often exploited by) the private investors of aid donor countries", Berthélemy and Tichit (2004) find some evidence that donors grant more aid to host countries of FDI.[8]

[8] Berthélemy and Tichit (2004) regard higher FDI inflows (in per cent of GDP) as an indicator of 'good' economic policies. The coefficient on FDI proves to be sensitive to the specification of the estimation equation and to the time period considered.

Harms and Lutz (2006) is the most prominent study on whether aid stimulates private foreign investment. Using data for 92 developing host countries during the 1988-1999 period, Harms and Lutz find that aggregate aid per se has no significant impact on foreign investment flows.[9] Surprisingly, however, the effect of aid proves to be strictly positive "where firms have to cope with substantial restrictions on their activities" (Harms and Lutz 2006: 780). Karakaplan et al. (2005) concur that aid per se has no positive effect on FDI. In contrast to Harms and Lutz, however, Karakaplan et al. show that aid is more likely to induce FDI in host countries with better governance and more developed financial markets. Asiedu et al. (2009) find that aid per se is negatively associated with FDI in low-income host countries, but aid tends to mitigate the adverse effects of country risk on FDI. Unconditionally positive effects of aid from bilateral sources, though not from multilateral sources, are reported by Yasin (2005) whose panel analysis covering the 1990-2003 period is restricted to eleven sub-Saharan Africa countries.[10] Blaise (2005; 2009) considers Japanese aid to be a determinant of Japanese FDI in China and, respectively, in four south-east Asian countries. Employing conditional logit analyses based on firm-specific data, both case studies reveal that aggregate Japanese aid had a significantly positive impact on the location choices of Japanese direct investors.[11]

All these studies ignore the sector-wise composition of aid. This may help explain the highly ambiguous results. As a first step toward disaggregating aid, Kimura and Todo (2010) distinguish between five major donors and separate 'aid for infrastructure' from other aid (mainly budget support, debt relief, and humanitarian aid). Both types of aid prove to be insignificant as

[9] Note that the dependent variable in Harms and Lutz (2006) includes FDI and portfolio equity investment. However, their results are essentially the same when considering only FDI in a robustness test. As concerns the aid variable, Harms and Lutz differentiate between loans and grants and also between aid from bilateral and multilateral sources in additional robustness tests. However, they do not consider sector-specific aid.

[10] In an earlier cross-section analysis for individual years (1976, 1979, or 1980), Schneider and Frey (1985) consider aid from three sources as possible determinants of FDI flows to developing countries: Western donor countries, communist donor countries, and multilateral institutions. While aid from communist countries enters significantly negative in their cross-country regression, the coefficients on aid from the other two sources are significantly positive.

[11] Blaise (2009) provides a detailed description of the sector-wise composition of Japanese aid to Indonesia, Malaysia, the Philippines, and Thailand. However, aggregate aid disbursements from the database of the OECD's Development Assistance Committee are used in the econometric estimation. Likewise, Kang et al. (2011) use aggregate aid data to show that Korean aid resembles Japanese aid in promoting bilateral FDI.

determinants of FDI, except for FDI from Japan. Kimura and Todo focus on the so-called vanguard effect of Japanese aid promoting Japanese FDI, though not FDI from other sources, but they hardly consider truly sector-specific aid. Their definition of 'aid for infrastructure' is extremely broad and includes aid for projects related to social and economic infrastructure as well as aid for production activities and so-called multi-sector aid.

Selaya and Sunesen (2012) refine major aid categories to address the theoretical ambiguity mentioned in our introduction above. Specifically, projects related to social and economic infrastructure are supposed to attract FDI by improving the supply of complementary factors of production. By contrast, aid is supposed to crowd out FDI when granted as "pure physical capital transfers" (Selaya and Sunesen 2012: 2155). Indeed, the empirical analysis reveals the expected opposing effects of both types of aid on FDI, even though the categorization of aid is still fairly broad and not related to specific 'needs' or bottlenecks to FDI in the recipient countries.[12] Kapfer et al. (2007) focus on aid for economic infrastructure (communication, transportation, energy), which they find to have a significant effect on FDI. Mayer's (2006: 34) analysis of dyadic aid and FDI patterns suggests, however, that the "very strong effect [of aid for infrastructure] seems entirely caused by the cross-sectional variation in the data" and largely disappears once country-pair fixed effects are included.

Mayer (2006) represents the only study that also considers aid for social infrastructure as a distinct determinant of FDI, with similarly sensitive results as in the case of aid for economic infrastructure. We suspect that social infrastructure is still too broad a concept to capture specific bottlenecks to FDI that sector-specific aid may help overcome. The OECD's aid statistics subsume not only aid for education, health, and water & sanitation under 'social infrastructure' but also aid projects related to government administration and civil society. As a matter of fact, education

[12] Note that aid for infrastructure covers (i) social infrastructure such as education, health, and water & sanitation and (ii) economic infrastructure such as energy, communication and transportation. Accordingly, aid for infrastructure accounted for about half of total aid in the sample used by Selaya and Sunesen (2012: 2158). Aid invested in physical capital includes aid projects in agriculture, manufacturing, trade, banking, and tourism.

accounted for just about 20 per cent of total aid commitments listed under 'social infrastructure' by all donors in recent years (2005-2010).[13]

3. EMPIRICAL ANALYSIS

The analysis in this section examines the relationship between aid for education and FDI in Latin America. We first describe the empirical model and the data. Subsequently, we present fixed-effects estimates of the impact of aid for education on FDI. Finally, we test the robustness of our results.

3.1. Empirical model and data

Our model is of the general form:

$$FDI_{it} = \beta_1 Aid_{it} + \sum_{m=1}^{M} \gamma_m X_{mit} + \alpha_i + \alpha_t + \varepsilon_{it} \quad (1)$$

where $i = 1, 2, ..., N$ is the country index; $t = 1, 2, ..., T$ is the time index; *FDI* represents net FDI inflows relative to GDP; and *Aid* stands for net aid flows relative to GDP.[14] In line with our reasoning above, we decompose *Aid* into aid for education, *Aidedu*, and all other (non-education) aid, *Aidother*. *X* is the usual vector of *m* time-varying control variables. Following Harms and Lutz (2006), we control for GDP per capita (GDP^{pc}), the trade-to-GDP ratio (*Trade*), governance (*Governance*), and investment risk (*Investment risk*). We include fixed effects, α_i, to control for any country-specific omitted factors that are stable over time. We also include period dummies, α_t, to account for common time effects such as shocks affecting all countries at the same time, as is standard in the literature.

The empirical analysis covers the period from 1984 to 2008.[15] As is common practice in panel studies, we use time-averaged data to eliminate business cycle effects. Specifically, we construct five-year averages as in Selaya and Sunesen (2012). This gives us five periods for our

[13] For details, see: http://stats.oecd.org/index.aspx?DataSetCode=CRS1 (accessed: October 2012).
[14] We follow previous studies in defining FDI and aid relative to GDP (e.g., Yasin 2005; Karakaplan et al. 2005). The reason is that both net aid and net FDI flows are negative in some years. These observations would be lost when taking logs. GDP data are from the World Development Indicators (WDI) (http://data.worldbank.org).
[15] Note that data on investment risk (described below) are not available before 1984.

panel (1984-1988 until 2004-2008). We include all Latin American countries with available data, with the exception of countries with a population below one million.[16] This yields a sample of 21 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

We now describe the data used in the empirical analysis. For our FDI variable, we use net FDI inflows from the United Nations Conference on Trade and Development (UNCTAD) FDI database.[17] As noted before, we distinguish two types of aid: aid for education, and aid for other purposes. Both categories of aid are based on aid commitments reported in the Creditor Reporting System (CRS) database of the Development Assistance Committee (DAC) of the OECD.[18] Aid for education includes aid for basic education, secondary education, postsecondary education, and unspecified levels of education according to CRS purpose code 110. *Aidother* comprises all other CRS purpose codes except code 110.

Principally, it would be more appropriate to use aid disbursements, instead of aid commitments, as the effects of aid should depend on actual flows rather than donor promises that are often not fully met. However, reliable data on sector-specific aid disbursements are available only for the more recent past.[19] Therefore, we follow previous studies and use aid data on a commitment basis in our baseline estimations (see, e.g., Dreher et al. 2008; Kimura and Todo 2010). This is reasonable as commitments and disbursements are usually highly correlated (see also Clemens et al. 2012). Nevertheless, we perform a robustness test below where we use estimated disbursements of aid for education, by multiplying sector-specific commitments with the ratio of

[16] We follow Harms and Lutz (2006) in excluding extremely small countries.
[17] Available at http://unctadstat.unctad.org
[18] Available at http://www.oecd.org/dac/stats/idsonline
[19] For a more detailed discussion of data issues with regard to sector-specific aid, see Michaelowa and Weber (2007), Dreher et al. (2008), and Clemens et al. (2012).

overall aid disbursements over overall aid commitments taken from the DAC's aggregate aid statistics.[20]

Our control variables are drawn from the previous empirical literature on the aid-FDI relationship. Data for GDP per capita (in 1000 US dollars) and trade (exports plus imports relative to GDP) are from the WDI online database. Following Harms and Lutz (2006) and Kapfer et al. (2007), we lag both variables one period to alleviate potential endogeneity problems.

As far as the measure of governance is concerned, the often used World Governance Indicators from the World Bank are available only from 1997 onwards. Therefore, we follow Kapfer et al. (2007) and include the democracy index from the POLITY IV database.[21] This index ranges from –10 (strongly autocratic) to +10 (strongly democratic). The choice of this variable is based on the following considerations: There is evidence to suggest that the level of democracy is both a determinant of aid (e.g., Alesina and Dollar 2000) and a determinant of FDI (e.g., Jensen 2003). Thus, one should control for democracy to avoid omitted variable bias. Moreover, the level of democracy appears to be a good proxy for the quality of governance. Li and Resnick (2003: 187), for example, point out that "democratic institutions […] collectively serve to secure private property rights and lower the risks of expropriation, contract repudiation, ineffective rule of law, and government corruption […]." Nevertheless, the relation between democracy and FDI is theoretically ambiguous. For instance, Li and Resnick (2003) argue that democratic governments are more likely to impose restrictions on multinational enterprises to prevent them from taking advantage of monopolistic positions. FDI could be discouraged by such restrictions. Therefore, we consider two alternative, more specific measures of governance in the robustness section: the Freedom House Civil Liberties index and the Freedom House Political Rights Index.[22]

[20] In an additional robustness test, we also account for possible underreporting by donors in the CRS statistics (Michaelowa and Weber 2007). Assuming that underreporting in the CRS statistics would affect all aid sectors to the same extent, we adjust the estimated disbursements of sector-specific aid (as defined above) by the ratio of overall commitments reported in DAC's aggregate aid statistics over overall commitments reported in the CRS.
[21] Available at http://www.systemicpeace.org/polity/polity4.htm
[22] Available at http://www.freedomhouse.org

Finally, in line with Harms and Lutz (2006) and Selaya and Sunesen (2012), we include a measure of investment risk: the investment profile index from the International Country Risk Guide (ICRG), published by the Political Risk Services Group.[23] This measure assesses several factors affecting the risk to investment, including contract viability and payment delays, and ranges from 0 (very high risk) to 12 (very low risk). Table 1 presents summary statistics on the variables included in Equation (1).

[Table 1 about here]

3.2. Baseline results

The baseline results are presented in Table 2. The effects of most of the control variables on FDI are in line with previous studies. The coefficients on the volume of trade and GDP per capita are positive, although only GDP per capita seems to have a statistically significant influence on FDI flows. As in previous studies (e.g., Harms and Lutz 2006) we also find lower investment risk and FDI to be significantly and positively correlated (recall that higher values imply a less risky business environment). More surprisingly, the negative coefficient on our governance variable suggests that more democratic regimes attract *less* FDI. While Kapfer et al. (2007) report the same finding, it is clearly at odds with the view that democratization induces more FDI through better governance in the broadest sense. It rather appears that FDI is discouraged by restrictions on the activities of multinational enterprises that democratic governments are more likely to impose (Li and Resnick 2003).

[Table 2 about here]

Turning to the variables of major interest, we do not find any statistically significant influence of aid to other sectors (*Aidother*) on FDI inflows. This is in line with the ambiguous

[23] See https://www.prsgroup.com/prsgroup_shoppingcart/pc-75-7-icrg-historical-data.aspx

results of previous studies using aggregate aid data. By contrast, aid for education is positively associated with FDI in Latin American countries. The *t*-value of *Aidedu* is highly significant, and the point estimate implies that an increase of *Aidedu* by one standard deviation increases the FDI-to-GDP ratio by more than one percentage point – an economically large effect.

3.3. Potential outliers

We perform several sensitivity tests in order to examine the robustness of the significantly positive effect of aid for education on FDI. Given the relatively small number of countries in our sample, we first need to ensure that the positive coefficient on *Aidedu* is not due to potential outliers. To this end, we re-estimate Equation (1), excluding one country at a time from the sample. The sequentially estimated coefficients and their *t*-statistics are presented in Figure 3. The horizontal axis lists the country omitted from the regression, beginning with Argentina (as the first omitted country) and ending with Venezuela. On the vertical axis we plot the respective coefficients and *t*-statistics of the aid variable in the remaining sample of twenty countries. As can be seen, the estimated coefficients are relatively stable and always significant at least at the five per cent level, suggesting that the positive effect of aid for education on FDI is not the result of an individual outlier.

[Figure 3 about here]

3.4. Potential sample selection bias

The positive relationship between aid for education and FDI may be due to sample selection bias if, for example, a group of countries in a particular region has a significant effect on the results. To investigate this, Equation (1) is re-estimated excluding either countries from the Caribbean (Cuba, Dominican Republic, Haiti, and Jamaica) or those in Central America (Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama). In additional estimations, we exclude:

- the three countries with the highest per capita income (Argentina, Mexico, Uruguay) or those with the lowest per capita income (Bolivia, Nicaragua, Haiti),
- the three countries with the highest share of FDI in GDP (Chile, Jamaica, Bolivia) or those with the lowest share of FDI in GDP (Paraguay, Haiti, Cuba), and
- the three countries with the highest share of aid for education in GDP (Nicaragua, Haiti, Bolivia) or those with the lowest share of aid for education in GDP (Argentina, Brazil, Mexico).

The resulting coefficients on *Aidedu* are listed in Table 3. They are all significant at least at the five per cent level, suggesting that the positive effect of aid for education on FDI is not due to sample selection bias.

[Table 3 about here]

3.5. Alternative measures of aid, FDI, and governance

Next, we examine whether our results are robust to using alternative measures of aid, FDI, and governance. In column (1) of Table 4, we use estimated disbursements of aid, as defined above, instead of aid commitments. Our results are hardly affected by this modification. In particular, estimated disbursements of aid for education enter significantly positive at the one per cent level, and the size of the coefficient is similar to that in Table 2. The baseline results are also corroborated insofar as *Aidother* proves to be insignificant once again. The same applies in column (2) where we account for possible underreporting by donors in the CRS statistics. Specifically, we adjust the estimated disbursements of sector-specific aid by the ratio of overall commitments reported in DAC's aggregate aid statistics over overall commitments reported in the CRS. As before, aid for education enters highly significant, though with a somewhat lower positive coefficient.

In the following, we return to our standard approach of using aid commitments. In column (3) of Table 4, we replace FDI flows by FDI stocks (relative to GDP) as our dependent variable.

The coefficient on *Aidedu* is still statistically significant and its impact continues to be quantitatively important. An increase of *Aidedu* by one standard deviation induces an increase in the FDI stocks-to-GDP ratio of four percentage points. In column (4), we follow Kapfer et al. (2007), Kimura and Todo (2010), and Kang et al. (2011) and use absolute FDI flows as the dependent variable and absolute aid flows as regressor. As can be seen, the coefficient on aid for education remains positive and statistically significant. Interestingly, the sign of our governance variable changes from negative to positive (although it is not significant).

In columns (5) and (6), we return to our standard definition of aid and FDI variables, relative to GDP. However, we replace the POLITY IV democracy index by two more specific measures of governance (see, e.g., Yasin 2005; Michaelowa and Weber 2007): the Freedom House Civil Liberties index and the Freedom House Political Rights Index. Irrespective of whether we use the POLITY IV measure or the Freedom House measures, the coefficient on *Aidedu* is statistically significant and positive, as the results in columns (5) and (6) show. At the same time, the alternative governance measures prove to be insignificant at conventional levels in Table 4. Presumably, this is at least partly because the variation of governance measures across countries is removed by the inclusion of country fixed effects, while the variation of governance measures over time is typically limited.

[Table 4 about here]

3.6. Alternative estimation methods

Finally, we investigate whether the estimates are robust to using alternative estimation methods. Specifically, a potential problem with the above estimation procedure could be that it assumes aid for education to be exogenous. However, aid may be endogenous. For example, causation may run from FDI to aid if foreign investors lobby their governments to increase aid. In particular, foreign investors drawing on qualified local labour may lobby for aid for education to be granted to their

preferred host countries. As a consequence, the above fixed effects estimations on the impact of aid on FDI may be biased upwards. On the other hand, the fixed effects estimations may be biased downwards if donors grant more aid to compensate for reduced FDI flows, for instance at times of economic and financial crises or in the aftermath of natural disasters.

To account for the potential endogeneity of aid, we re-estimate Equation (1) by two-stage least squares (2SLS) using as instruments lagged values of aid for education, the log of population, the lagged log of population, and the log of the infant mortality rate (from the WDI online database). Such instruments are widely used in the aid-growth literature (see, e.g., Boone 1996; Burnside and Dollar 2000; Hansen and Tarp 2000). The 2SLS results are presented in column (1) of Table 5. As far as the quality of our instruments is concerned, the F-statistic reported at the bottom of Table 5 suggests a strong explanatory power of the first stage regression, and the Hansen J-test of over-identification restrictions shows that the instruments are uncorrelated with the error term in the second stage equation. Thus, our instruments are relevant and exogenous. The coefficient on *Aidedu* is again statistically significant, corroborating the positive effect of aid for education in the baseline estimation. Surprisingly, the effect is quite large (6.577) compared to its counterpart in Table 2 (3.926). In other words, our fixed effects estimate appears to be biased downwards due to endogeneity. However, a Durbin-Wu-Hausman (DWH) test rejects the null hypothesis that aid for education is exogenous only at the ten per cent level (p-value = 0.075). This implies that we should be cautious in concluding that the two-stage instrumental variables estimation is clearly superior to the fixed effects estimation.

[Table 5 about here]

Indeed, we do not find compelling evidence for a downward bias of aid effects on FDI when employing a Generalized Methods of Moments (GMM) IV estimator to account for possible endogeneity of aid. The most commonly used GMM estimators are the Arellano and Bond (1991)

difference GMM estimator and the Blundell and Bond (1998) system GMM estimator. Both estimators are based on a dynamic panel data model with the lagged dependent variable as a regressor. This variable captures the impact of the self-reinforcing effect of past values of the dependent variable (and its determinants) and thus determines the long-run response of the dependent variable to changes in the explanatory variables.

The Arellano and Bond (1991) estimator involves first removing the fixed effects from the regression by first-differencing and then instrumenting the differenced right-hand-side variables using lagged values of the original regressors. However, Alonso-Borrego and Arellano (1999) have shown that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small-sample performance of the difference estimator toward inefficient and biased coefficient estimates, respectively. Therefore, we use the Blundell and Bond (1998) system GMM estimator. This estimator reduces the weak instrument bias by using lagged differences as instruments in the levels equation. More specifically, it combines the regression equation in differences and the regression equation in levels into one system. For the equation in differences, the instruments are lagged levels of the explanatory variables. For the equation in levels, the instruments are lagged differences of the independent variables.

The system GMM results (SYS-GMM) are presented in column (2) of Table 5. Column (2) also reports the Hansen J-test and a serial correlation test (AR2) where the null hypothesis is that the errors in the differenced equation exhibit no second-order serial correlation (by construction, the differenced error term is probably first-order serially correlated even if the original error term is not). As can be seen, the tests suggest that the instruments are valid and that the errors in the first-difference regression exhibit no second-order serial correlation.

Many authors do not place much emphasis on the significance of the lagged dependent variable (e.g., Forbes 2000). Yet, it is worth mentioning that the lagged FDI variable it is not

significant in Table 5. We accounted for the possibility that the coefficient on the lagged dependent variable becomes insignificant when the number of instruments is too large. Roodman (2009a) argues that as the time dimension increases, the number of instruments can be too large compared to the sample size, so that some asymptotic GMM results and specification tests are not valid. Too many instruments can overfit instrumented variables and fail to expunge their endogenous components, resulting in biased coefficients. Unfortunately, there is little guidance in the literature to determine how many instruments are "too many" (Roodman 2009a). As a "minimally arbitrary rule of thumb", Roodman (2009b: 99) suggests that the number of instruments should not exceed the number of countries in the regression. Because our sample includes only 21 countries, we reduced the number of instruments from a maximum of 31 unrestricted instruments to 19 restricted instruments by using only two-period lags of aid for education (and the lagged dependent variable) as instruments. Nevertheless, the behaviour of FDI and its determinants in previous periods does not appear to matter for current FDI.

This implies that aid for education would have only short-run effects on FDI according to the GMM results shown in column (2) of Table 5. Importantly, the coefficient on *Aidedu* is positive and highly significant once again. Moreover, the short-run effect is of similar magnitude as in the baseline estimation in Table 2. All in all, we tend to prefer the estimates in Table 2 over those in Table 5. This is also because both the Arellano-Bond estimator and the Blundell-Bond estimator are designed for large *N* (and small *T*) and thus may be biased in small country samples (as here).

4. CONCLUSION

Well targeted sector-specific foreign aid could possibly remove critical impediments to higher FDI inflows and, thereby, help diffuse FDI-related benefits across a wider spectrum of developing host countries. Specifically, we raise the hypothesis that aid for education is an effective means to increase FDI flows to host countries where schooling and qualification appear to be inadequate from the viewpoint of foreign direct investors. This is the case in large parts of Latin America.

Our results provide strong empirical evidence that aid for education is indeed associated with higher net FDI inflows to developing countries in Latin America. Employing data for 21 countries over the period from 1984 to 2008, we find no statistically significant effect of other (non-education) aid. By contrast, aid for education proves not only statistically significant but also has a quantitatively important positive impact on FDI flows to Latin American economies. In our baseline estimation, an increase in the ratio of aid for education over GDP by one standard deviation raises the FDI-to-GDP ratio by more than one percentage point. This finding is robust to potential outliers, sample selection, and different variable definitions. The impact might even be stronger when using different estimation techniques to correct for potential endogeneity issues.

Our findings suggest that aid can be effective even though the relation between aggregate aid and economic growth appears to be elusive. This underscores the need to disaggregate aid and assess its effects on more specific outcome variables. To further explore possible synergies between aid and FDI flows (OECD 2002), the case of aid for education in Latin America invites future research into the alignment of sector-specific aid with FDI-related needs in particular host countries or regions. For instance, aid targeted at fighting HIV/AIDS could improve access to FDI for countries with particularly high infection rates. Likewise, aid may help upgrade physical infrastructure and, thereby, remove critical impediments to higher FDI flows to where physical infrastructure is particularly deficient. At the same time, deeper insights into the relationship between aid and FDI could be gained if inward FDI was differentiated by sectors and industries. It clearly deserves more attention whether sector-specific aid such as aid for education attracts FDI to certain sectors and particular types of FDI, though not necessarily other types.

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Table 1. *Summary statistics and bivariate correlations*

	Observations	Mean	Min.	Max.	Std. Dev.
FDI	82	0.0282	0.0000	0.0927	0.0212
Aidedu	82	0.0016	0.0000	0.0127	0.0027
Aidother	82	0.0349	0.0002	0.3976	0.0651
Trade	82	0.5834	0.1521	1.7905	0.3234
GDP^{pc}	82	2.325	0.332	7.814	1.570
Governance	82	6.6732	-7.0000	10.0000	3.7675
Investment risk	82	6.9498	3.0167	11.5000	1.9328

Correlation coefficients

	FDI	*Aidedu*	*Aidother*	*Trade*	GDP^{pc}	*Governance*	*Investment risk*
FDI	1.00	-	-	-	-	-	-
Aidedu	0.16	1.00	-	-	-	-	-
Aidother	0.04	0.78	1.00	-	-	-	-
Trade	0.43	0.06	0.03	1.00	-	-	-
GDP^{pc}	0.20	-0.52	-0.49	-0.11	1.00	-	-
Governance	0.44	0.01	0.01	0.22	0.16	1.00	-
Investment risk	0.59	-0.16	-0.28	0.26	0.36	0.46	1.00

Table 2. *Baseline results*

Aidedu	3.926** (3.02)
Aidother	0.019 (0.47)
Trade	0.014 (0.86)
GDP^{pc}	0.004** (5.89)
Governance	-0.002* (-2.64)
Investment risk	0.006** (3.56)
Number of observations	82
Number of countries	21
Adj. R^2	0.66

Note: *t*-statistics (calculated with White-corrected standard errors) are in parenthesis. **, (*) indicate significance at the one- (five-) per cent level. Coefficients for country and time fixed effects are not reported.

Table 3. *Estimates of the effect of aid for education on FDI using different samples*

	Coefficient on *Aidedu*	Number of countries in the sample	Number of observations
Excluding the Caribbean	3.948** (2.77)	17	68
Excluding Central America	4.294* (2.53)	14	54
Excluding the three countries with the highest GDP per capita	4.477** (3.77)	18	70
Excluding the three countries with the lowest GDP per capita	3.378** (3.18)	18	71
Excluding the three countries with the highest share of FDI in GDP	2.974* (2.37)	18	71
Excluding the three countries with the lowest share of FDI in GDP	4.211** (3.08)	18	71
Excluding the three countries with the highest share of aid in GDP	3.378** (3.18)	18	71
Excluding the three countries with the lowest share of aid in GDP	3.883* (2.69)	18	70

Note: t-statistics (calculated with White-corrected standard errors) are in parenthesis. **, (*) indicate significance at the one- (five-) per cent level. Coefficients for country and time fixed effects are not reported.

Table 4. *Estimates using different measures of aid, FDI, and governance*

	Alternative measures of FDI and aid				Alternative measures of governance	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	FDI flows in % of GDP	FDI flows in % of GDP	FDI stocks in % of GDP	FDI (absolute)	FDI in % of GDP	FDI in % of GDP
Aid variable	Estimated aid disbursements in % of GDP	Estimated aid disbursements in % of GDP (adj. for underreporting)	Aid in % of GDP	Aid (absolute)	Aid in % of GDP	Aid in % of GDP
Governance variable	POLITY	POLITY	POLITY	POLITY	Civil liberties	Political rights
Aidedu	4.354** (3.21)	3.316** (3.94)	15.144* (2.27)	140.467** (3.80)	3.453* (2.50)	3.430* (2.46)
Aidother	0.033 (1.00)	-0.004 (-0.10)	-0.389 (-1.13)	-3.945 (-1.64)	-0.006 (-0.16)	-0.008 (-0.21)
Trade	0.015 (0.90)	0.016 (0.95)	0.087 (1.59)	136.256 (0.10)	0.007 (0.51)	0.006 (0.49)
GDP^{pc}	0.004** (6.41)	0.003** (7.14)	0.013 (1.59)	1943.061* (2.41)	0.003** (6.75)	0.003** (6.09)
Governance	-0.002** (-2.72)	-0.002** (-3.43)	-0.003 (-0.58)	162.265 (0.79)	-0.001 (-0.24)	-0.001 (-0.49)
Investment risk	0.006** (3.65)	0.006** (3.61)	0.004 (0.57)	149.225 (0.30)	0.005** (2.84)	0.005** (2.96)
No. of observations	82	82	81	82	82	82
Number of countries	21	21	21	21	21	21
Adj. R^2	0.66	0.66	0.82	0.76	0.64	0.65

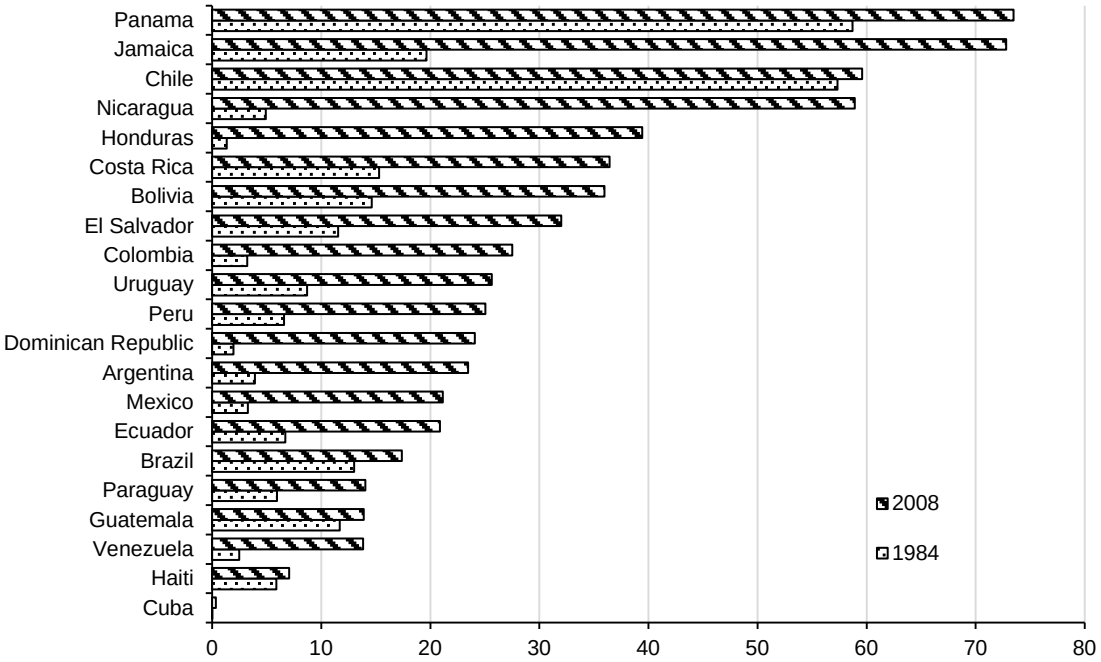
Note: t-statistics (calculated with White-corrected standard errors) are in parenthesis. **, (*) indicate significance at the one- (five-) per cent level. Coefficients for country and time fixed effects are not reported.

Table 5. *Alternative estimation methods*

	(1) 2SLS	(2) SYS-GMM
Aidedu	6.577**	3.283**
	(2.79)	(4.35)
Aidother	0.044	-0.029
	(1.60)	(-1.20)
Trade	0.016	0.016*
	(1.26)	(2.04)
GDP^{pc}	0.005**	0.004**
	(14.75)	(2.75)
Governance	-0.002**	0.001
	(-3.46)	(1.36)
Investment risk	0.007**	0.002
	(4.50)	(1.33)
FDI (lagged)		0.326
		(1.25)
Number of observations	81	82
Number of countries	21	21
Adj. R^2	0.640	-
Number of instruments	4	19
1st stage F-statistic (p-value)	0.00	-
Hansen J-statistic (p-value)	0.971	0.632
AR2-test (p-value)	-	0.687

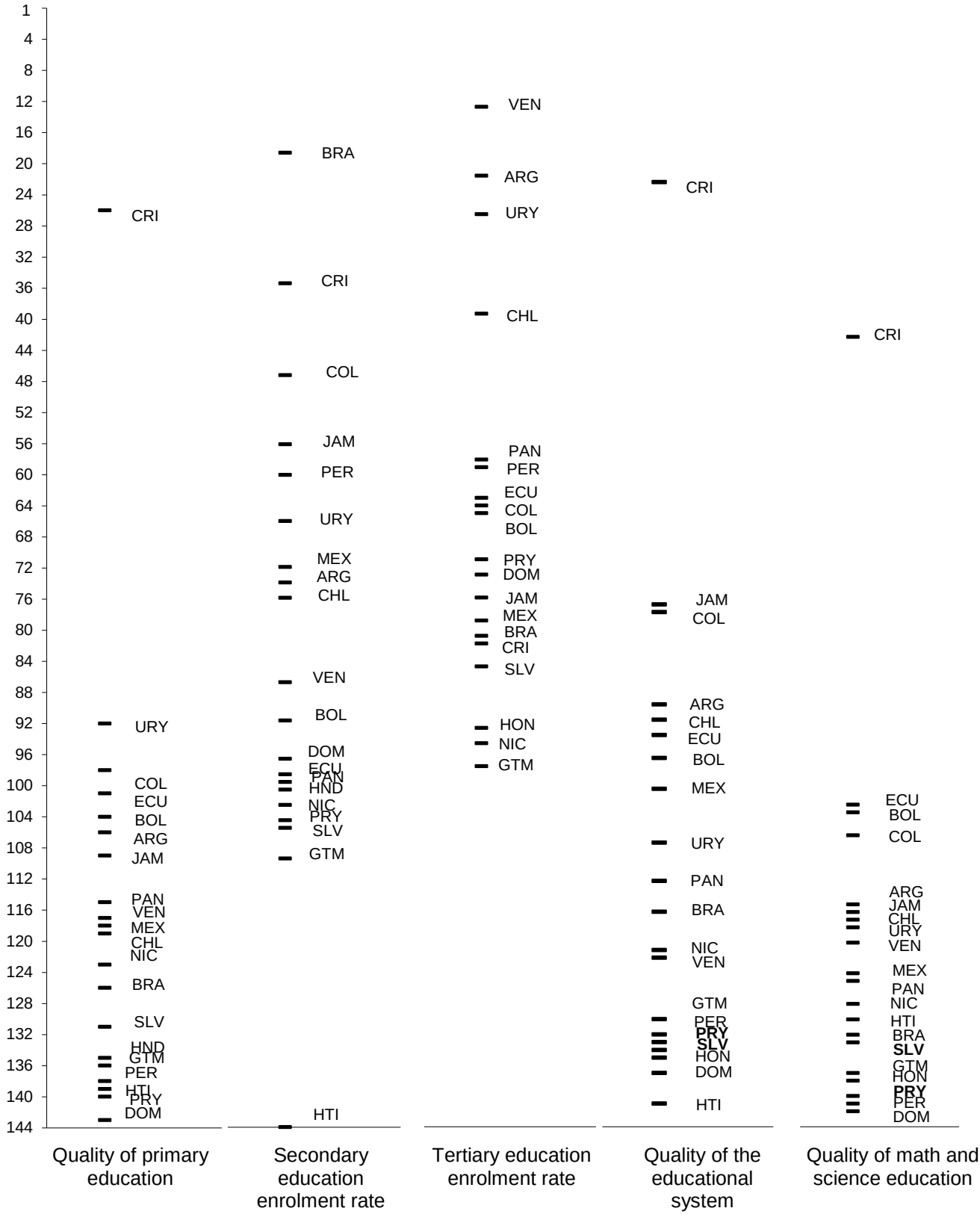
Note: t-statistics (calculated with White-corrected standard errors) are in parenthesis. **, (*) indicate significance at the one- (five-) per cent level. Coefficients for country and time fixed effects are not reported. GMM results are reported for two-step GMM estimator using the finite sample correction proposed by Windmeijer (2005).

Figure 1 — FDI stocks in per cent of GDP, 21 Latin American sample countries, 1984 and 2008



Source: UNCTAD online database

Figure 2 — Ranking of Latin American sample countries with respect to education



Note: Cuba is missing in the source; Haiti is missing with respect to tertiary enrolment rate.

Source: World Economic Forum (2012).

Figure 3 — Estimation with single country excluded from the sample