Gender Disparity in Education and the International Competition for FDI

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Abstract

With few exceptions, the empirical literature on foreign direct investment (FDI) continues to be gender-blind. This paper contributes to filling this gap by assessing the importance of gender inequality in education as a determinant of FDI. We estimate a standard gravity model on bilateral FDI flows which is augmented by educational variables, including different measures of gender inequality in education. The analysis covers an unprecedented number of both host and source countries of FDI, thereby reducing the risk of distorted results because of a sample selection bias. Our results clearly reject the view that foreign investors favor locations where education-related gender disparities may offer cost advantages. Rather, we find that gender disparity discourages FDI inflows. However, the strength of this relation depends on the level of education as well as on the destination and source of FDI flows.

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1. Introduction

The question of whether gender inequality hinders or helps the integration of countries into the international division of labor has received only scant attention in the empirical literature. Some evidence exists on the links between gender inequality and trade. Matthias Busse and Christian Spielmann (2006) find that wage inequality is positively associated with comparative advantage in labor-intensive exports, whereas inequality in terms of labor market participation and education is negatively related with such exports. According to Stephanie Seguino (1997), wage inequality may have contributed to the export success of countries such as South Korea.[1] As concerns the countries' attractiveness for foreign direct investment (FDI), however, the role of gender inequality has been largely ignored so far.

This is fairly surprising in the light of the fierce international competition for FDI. Policymakers are falling over themselves in enticing foreign investors, in the hope that FDI inflows would induce higher growth and employment. Yet, it is still open to debate what actually drives FDI inflows.[2] In particular, the fairly large literature on FDI determinants has generally been gender-blind (Elissa Braunstein 2006:1).

This paper attempts to fill this gap by assessing the role of gender disparity with respect to the host countries' attractiveness for FDI. The focus will be on *education-related* gender disparity and its effects on FDI inflows. Opposing hypotheses in this regard call for empirical analyses. We estimate a standard gravity model on bilateral FDI flows which is augmented by educational variables, including different measures of gender inequality in education. We argue that it is crucially important to cover as many host countries of FDI as possible to avoid a sample selection bias.

Our results clearly reject the view that foreign investors favor locations where education-related gender disparities may offer cost advantages. Rather, we find that gender disparity discourages FDI inflows. However, the strength of this relation depends on the level of education, being most pronounced with respect to secondary education. Additional robustness tests reveal that the discouraging effect of gender disparity is somewhat weaker for FDI in developing host countries, and it turns insignificant when considering only FDI flows from developing source countries.

[1] By contrast, Günseli Berik, Yana van der Meulen Rodgers and Joseph E. Zveglich (2004) consider openness to trade to be a determinant of gender wage gaps, finding that greater openness has contributed to wage discrimination of female workers in South Korean and Taiwanese industries.

2. Previous Studies and Gender Disparity Measures

Even though gender issues are hardly addressed in the literature on FDI determinants, there is a strand of this literature that is related to the analysis in this paper. Several studies raise the question of whether FDI tends to go where social standards are low and worker rights repressed, in order to save cost, or rather where social and political conditions are similar to those prevailing in the home country.[3] The question addressed in the following, i.e., whether gender inequality attracts or rather discourages FDI inflows, resembles this strand of the literature on FDI determinants in that there are two opposing hypotheses.

On the one hand, the widely perceived "race to the bottom" (Elissa Braunstein 2002; Kucera 2002) may imply that multinational companies favor locations where education-related gender discrimination offers cost advantages. Arguably, average wages will decline if less educated women enter the labor force in the host country.[4] Multinational companies may be increasingly inclined to exploit unqualified, cheap female labor. They face mounting cost pressure and increasingly refer to vertical types of FDI, which involve the relocation of labor-intensive parts of the value chain to lower-cost locations. At the same time, the fiercer international competition for FDI has added to the bargaining power of multinational companies vis-à-vis the host countries. Hence, policymakers in developing countries may be tempted to attract FDI not only through lower tax rates and outright subsidies, but also through lower social standards, including gender discriminating in education, to offer cheap labor. Gender disparity in education could then be associated with higher FDI inflows.

On the other hand, multinational companies may be more interested in drawing on sufficiently qualified labor, rather than the host country offering just cheap labor. Kucera (2002) refers to survey results according to which the managers of multinational companies rated the quality of labor in the host country to be more important than the cost of labor. Indeed, the empirical evidence suggests that the labor demand of multinational companies is biased towards relatively skilled workers in developing host countries (Overseas Development Institute 2002). Furthermore, multinational companies are increasingly under pressure, notably from NGOs, to show good corporate behavior (Busse 2004). As a

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[2] Avik Chakrabarti (2001) subjects the findings of various studies on FDI determinants to Extreme Bounds Analysis and concludes that few determinants are robust to minor changes in sample selection and the specification of the test equation.

[3] Overall, the available evidence seems to be in conflict with the hypothesis that exploiting low social standards and repressed worker rights represents an important motivation of FDI. The survey of Drusilla K. Brown (2000) concludes that poor labor practices did not attract FDI; recent studies include David Kucera (2002), Phillipp Harms and Heinrich W. Ursprung (2002) and Matthias Busse (2003, 2004).

[4] As noted by Kucera (2002), labor costs tend to decline when some groups of workers are paid less than others for similarly productive work due to discrimination.

consequence, they may shy away from host countries with pervasive social injustice in general, and gender discrimination in particular.[5]

Ideally, we would like to cover several aspects of gender disparity and their effects on FDI inflows, i.e., gender wage gaps, differences in labor market participation rates between males and females, and education-related differences. However, the first two disparity measures are not particularly suited to be considered a possible determinant of FDI in the present context of a large panel of host countries and a time span of about 25 years:

- Data on wage differences are only available for selected years and a limited number of countries.[6] Especially the insufficient country coverage may cause seriously biased results when analyzing FDI determinants (Shatz 2003; Busse, Königer and Nunnenkamp 2007). Moreover, even if available, wage data typically refer to the manufacturing sector only (Kucera 2002; Busse and Spielmann 2006).[7] This limitation is problematic as FDI in developing countries, too, increasingly consists of FDI in the services sector (UNCTAD 2004; Braunstein 2006). And finally, the problem of reverse causation running from FDI to wages and wage disparity would be all but impossible to resolve.
- Similar arguments apply to labor market participation rates. Again, problems of reverse causality loom large (Braunstein 2006). The insignificant results Kucera (2002) achieves when adding the proportion of female workers in industry to his list of FDI determinants may well reflect that causality between FDI and female employment shares goes both ways (see also Braunstein 2002). Moreover, gender-specific labor market participation rates do not necessarily reflect discrimination but may rather be based on voluntary decisions of female workers (Busse and Spielmann 2006).

Consequently, education-related gender disparity appears to be the first choice when analyzing FDI determinants. While theory indicates that the level of education in a host country should influence FDI inflows (Shatz 2003), the possibility of reverse causation, i.e., higher FDI resulting in better education, seems to be rather remote in comparison with wages and employment. The empirical studies of Shatz (2003) as well as Jonathan Eaton and Akiko Tamura (1996), considering education among the determinants of FDI, find that better educated workers in host countries attract higher FDI inflows. However, both studies cover

[5] The point made by Howard J. Shatz (2003) and Matthias Busse, Jens Königer and Peter Nunnenkamp (2007) about sample selection (see below) suggests a further twist to this debate. While multinational companies may shy away from countries that do not pass a basic threshold in terms of social standards and gender equality, companies may exploit cost advantages once this threshold is passed. In order to account for the possible non-linearity in the relation between FDI and gender inequality, the various zero observations with respect to bilateral FDI flows must not be dismissed. The Tobit model we apply in this paper explicitly deals with this issue.

[6] Moreover, Remco H. Oostendorp (2004) stresses the heterogeneous format of available wage data.

only selected source countries of FDI (US FDI in the case of Shatz; US and Japanese FDI in the case of Eaton and Tamura). Furthermore, Braunstein's (2006) verdict that most FDI studies are gender-blind applies to both Shatz (2003) and Eaton and Tamura (1996).

To the best of our knowledge, Kucera (2002) is the only exception in that he considers gender-specific educational variables as determinants of FDI. He does not find evidence suggesting that education-related gender discrimination resulted in higher FDI inflows. Yet, his results are far from robust. The positive effect of (relative) female educational attainment on FDI is significant only when industrial host countries are included in the sample, and the coefficient of this variable even changes its sign once the regressions are run with regional dummies.

Moreover, Kucera's study has some shortcomings that we attempt to overcome in the following. First of all, it is purely cross-sectional, while we use a panel analysis to examine changes over time in the relation between gender gaps in education and FDI. Second, we employ a gravity model on bilateral FDI flows, and we explicitly account for the fact that various host countries have not attracted any FDI flows from particular source countries. Third, we draw on a large new dataset, in order to cover essentially all host countries as well as a large number of source countries and, thereby, avoid or, at least, substantially reduce a sample selection bias.

3. Some Stylized Facts

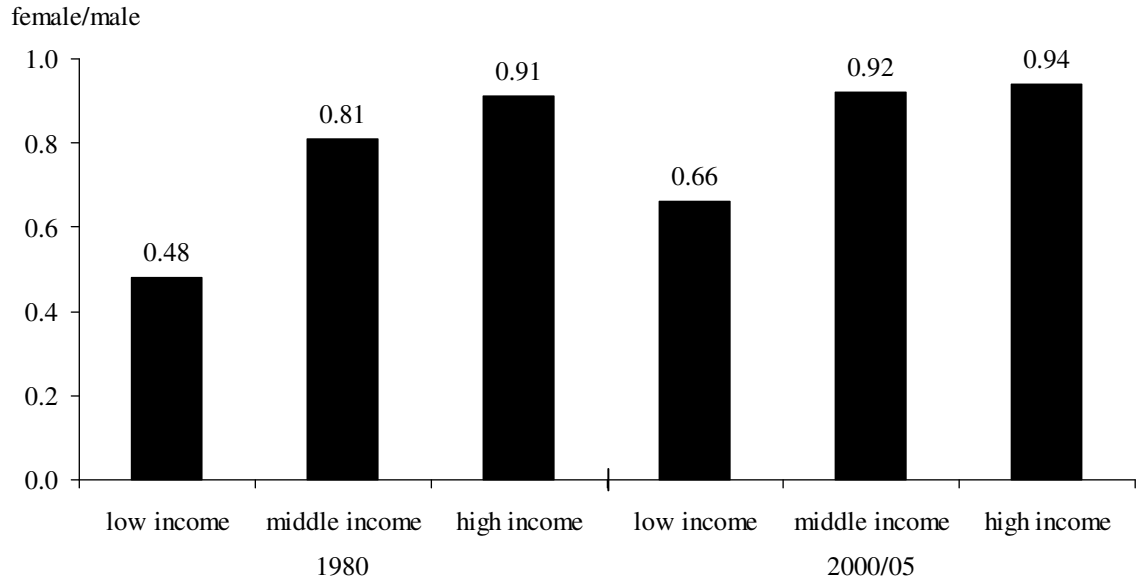
In our baseline regressions, we measure gender gaps in education by comparing females and males with respect to average years of schooling. While we also consider three different levels of education when estimating the Tobit model in Section 5, the subsequent presentation of stylized facts is confined to gender gaps in education at all levels of schooling combined, in order to save space. We compare the situation prevailing in 1980 with that in most recent years (average of 2000 and 2005). The mean and the range of gender differences at specific levels of schooling are presented in Appendix B.

In Figure 1, ratios far below one reflect larger gender gaps in education working against women. On the other hand, women are overrepresented in some countries with ratios above one (notably in several Latin American countries). Not surprisingly, high-income countries, on average, have a relatively narrow gender gap in education, whereas the gap is widest in low-income countries. This applies to both 1980 and most recent years. In contrast

[7] Oostendorp (2004) provides a major exception.

to what one might expect, however, there is also considerable variation over time.[8] Middle-income countries, on average, caught up with high-income countries in terms of narrowing the gender gap; in recent years, middle-income countries resembled the high income group in that the gender gap in education was less than ten percent. At the same time, low-income countries, while still lagging behind, made remarkable progress in expanding schooling of females relative to males.

Figure 1 — Gender Disparity in Schooling[a], 1980 and 2000/2005



[a]Average years of schooling at all levels combined: females divided by males; 2000/2005 represents the average for 2000 and 2005.

Sources: Barro and Lee (2001) and UNESCO (2007).

Moreover, the group averages reported in Figure 1 conceal significantly different developments in particular countries. This may be exemplified by three middle-income countries in Latin America. Colombia and Honduras started from a ratio of close to one in 1980, but subsequent developments diverged: Females spent 24 percent more time in education than males in Colombia in recent years, whereas the ratio of females to males deteriorated to 0.67 in Honduras. Bolivia, starting from a pronounced gender gap (0.68), made substantial progress in closing this gap (to 0.88 in 2000/2005). Similar discrepancies apply to low-income countries in sub-Saharan Africa. Mozambique reported a huge gender gap (0.23) at the beginning of the period of observation, but a relatively narrow one recently (0.69).

[8] For instance, Shatz (2003) argues against panel analyses on education-related determinants of FDI as he suspects variation over time to be marginal.

Ghana and Sudan started from a ratio of females to males in education of about 0.4. While this ratio increased to 0.62 in Sudan, it declined slightly in Ghana.

The wide variation in education-related gender gaps, both across countries and over time, is not restricted to average years of schooling. For groups of countries, similar patterns prevail with respect to the ratio of the literacy rate of adult females relative to that of adult males (not shown).[9] For the average of middle-income countries, the gap revealing the discrimination of women narrowed from 0.81 in 1978 to 0.94 in 2004. Low-income countries, on average, are characterized by a larger gap during the whole period of observation, but the change towards less discrimination of women was more pronounced for this group (from 0.50 to 0.71). Yet, at the country level, changes in the ratio of relative literacy rates may deviate considerably from changes in the ratio of relative years of schooling. As concerns the above mentioned three Latin American economies, for example, the divergent development between Colombia and Honduras does not apply to relative rates of literacy, while Bolivia narrowed the gender gap with respect to literacy rates, too. The progress made by Mozambique is less impressive with respect to relative literacy rates (from 0.28 in 1978 to 0.50 in 2002)[10], which is not surprising considering the path dependence of literacy rates of the adult population. Comparing relative literacy rates between Ghana and Sudan, it is still true that Sudan was more successful in reducing gender disparity, but the deteriorating ratio of relative years of schooling contrasts with an improving ratio of relative literacy rates in Ghana.

Finally, in order to provide first clues on the relation between gender disparity in education and FDI, we perform a simple correlation exercise in the remainder of this section. Gender disparity in schooling and adult literacy is defined as above. We use the most recent data on these indicators for the correlations. FDI in this section refers to inward FDI stocks in 2005 in percent of the host countries' GDP (UNCTAD 2007a). Even though the sample of host countries differs in size and composition, depending on availability of the two indicators of gender disparity, the correlation with FDI turns out to be very similar. In both cases, the correlation coefficient of 0.28 (for schooling) and 0.25 (for literacy) is statistically significant at the 5 percent level. Figure 2 presents the scatter plot when measuring gender disparity by average years of schooling.

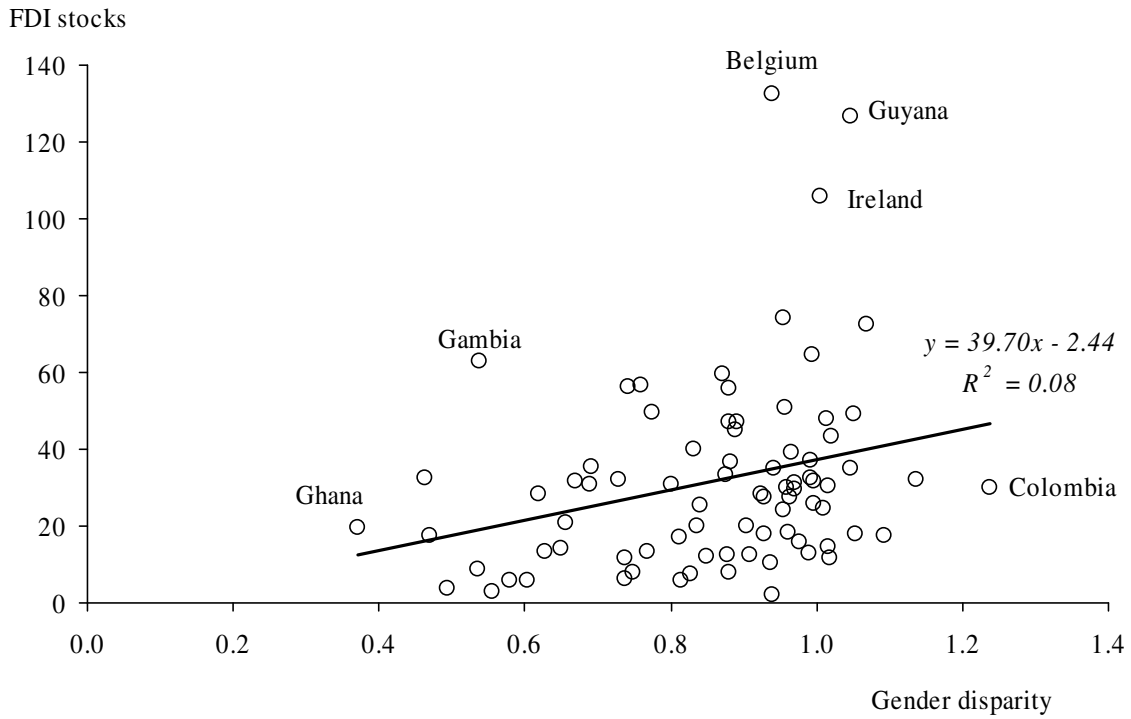
Obviously, the simple correlation does not tell anything about causation. Moreover, it is restricted to the cross-country dimension of the data in the most recent past. Therefore, we

[9] Note that we consider gender specific literacy rates as an alternative measure of gender gaps in education in the estimations reported in Section 6 below

[10] Data for more recent years are not available for Mozambique.

proceed by presenting our approach to analyze the relation between gender disparity in education and FDI inflows in a panel context in the next section.

Figure 2 — FDI Stocks[a] and Gender Disparity in Schooling[b]



[a]Inward FDI stocks in 2005 in percent of GDP. — [b]Average years of schooling in 2000 and 2005 (average): females divided by males.
Sources: Barro and Lee (2001); UNESCO (2007); UNCTAD (2007a).

4. Approach and Data

We follow large parts of the relevant literature and estimate a gravity-type model on the determinants of FDI.[11] As noted by Alan V. Deardorff (1998), this class of models first appeared in the empirical literature on bilateral trade flows without much serious attempt to justify them theoretically. However, Deardorff shows that even simple gravity models can be derived from standard trade theories. More recently, gravity models have also been applied to analyze financial flows. The explanatory power of gravity models on financial flows is comparable to that of models on trade flows (Philippe Martin and Hélène Rey 2004). According to Richard Portes and Hélène Rey (2005: 275), this is hardly surprising as the gravity approach "emerges naturally" from theories of asset trade. Recent examples

[11] The origin of the expression "gravity model" derives from the law of gravity for objects. In its simplest version, a gravity model is built on two variables: economic sizes of and the distance between two countries. Various extensions have been suggested in the literature. The extended version we use is specified below.

employing gravity models to analyze bilateral FDI include: Shatz (2003) and John H. Mutti and Harry Grubert (2004).[12]

Hence, in contrast to Chakrabarti's (2001) earlier verdict of "measurement without theory," there appears to be widespread agreement by now on the appropriate analytical framework to guide empirical work on the determinants of FDI. Indeed, variables such as market size and openness to trade that the Extreme Bounds Analysis of Chakrabarti (2001) found to be fairly robust determinants of FDI represent important cornerstones of the gravity model. The particular advantage of the extended gravity model in explaining the determinants of bilateral FDI flows is the fact that differences between source and host country characteristics can be used as explanatory variables. A standard FDI analysis using aggregated FDI flows would not be suitable for that task.

While the core variable set of gravity models helps prevent fragile results due to ad-hoc choices on controlling variables, the estimation results may still be sensitive with respect to sample selection. Shatz' (2003) analysis of US FDI clearly reveals that sample selection matters for empirical results.[13] Consequently, we cover as many countries as possible in our baseline regressions and, at the same time, perform various robustness tests for specific sub-samples.[14]

Furthermore, when applying gravity models to FDI flows, the concentration of FDI on a few host countries has to be taken into account. During the period under consideration (1978 – 2004), high-income OECD countries accounted for almost three quarters of worldwide FDI flows; and about 80 percent of FDI flows to all (150) middle- and low-income countries were concentrated in just 20 countries belonging to this group (World Bank 2006). Bilateral FDI flows are actually often equal to zero.[15] The censored nature of this variable implies that we should use a non-linear method of estimation. Three different approaches could have been applied: (1) A two-part model, using a Probit model in the first step and a linear model in the second step; (2) Heckman's two-step method; and (3) a Tobit model. In general, all three methods have similar econometric properties, as they are based on maximum likelihood methods.

[12] However, none of these studies considers gender disparity in education to be a possible determinant of FDI.
[13] As noted by Shatz (2003: 118), "national statistical agencies publish bilateral data about the investment activities of their multinationals only for host countries that have sizeable inflows of FDI. This means that nearly all research on foreign direct investment focuses on the winners, countries that have achieved at least some success in attracting FDI. This is a significant problem since policy advice is most often sought by the countries that are excluded from analysis."
[14] By replicating the regressions for specific sub-groups of countries, we assess the sensitivity of results with respect to sample selection, while the Extreme Bounds Analysis of Chakrabarti (2001) is particularly suited to assess the sensitivity of results with respect to variable selection.

We use a Tobit model for the following reasons. A two-part model may suffer from a selection bias in the second step, since the fact that a country receives strictly positive FDI flows is not independent from the right-hand-side variables. Heckman's two-step method does correct for the potential bias due to the endogenous nature of the allocation of positive FDI flows. However, Heckman's method may suffer from a loss of robustness of the estimators if, as is the case in the present context, the lists of explanatory variables are the same in both equations being estimated.[16]

In our empirical approach, we principally follow David L. Carr, James R. Markusen and Keith E. Maskus (2001), who estimate the so-called knowledge-capital model that combines horizontal (market seeking) and vertical (efficiency seeking) FDI in a single model.[17]

Our basic specification reads as follows:

$$\ln(\mathrm{FDI}_{ijt}) = \alpha_0 + \alpha_1 \ln(\mathrm{FDI}_{ijt-1}) + \gamma' \mathrm{X}_{jt} + \varphi' \mathrm{Y}_{ijt} + \alpha_2 \,\mathrm{GenderInequality}_{jt} + \lambda_t + \varepsilon_{ijt} \quad (1)$$

where FDI_{ijt} stands for foreign direct investment of country i in country j at period t, FDI_{ijt-1} corresponds to FDI inflows in the previous period $t-1$, X_{jt} represents a set of host country control variables, Y_{ijt} denotes the difference between source and host country characteristics, λ_t is a set of year dummies, and $GenderInequality_{jt}$ corresponds to gender inequality in education between males and females in the host country. The error term can be written as:

$$\varepsilon_{ijt} = v_{ijt} + u_{ijt} \quad (2)$$

where u_{ijt} is the random unobserved bilateral effect and v_{ijt} represents the remaining error.[18]

As concerns the dependent variable, we use two measures of FDI: first, FDI flows from the source to the host country in US$ million (the variable is labeled *FDI1*) and, second, the share of FDI attracted by a specific host country in total FDI flows from the source country under consideration to all host countries (*FDI2*) or to all developing host countries

[15] Roughly two-thirds of all observations in our sample are zeros.
[16] The Tobit model supposes the exogenous variables to have the same impact on the probability of receiving any FDI and on the amount of FDI allocated thereafter. This appears to be an appropriate assumption.
[17] We divert from the model by Carr, Markusen and Maskus (2001) in that we use additional control variables. Moreover, to include as many countries as possible, we sometimes refer to slightly different control variables for which we could obtain data for a large number of developing countries. Also, we do not include the interactive terms used by them.
[18] In Section 6, we add a fixed-effects analysis to check the robustness of the random-effect results.

(*FDI3*) included in our sample.[19] The second measure captures the attractiveness of a particular country relatively to other host countries.[20] The limited host country coverage of previous analyses of bilateral FDI flows is overcome by fully exploiting the (largely unpublished) data available upon request from UNCTAD's Data Extract Service. We calculate three-year averages in order to smooth the considerable fluctuation of annual bilateral FDI flows. At the same time, this approach ensures that we have enough variation in the data. Negative FDI flows (for *FDI2* and *FDI3*) were set equal to zero to include as many observations as possible.[21]

We include the lagged dependent variable on the right hand side of the regression equation for two reasons. First of all, this solves the potential problem of autocorrelation in the pooled time-series regressions.[22] Second, this procedure is theoretically plausible as foreign investment in the previous period is highly relevant for FDI in the current period. Above all, multinational corporations are much more likely to be attracted by countries that already have considerable FDI inflows. This has been shown, for example, by Victor M. Gastanaga, Jeffrey B. Nugent and Bistra Pashamova (1998); the lagged FDI variable is always highly significant in their regressions. By including lagged FDI flows, the econometric specification becomes a dynamic panel.

We employ a fairly standard set of controls, including total (real or nominal) host country GDP and real GDP growth for market seeking FDI (labeled *GDP* and *Growth*, respectively),[23] [24] host country inflation (*Inflation*), host country openness to trade (*Openness*), the difference in GDP per capita between the source and the host country for vertical FDI (*DiffGDPpc*), and a dummy for the existence of a bilateral or regional trading

[19] We run separate regressions for all countries and developing countries. Thus, we computed two versions of the FDI variable as a share of total outflows.
[20] In addition to FDI flows in absolute values and FDI shares, we could have used FDI as a share of the host country's GDP as another dependent variable. However, estimates for this variable are difficult to interpret due to the fact that GDP stands on both sides of the equation.
[21] Importantly, the results hardly change if we exclude negative values. *FDI1*, however, does include negative values, since we do not compute shares for this variable.
[22] While a standard Durbin-Watson test showed that we do not necessarily have (first-order serial) correlation in the regressions, we cannot reject the hypothesis of no correlation either. In fact, the evidence is inconclusive.
[23] In a panel FDI model, adding GDP as an explanatory variable implies that changes in FDI are regressed on changes in GDP, that is, the growth rate. The results for the GDP growth rate, in contrast, can be interpreted as regressing FDI on changes in the change of GDP, that is, variations in the growth rate. In fact, by adding the GDP growth rate we test the hypothesis whether fluctuations in the growth rate have an impact on FDI. Note that we use real GDP if FDI2 or FDI3 are the dependent variables, but nominal GDP in the case of *FDI1*, since there is no adequate deflator available for FDI in many developing countries. Using instead the US deflator is likely to bias the results (Richard E. Baldwin and Daria Taglioni 2006).
[24] Both GDP levels and GDP growth rates may suffer from endogeneity, as FDI inflows could have an impact on them. In the present context, however, we are not particularly interested in an unbiased estimate of the coefficients on GDP and growth. Crucially, any bias in this respect is unlikely to affect the coefficient on our educational indicators, that is, the main interest of the present empirical analysis.

agreement, that is, a free trade agreement or customs union (*RTA*).[25] We expect a positive association of *GDP*, *Growth*, *DiffGDPpc,* and *RTA* with FDI; the opposite applies to *Inflation*, as this variable can be interpreted as a proxy for macroeconomic distortions.[26]

As for time invariant variables, we also closely follow the empirical literature on gravity models and incorporate dummies for a common border (*ComBorder*), common language (*ComLang*) and colonial ties (*ColonTies*), as well as the distance between the source and the host country (*Distance*). The first three control variables are expected to be positively associated with FDI flows, whereas the sign of *Distance* is unclear. On the one hand, management and transport costs are likely to increase if two countries are located far away from each other; on the other hand, remote markets might be better served through local production, that is, FDI in the host country. Hence, the net impact on FDI is uncertain.

To reduce the skewness in the data, we take the natural logarithm of *GDP*, *FDI1*, *FDI2*, *FDI3*, *DiffGDPpc*, *Distance*, and *Inflation*. Obviously, this threatens to come at the cost of losing observations for which we have negative values or zeros. As argued before, this loss of observations may result in a serious sample selection bias. In order to overcome this dilemma, we use the following logarithmic transformation that reduces the skewness in the data and, at the same time, keeps negative and zero observations:

$$y = \ln\left(x + \sqrt{\left(x^2 + 1\right)}\right) \qquad (3)$$

Whereas the sign of x is unchanged, the values of x pass from a linear scale at small absolute values to a logarithmic scale at large values by using this transformation.

In addition to these standard control variables, we include the institutional development of host countries, proxied by political constraints on the executive branch (*PolCon*). Poor institutions may discourage FDI by giving rise to uncertainty (e.g., with respect to the protection of property rights; Jeong-Yeon Lee and Edwin Mansfield 1996; Witold J. Henisz 2000) and additional costs (e.g., in the case of corruption; Shang-Jin Wei 2000). We use the index for political constraints that has been developed by Henisz (2000). In contrast to alternative institutional indicators, this variable is available for a large number of countries and years. *PolCon* focuses on the political discretion of the executive branch. Less discretion is supposed to render credible commitments to (foreign) investors more likely. The indicator ranges from zero (total political discretion) to one (no political discretion). Thus, we expect a positive link between *PolCon* and FDI flows. Finally, we include two variables that

[25] See Appendix A for exact definitions and data sources for all variables.
[26] Descriptive statistics can be found in Appendix B.

control for investment liberalization: (i) *CapOpen* for unilateral capital account liberalization of the host country (Menzie D. Chinn and Hiro Ito 2005), and (ii) *BIT* for a bilateral investment treaty ratified between the source and the host country (Busse, Königer and Nunnenkamp 2007). Both measures are expected to stimulate higher FDI flows.

As concerns our variable of principal interest, we measure gender inequality in education as the difference between the male and female score for average years of schooling in the population age 15 and above (*EducationInequality*).[27] In additional estimations, we use more detailed information of gender inequality in primary, secondary, and tertiary education. This allows us to examine at which level of education gender inequality matters most for the host countries' attractiveness to FDI. Needless to say, we also control for years of schooling of both sexes combined with respect to either all levels of schooling (*Education*), or specific levels of schooling (*Primary Education*, *Secondary Education*, *Tertiary Education*).

Our analysis covers the period 1978-2004, that is, nine observations of three-year averages for all indicators. UNCTAD's Data Extract Service provides FDI data since 1970, but very few countries report FDI flows for the 1970s at a bilateral level. To avoid any biases arising from an extremely small sample of reporting countries, we start with 1978. We include the maximum number of source and host countries for which bilateral FDI flows are available, except financial offshore centers, such as Panama, The Bahamas, or the Cayman Islands.[28] Extending the sample to include a large number of poor developing host countries is crucial to avoid a sample selection bias and to assess the chances of these countries to become more attractive to FDI. Our (principle) sample consists of 81 developed and developing host countries.[29] By covering 31 source countries of FDI, including various non-OECD source countries, we at least partly capture the recent surge of FDI flows from developing countries to other developing countries.[30]

5. Main Results

Following the model specification and the introduction of the variables, we now turn to the empirical results. Columns (1) and (2) in Table 1 report the results of the Tobit model for the full sample of host countries. The estimations include all control variables introduced before,

[27] The data have principally been taken from Robert J. Barro and Jong-Wha Lee (2001). We extended their dataset with more recent figures from UNESCO (2007) to ensure that we can run a panel analysis up to the year 2004.

[28] The FDI data for financial offshore centers are highly likely to be biased. We exclude all countries that are on the list of offshore financial centers as reported by Eurostat (2005).

[29] The total number of host countries increases to 102 if we consider gender specific literacy rates as an alternative measure of gender disparity (Section 6).

except for *BIT* since the conclusion of bilateral investment treaties can be supposed to matter for developing host countries only (Busse, Königer and Nunnenkamp 2007).[31] Almost all control variables have the expected sign, and the significance of the coefficients is hardly affected when considering FDI flows in absolute terms (*FDI1*) or FDI shares (*FDI2*) as the dependant variable.

As anticipated, FDI in the past is a strong predictor for current FDI as the coefficient of the lagged dependent variable is positive and highly significant. The strongly positive coefficients of the host countries' GDP (*GDP*) and the difference in per capita income between the host and the source country (*DiffGDPpc*) reveal that FDI flows to the sample countries are driven by both market-seeking and efficiency-seeking motives (horizontal and vertical FDI). The importance of vertical FDI is also indicated by the significantly positive coefficient of *Openness*; greater openness to trade reflected in this variable improves the host countries' attractiveness to FDI involving the relocation of particular segments of the value chain and the offshoring of intermediate production.[32] Likewise, less regulated capital transactions are associated with higher bilateral FDI flows, as the coefficient of *CapOpen* is positive and significant at the 1 percent level.

Apart from colonial ties in one specification, all the time-invariant variables traditionally included in gravity models turn out to be significant at the 1 percent level. Bilateral FDI flows between a source and a host country having a common border or speaking the same language are higher than bilateral flows between countries without such common characteristics. The same applies for colonial ties (except column (4)). By contrast, a larger distance between the host and the source country tends to reduce bilateral FDI flows, suggesting that distance-related management and transport costs outweigh the incentive to undertake FDI in remote countries in order to serve their markets through local production rather than through exports.

Results turn out to be weaker for some other controlling variables. *RTA* has the expected positive coefficient, but fails to reach the conventional 10 percent significance level in two specifications. For economic growth rates, we obtain a similar outcome; *Growth* is

[30] See Appendix C and Appendix D for the source and host country sample.
[31] Developed countries have signed very few bilateral investment treaties with each other. Nevertheless, we replicated the estimations reported in columns (1) and (2) of Table 1 with *BIT* included. As a matter of fact, the *BIT* variable remained insignificant for the full sample (results not shown), in contrast to what we report below for the subsample of developing countries. Moreover, the inclusion of *BIT* does not affect the results for our variables of principal interest in the full sample.
[32] Obviously, greater openness to trade encourages trade in finished goods, too. In contrast to trade in intermediates, however, the effect of more trade in final goods on FDI flows tends to be ambiguous. This is

positive and significant in three out of four regressions. This non-robust finding is hardly surprising if foreign investors are mainly interested in the longer-term growth prospects of host countries, rather than reacting to short-term fluctuations in growth rates captured by *Growth. Inflation* is never significant and fluctuates between a positive and a negative sign.[33] Most surprisingly perhaps, *PolCon* is significant, but with an unexpected negative sign when running the estimations for the full sample of host countries with *FDI2* as the dependent variable. However, this variable switches sign when the sample is reduced to developing host countries. As noted in Section 4, *PolCon* refers to political discretion of the executive branch. It appears that discretion does involve some risk for foreign investors in developing countries and, thus, discourages FDI in these locations, whereas foreign investors may be confident that discretion is used more reasonably (or even to the benefit of foreign investors) in economically and politically advanced host countries.

Turning to the education-related determinants of FDI for the full sample, our results corroborate Shatz (2003) as well as Eaton and Tamura (1996) in that average years of schooling of both sexes taken together (*Education*) are associated with higher FDI flows at the 10 percent level or better. The finding that better educated workers attract more FDI clearly rejects the counter-hypothesis, according to which FDI is undertaken "in countries with low levels of education to escape the high compensation costs with which higher levels of education and skill are associated" (Shatz 2003: 188).

In the present context of gender inequality, it is still more important that *EducationInequality* is negatively related to bilateral FDI flows. The coefficient of our variable of principal interest, which captures the difference between male and female years of total (primary, secondary and tertiary) schooling, turns out to be significant at the 1 percent level for the full sample of host countries. Hence, our panel analysis produces stronger results than the cross-section analysis of Kucera (2002). While Kucera finds no evidence suggesting that gender discrimination in education leads to higher FDI inflows, our results reported in columns (1) and (2) of Table 1 support the stronger conclusion that gender discrimination in education clearly reduces FDI inflows.

The quantitative effect of less gender discrimination in education on FDI inflows is modest, but by no means negligible. Taking the estimated coefficient on *EducationInequality*

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because the removal of trade barriers for finished goods reduces the incentive to undertake FDI of the "tariff jumping" sort to penetrate protected host-country markets.

[33] The results for the remaining variables do not change much, if *Inflation* and other insignificant variables are excluded from the analysis. Yet we keep them included as they could have an impact on FDI from a theoretical point of view.

for the full sample of host countries and with *FDI1* as the dependent variable (-0.081) at face value, a decrease in the difference between male and female years of total schooling by 0.85 years (that is, the standard deviation of *EducationInequality*) would lead – on average – to an increase in FDI inflows by some US$ 69,000 per annum. While this increase may appear marginal at first sight, it should be taken into account that it relates to bilateral FDI flows from each of the 31 source countries included in the sample. Given the mean of *FDI1* of about US$ 1.027 million,[34] the quantitative effect amounts to 6.7 percent of average FDI inflows. The long-run effect would still be more pronounced. The long-run effect can be calculated by dividing the coefficient of *EducationInequality* by one minus the coefficient of the lagged dependent variable. Based on the estimate reported in column (1) of Table 1, the long-run FDI effect of a decrease in *EducationInequality* by one standard deviation would be 12.2 percent of FDI inflows.

Overall, the evidence for gender discrimination underscores the findings for education of both sexes combined: In the first place, the attractiveness of host countries to FDI stems from offering foreign investors the opportunity to draw on sufficiently qualified labor, be it male or female workers. This does not rule out that foreign investors aim at reducing wage costs for similarly qualified labor.[35] But the estimation results suggest that this motive of FDI is dominated by the motive to complement FDI-related production techniques with sufficiently qualified labor in the host country. Gender discrimination in education tends to constrain this option as it limits the pool of locally available labor that meets the standards required by foreign investors.

[34] Note that the mean of US$ 0.90 for *FDI1*, reported in Appendix B, has to be changed using the reversed transformation equation (3), which results in an amount of US$ 1.027 million.
[35] Obviously, it would desirable to control for wage costs for differently qualified labor in our estimations. However, the data situation does not allow us to do so.

Table 1: FDI and Education, Total Years of Schooling

	(1)	(2)	(3)	(4)
Dependent Variable	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)
Country Group	All Countries		Developing Countries	
ln (FDI_{t-1})	0.449***	0.637***	0.397***	0.581***
	(0.0096)	(0.0068)	(0.012)	(0.020)
Education	0.0608***	0.00337**	0.0552***	0.0120*
	(0.015)	(0.0015)	(0.017)	(0.0069)
Education Inequality	-0.0810***	-0.0346***	-0.0382*	-0.0240***
	(0.025)	(0.0060)	(0.023)	(0.0093)
ln (GDP)	0.238***	0.0582***	0.243***	0.103***
	(0.015)	(0.0037)	(0.017)	(0.0078)
ln (DiffGDPpc)	0.0733***	0.00321*	0.0742***	0.0159***
	(0.0094)	(0.0017)	(0.0099)	(0.0041)
Growth	0.0167**	0.00164	0.0103*	0.00582**
	(0.0067)	(0.0017)	(0.0062)	(0.0023)
ln (Inflation)	0.00761	-0.00482	0.0108	0.00364
	(0.015)	(0.0037)	(0.014)	(0.0052)
Openness	0.0014**	0.00027*	0.0026***	0.00088***
	(0.00061)	(0.00015)	(0.00061)	(0.00024)
ComBorder	0.846***	0.295***	0.470***	0.335***
	(0.13)	(0.031)	(0.16)	(0.065)
ComLang	0.181***	0.100***	0.0693***	0.0829***
	(0.061)	(0.015)	(0.022)	(0.024)
ln (Distance)	-0.404***	-0.0931***	-0.279***	-0.153***
	(0.034)	(0.0083)	(0.034)	(0.015)
ColonTies	0.503***	0.0689**	0.413***	0.0633
	(0.12)	(0.028)	(0.11)	(0.047)
RTA	0.189**	0.0301	0.314***	0.0322
	(0.082)	(0.020)	(0.11)	(0.042)
PolCon	-0.182	-0.143***	0.0939	0.0391*
	(0.11)	(0.028)	(0.10)	(0.019)
CapOpen	0.0425***	0.0212***	0.0448***	0.0185***
	(0.016)	(0.0039)	(0.015)	(0.0058)
BIT			0.131**	0.0316***
			(0.052)	(0.010)
Observations	13,104	13,104	8,446	8,446
Country Pairs	2,450	2,450	1,559	1,559

Notes: Standard errors are reported in parentheses; due to space constraints, the coefficients for constant term and the year dummies are not shown; *** significant at 1% level; ** significant at 5% level; * significant at 10% level. The p-values of the Wald χ^2 test for the null hypothesis that all explanatory variables equal zero are always statistically significant at the 1 percent level (not reported).

Our results are in line with Kucera's findings in that the discouraging effect of gender discrimination in education on FDI inflows weakens somewhat in statistical terms when the sample is restricted to developing host countries.[36] The significance of the coefficients of *EducationInequality* declines to 10 percent if FDI inflows are measured in absolute terms

[36] Restricting the sample to developing host countries is in line with Bruce A. Blonigen and Miao Grace Wang (2005), who argue strongly against pooling rich and poor countries in empirical FDI studies. Blonigen and Wang account for varying effects in developed and developing countries by interacting their independent variables with a dummy variable set equal to one for developing countries. By contrast, we opt for running separate regressions for the sub-sample of developing countries. This choice is because we go beyond Blonigen and Wang and consider various other sub-samples in the next section. For example, we differentiate not only between

(column 3 in Table 1). It should be noted, however, that we still find statistically significant results, whereas the effect of relative female educational attainment turns insignificant in Kucera's cross-country analysis once the sample is restricted to developing host countries.

Moreover, the substantially smaller coefficient on *EducationInequality* in column (3) of Table 1, compared to column (1), must not be interpreted as indicating a marginal economic significance of gender discrimination in discouraging FDI inflows for the sub-sample of developing countries. Considering a decrease in the difference between male and female years of total schooling by one standard deviation years as before,[37] FDI inflows would still increase by about 6.6 percent in the short run, and by about 11 percent in the long run relative to the mean of US$ 0.523 million for this sub-sample. In other words, the motivation to draw on sufficiently qualified labor, the available pool of which expands with less gender discrimination in education, dominates even in developing host countries where foreign investors may be more inclined to exploit cost savings through lower wages.

The results for the controlling variables are hardly affected when replicating the estimations for the reduced sample of developing host countries. Most notably, the strongly significant coefficients of *GDP*, *DiffGDPpc* and *Openness* underscore the prevalence of both horizontal and vertical types of FDI. As mentioned before, political discretion by the executive branch (*PolCon*) now tends to discourage FDI, as was to be expected at least for developing host countries. Openness to capital transactions (*CapOpen*) is still very important, which is hardly surprising given that most developing countries liberalized capital account restrictions recently. Finally, the ratification of bilateral investment treaties (*BIT*) leads to higher FDI inflows, which is in line with previous findings by Busse, Königer and Nunnenkamp (2007).

In the next step of our analysis, we differentiate the educational variables (i.e., average years of schooling of both sexes combined as well as gender discrepancies related to years of schooling) by considering three levels of schooling separately. In all other respects, the specification of the Tobit model remains as before.[38]

The results shown in Table 2 suggest that earlier findings for total schooling are driven for a considerable part by average years of schooling and gender disparities at the level of secondary education. Secondary education has a strongly significant, positive effect on FDI in

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developed and developing host countries but also between low- and medium-income countries within the fairly heterogeneous group of developing countries.

[37] Note that the standard deviation of *EducationInequality* is slightly higher (0.906) for the sub-sample of developing countries than for the full sample (0.85).

the full sample of host countries, while gender inequality in secondary education strongly discourages FDI (columns 5 and 6). As before, more pronounced gender inequality still goes along with lower FDI inflows at the 10 (or 1) percent level (columns 7 and 8) when restricting the sample to developing host countries.

Neither at the lower level of primary education nor at the higher level of tertiary education do we find any evidence that gender inequality results in higher FDI inflows. Yet, the evidence for primary and tertiary education is not as clear-cut as that for secondary education. In particular, our results are in conflict with Shatz (2003), according to whom primary education had stronger effects on FDI by US companies than higher levels of education. For the full sample of host countries, we find the opposite pattern. This difference is probably at least partly because the motives underlying US FDI differ from those underlying FDI from other sources, which underscores our point that covering various sources of FDI is essential to avoid a sample selection bias.[39] The pattern found here for various sources of FDI appears to be plausible given that primary education tends to be a weaker indicator of the availability of skilled labor than higher levels of education.[40]

At the same time, sample selection on the host-country side matters for assessing the effects of gender inequality at different levels of education. In fact, we do obtain a positive (and significant) coefficient for *Education* at the primary level (columns 1 to 4) if we exclude sub-Saharan African countries (results not reported). Several countries in this region made considerable progress in achieving higher educational attainment rates in particular at the primary level, but still did not get much FDI (see also Section 6 below). Furthermore, *EducationInequality* in primary education becomes significantly negative at the 5 percent level or better if African countries are excluded.

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[38] The results for the controlling variables are essentially unchanged. Therefore, they are not discussed here in any detail.

[39] Another reason for different results is that Shatz (2003) performs a pure cross-country analysis, whereas our findings are based on a panel analysis.

[40] Note that the coefficient of variation (standard deviation divided by mean) is substantially lower for primary education than that for higher levels of education (Appendix B).

Table 2: FDI and Primary, Secondary and Tertiary Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Educational Level	Primary Education				Secondary Education				Tertiary Education			
Dependent Variable	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)
Country Group	All Countries		Developing Countries		All Countries		Developing Countries		All Countries		Developing Countries	
ln (FDI_{t-1})	0.450***	0.637***	0.398***	0.588***	0.446***	0.634***	0.399***	0.592***	0.449***	0.635***	0.400***	0.590***
	(0.0095)	(0.0068)	(0.012)	(0.020)	(0.0096)	(0.0068)	(0.012)	(0.020)	(0.0095)	(0.0068)	(0.012)	(0.020)
Education	0.0145	-0.00871	0.0254	0.021***	0.0348**	0.0062**	0.0991***	0.0549***	0.305***	0.125***	-0.297	-0.0946
	(0.017)	(0.0062)	(0.019)	(0.0078)	(0.015)	(0.0026)	(0.034)	(0.014)	(0.097)	(0.024)	(0.24)	(0.064)
Education Inequality	-0.150***	-0.054***	-0.046	-0.0270*	-0.212***	-0.0918***	-0.0911*	-0.0530***	0.463	0.151	-0.588*	-0.460***
	(0.042)	(0.010)	(0.039)	(0.016)	(0.052)	(0.013)	(0.052)	(0.020)	(0.35)	(0.10)	(0.31)	(0.12)
ln (GDP)	0.265***	0.0585***	0.234***	0.093***	0.271***	0.0577***	0.269***	0.115***	0.247***	0.0472***	0.259***	0.108***
	(0.014)	(0.0034)	(0.017)	(0.0074)	(0.015)	(0.0035)	(0.016)	(0.0074)	(0.014)	(0.0034)	(0.015)	(0.0072)
ln (DiffGDPpc)	0.0207***	0.0016**	0.0181***	0.010***	0.0204***	0.00141*	0.0169***	0.00890***	0.0215***	0.00241***	0.0169***	0.00915***
	(0.0020)	(0.00072)	(0.0025)	(0.0019)	(0.0021)	(0.00074)	(0.0024)	(0.0018)	(0.0021)	(0.00073)	(0.0024)	(0.0018)
Growth	0.0114*	0.00140	0.0118*	0.0069***	0.0107	0.00162	0.00769	0.00445**	0.0106	0.00155	0.00744	0.00469**
	(0.0067)	(0.0017)	(0.0061)	(0.0023)	(0.0067)	(0.0017)	(0.0061)	(0.0023)	(0.0067)	(0.0017)	(0.0061)	(0.0023)
ln (Inflation)	-0.00337	-0.00337	0.00915	0.00325	-0.00390	-0.00582	0.0120	0.00421	0.0106	0.000848	0.00975	0.00316
	(0.015)	(0.0037)	(0.014)	(0.0052)	(0.015)	(0.0038)	(0.014)	(0.0051)	(0.015)	(0.0038)	(0.014)	(0.0052)
Openness	0.0017***	0.0003**	0.0022***	0.00058**	0.0022***	0.00031**	0.0034***	0.0013***	0.00214***	0.000244*	0.0030***	0.0011***
	(0.00061)	(0.00015)	(0.00061)	(0.00024)	(0.00059)	(0.00014)	(0.00058)	(0.00023)	(0.00058)	(0.00014)	(0.00055)	(0.00021)
ComBorder	0.855***	0.298***	0.529***	0.343***	0.847***	0.296***	0.515***	0.335***	0.886***	0.312***	0.517***	0.331***
	(0.13)	(0.031)	(0.16)	(0.064)	(0.13)	(0.031)	(0.16)	(0.063)	(0.13)	(0.031)	(0.16)	(0.063)
ComLang	0.232***	0.102***	0.146**	0.096***	0.226***	0.0987***	0.142**	0.0958***	0.232***	0.101***	0.136**	0.0904***
	(0.060)	(0.015)	(0.060)	(0.024)	(0.060)	(0.015)	(0.060)	(0.024)	(0.060)	(0.015)	(0.060)	(0.024)
ln (Distance)	-0.365***	-0.0910***	-0.237***	-0.145***	-0.365***	-0.0932***	-0.239***	-0.144***	-0.353***	-0.0890***	-0.241***	-0.148***
	(0.034)	(0.0083)	(0.034)	(0.014)	(0.034)	(0.0082)	(0.034)	(0.014)	(0.034)	(0.0082)	(0.034)	(0.015)
ColonTies	0.405***	0.0671**	0.285**	0.0384	0.418***	0.0708**	0.281**	0.0327	0.410***	0.0703**	0.280**	0.0355
	(0.11)	(0.028)	(0.11)	(0.046)	(0.12)	(0.028)	(0.11)	(0.045)	(0.11)	(0.028)	(0.11)	(0.045)
RTA	0.256***	0.0273	0.329***	0.0139	0.284***	0.0363*	0.349***	0.0358	0.306***	0.0396**	0.366***	0.0394
	(0.082)	(0.020)	(0.11)	(0.041)	(0.082)	(0.020)	(0.11)	(0.041)	(0.082)	(0.020)	(0.11)	(0.041)
PolCon	-0.138	-0.130***	0.102	-0.00881	-0.125	-0.148***	0.0930	-0.0162	-0.0735	-0.123***	0.173*	0.0112
	(0.11)	(0.029)	(0.10)	(0.039)	(0.11)	(0.028)	(0.10)	(0.039)	(0.11)	(0.028)	(0.10)	(0.039)
CapOpen	0.0686***	0.0235***	0.0410***	0.0160***	0.0635***	0.0196***	0.0539***	0.0240***	0.0743***	0.0227***	0.0498***	0.0195***
	(0.015)	(0.0039)	(0.015)	(0.0057)	(0.016)	(0.0040)	(0.015)	(0.0058)	(0.015)	(0.0039)	(0.015)	(0.0057)
BIT			0.118**	0.0376*			0.140***	0.0393**			0.122**	0.0368*
			(0.052)	(0.020)			(0.052)	(0.020)			(0.051)	(0.020)
Observations	13,103	13,103	8,446	8,446	13,103	13,103	8,446	8,446	13,076	13,076	8,422	8,422
Country Pairs	2,450	2,450	1,559	1,559	2,450	2,450	1,559	1,559	2,450	2,450	1,559	1,559

Notes: See Table 1; *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

At the level of tertiary education, we obtain a negative sign for *Education* for developing countries, though the coefficient does not reach conventional significance levels. This outcome can be explained by a number of sub-Saharan African and Latin American countries, where advances in higher education were not associated with an increase in FDI inflows.[41] Moreover, the estimated coefficient for gender inequality in tertiary education appears to be significant and surprisingly large in comparison to the primary and secondary level if the host country sample is restricted to developing countries (columns 11 and 12). This outcome is mainly due to the fact both the mean and the standard deviation of educational disparity at the tertiary level are substantially smaller than at lower levels of education for developing countries during the period of observation. This explains why any change in the inequality measure has been associated with a larger increase in FDI.

6. Sensitivity Analyses

We perform three types of sensitivity analyses in this section. First, we refer to literacy instead of average years of schooling to measure gender inequality in education; second, we replicate our estimations with average years of schooling at all levels combined for various sub-samples of host and source countries; and, third, we perform Tobit fixed-effects estimations to control for country-pair fixed effects.

Adult literacy rates represent the percentage of the host country's population (ages 15 and above) with basic reading and writing skills. Gender inequality with respect to literacy is calculated as before, by computing the difference between male and female rates of literacy. Table 3 reports the results when schooling measures are replaced by literacy rates for all adults and gender differences in literacy. This substitution has hardly any effect on the coefficients of the controlling variables, the list of which is as before.

In contrast to *Education*, the coefficients of the literacy rate fluctuate between a negative and a positive sign but they are never significant. Arguably, literacy is a relatively weak indicator of the availability of skilled labor in the host country. In that respect literacy resembles primary schooling. Therefore, literacy could be expected to have limited effects on the host country's attractiveness to FDI if foreign investors demand more than basic skills. Moreover, some host countries in sub-Saharan Africa reported quite remarkable improvements in adult literacy during the period of observation. For instance, the literacy rate in Niger increased from an extremely low level of some 7 to 8 percent in the late 1970s to 29

[41] If we exclude all countries that belong to both regions, we obtain a positive but not significant coefficient for *Education*.

percent in 2004. Increases in literacy rates of more than 20 percentage points also occurred in Mozambique, Sudan and Togo. Nevertheless, literacy rates in various sub-Saharan African host countries probably remained too low to provide an attraction to foreign investors, while smaller improvements in literacy may have encouraged FDI in other host countries where the overall level of literacy was considerably higher than in large parts of sub-Saharan Africa.

Table 3: FDI and Literacy Rates

	(1)	(2)	(3)	(4)
Dependent Variable	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)
Country Group	All Countries		Developing Countries	
ln (FDI_{t-1})	0.391***	0.634***	0.400***	0.647***
	(0.015)	(0.0065)	(0.012)	(0.0079)
Literacy Rate	0.00010	-0.00041	0.00034	0.00012
	(0.0016)	(0.00036)	(0.0013)	(0.00043)
Literacy Rate Inequality	-0.0135***	-0.00386***	-0.00495*	-0.00168*
	(0.0037)	(0.00082)	(0.0030)	(0.0009)
ln (GDP)	0.312***	0.0663***	0.260***	0.0925***
	(0.018)	(0.0039)	(0.017)	(0.0059)
ln (DiffGDPpc)	0.0200***	0.00120	0.0157***	0.00724***
	(0.0023)	(0.00073)	(0.0022)	(0.0014)
Growth	0.0188***	0.00399***	0.0143***	0.00680***
	(0.0054)	(0.0014)	(0.0046)	(0.0016)
ln (Inflation)	0.00210	-0.00202	0.000733	-0.00352
	(0.013)	(0.0033)	(0.012)	(0.0041)
Openness	0.00128*	0.0000255	0.00203***	0.000506**
	(0.00073)	(0.00016)	(0.00069)	(0.00023)
ComBorder	0.919***	0.344***	0.430***	0.379***
	(0.14)	(0.030)	(0.15)	(0.053)
ComLang	0.257***	0.0881***	0.137**	0.0738***
	(0.066)	(0.015)	(0.059)	(0.020)
ln (Distance)	-0.403***	-0.0905***	-0.276***	-0.129***
	(0.034)	(0.0074)	(0.030)	(0.0100)
ColonTies	0.530***	0.0799***	0.377***	0.00168
	(0.12)	(0.027)	(0.11)	(0.036)
RTA	0.253***	0.0243	0.217**	0.0207
	(0.080)	(0.019)	(0.091)	(0.032)
PolCon	0.0488	-0.0323	0.155	0.0226
	(0.11)	(0.027)	(0.097)	(0.034)
CapOpen	0.0524***	0.0207***	0.0170	0.00842*
	(0.016)	(0.0037)	(0.014)	(0.0048)
BIT			0.185***	0.0322**
			(0.047)	(0.016)
Observations	14,303	14,303	9,447	9,447
Country Pairs	2,922	2,922	1,979	1,979

Notes: See Table 1; *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

The ambiguity concerning the literacy rate for all adults notwithstanding, Table 3 supports our previous findings on gender inequality in education. The difference between male and female rates of literacy enters significantly negative in all four estimations. In other words, education-related gender inequality measured in this way, too, discourages FDI

inflows, independently of whether FDI is considered in absolute terms (*FDI1*) or as the share of the particular host country in the source country's overall FDI outflows (*FDI2* and *FDI3*), and independently of whether the estimations are run for the full sample or the reduced sample of developing host countries.

In the estimations reported in Table 4, we return to average years of schooling at all levels combined as a measure of gender inequality in education. In order to save space, we show only the results for the variable of principal interest in the present context.[42] To alleviate comparison, the main results from Table 1 are listed again in the first row of Table 4.

As mentioned before, the discouraging effect of gender inequality in education on FDI inflows is somewhat weaker, in statistical terms at least, for developing host countries. For this reason, we test whether further differentiation of the fairly heterogeneous group of developing host countries offers additional insights. And indeed, the differences in the impact of gender inequality on FDI become more pronounced when considering two sub-groups of developing countries. The discouraging effects of gender inequality on FDI are confined to middle-income countries, which (according to the World Bank's classification) comprise countries with a per-capita income of between US$ 876 and US$ 10,725 in 2005 (World Bank 2006). By contrast, gender inequality remains completely insignificant as a determinant of FDI in low-income countries, that is, countries with a per-capita income of US$ 875 or less. Some types of FDI undertaken in low-income countries are rather unlikely to be motivated by the availability of qualified labor. For example, this probably applies to resource-seeking FDI in the primary sector, which accounts for the bulk of total FDI flows to various low-income countries. In any case, qualified labor tends to be in extremely short supply in these host countries, and less gender inequality in education is unlikely to improve this situation significantly. Consequently, foreign investors may care less about gender inequality than in more advanced host countries. It is important to note, however, that even in low-income countries gender inequality does not induce more FDI.

Next, we check whether the impact of gender inequality on FDI has changed over time. One could have expected that the discouraging effect had become more pronounced in recent years. The demand of foreign investors for qualified local labor may have increased with the increasing complexity of production techniques transferred to the host countries. However, there is no support to this proposition. Rather, the size of the coefficients is somewhat smaller (in three out of four regressions) when the estimations are based on the period 1990-2004, instead of 1978-2004.

Table 4: Robustness Checks and Extensions, Education Inequality

Dependent Variable	(1) ln (FDI1)	(2) ln (FDI2)	(3) ln (FDI1)	(4) ln (FDI3)
Country Group	All Countries		Developing Countries	
Full Sample (as reported in Table 1)	-0.0810***	-0.0346***	-0.0382*	-0.0240***
	(0.025)	(0.0060)	(0.023)	(0.0093)
Middle-income Countries			-0.114***	-0.0421***
			(0.039)	(0.016)
Low-income Countries			0.0156	0.00446
			(0.031)	(0.012)
Period 1990-2004	-0.0701***	-0.0371***	-0.0338*	-0.0216**
	(0.027)	(0.0068)	(0.018)	(0.0089)
Developed Source Countries	-0.134***	-0.0393***	-0.0647*	-0.0301***
	(0.037)	(0.0067)	(0.034)	(0.011)
Developing Source Countries	-0.0193	-0.0195	-0.00787	-0.00788
	(0.035)	(0.014)	(0.030)	(0.018)

Notes: To save space, we only report the results for the education inequality variable; *** significant at 1% level; ** significant at 5% level; * significant at 10% level. See Table 1 for further notes.

Next, we replicate the estimations for two groups of source countries. As mentioned in Section 4, developing countries have increasingly become sources of FDI. Arguably, the motives underlying FDI from developing countries differ from the motives underlying FDI from more advanced source countries:[43]

- FDI undertaken by developing countries in more developed host countries can be supposed to be largely of an asset-seeking type, i.e., providing a means to acquire superior technologies available in the host country. Technological knowledge could be acquired more easily by employing qualified local staff. However, gender disparities are rather unlikely to play a significant role in this respect as they tend to be fairly small in high-income host countries (see Figure 1 above).
- The motives underlying FDI by developing countries in other developing countries are more complex. On the one hand, wage-related cost savings could be a less important driving force of FDI undertaken by less developed source countries, where wages tend to be similar to those in the host country. *Ceteris paribus*, this could have strengthened the discouraging effect of gender inequality on FDI from developing countries. On the other hand, important source countries such as Singapore used FDI as a means to relocate less sophisticated industrial activities to where cost savings could be realized (Gaute Ellingsen, Winfried Likumahuwa and Peter Nunnenkamp 2006). This type of FDI probably draws

[42] Complete results are available from the authors upon request.
[43] Since we use the (current) World Bank definition for the distinction between developing und developed countries, economies like Taiwan and the Republic of Korea fall into the latter category. While this has not been

less on qualified labor in the lower-income host countries. The same applies to resource-seeking FDI undertaken by developing source counties such as China in low-income regions, notably in Africa.

Against this backdrop, it is not surprising that gender inequality in education enters insignificantly when the estimation is restricted to developing source countries. The results for the full sample of source countries are mainly driven by the discouraging effect of gender inequality on FDI from developed source countries. For the latter, the significance level closely resembles the general pattern reported in Table 1 and the size of the coefficients is somewhat larger.

Finally, the results presented so far are based on a random-effects model, and it may be argued that they are mainly driven by variations across countries rather than over time. To account for this potential weakness of our results, we replicate the analysis from Table 1 using a Tobit fixed-effects model as a robustness check. The results show that the country fixed effects capture a considerable part of the variation in the dependent variables, as a number of independent variables are no longer significant (Table 5). Above all, this applies to *Education*, *Growth*, and *CapOpen*. On the other hand, GDP levels, differences in GDP per capita, openness to trade, and joining a regional trade agreement still matter for FDI flows, though significance levels are sometimes weaker in comparison to the random-effects model. Importantly, gender inequality in education is always negatively associated with FDI inflows; the coefficient is significant at the 10 percent level or better. Jointly with the previous evidence from additional regressions in this section, this outcome demonstrates that the link between *EducationInequality* and FDI inflows is quite robust.

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the case for the entire period 1978 to 2004, our results do not change much if both countries are treated as developing countries.

Table 5: FDI and Total Years of Schooling: Fixed-Effects Estimation

	(1)	(2)	(3)	(4)
Dependent Variable	ln (FDIl)	ln (FDI2)	ln (FDIl)	ln (FDI3)
Country Group	All Countries		Developing Countries	
ln (FDI_{t-1})	0.0202	0.0408	0.0117	0.194***
	(0.028)	(0.028)	(0.033)	(0.032)
Education	0.0537	0.0173	0.0450	0.0683*
	(0.091)	(0.021)	(0.091)	(0.035)
Education Inequality	-0.275**	-0.0510*	-0.424***	-0.138***
	(0.11)	(0.027)	(0.12)	(0.046)
ln (GDP)	0.518***	0.174***	0.675***	0.271***
	(0.092)	(0.041)	(0.11)	(0.071)
ln (DiffGDPpc)	0.0132	0.00493*	0.0131***	0.00753**
	(0.013)	(0.0029)	(0.0044)	(0.0030)
Growth	0.00633	0.00101	0.00481	0.00446*
	(0.0066)	(0.0014)	(0.0070)	(0.0026)
ln (Inflation)	-0.0223	-0.00529	-0.00357	0.00450
	(0.019)	(0.0038)	(0.020)	(0.0068)
Openness	0.00389**	0.000041	0.00332*	0.00099*
	(0.0017)	(0.00033)	(0.0017)	(0.00055)
RTA	0.393**	0.121**	0.453**	-0.0758
	(0.17)	(0.049)	(0.22)	(0.10)
PolCon	-0.0216	0.0421	0.0902	0.0241
	(0.13)	(0.029)	(0.13)	(0.044)
CapOpen	-0.00699	0.000174	0.0178	0.0132*
	(0.023)	(0.0050)	(0.024)	(0.0073)
BIT			0.0729*	0.00479*
			(0.04)	(0.0028)
Observations	13,104	13,104	8,446	8,446
Country Pairs	2,450	2,450	1,559	1,559
R^2 (overall)	0.14	0.26	0.12	0.29

Notes: See Table 1; *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

7. Conclusions

With few exceptions, the empirical literature on foreign direct investment (FDI) continues to be gender-blind. This paper contributes to filling this gap by assessing the importance of gender inequality in education as a determinant of FDI. We estimate a standard gravity model on bilateral FDI flows which is augmented by educational variables, including different measures of gender inequality in education. The analysis covers an unprecedented number of both host and source countries of FDI, thereby reducing the risk of distorted results because of a sample selection bias.

Our findings on gender disparity in education cast further doubt on the view held by various critics of globalization in general, and FDI in particular, according to which the exploitation of low social standards and repressed worker rights in developing countries represents an important motive of relocation and offshoring by means of producing abroad. We find no evidence whatsoever that multinational companies favor locations where

education-related gender discrimination offers cost advantages. Rather, gender disparity in education discourages FDI inflows.

The major finding that gender disparity in education does not provide an attraction to FDI applies to both developed and developing host countries, as well as to FDI from different sources. Yet, the discouraging effects of gender disparity tend to be stronger in more advanced host countries, while they turn insignificant in low-income host countries. The latter finding can be attributed to the prominence of specific types of FDI that rely considerably less on qualified local labor; resource-seeking FDI in the primary sector of low-income countries is a case in point. Likewise, the motivation underlying FDI from developing countries – notably, asset-seeking FDI in developed host countries and resource-seeking FDI in fairly poor developing countries – provides an explanation why this group of foreign investors appears to care less about gender inequality in the host countries.

Still, it needs to be re-emphasized that for none of the sub-groups of host and source countries under consideration do we find evidence suggesting that gender disparity in education attracts more FDI. This has important implications concerning the fierce international competition for FDI inflows. It would clearly be counter-productive if policymakers entered into the widely perceived race to the bottom not only by lowering corporate tax rates or corporate contributions to social security systems, but also by trying to contain wage increases for unskilled labor through being lenient about the still widespread gender gaps in education and, thus, ensuring a constant supply of cheap female workers.

Rather, policymakers would be well advised to tackle the persistent discrimination of women in order to improve their countries' attractiveness to FDI, if not for more general reasons of fairness and equity. Multinational companies in the manufacturing and services sectors tend to rely on relatively skilled labor in the host countries of FDI. Therefore, better educated and qualified women would enhance the attractiveness to FDI by adding to the pool of skilled labor available in the host country.

All this does not necessarily imply that less gender disparity promotes economic growth through providing an incentive to higher FDI inflows. Several caveats have to be kept in mind: First, the FDI effects of removing gender disparity in education are likely to be modest, though far from negligible. Second, our findings with respect to gender gaps in education leave it open to question how other aspects of gender disparity are related to FDI. In this context, it should be noted that the effects of gender inequality on the economic development of the countries concerned appear to depend on the particular aspect of inequality under consideration (Jean Drèze and Amartya Sen 1989; Lant Pritchett and

Lawrence H. Summers 1996; Stephanie Seguino 2000; Stephan Klasen 2002). Third, the literature on the growth effects of FDI suggests that attracting more FDI is no guarantee to achieve higher growth (e.g., Maria Carkovic and Ross Levine 2005).

Clearly, more research is required to help resolve such pending questions. Yet the present study offers interesting insights into some missing links in the previous literature. On the one hand, by analyzing the FDI effects of gender inequality, we specify an important transmission mechanism that has received little attention in the literature on gender inequality and economic growth. On the other hand, by introducing gender issues into the FDI literature, we show that female education and qualification can help overcome human capital constraints which, according to Eduardo Borensztein, José De Gregorio and Jong-Wha Lee (1998), hinder positive growth effects of FDI in many developing host countries.

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Appendix A: Definition of Variables and Data Sources

Variable	Definition	Source
FDI1	Bilateral FDI flows from source to host country in US$ million	UNCTAD (2007a)
FDI2	Bilateral FDI flows from source to host country in % of total FDI to all countries included in our sample	UNCTAD (2007a)
FDI3	Bilateral FDI flows from source to (developing) host country in % of total FDI to all developing countries included in our sample	UNCTAD (2007a)
GDP	Real (or nominal) GDP, constant 2000 (current) US$	World Bank (2006)
DiffGDPpc	Difference between source and host GDP per capita, constant 2000 US$	World Bank (2006)
Growth	Real GDP growth rate of host country in %	World Bank (2006)
Inflation	Inflation rate of host country in % (GDP deflator)	World Bank (2006)
Openness	Sum of imports and exports in % of GDP (host country)	World Bank (2006)
ComBorder	Common border between source and host country	Dollar & Kraay dataset
ComLang	Common language between source and host country	Dollar & Kraay dataset
Distance	Distance in km between source and host country	Dollar & Kraay dataset
ColonTies	Colonial ties between source and host country	Dollar & Kraay dataset
RTA	Dummy regional trade agreement, 0-1	WTO (2007)
PolCon	Political constraints III, Henisz database, 0-1	Downloaded from Henisz's homepage
CapOpen	Indicator for capital account openness; Chinn-Ito index on financial openness	Chinn and Ito (2005); data kindly provided by Hiro Ito
BIT	Bilateral investment treaty, ratified between source and (developing) host country,	UNCTAD (2007b)
Education	Average Years of (total) schooling, total population, age 15+	Barro and Lee (2001) and UNESCO (2007)
Education Inequality	Average Years of (total) schooling, male minus female score, age 15+	Barro and Lee (2001) and UNESCO (2007)
Primary Education	Average Years of primary schooling, total population, age 15+	Barro and Lee (2001) and UNESCO (2007)
Primary Education Inequality	Average Years of primary schooling, male minus female score, age 15+	Barro and Lee (2001) and UNESCO (2007)
Secondary Education	Average Years of secondary schooling, total population, age 15+	Barro and Lee (2001) and UNESCO (2007)
Secondary Education Inequality	Average Years of secondary schooling, male minus female score, age 15+	Barro and Lee (2001) and UNESCO (2007)
Tertiary Education	Average Years of tertiary schooling, total population, age 15+	Barro and Lee (2001) and UNESCO (2007)
Tertiary Education Inequality	Average Years of tertiary schooling, male minus female score, age 15+	Barro and Lee (2001) and UNESCO (2007)
Literacy Rate	Literacy rate, total population, age 15+	World Bank (2006)
Literacy Rate Inequality	Literacy rate, male minus female score, age 15+	World Bank (2006)

Appendix B: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
ln (FDI1)	15,410	0.90	2.36	-10.07	11.67
ln (FDI2)	15,410	0.25	0.75	0.00	5.29
ln (FDI3)	15,410	0.29	0.82	0.00	5.30
ln (GDP)	15,410	23.95	2.11	19.14	29.97
ln (DiffGDPpc)	15,410	8.59	11.11	-32.20	37.09
Growth	15,410	3.32	4.95	-18.20	77.70
ln (Inflation)	15,410	2.73	1.65	-3.26	9.44
Openness	15,410	71.94	37.83	9.31	245.81
ComBorder	15,410	0.02	0.15	0.00	1.00
ComLang	15,410	0.10	0.30	0.00	1.00
ln (Distance)	15,410	8.77	0.83	4.31	9.89
ColonTies	15,410	0.03	0.17	0.00	1.00
RTA	15,410	0.12	0.32	0.00	1.00
PolCon	15,410	0.30	0.21	0.00	0.71
CapOpen	15,410	0.22	1.53	-1.75	2.62
BIT	9,909	0.16	0.35	0.00	1.00
Total Education	15,410	6.17	2.80	0.49	13.18
Total Schooling Inequality	15,410	0.86	0.85	-1.13	3.64
Primary Education	15,410	4.03	1.56	0.42	7.85
Primary Education Inequality	15,410	0.47	0.54	-0.71	1.97
Secondary Education	15,410	1.86	1.25	0.06	5.74
Secondary Education Inequality	15,410	0.30	0.38	-0.61	1.91
Tertiary Education	15,410	0.29	0.27	0.00	1.61
Tertiary Education Inequality	15,410	0.09	0.11	-0.24	0.57
Literacy Rate	16,916	78.05	23.73	7.70	99.80
Literacy Rate Inequality	16,916	9.25	10.42	-5.45	38.69

Appendix C: Source Country Sample

Argentina, Australia, Austria, Belgium-Luxembourg, *Brazil*, Canada, *Chile*, *Colombia*, Denmark, Finland, France, Germany, Iceland, Ireland, Japan, Republic of Korea, *Malaysia*, *Mexico*, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Taiwan, *Thailand*, *Turkey*, United Kingdom, United States, *Venezuela*

Note: Developing source countries in italics.

Appendix D: Host Country Sample

Albania, *Algeria,* ***Angola****, Argentina,* Australia, Austria, *Bangladesh,* Belgium-Luxembourg, *Bolivia, Botswana, Brazil,* ***Bulgaria****,* ***Burkina Faso***, *Cameroon,* Canada, *Chile, China, Colombia, Republic of Congo, Costa Rica****,*** ***Côte d'Ivoire***, ***Croatia***, Denmark*, Dominican Republic, Ecuador, Egypt, El Salvador,* ***Estonia, Ethiopia***, Finland, France, *Gambia,* Germany, *Ghana,* Greece, *Guatemala, Guyana, Haiti, Honduras, Hungary,* Iceland, *India, Indonesia,* Ireland, Israel, Italy, Japan, *Jordan,* ***Kazakhstan***, *Kenya,* Republic of Korea, ***Latvia***, ***Lithuania***, *Malaysia, Mali, Mauritius, Mexico,* ***Mongolia***, *Mozambique,* ***Namibia***, Netherlands, New Zealand, *Nicaragua, Niger,* ***Nigeria***, Norway, ***Oman***, *Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Poland,* Portugal, ***Romania***, ***Russian Federation***, ***Saudi Arabia***, *Senegal,* ***Slovenia***, Spain, *Sri Lanka, Sudan, Swaziland,* Sweden, Switzerland, *Syrian Arab Republic,* Taiwan, *Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda,* ***Ukraine***, United Kingdom, United States, *Uruguay, Venezuela,* ***Vietnam***, *Zambia, Zimbabwe*

Note: Developing host countries in italics; countries in bold are only included in the literacy rates regressions.