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ORIGINAL PAPER

FDI promotion through bilateral investment treaties: more than a bit?

Matthias Busse · Jens Königer · Peter Nunnenkamp

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Abstract Policy makers in developing countries have increasingly pinned their hopes on bilateral investment treaties (BITs) in order to improve their chances in the worldwide competition for foreign direct investment (FDI). However, the effectiveness of BITs in inducing higher FDI inflows is still open to debate. It is in several ways that we attempt to clarify the inconclusive empirical findings of earlier studies. We cover a much larger sample of host and source countries by drawing on an extensive data set on bilateral FDI flows. Furthermore, we account for unilateral FDI liberalization, in order not to overestimate the effect of BITs, as well as for the potential endogeneity of BITs. Employing a gravity-type model and various model specifications, including an instrumental variable approach, we find that BITs do promote FDI flows to developing countries. BITs may even substitute for weak domestic institutions, though probably not for unilateral capital account liberalization.

Keywords FDI · Multinational corporations · Bilateral investment treaties

JEL Classification C33 · F21 · F23

1 Introduction

Foreign direct investment (FDI) inflows are widely perceived to be superior to other types of capital inflows. Apart from offering additional investment resources, FDI may help host countries foster economic development by offering access to

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internationally available technologies and managerial know-how, rendering it easier for the host countries to penetrate foreign markets, and making them less prone to sudden reversal of flows in times of crisis. At the UN Conference on Financing for Development in Monterrey, Mexico, in March 2002, Heads of State and Government propagated the view that FDI provides an important means to eradicate poverty in developing countries. According to the Monterrey Consensus, the central challenge is to overcome the concentration of FDI in few (large and relatively advanced) developing countries so that poor countries would be able to reap the benefits of FDI (UN 2002).

Hence, it is not surprising that policy makers in almost all countries are engaged in fierce competition for FDI inflows. However, it has remained disputed as to how effective the means are that national policy makers have at their disposal when attempting to attract FDI. Major driving forces of FDI (e.g., the size and development of host country markets, the endowment of local factors of production, and geographical and cultural proximity to major source countries) are largely beyond the realm of short-term policy making. This may explain why policy makers have increasingly pinned their hopes on two sets of measures: (i) unilateral regulatory changes and incentives such as opening up previously restricted industries, removing foreign ownership restrictions, promotional efforts, and tax and fiscal inducements; and (ii) bilateral agreements through which host country governments commit themselves to binding obligations, e.g., concerning the entry of foreign investors, post-entry regulations, profit remittances and dispute settlement.

In this paper, we focus on the effectiveness of bilateral investment treaties (BITs) in stimulating additional FDI inflows. The few empirical studies addressing this question have produced highly ambiguous results (Sect. 2). We suspect that this is at least partly due to the fairly small sample of host countries covered by most previous studies. We make use of the extensive data on bilateral FDI flows collected by UNCTAD (which is largely unpublished, but available from its Data Extract Service). In this way, we avoid a sample selection bias which is likely to arise when the sample is restricted to relatively advanced host countries. Moreover, this paper is the first to address the issue of isolating the effects of BITs from the effects of unilateral regulatory changes on FDI inflows.

After reviewing the results obtained by previous studies in Sect. 2, we illustrate some stylized facts on both BITs and unilateral measures to liberalize the capital account in Sect. 3. The gravity-type model applied is presented in Sect. 4, where we also discuss methodological choices (notably the use of bilateral FDI flows) as well as the data employed. Sect. 5 reports our main results. We find that BITs are effective in promoting FDI inflows and may even substitute for weak domestic institutions, though probably not for unilateral regulatory measures to promote FDI. Various robustness checks are carried out in Sect. 6. Sect. 7 concludes.

2 Previous literature

More than 20 years ago, Schneider and Frey (1985) found it surprising that two strands of the literature on the determinants of FDI had developed quite separately

from each other. Studies stressing political factors had largely neglected economic factors, whereas studies stressing economic factors had largely neglected political factors. A similar dichotomy can still be observed even though the call by Schneider and Frey for a politico-economic model that accounts for both economic and political determinants is fairly common by now.

What recent studies tend to ignore is that policy makers in various countries have resorted to two sets of measures to attract more FDI inflows: (i) unilateral, i.e., non-binding changes in FDI-related regulations, most of which amount to a more favorable treatment of FDI, and (ii) bilateral (as well as plurilateral) treaties in which host countries have committed themselves in a legally binding way to grant foreign investors various rights that reduce uncertainty with respect to entry and exit conditions, post entry operations as well as dispute settlement mechanisms.

Several empirical analyses focus on unilateral measures. Examples include Gastanaga et al. (1998), Asiedu and Lien (2004), Pica and Rodríguez Mora (2005), Asiedu (2006), and Desai et al. (2006). Gastanaga et al. examine the effects of various policy measures on FDI flows, including the role of investment regulations. They employ two indicators of the degree of openness to international capital flows, both of which are constructed from the International Monetary Fund's (IMF) Annual Report on Exchange Arrangements and Restrictions. Less restrictive capital controls are typically associated with higher FDI inflows (pooled data for 49 developing countries in the period 1970–1995). Asiedu and Lien (2004) refer to the same source, but consider three types of controls (multiple exchange rates, controls on capital account transactions, and controls with regard to export proceeds) for a broader panel of 96 developing countries in 1970–2000. The coefficients of all three dummy variables are statistically significant; the absence of controls on capital account transactions increases the ratio of FDI to GDP by about 0.6%. In a paper on FDI in Africa, Asiedu (2006) refers to the International Country Risk Guide (ICRG) to assess the host countries' attitude towards inward FDI. The ICRG index comprises four components: risk of operations, taxation, repatriation of profits, and labor costs. Lagged openness to FDI according to this index is shown to have positive effects on FDI in Africa. However, the coverage of this index extends well beyond capital account restrictions. The same applies to the measures of "regulatory distance" employed by Pica and Rodríguez Mora (2005),[1] which they find to be negatively related to bilateral FDI flows. By contrast, Desai et al. (2006) focus on a more specific measure than the IMF's overall assessment of capital controls, i.e., restrictions on capital repatriation and profit remittances as provided by Shatz (2000). When using this more specific measure, the negative effects of capital controls on FDI by US-based companies become stronger.

The few studies addressing the question whether the recent surge of BITs has helped host countries attracting more FDI typically do not take into account that unilateral liberalization of FDI regulations has proceeded at the same time.[2] When

[1] These authors use OECD data on product market regulations in OECD countries as well as the World Bank's *Doing Business* database.

[2] This is even though it is sometimes discussed whether BITs may substitute for weak local (political and economic) conditions; see below.

discussed at all, unilateral measures are discounted as non-binding (Neumayer and Spess 2005). This reasoning is based on the presumption that bilateral contractual arrangements, in contrast to unilateral measures, provide a credible commitment through which time-inconsistency problems can be overcome (Vandevelde 1998; Hallward-Driemeier 2003; Elkins et al. 2006). Non-binding unilateral measures would be time inconsistent if the host country had an incentive to renege on earlier promises after the investment has been made.

Yet it is open to question whether the commitment through BITs is more effective than unilateral liberalization. Theoretically, BITs would be superior if attracting FDI were a one-time game. The host country could then easily renege on unilateral promises with regard to the treatment of FDI once the foreign investor realized the sunk costs associated with locating in the host country. In reality, however, attracting FDI amounts to a repeated game in which the host country strives for a continuous stream of FDI inflows from investors observing its behavior in the past. In other words, reversing unilateral liberalization once some FDI is "locked in" would come at the cost of deterring future inflows.

Moreover, Vandevelde (1998) argues that the bilateral commitment is often of limited value as BITs constitute "only a small part of a liberal investment regime" (p. 515) and "allow the host state considerable discretion" (p. 517). Most BITs share important features: "The majority of existing BITs have very similar provisions based as they are on the model treaties developed by the home countries of the major MNCs" (Tobin and Rose-Ackerman 2006, p. 8). In particular, BITs typically include a guarantee of national treatment as well as most-favored-nation (MFN) treatment for FDI projects. In the "traditional admission model" (UNCTAD 2007), however, these guarantees apply only after FDI has been approved (post establishment). Consequently, unilateral FDI liberalization going beyond the traditional BIT model may offer more in terms of substance, even if BITs are superior in terms of commitment.[3]

Apart from being used deliberately as a commitment device, Elkins et al. (2006) present a "competitive model" to explain why it is rational for a host country to expect higher FDI inflows through signing BITs. Host countries face a collective action problem once it is taken into account that the conclusion of BITs involves costs for them, e.g., by relegating adjudicative authority to foreign tribunals (sovereignty costs). Host countries may be better off when collectively resisting the demand of foreign investors for BITs. For the individual host country, however, it is rational to sign BITs in order to gain reputational advantage and thereby, divert FDI away from competing host countries.[4] Especially countries competing for similar types of FDI are expected to sign BITs, in order not to place themselves at a disadvantage (see also Tobin and Rose-Ackerman 2005). However, this line of reasoning not only applies to BITs but also to unilateral FDI liberalization.

[3] Note, however, that "another—relatively small—category of BITs imposes a higher degree of discipline on the contracting parties" (UNCTAD 2007, p. 155). We return to this issue in Sect. 4 and discuss the resulting limitations of the dummy variable on BITs used here and in previous literature.

[4] As discussed in more detail in Sect. 4, this argument leads us to consider the share of host country j in total FDI flows from source country i to be our preferred FDI measure when specifying the empirical model.

While previous empirical studies on the effects of BITs have largely in common that they do not account for unilateral FDI liberalization, their research design as well as the data used and the sample of host and source countries differ significantly.[5] Hence, it is not surprising that empirical findings have remained highly ambiguous. Hallward-Driemeier (2003) is the only study that employs bilateral FDI flows for more than one source country, as we do in this paper.[6] She finds little evidence that BITs have stimulated FDI flows from OECD countries to developing host countries. However, the study covers just 31 host countries. While Hallward-Driemeier does not provide details on the sample, this is likely to bias results as minor hosts of FDI typically go unreported in published OECD statistics on FDI outflows.

Neumayer and Spess (2005) suspect that the dyadic approach of Hallward-Driemeier underestimates the effects of BITs on FDI, and argue in favor of a non-dyadic approach instead, since published data on aggregate FDI flows from all sources are available for a much larger sample of host countries. Moreover, the non-dyadic approach may capture spillover effects that BITs with important source countries may have on FDI flows from other source countries. Indeed, Neumayer and Spess find that developing host countries which have agreed to a larger number of BITs have attracted higher FDI inflows. By contrast, Tobin and Rose-Ackerman (2005, p. 23) conclude that "BITs do not seem to encourage FDI except at low levels of political risk", even though their analysis, too, is non-dyadic. In particular, Tobin and Rose-Ackerman reject the view that BITs are a substitute for a favorable local business environment, whereas Neumayer and Spess report some evidence to this effect.[7] In another paper, Tobin and Rose-Ackerman (2006) focus on political and economic factors as complements to BITs. It turns out that the positive impact of BITs on FDI inflows strongly depends on a supportive political-economic environment.

The striking differences between previous studies may be partly due to sample size. For instance, Neumayer and Spess (2005) cover a broader sample than Tobin and Rose-Ackerman (2005). Results may also depend on whether (and in which way) the possible endogeneity of BITs is taken into account.[8] Salacuse and Sullivan (2005) add another dimension to the debate. These authors find that BITs concluded

[5] The short review of previous empirical literature is restricted to studies that focus on the effects of BITs on FDI flows to developing countries, where this issue appears to be most relevant. Some other studies concentrate on FDI relations within the OECD, or between OECD countries and a small number of East and Central European transition countries; see Egger and Merlo (2007) for a recent example. Arguably, these studies offer limited insights for policy makers in developing countries. They exclude "the very set of poor to lower middle-income and small to medium-sized developing countries, for which the conclusion of a DTT (or BIT, for that matter) can be an important instrument to woo foreign investors" (Neumayer 2007, p. 1506). See also Sect. 4 below.

[6] Blonigen and Davies (2005) use bilateral FDI data to evaluate the effects of double taxation treaties.

[7] Similar to Tobin and Rose-Ackerman (2005), Hallward-Driemeier (2003, p. 22) concludes: "A BIT has not acted as a substitute for broader domestic reform." Note, however, that none of the three studies employs FDI-specific regulations as a control variable which with the BITs variable is interacted, as we do in the following.

[8] See Sect. 4 on how we deal with endogeneity.

by developing countries with the United States lead to higher FDI inflows, whereas BITs with other source countries do not.[9]

The gravity model results of Daude and Fratzscher (2008) provide further reason to carefully test for the robustness of empirical estimates on the impact of BITs on FDI inflows. Daude and Fratzscher focus on information frictions as determinants of (bilateral) FDI stocks (and other types of foreign capital), but include BITs as a control variable. The effect of BITs on FDI proves to be highly sensitive to the size of the sample.[10] The analysis of these authors is purely cross-sectional so that the effects BITs may have over time remain open to question. Yet, this study provides an important insight. In addition to their gravity model, Daude and Fratzscher assess various factors that may explain the host country fixed effects emerging from this model. Inter alia, they consider a dummy on capital account openness as well as institutional indicators related to investor protection (risk of expropriation, risk of repudiation and time of dispute settlement) as possible determinants of FDI. Even though FDI is found to be relatively insensitive to these factors across host countries, especially compared to portfolio investment, their analysis stands out in that it takes account of the bilateral dimension of FDI determinants *and* host country effects resulting from unilateral measures.

3 Stylized facts on BITs and unilateral FDI liberalization

The conclusion of BITs and unilateral FDI liberalization developed in unison with each other. It is in both ways that host countries increasingly attempted to attract FDI inflows, notably since the early 1990s. The number of BITs remained fairly limited until the late 1970s. The conclusion of BITs gathered considerable momentum during the last 15 years when the number of BITs soared from about 400 to almost 2,500 at the end of 2005 (Fig. 1).

Considering the contractual parties that have concluded BITs, Fig. 2 reveals that developed countries are involved as a signatory in 60% of all BITs in force at the end of 2005, with either developing countries (39%), transition countries (13%) or another developed country (8%) representing the second signatory. Neumayer and Spess (2005, p. 1573) argue that it is mainly BITs concluded between a developed and a developing (or transition) country that can be expected to have significant effects on FDI flows from the former to the latter. It should be noted, however, that various developing countries account for a rising share of worldwide FDI *out*flows. Taken together, developing source countries accounted for 12% of total outward FDI stocks in 2005 (UNCTAD 2006).[11] At the same time, an increasing number of

[9] By contrast, Tobin and Rose-Ackerman (2005) do not find that US FDI is directed to host countries that concluded BITs with the United States. Gallagher and Birch (2006) focus on Latin America. They show that the total number of BITs had a positive effect on aggregate FDI flows to South America, whereas having a BIT with the United States did not attract US FDI.

[10] The number of observations varies considerably depending on the specification of the model, i.e., the use of alternative indicators on information frictions.

[11] Major developing source countries include Brazil, China, Hong Kong, Rep. of Korea, Singapore, and Taiwan.

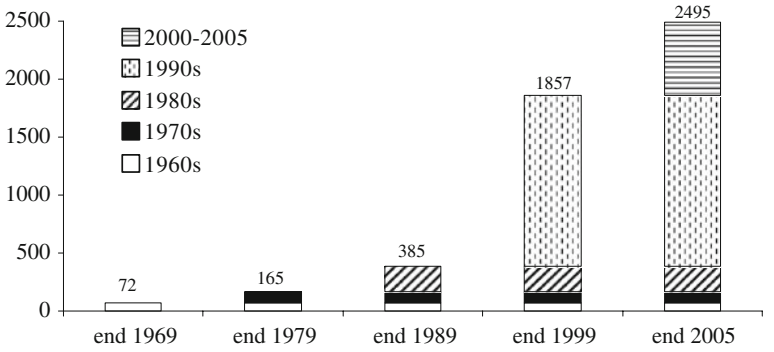

Fig. 1 Number of BITs concluded, 1969–2005. *Source* UNCTAD (2008b)

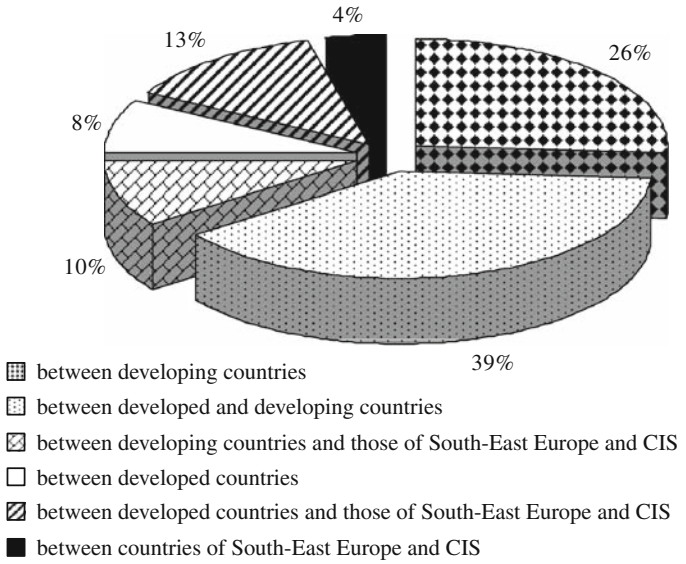

Fig. 2 Total BITs concluded, by country group, as of end 2005. *Source* UNCTAD (2008b)

BITs have been concluded among developing countries. Hence, it makes sense to account for developing countries as source countries, too, as well as for BITs concluded among developing countries. We will test for the robustness of our results by running separate estimates for developed and developing source countries.

Similar to the time pattern observed for BITs, unilateral capital account liberalization gathered momentum only in the 1990s. Fig. 3 portrays the Chinn–Ito index on financial openness (Chinn and Ito 2005).[12] The index is based on several dummy variables, including the presence of multiple exchange rates, restrictions on

[12] We would like to thank Hiro Ito for providing access to these data. See Sect. 4 for a short discussion of alternative indicators of unilateral capital account liberalization.

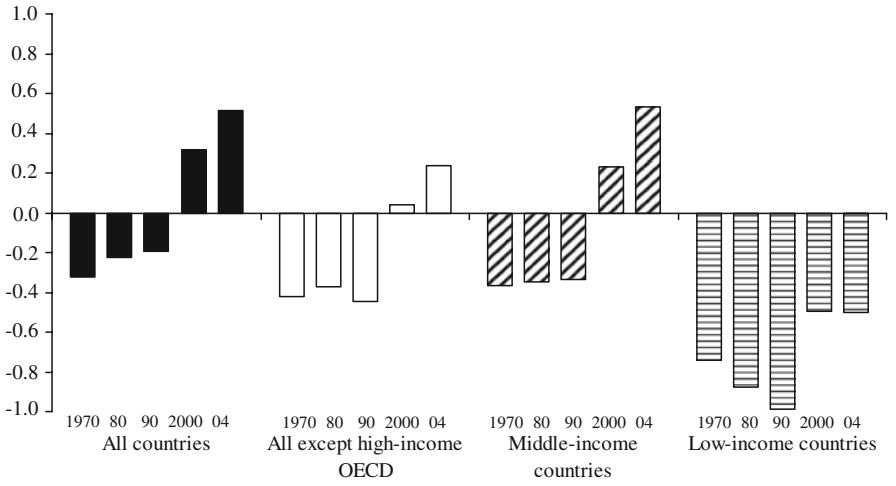

Fig. 3 Capital account liberalization, average for selected country groups 1970–2004. *Note* Country classification according to World Bank (2006); see text for explanation of the Chinn–Ito index on financial openness. *Source* Chinn and Ito (2005)

capital account transactions and requirements to surrender export proceeds. Unilateral liberalization in these respects can reasonably be expected to help attract higher FDI inflows. The index is calculated so that higher index values indicate greater openness to cross-border capital transactions (with a mean of zero).

Prior to 1990, unilateral capital account liberalization according to the Chinn–Ito index was largely confined to high-income OECD countries. By contrast, the 1990s witnessed a major change in capital account regulations by non-OECD countries, i.e., the host countries of FDI on which we focus in the following. Capital account liberalization in this broadly defined group of countries continued in most recent years. However, recent liberalization was restricted to the sub-group of middle-income countries. Unilateral liberalization was discontinued by the sub-group of low-income countries which, on average, still have much stricter capital account restrictions.

Taken together, the short account of trends with respect to the conclusion of BITs and unilateral regulatory changes that may help attract FDI inflows strongly suggests accounting for both sets of policy measures when assessing the effectiveness of BITs.

4 Method and data

As detailed below, we estimate a gravity-type model on the determinants of FDI. A theoretically more appealing option might have been to base our estimations on the well-known knowledge–capital model of the multinational enterprise (MNE) developed by Carr et al. (2001). This model integrates the two major types of MNEs into a single theoretical framework: horizontal MNEs with similar production

activities in their home and host countries and vertical MNEs with segmented value chains and headquarter services in the (more advanced) home country. Essential elements of the knowledge–capital model determining the type of MNE activity include trade and investment costs, the size of markets, skill endowments, as well as interactions, e.g., between size and endowment differences of the host and home countries of MNEs.

A major advantage of the knowledge–capital model is that it yields testable hypotheses on the relevance of the driving forces of horizontal and vertical FDI. Yet, deriving the estimation equation from this model meets with several problems in the present context of employing the largest possible panel data set on bilateral FDI to contain sample selection bias. Data restrictions prevent us from capturing several of the above noted essential elements of the knowledge–capital model. Especially for low-income countries, data on skill endowments are often not available for sufficiently long periods of time. Comparable indicators on trade and investment costs, ranging back in time, are available for just a small part of our host country sample. Apart from data constraints, Egger and Merlo (2007) have argued that empirical models based on Carr et al. (2001) perform less well in panel settings such as the current one. Specifically, the interaction terms of the knowledge–capital model lead to multicollinearity among the regressors, which Egger and Merlo consider to be particularly harmful in the time dimension of FDI panel data. Note also that we define the dependent FDI variable as the share of host country j in source country i's overall FDI. While this preferred definition follows from the aforementioned "competitive model" of BITs by Elkins et al. (2006), it would fit less well with the knowledge–capital model.

Therefore, we follow large parts of the relevant literature and estimate a gravity-type model on the determinants of FDI.[13] As noted by 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 bilateral FDI; prominent examples include: Shatz (2003), Mutti and Grubert (2004), Martin and Rey (2004), as well as Portes and Rey (2005). Shatz' (2003) analysis of US FDI clearly reveals that sample selection matters for empirical results.[14] However, none of these studies considers BITs to be a possible determinant of FDI.

According to Portes and Rey (2005, p. 275), the gravity approach "emerges naturally" from theories of asset trade. In order to avoid misspecification and omitted variable biases, however, unobservable host and source country effects, as well as bilateral effects have to be controlled for.[15] Anderson and van Wincoop

[13] Blonigen et al. (2007, 1309) note that the gravity model "is arguably the most widely used empirical specification of FDI".

[14] As noted by Shatz (2003, p. 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".

[15] We are particularly grateful to an anonymous referee for alerting us to this point.

(2003) stressed so-called "multilateral resistance" as an important potential source of omitted variable bias in trade-related gravity equations. Accordingly, trade between two partner countries depends on bilateral barriers relative to the average barriers of the two countries to trade with all their trading partners. Baier and Bergstrand (2007, p. 75) note that some earlier contributions have in common with Anderson and van Wincoop's (2003) multilateral (price) resistance terms that "price levels or some form of multilateral price indexes surface theoretically."

Anderson and van Wincoop (2003) as well as Feenstra (2004) argue that country-specific fixed effects offer a computationally simple method to account for multilateral resistance terms and, thereby, generate consistent coefficient estimates in cross-section gravity models.[16] In a panel setting of bilateral trade, Baier and Bergstrand (2007) demonstrate that most plausible estimates of the average effect of free-trade agreements on trade flows are obtained with pair fixed effects and country-and-time effects.[17] Note that multilateral resistance terms would be time varying in a panel setting, suggesting to include country-specific dummies for each time period. Bergstrand and Egger (2007) provide a similar theoretical rationale for estimating gravity equations of bilateral FDI flows (and foreign affiliate sales). In particular, they include bilateral pair fixed effects to eliminate any omitted variable bias associated with unobserved time-invariant pair-specific heterogeneity.[18]

Against this backdrop, we include host-year and source-year effects as well as pair fixed effects to achieve a consistent estimate of the impact of BITs on bilateral FDI. The basic specification of our gravity model reads as follows:

$$\ln\left(\frac{FDI_{ijt}}{FDI_{it}}\right) = \alpha_0 + \gamma' X_{jt} + \varphi' Y_{ijt} + \alpha_1 BIT_{ijt} + \lambda_t + \mu_{it} + \phi_{jt} + \varepsilon_{ijt} \qquad (1)$$

where FDI_{ijt} stands for foreign direct investment of country i in country j in period t, FDI_{it} for total FDI of country i in all (developing) countries included in our sample, 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 BIT_{ijt} corresponds to a ratified bilateral investment treaty. We also control for source-year effects (μ_{it}) and host-year effects (ϕ_{jt}).

In order to be able to compare our results with those of previous studies such as Hallward-Driemeier (2003), Neumayer and Spess (2005) and Tobin and Rose-Ackerman (2005, 2006), we follow them in using FDI *flows* as our dependent variable. This is not to ignore that FDI flows are a flawed proxy for the activity of MNEs. However, clearly superior measures such as MNE sales, production or employment are available for just a few of the host-source country pairs. In terms of data availability, FDI *stocks* offer the only alternative. But stocks are not necessarily

[16] The fixed-effect approach might result in less efficient coefficient estimates, compared to using the explicit multilateral resistance terms. Yet, Feenstra (2004, p. 161–162) considers the fixed-effect approach to be the preferred empirical method due to its computational simplicity.

[17] See also Egger (2000, p. 29) who argued in a panel setting of trade flows that "the proper econometric specification of the gravity equation in most applications would be one of fixed country and time effects".

[18] In contrast to Baier and Bergstrand (2007), multilateral resistance terms are assumed to be "slow moving" by Bergstrand and Egger (2007, p. 284) so that pair fixed effects are supposed to capture also "the (most important) cross-sectional influence of these terms".

superior to flows as a measure of MNE activity. Lipsey (2001, p. 17) concluded from reviewing the literature that FDI stocks "tell us little about what kind of activity is taking place, and what they tell us is often wrong." More recently, Mayer-Foulkes and Nunnenkamp (2009), applying various measures of US FDI, also find that FDI stocks are probably even less suited than flows to reflect MNE activity.

More specifically, we follow Hallward-Driemeier (2003) in that we use *bilateral* FDI flows. We overcome the critique of Neumayer and Spess (2005) concerning the limited host country coverage of previous dyadic analyses by fully exploiting the (largely unpublished) data on bilateral FDI flows available upon request from UNCTAD's Data Extract Service. As discussed in Sect. 2, the dyadic approach may underestimate the impact of BITs if the host country, by concluding a BIT with one source country, signals to other source countries that their FDI will be protected in the same way. However, signaling effects cannot necessarily be attributed to BITs once it is taken into account that host countries have followed a two-pronged approach of unilateral FDI liberalization and bilateral commitments through BITs (Sect. 3). Any BIT-related signaling to third parties is no more credible than non-binding unilateral liberalization. Hence, we control for unilateral liberalization in our dyadic approach in order not to overestimate the effects of BITs on FDI inflows.

Our preferred definition of the dependent variable is the share of FDI attracted by a specific host country in total FDI flows from the source country under consideration to all developing host countries included in our sample. This measure captures the attractiveness of a particular developing country relatively to other developing countries. Moreover, this FDI measure clearly relates to the theoretical model of Elkins et al. (2006), according to which host countries sign BITs in order to divert FDI away from competing host countries. As part of our extensive robustness tests in Sect. 6, we employ two additional specifications of the dependent variable: FDI inflows in US$ million and FDI as a share of GDP.

Since there is a large number of zero observations for FDI at a bilateral level, we consider two variants of our preferred FDI measure, with (*FDI*1) or without zero observations (*FDI*2). It is highly likely that the missing data in our data set are in fact zeros, since we consider FDI at a bilateral level for a long period of time. Hence, *FDI*1 includes missing values as zero observations even though there might be some unreported FDI figures due to confidentiality. We calculate 3-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 3-year averages) were set equal to zero to include as many observations as possible.[19]

We employ a fairly standard set of controls. We include total real host country GDP and real GDP growth for market seeking FDI (labeled *GDP* and *Growth*, respectively), host country inflation (*Inflation*), host country openness to trade (*Openness*), and the difference in GDP per capita between the source and the host country for vertical FDI (*DiffGDPpc*). Moreover, we incorporate dummies for the existence of a bilateral or regional trading agreement, that is, a free trade agreement

[19] The results hardly change if we exclude negative values.

or customs union (*RTA*), a double taxation treaty (*DTT*), and a common currency (*CommonCurrency*).[20] We expect a positive association of *GDP*, *Growth*, *DiffGDPpc*, *RTA*, *DTT*, and *CommonCurrency* with FDI; the opposite applies to *Inflation*, as this variable can be interpreted as a proxy for macroeconomic distortions.[21]

To reduce the skewness in the data, we take the natural logarithm of *GDP*, *FDI*1, *FDI*2, *DiffGDPpc*, and *Inflation*. To avoid the loss of observations for which we have negative values or zeros, for example for *Inflation,* we use the following logarithmic transformation:

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

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.

Institutional development of host countries, proxied by political constraints on the executive branch (*PolCon*), is included as a control variable as poor institutions may discourage FDI by giving rise to uncertainty (e.g., with respect to the protection of property rights; Lee and Mansfield 1996; Henisz 2000) and additional costs (e.g., in the case of corruption; 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.

In contrast to earlier studies, we mitigate the omitted variable bias by controlling for unilateral regulatory changes that may have an impact on FDI flows. Note that unilateral regulatory changes typically apply to FDI from all sources in the same way. We use the Chinn–Ito index measuring a country's capital account openness (*CapOpen*), expecting a positive link between *CapOpen* and FDI flows. The Chinn–Ito index is available for the period 1970–2004 and for more than 160 countries. Given its broad coverage over time and across countries, the Chinn–Ito index is clearly superior to other possible measures of FDI-related local restrictions.[22] For example, UNCTAD's account of changes in national FDI regulations is not available for specific host countries. The World Economic Forum (2006) presents survey information on foreign ownership restrictions for 125 countries, but this information is not available over time. The time series data of Quinn and Toyoda (2008) on countries' policies towards the capital account come closest to the Chinn–Ito index.[23] However, country coverage (94) is far from that of the Chinn–Ito index.

[20] See Table 6 in Appendix 1 for exact definitions and data sources for all variables.

[21] Descriptive statistics can be found in Table 7 in Appendix 1.

[22] See Quinn and Toyoda (2008) for a comparison of different measures on capital account openness.

[23] We would like to thank Dennis Quinn for providing access to these data, derived from the coding of de jure measures published in the IMF's Annual Report on Exchange Arrangements and Restrictions. The scoring takes into account the severity of restrictions in various categories of financial transactions.

In particular, low-income countries are underrepresented in the Quinn–Toyoda data set, giving rise to a sample selection bias.[24]

As concerns our variable of principal interest, *BIT* stands for a ratified bilateral investment treaty between the source and the host country. While we could have used the date of signing a BIT, we rather employ the date of ratification since only ratified BITs offer protection to (foreign) investors.[25] Accordingly, the BIT variable represents a dummy taking the value of 1 when FDI flows from a specific source country to a specific host country were governed by a (ratified) BIT in a particular year. Since we use 3-year averages for all variables, *BIT* takes the value of either 0, 0.33, 0.66, or 1.

While we follow previous studies in employing a dummy variable for BITs, the resulting limitations should be kept in mind. Treating BITs as homogenous may be justified to the extent that most of them share important characteristics; but this "does not mean…that all agreements provide the same degree of investment protection" (UNCTAD 2007, p. 155). In particular, some recent BITs have broadened the coverage of FDI-related issues and have become more binding. We tentatively address this issue in Sect. 6 by testing whether recent BITs have been more effective than older BITs in promoting FDI inflows. We also perform separate estimations for BITs concluded with the United States, which has been the frontrunner in pressing for stricter BITs and imposing more discipline on host countries (Tobin and Rose-Ackerman 2006, p. 8). However, it is clearly beyond the scope of the present paper to classify the about 2,500 BITs according to the degree of protection offered.[26]

To check the robustness of our results, we use different estimation techniques: For a start, we ignore the potential endogeneity of *BIT*. First of all, we estimate a simple ordinary least squares (OLS) fixed-effects model. This is in line with the recent literature on a theoretically motivated gravity equation. Indeed, a standard Hausman test indicated that this model is preferred in comparison to a random-effects model. We then estimate a fixed-effects Poisson Pseudo Maximum Likelihood (PPML) model to account for the fact that the sample includes a large number of zero observations (*FDI*1).

In the next step, we account for possible endogeneity. While ratifying a BIT could increase FDI flows to a developing country, we cannot rule out reverse causality. Above all, investors might press their government to ratify BITs with host countries in which they are heavily engaged, though feeling insecure regarding, for example, expropriation or the repatriation of profits. Neumayer and Spess (2005) lag BITs by one period to mitigate potential reverse causality, but dismiss instrumental

[24] The sample of Quinn and Toyoda includes just 18 countries with a per capita income of less than US$ 875 (2005), compared to 47 low-income countries for which the Chinn–Ito index is available. Moreover, the Quinn–Toyoda data set covers just four annual observations for the period under consideration here, with 1997 being the most recent observation for most of the country sample. Hence, it is also with respect to the time dimension that the Chinn–Ito index is to be preferred for the present purpose.

[25] A few countries signed BITs but never ratified them; for example, Brazil was signatory of 14 non-ratified BITs as of 1 June 2008. Any impact of the signed BITs is thus questionable.

[26] As argued by Neumayer (2007) with respect to DTTs, this would require an enormous effort; various provisions may be next to impossible to quantify.

variable (IV) regressions for lack of appropriate instruments.[27] One period lags can be problematic, however, especially when using annual data as in Neumayer and Spess (2005).

As for the instrumentation technique, we use a dynamic Generalized Methods of Moments (GMM) estimator, as some of the control variables may be endogenous, too. For instance, FDI may affect the overall trading volume (and, thus, *Openness*) if foreign companies import intermediate goods and export processed goods, or may have an impact on growth in the host country. More specifically, we employ the system GMM estimator, introduced by Arellano and Bover (1995) and Blundell and Bond (1998), which is derived from the estimation of a system of two simultaneous equations: the first one in levels (with lagged first differences as instruments), and the second one in first differences (with lagged levels as instruments). As shown by Blundell and Bond (1998), the system GMM performs better than the difference GMM, as the latter can have poor finite sample properties and is downwards biased, especially when the number of periods t is small. Moreover, the difference GMM is not suitable for the BIT variable which changes its value only in periods of the ratification of a bilateral investment treaty.

Our analysis covers the period 1978–2004, that is, nine observations of 3-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] However, as concerns the hosts of FDI, we follow most of the previous studies and consider developing countries only. It is mainly for them that BITs may compensate for less developed local institutions and can, thus, be expected to promote FDI inflows. At the same time, 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 sample consists of 83 developing host countries, which is almost three times as large as the sample used by Hallward-Driemeier (2003). By covering 28 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.[29]

[27] Hallward-Driemeier (2003) applies the number of BITs a host country has concluded with third countries as an instrument for the BITs concluded between particular pairs. This instrumentation is awkward if Neumayer and Spess (2005) are right in that BITs concluded with a particular source country have signaling effects and may, thus, be correlated with FDI from other sources, too. Tobin and Rose-Ackerman (2005) use a time variable and the level of democracy in the host country as instruments. The reason given for this instrumentation is that, observing that more and more countries conclude BITs, a particular host country may feel the need to join this trend in order not to be left out. However, this argument rather suggests employing the number of BITs concluded by other host countries, and in particular by neighboring host countries, as an instrument for pair-wise BITs concluded by the particular host country under consideration.

[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] See Appendices 2 and 3 for the source and host country sample.

5 Main results

Following the model specification and the introduction of the variables, we now turn to the empirical results. We start with the OLS fixed-effects technique and focus, for a start, on *FDI*1 [columns (1)–(4) in Table 1]. In Model I, we include all relevant control variables except *CapOpen*.[30] As expected, FDI is clearly flowing to larger markets (marking seeking, or horizontal FDI), as the coefficient for the size of the host country market is positive and highly significant at the 1% level. The same applies to the difference in GDP per capita between source and host countries (vertical FDI). While higher inflation is associated with lower FDI inflows, ratifying a regional trade agreement or a double taxation treaty boosts FDI. Improved institutional quality in the host country is also associated with an increase in FDI. Economic growth, openness to trade of the host economy or a common currency between source and host countries all have the expected positive sign but fail to reach conventional significance levels.

Finally, the *BIT* variable has a positive coefficient and is significant at the 1% level, meaning that having a BIT ratified with the source country is associated with an increase in FDI flows to the host country. Concerning the economic impact, some peculiarities have to be taken into account. According to Kennedy (1981), the impact $g*$ of a dummy variable on a dependent variable that enters the empirical model as a logarithm would have to be approximated appropriately as follows[31]:

$$g* = \exp\left[\hat{c} - \frac{1}{2}\hat{V}\left(\hat{c}\right)\right] - 1 \tag{3}$$

with $\hat{c}$ the estimated coefficient for *BIT* in our case, and $\hat{V}$ the estimated variance of $\hat{c}$.

A further complication results from the transformation of variables according to Eq. 2 above, which helped us keeping zero and negative observations. This transformation implies that the dependent FDI variable has a linear and a logarithmic part, with the former ranging up to 1% in the case of *FDI*1. With the mean of about 0.3 for *FDI*1 remaining considerably below this threshold, the coefficient for *BIT* in column (1) of Table 1 suggests that, at the mean, the conclusion of BITs with all source countries would raise the host country's share in total FDI flows from all source countries by almost 35%.

The overall fit of the fixed-effects estimations regarding the (within) R^2 is relatively low. It should be noted that *FDI*1 and *FDI*2 stand for relative shares in FDI inflows into developing countries and that we cover a fairly diverse sample of 28 source and 83 developing (host) countries.[32] Hence, a much better fit was hardly to be expected. In fact, our model fit is quite similar to those obtained by Hallward-Driemeier (2003) and Neumayer and Spess (2005).

In Model II, reported in column (2), we add *CapOpen* to control for unilateral capital account liberalizations by host countries. The coefficient of *CapOpen* has the

[30] The sample declines by 330 observations if *CapOpen* is included (Model II).

[31] This point is stressed by Egger and Merlo (2007) in the context of BITs and FDI.

[32] Overall, our sample consists of 14,077 observations and 2,313 country pairs, that is, more than four times as many country pairs as used by Hallward-Driemeier (2003), who employed 537 pairs.

Table 1 OLS fixed-effects estimation results

Dependent variable	(1) ln (*FDI*1)	(2) ln (*FDI*1)	(3) ln (*FDI*1)	(4) ln (*FDI*1)	(5) ln (*FDI*2)	(6) ln (*FDI*2)	(7) ln (*FDI*2)	(8) ln (*FDI*2)
Model	I	II	III	IV	I	II	III	IV
BIT	0.106*** (3.37)	0.0899*** (2.77)	0.226*** (4.23)	0.0985*** (2.91)	0.231*** (3.56)	0.199*** (3.01)	0.195*** (2.96)	0.200*** (3.02)
ln (GDP)	0.193*** (5.46)	0.201*** (5.16)	0.193*** (5.05)	0.200*** (5.14)	0.155*** (2.92)	0.119*** (2.99)	0.102*** (3.00)	0.119*** (2.99)
ln (DiffGDPpc)	0.00824*** (3.54)	0.00884*** (3.51)	0.00863*** (3.43)	0.00883*** (3.51)	0.0156*** (3.58)	0.0159*** (3.68)	0.0155*** (3.59)	0.0159*** (3.69)
Growth	0.00114 (1.21)	0.00102 (1.05)	0.000882 (0.91)	0.00106 (1.09)	−0.0121 (−0.93)	−0.0120 (−0.91)	−0.0143 (−1.08)	−0.0119 (−0.90)
ln (Inflation)	−0.00710* (−1.92)	−0.00763* (−1.91)	−0.00880** (−2.21)	−0.00783** (−1.97)	−0.000770 (−0.65)	−0.000409 (−0.34)	−0.000280 (−0.23)	−0.000452 (−0.37)
Openness	0.000241 (0.74)	0.000415 (1.20)	0.000454 (1.31)	0.000382 (1.11)	0.167** (1.99)	0.0312 (0.37)	0.0383 (0.45)	0.0347 (0.41)
RTA	0.180*** (2.68)	0.167** (2.43)	0.177** (2.57)	0.172** (2.49)	0.165 (1.32)	0.0922 (0.74)	0.223 (1.61)	0.0927 (0.75)
PolCon	0.110*** (3.19)	0.114*** (3.21)	0.172*** (4.66)	0.115*** (3.23)	0.172*** (2.82)	0.123** (2.03)	0.290*** (2.94)	0.127** (2.08)
DTT	0.105** (2.22)	0.0809* (1.64)	0.0832* (1.68)	0.0803* (1.65)	−0.00465 (−0.064)	0.0157 (0.22)	0.0104 (0.14)	0.0160 (0.22)
CommonCurrency	0.112 (1.47)	0.103 (1.36)	0.115 (1.52)	0.105 (1.39)	0.115 (0.79)	0.108 (0.74)	0.114 (0.78)	0.108 (0.74)
CapOpen		0.0114** (1.97)	0.0118** (2.04)	0.0157*** (2.73)		0.0331* (1.64)	0.0333* (1.65)	0.0386* (1.68)
PolCon × BIT			−0.400*** (−3.47)				−0.474** (−2.14)	
CapOpen × BIT				−0.0247 (−1.56)				−0.0158 (−0.50)
Observations	14,077	13,747	13,747	13,747	3,726	3,706	3,706	3,706
Country pairs	2,313	2,313	2,313	2,313	870	869	869	869
R^2 (within)	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03

t-values, reported in parentheses, are corrected for heteroskedasticity; due to space constraints, the coefficients for the year dummies are not shown; likewise, host-year and source-year effects are always included but not displayed; ***, ** and * denote significance at the level of 1, 5 and 10%, respectively

expected positive sign and is significant at the 5% level. While the BIT variable keeps the positive sign, the size of the estimated coefficient is slightly lower. This is consistent with our expectation that the impact of BITs on FDI flows tends to be overestimated when ignoring unilateral measures of capital account liberalization.

Next we consider the possibility that the impact of BITs may depend on major characteristics of the host country by including interaction terms of institutional development (*PolCon*) and capital account openness (*CapOpen*) with the BIT variable (Models III and IV). This allows us to test whether BITs might act as a complement or substitute for unilateral improvements in institutions and the degree of capital account openness. In column (3), *PolCon* turns out to be still significantly positive while the interaction term *PolCon* × *BIT* is negative (and highly significant at the 1% level). This suggests that BITs may substitute for institutional quality in the host country. The evidence is considerably weaker for the second interaction term, *CapOpen* × *BIT;* the sign of the coefficient is also negative, but just fails to pass the conventional 10% significance level. The *BIT* variable, on the other hand, is always positive and significant at the 1% level.[33]

In the remaining four columns of Table 1, we report the results for the same model specifications, except that we use *FDI*2 as the dependent variable. Note the considerable decline in both the number of observations (by some 10,300) and the number of country pairs (from 2,313 to 870). The substantial drop in the sample affects the size and significance level of the coefficients for a number of control variables. Most notably, *Inflation*, *RTA*, and *DTT* are no longer significant.[34] Importantly, *BIT* always remains positive and significant at the 1% level. Thus, even if we exclude the (large number of) zero observations for the dependent variable, the positive linkage between ratified BITs and FDI inflows still holds. Moreover, the size of the coefficients of *BIT* is considerably larger with *FDI*2 as the dependent variable, compared to the estimations with *FDI*1. This suggests that BITs help less in countries that appear to be totally unattractive (and, thus, have zero FDI inflows).

Still, it can be argued that the inclusion of a large number of zeros in *FDI*1 might bias the results, since OLS might not be the appropriate estimation technique for this sample. To account for this possibility, we employ the PPML estimator that has been suggested for gravity trade models by Silva and Tenreyro (2006). Unlike the OLS method, the PPML estimator is consistent even in the presence of heteroskedasticity and it will not ignore zero FDI flows.[35] We use fixed effects and the same four model specifications (Models I–IV) as before, but focus on *FDI*1 only. As can be seen in Table 2, the results for most of the previously used control variables are similar to the

[33] Note the increase in the size of the coefficient for *BIT* from Models I and II to Model III. This is mainly due to the fact that we add the interaction term. To get the net impact of a ratification of a BIT, we would have to take the estimated coefficient for the interaction term into account too. The overall impact in this specification (and all other specifications in the following) is always positive and significant, which has been confirmed by an appropriate *F*-test.

[34] Note that *DTT* turns out to be positive and highly significant when excluding the BIT variable in the regressions with *FDI*2. Obviously, a large number of countries ratified both BITs and DTTs more or less at the same time, thereby making it difficult to sort out the net impact of both variables on FDI flows.

[35] We also employed a Tobit model to examine the robustness of the results. Importantly, the BIT variable remains positive and highly significant.

Table 2 PPML fixed-effects estimation results

Dependent variable Model	(1) ln (*FDI*1) I	(2) ln (*FDI*1) II	(3) ln (*FDI*1) III	(4) ln (*FDI*1) IV
BIT	0.180*** (2.58)	0.136** (1.93)	0.463*** (3.85)	0.153** (2.15)
ln (GDP)	0.461*** (3.91)	0.556*** (4.46)	0.524*** (4.17)	0.562*** (4.51)
ln (DiffGDPpc)	0.0763*** (4.52)	0.0792*** (4.68)	0.0793*** (4.68)	0.0794*** (4.68)
Growth	0.0257*** (4.59)	0.0257*** (4.59)	0.0246*** (4.40)	0.0256*** (4.58)
ln (Inflation)	−0.0113 (−0.75)	−0.0120 (−0.75)	−0.0156 (−0.98)	−0.0129 (−0.81)
Openness	−0.000692 (−0.50)	0.000629 (0.44)	0.00125 (0.86)	0.000677 (0.47)
RTA	0.0797 (0.97)	0.0668 (0.81)	0.0788 (0.95)	0.0793 (0.96)
PolCon	0.390** (2.52)	0.424*** (2.72)	0.690*** (3.94)	0.435*** (2.79)
DTT	0.0491 (0.63)	0.0192 (0.24)	−0.000180 (−0.0023)	0.0141 (0.18)
CommonCurrency	0.173 (0.92)	0.104 (0.55)	0.117 (0.62)	0.111 (0.59)
CapOpen		0.0657*** (2.67)	0.0660*** (2.68)	0.0935*** (3.27)
PolCon × BIT			−0.911*** (−3.36)	
CapOpen × BIT				−0.0726* (−1.91)
Observations	14,077	13,747	13,747	13,747
Country pairs	2,313	2,313	2,313	2,313

z-values are reported in parentheses; ***, ** and * denote significance at the level of 1, 5 and 10%, respectively. See Table 1 for further notes

OLS results in Table 1. However, *Growth* is now clearly significant, whereas *Inflation*, *RTA*, and *DTT* remain insignificant in Table 2.[36] Better institutions and a liberalized capital account are still strongly associated with higher FDI inflows.

Importantly, independent of the model specification, *BIT* is always positive and significant at the 5% level or better. Similar to the OLS fixed-effects estimation, the first interaction term maintains its negative coefficient and is highly significant, whereas the interaction term *CapOpen* × *BIT* is now significant too. This provides further evidence that BITs might act as a substitute for institutional quality and maybe even for capital account liberalization. Concerning institutional quality, our finding corroborates the results reported by Neumayer and Spess (2005),[37] rather than the results obtained by Tobin and Rose-Ackerman (2005) and Hallward-Driemeier (2003) according to whom BITs are only effective in stimulating FDI in countries with an already stable political and business environment. Again, we think that the sample selection bias of most of the previous studies can explain these contrasting results.

So far, we have assumed that the BIT variable is exogenous. As noted before, however, FDI may affect the ratification of BITs if foreign companies press for some sort of protection of their capital invested abroad. This is why we proceed with the system GMM in Table 3 estimator to account for endogeneity of the BIT

[36] Again, *DTT* would be highly significant if we excluded the BIT variable.

[37] Neumayer and Spess (2005) use several indicators for institutional quality and also find that the interaction terms are not always significant.

Table 3 System GMM estimation results

Dependent variable Model	(1) ln (*FDI*1) I	(2) ln (*FDI*1) II	(3) ln (*FDI*1) III	(4) ln (*FDI*1) IV	(5) ln (*FDI*2) I	(6) ln (*FDI*2) II	(7) ln (*FDI*2) III	(8) ln (*FDI*2) IV
BIT	0.0598** (2.20)	0.0537** (1.94)	0.0575** (2.03)	0.286*** (4.20)	0.121* (1.85)	0.110* (1.69)	0.109* (1.68)	0.426*** (2.89)
ln (FDI_{t-1})	0.748*** (22.4)	0.759*** (23.3)	0.757*** (23.3)	0.753*** (23.6)	0.525*** (10.6)	0.542*** (11.1)	0.540*** (11.1)	0.533*** (10.8)
ln (GDP)	0.0447*** (4.64)	0.0373*** (4.33)	0.0377*** (4.37)	0.0312*** (3.62)	0.211*** (5.98)	0.201*** (5.81)	0.202*** (5.84)	0.199*** (5.78)
ln (DiffGDPpc)	0.00255 (0.95)	0.00123 (0.45)	0.00161 (0.60)	0.000406 (0.15)	0.0109 (0.44)	0.0115 (0.47)	0.0119 (0.48)	0.0109 (0.44)
Growth	0.00316*** (2.89)	0.00281** (2.56)	0.00288*** (2.60)	0.00259** (2.38)	0.00468 (0.72)	0.00525 (0.80)	0.00526 (0.80)	0.00377 (0.58)
ln (Inflation)	0.00205 (0.45)	0.000670 (0.14)	0.000798 (0.17)	−0.000708 (−0.15)	−0.0135 (−0.78)	−0.00947 (−0.54)	−0.00917 (−0.52)	−0.0119 (−0.68)
Openness	−0.0000637 (−0.30)	−0.0000112 (−0.054)	−0.0000124 (−0.059)	0.0000365 (0.17)	0.000244 (0.29)	0.000304 (0.37)	0.000275 (0.33)	0.000516 (0.61)
RTA	0.0940** (2.07)	0.0839* (1.87)	0.0871* (1.93)	0.112** (2.53)	0.400*** (4.92)	0.383*** (4.86)	0.386*** (4.90)	0.428*** (5.49)
PolCon	−0.0138 (−0.33)	−0.0177 (−0.42)	−0.0122 (−0.29)	0.127** (2.47)	0.0108 (0.072)	−0.00335 (−0.022)	0.00791 (0.053)	0.374* (1.73)
DTT	0.127*** (3.44)	0.147*** (3.83)	0.144*** (3.72)	0.143*** (3.73)	−0.0111 (−0.12)	0.00365 (0.041)	−0.000487 (−0.0055)	−0.0240 (−0.27)
CommonCurrency	−0.00231 (−0.061)	−0.0122 (−0.32)	−0.00793 (−0.21)	−0.00291 (−0.073)	0.0754 (1.03)	0.0692 (0.94)	0.0740 (1.01)	0.0901 (1.17)
CapOpen		0.0116*** (2.72)	0.0148*** (3.06)	0.0123*** (2.86)		0.0322** (2.05)	0.0421** (1.97)	0.0405** (2.54)
PolCon × BIT			−0.649*** (−4.10)				−0.934*** (−2.76)	

Table 3 continued

Dependent variable Model	(1) ln (*FDI*1) I	(2) ln (*FDI*1) II	(3) ln (*FDI*1) III	(4) ln (*FDI*1) IV	(5) ln (*FDI*2) I	(6) ln (*FDI*2) II	(7) ln (*FDI*2) III	(8) ln (*FDI*2) IV
CapOpen × BIT				−0.0147 (−1.13)				−0.0224 (−0.71)
Observations	12,088	11,882	11,882	11,882	2,769	2,768	2,768	2,768
Country pairs	2,301	2,301	2,301	2,301	743	743	743	743
Sargan (*p*-value)[a]	0.16	0.13	0.13	0.15	0.60	0.47	0.52	0.47
AB 2 (*p*-value)[b]	0.15	0.16	0.16	0.15	0.16	0.15	0.16	0.15
Instruments (# of lags)	299 (2–7)	334 (2–7)	369 (2–7)	369 (2–7)	299 (2–7)	334 (2–7)	369 (2–7)	369 (2–7)

Estimation based on one-step system-GMM estimator with robust standard errors; corresponding *z*-values are reported in parentheses; ***, ** and * denote significance at the level of 1, 5 and 10%, respectively. See Table 1 for further notes

[a] Sargan test of overidentification

[b] Arellano–Bond test that second-order autocorrelation in residuals is 0; first-order autocorrelation is always rejected (not reported)

variable (and most of our control variables). All specifications pass the Sargan–Hansen J statistic test for overidentifying restrictions, demonstrating that the instrument set can be considered valid, and the *F* tests for the Arellano–Bond tests for serial correlation support the model specification.

In all four models and for both FDI variables (*FDI*1 and *FDI*2), we find that the coefficient of the BIT variable remains positive and significant, in most cases at the 5 or 1% level. The GMM approach thus corroborates that ratifying a BIT with a source country leads to higher FDI inflows from that country.[38] In line with our expectations, the estimated coefficients of *BIT* are typically smaller in the system GMM regressions in comparison to the fixed-effects estimations. The exceptions are the two regressions for Model IV. This model specification includes the interaction term (*CapOpen* × *BIT*), which is not significant but would have to be taken into account when calculating the final impact of the BIT variable on FDI inflows. Overall, we can conclude that the fixed-effects estimates tend to overstate the impact of BITs on bilateral FDI inflows, whereas the GMM estimates do not suffer from this bias and are, thus, more reliable.

6 Sensitivity tests

We check the robustness of our main findings by using several additional model specifications. In view of space constraints, we focus on the GMM regressions and only report the coefficients for the BIT variable with *FDI*1 as the dependent variable.[39] First, we exclude *RTA*. Recall that we controlled for regional trade agreements since they increasingly include FDI-related prescriptions, thus reducing investor uncertainty. Hence, the isolated impact of BITs should be biased upwards if RTAs are ignored. This expectation turns out to be true. The coefficient of *BIT*, reported in Table 4, is slightly larger when replicating the estimations without *RTA*.[40]

Second, we exclude double taxation treaties as a considerable number of countries sign both types of bilateral treaties. Hence, the impact of BITs on FDI flows might be biased. As expected, the size of the coefficients for the BIT variable roughly doubles if the DTT variable is omitted.

Third, we exclude all transition countries. It can be argued that our results might be biased due to the inclusion of Eastern Europe and the former Soviet Union since the countries in this region have received much more FDI (or for the first time) after 1990 and, at the same time, have signed various BITs with developed countries. Indeed, the exclusion of transition countries results in smaller (and sometimes even

[38] For the interaction terms, we obtain the same outcome as in the fixed-effects estimation, that is, a negative coefficient for *PolCon* × *BIT* and *CapOpen* × *BIT*, though only the former is statistically significant.

[39] All GMM robustness checks reported in this section have also been performed for the OLS and PPML models as well as for *FDI*2. As the sign and significance levels of the coefficients are quite similar, we do not report them. Like all other non-reported results, they can be obtained from the first author upon request.

[40] For reference, we show previous GMM estimates for the full sample in the first row of Table 4.

Table 4 Robustness checks and extensions, system GMM estimation

Dependent variable Model	(1) ln (*FDI*1) I	(2) ln (*FDI*1) II	(3) ln (*FDI*1) III	(4) ln (*FDI*1) IV
Full sample (as reported in Table 3)	0.0598** (2.20)	0.0537** (1.94)	0.0575** (2.03)	0.286*** (4.20)
Excl. RTA	0.0796*** (3.01)	0.0715*** (2.66)	0.0750*** (2.70)	0.299*** (4.34)
Excl. DTT	0.122*** (4.92)	0.121*** (4.89)	0.125*** (4.93)	0.354*** (5.16)
Excl. transition countries	−0.000619 (−0.022)	−0.00540 (−0.19)	−0.00575 (−0.19)	0.168** (2.40)
Excl. resource-intensive countries[a]	0.0437** (1.95)	0.0351* (1.71)	0.0354* (1.81)	0.216*** (2.90)
Low-income countries	0.113*** (2.99)	0.112*** (3.04)	0.107*** (3.28)	0.232*** (2.93)
Middle-income countries	0.0478** (1.99)	0.0334* (1.82)	0.0449* (1.78)	0.327*** (3.66)
Period 1990–2004	0.0486* (1.72)	0.0438* (1.68)	0.0491* (1.66)	0.248*** (3.61)
Developed source countries	0.0688** (2.38)	0.0621** (2.10)	0.0644** (2.13)	0.260*** (3.85)
Developing source countries	0.0386 (0.60)	0.0393 (0.62)	0.0554 (0.84)	0.678*** (2.81)
United States as source country	−0.0729 (−1.60)	−0.0662 (−1.44)	−0.0652 (−1.43)	−0.0428 (−0.42)
Incl. total number of BITs ratified by source country	0.0741** (2.50)	0.0689** (2.30)	0.0728** (2.38)	0.307*** (4.63)

To save space, we only report the results for the BIT variable with *FDI*1 as the dependent variable; *z*-values are reported in parentheses; ***, ** and * denote significance at the level of 1, 5 and 10%, respectively. See Tables 1 and 3 for further notes

[a] Algeria, Bolivia, China, Rep. of Congo, Ecuador, Egypt, Guyana, Indonesia, Nigeria, Oman, Papua New Guinea, Syrian Arab Republic, Trinidad and Tobago, Venezuela, Zambia

negative) coefficients of *BIT*. The BIT variable remains significantly positive in only one out of four model specifications. Note, however, that the results for Models I–III are not reliable for the reduced sample without transition countries; the Sargan–Hansen J statistic test for overidentifying restrictions indicates that the instrument set is not valid, and we do have serial correlation here. Still, BITs tend to be more effective in transition countries. The reason may be that many transition countries lacked any reputation concerning the credibility of unilateral measures immediately after the regime change.

Fourth, the size of the BIT coefficient also declines slightly when excluding resource-intensive host countries. This is surprising since the availability of natural resources in host countries could be expected to provide such a strong incentive to foreign companies that they care less about protection of resource-seeking FDI. While our results do not support this view, they are subject to some qualifications. The data situation is far from perfect. The World Bank criterion we use for classifying resource-intensive host countries[41] is not available for various countries

[41] We classify a country as resource-intensive if its resource rents, that is, energy plus mineral depletion in percent of GNI, are higher than 15% in the first three-year period (1978–1980). See the notes below Table 4 for all resource-intensive countries that have been excluded in this set of regressions.

of our sample. This may affect results especially because some countries in which FDI is fairly likely to be resource-seeking could not be classified (e.g., Azerbaijan, Equatorial Guinea, or Kazakhstan). Moreover, foreign companies are most likely to be rather lenient about protection in the case of oil. However, many oil-exporting countries are not included in our sample of host countries, as the required data for the independent variables are not available.

Fifth, we run separate estimations for low- and middle-income host countries. The BIT variable retains its positive impact for both sub-groups.[42] One could have expected relatively strong effects for middle-income host countries. More advanced host countries should be better able to make use of FDI-specific assets, for example, by infringing on property rights. Hence, there might be greater uncertainty for foreign companies in host countries with higher imitative capacity. However, it is only in Model IV that we find evidence for a stronger link between credible protection through BITs and FDI inflows, compared to low-income countries with less imitative capacity. The evidence is rather the opposite in columns (1)–(3) of Table 4, possibly because low-income countries have less reputation concerning the credibility of unilateral measures.

Sixth, the picture remains essentially the same when our estimations are based on a shorter period of observation (1990–2004, instead of 1978–2004). It should be noted, however, that the size of the BIT coefficients is slightly smaller compared to the complete period. This outcome may come as a surprise, since one could have expected that more recent BITs were more effective in promoting FDI as the coverage of FDI-related issues became broader and more binding in the course of time. Interestingly, our results are similar to what Blonigen and Davies (2005) find with regard to bilateral *tax* treaties: While older tax treaties are positively associated with FDI, this does not apply to more recent tax treaties. There are several possible explanations why BITs have not become more effective over time. Increasingly binding BITs may essentially mean that it becomes easier for foreign companies to remit profits and repatriate capital, which *ceteris paribus* would reduce *net* FDI inflows.[43] Moreover, BITs may suffer from diminishing returns due to their proliferation (UNCTAD 1998; Nunnenkamp and Pant 2003; Tobin and Rose-Ackerman 2006). In contrast to earlier times, the conclusion of a BIT is no longer a distinctive factor signaling a particular host country's readiness to offer favorable FDI conditions. Rather, foreign companies may increasingly tend to regard BITs as a standard feature of the institutional framework governing FDI worldwide.

Seventh, we perform separate estimations for developed and developing source countries. It appears that BITs are effective only in stimulating FDI flows from developed source countries to developing countries. By contrast, Models I–III suggest that BITs do not matter as a commitment device in developing countries' FDI relations with other developing countries. This finding may justify the

[42] By contrast, Neumayer (2007) finds that double taxation treaties were effective in increasing FDI flows only to middle-income host countries.

[43] In the context of tax treaties, Blonigen and Davies (2005) refer to concerns that such treaties arise due to lobbying efforts by profit-seeking investors. They conclude that treaties may then be geared towards maximizing investor profits rather than promoting FDI.

assumption of Tobin and Rose-Ackerman (2006, p. 15), who consider only BITs concluded with high-income OECD partner countries "on the ground that they are the ones with the potential to have an impact on FDI flows." However, the underlying reasoning that developing countries are unlikely to undertake much FDI in other developing countries has become less compelling in the recent past, and BITs may play a more important role in future FDI relations among developing countries.

Eighth, we run separate regressions for the United States as a source country to compare our results with those obtained by previous studies. Like Tobin and Rose-Ackerman (2005), we cannot establish any clear link between US BITs and US FDI to developing countries. We never obtain a statistically significant coefficient for *BIT*. This outcome can partly be explained by the fact that the United States has not concluded a large number of BITs. As of 1 June 2008, the United States had ratified a total of 40 BITs (and 29 BITs with the 83 developing countries included in our sample), whereas Germany had concluded 114 (70) and the United Kingdom 91 (57) (UNCTAD 2008b). This is even though US multinationals accounted for 19.2% of total outward FDI stocks in 2005, much more than the corresponding figures for German (9.1%) and British (11.6%) multinationals (UNCTAD 2008a). Moreover, the United States concluded BITs with some countries mainly for political reasons. For instance, US commercial interest did not play a major role in Morocco and Jordan. The peculiar findings for the United States clearly reveal that it is important to include as many source countries as possible, as we do in this paper, to avoid any bias due to country-specific effects and to provide a comprehensive assessment of the impact of BITs on FDI.

Finally, we test for possible dilution effects due to the proliferation of BITs. We include the total number of BITs ratified with all host countries (in our sample) by the source country belonging to a specific pair of a BIT as an additional explanatory variable. While the sign of this control variable is often negative, we do not get any significant results (not shown in the table). Importantly, the sign and significance level of the pair-wise BIT dummy are not affected by the inclusion of this additional control variable.

In another set of robustness checks, we use two alternative FDI measures, that is, bilateral FDI flows in million US$ (*FDI*3) and in percent of the host country's GDP (*FDI*4).[44] As can be seen in Table 5, the BIT variable is always significant in all four model specifications and for all three econometric methods. The significance levels are often somewhat lower if we use FDI flows as a share of the host country's GDP as the dependent variable. This outcome might be due to the fact that GDP stands on both sides of the equation, which could lead to less reliable estimates for the explanatory variables.

In summary, our robustness checks strongly support our basic message that BITs help attract FDI to developing host countries, even though the size and significance level of coefficients differ somewhat across different specifications.

[44] To save space, we continue to only report the results with zero observations for FDI flows included.

Table 5 Robustness checks and extensions, alternative FDI measures

Model	(1) I	(2) II	(3) III	(4) IV
Dependent variable and estimation technique				
*FDI*3, OLS fixed effects	0.324*** (4.03)	0.239*** (2.84)	0.276** (2.05)	0.237*** (2.74)
*FDI*3, PPML fixed effects	0.200*** (4.08)	0.117** (2.35)	0.282*** (3.37)	0.122** (2.44)
*FDI*3, System GMM	0.168** (2.23)	0.155** (2.00)	0.164** (2.04)	0.385** (2.24)
*FDI*4, OLS fixed effects	0.425*** (2.77)	0.344** (2.15)	0.331* (1.72)	0.352** (2.15)
*FDI*4, PPML fixed effects	0.254** (1.94)	0.183* (1.67)	0.464* (1.69)	0.179* (1.65)
*FDI*4, System GMM	0.487*** (3.13)	0.433*** (2.70)	0.449*** (2.76)	0.691** (1.93)

To save space, we only report the results for the BIT variable; *z*-values are reported in parentheses; ***, ** and * denote significance at the level of 1, 5 and 10%, respectively. See Tables 1 and 3 for further notes

7 Conclusions

Policy makers in almost all developing countries are engaged in fierce competition for FDI. However, it has remained disputed how effective the means are that national policy makers have at their disposal when attempting to attract FDI inflows. In this paper, we focus on the impact of BITs that have increasingly been concluded in order to reduce uncertainty of foreign investors in a credible way and, thus, to promote FDI flows to developing countries.

Few earlier studies have addressed the effectiveness of BITs, and the available empirical evidence is inconclusive. Depending on the particular study, we argue that previous evaluations of the effectiveness of BITs are distorted due to sample selection and omitted variable biases as well as the potential endogeneity of BITs in the regressions. We attempt to overcome these econometric concerns by covering a much larger sample of host and source countries, by accounting for unilateral FDI liberalization, and by including an appropriate instrumental variable approach.

Our main finding is that BITs do promote FDI flows to developing countries. This result is fairly robust across various models. Moreover, the significantly positive effect of BITs on bilateral FDI flows holds for FDI flows from developed source countries to various sub-samples of developing host countries. BITs may even substitute for weak local institutions, though probably not for unilateral FDI-related liberalization measures.

All this suggests that policy makers in developing countries have resorted to an effective means to promote FDI by concluding BITs. Nevertheless, our analysis leaves several questions for future research. It depends not only on the benefits in terms of higher FDI inflows but also on the costs involved whether ratifying still more BITs would be rational. Costs may arise by reducing the policy options host countries might want to consider in selecting FDI projects at the entry stage and in regulating approved FDI projects after entry. In particular, it remains open to debate

whether host countries have reason to feel unduly constrained given that recent BITs have become more binding and broader in coverage. Concerns are that recent BITs have shifted the balance towards the interests of profit maximizing foreign investors and away from the developmental interests of host countries. This calls for a detailed evaluation of the *contents* of BITs, rather than only focusing on the number of BITs.

Furthermore, the effectiveness of more BITs to come will be affected by several factors. On the one hand, as argued by Tobin and Rose-Ackerman (2006), the proliferation of BITs is likely to result in diminishing returns. With an ever increasing share of bilateral FDI covered by contractual arrangements, BITs would no longer be a distinctive factor signaling the host country's readiness to protect foreign investors. The future effectiveness of BITs may be eroded further if plurilateral and multilateral agreements increasingly include FDI-related prescriptions. At the same time, the binding character of BITs may become less relevant: if the trend of unilateral FDI liberalization continues and reversals are rare, more and more developing countries will improve their reputation of treating FDI favorably.

On the other hand, BITs going beyond the "traditional admission model" (UNCTAD 2007, p. 155) may have a stronger impact on FDI. To capture this effect, future research should explore possibilities to relax the assumption of homogenous BITs. It would be an important step towards a more realistic treatment of BITs if, as suggested by UNCTAD, two main models could be distinguished, with the "new" model involving a higher degree of discipline than the traditional model. To arrive at a nuanced categorization, three aspects of heterogeneity seem to be of particular importance: (i) BITs with explicit provisions relating to the pre-establishment phase should be treated differently from those granting protection only after establishment; (ii) BITs with pervasive provisions related to performance requirements may be separated from those without such provisions; and (iii) BITs including investor-state arbitration should be distinguished from those being limited to state-to-state arbitration.

But it is not only with regard to BITs that heterogeneity should be taken into account. The same may be required with respect to the dependent FDI variable. For instance, Gallagher and Birch (2006) suspect that BITs have been a more effective means of FDI promotion in South America than in Mesoamerica because of the different types of FDI attracted by the two sub-regions. Arguably, the protection of FDI through BITs is more relevant for horizontal, market-seeking FDI which stands in direct competition with local companies than for vertical, efficiency-seeking FDI. Future research may also explore in more detail the links between sector-specific BIT provisions, e.g., with regard to services, and sector-specific FDI flows. Data constraints may render it impossible to address such questions in panel studies; but country-specific studies may offer detailed insights to this effect.

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Appendix 1

See Tables 6 and 7.

Table 6 Definition of variables and data sources

Variable	Definition	Source
*FDI*1	Bilateral FDI flows from source to host country in percent of total FDI to all developing countries included in our sample, including zeros	UNCTAD (2008a)
*FDI*2	Bilateral FDI flows from source to host country in percent of total FDI to all developing countries included in our sample, excluding zeros	UNCTAD (2008a)
*FDI*3	Bilateral FDI flows from source to host country in mill. US$, including zeros	UNCTAD (2008a)
*FDI*4	Bilateral FDI flows from source to host country in percent of GDP of host country, including zeros	UNCTAD (2008a)
GDP	Real GDP, constant 2000 US$	World Bank (2006)
DiffGDPpc	Difference between source and host countries' GDP per capita, constant 2000 US$	World Bank (2006)
Growth	Real GDP growth rate of host country in percent	World Bank (2006)
Inflation	Inflation rate of host country in percent (GDP deflator)	World Bank (2006)
Openness	Sum of imports and exports in percent of GDP (host country)	World Bank (2006)
BIT	Bilateral investment treaty, ratified between source and host country	UNCTAD (2008b)
DTT	Double taxation treaty, ratified between source and host country	IBFD (2008)
CommonCurrency	Common currency between source and host country	Reinhart and Rogoff (2004)
RTA	Dummy regional trade agreement	WTO (2008)
PolCon	Political constraints III, Henisz database, range from 0 to 1	Henisz (2000)
CapOpen	Indicator for capital account openness; Chinn–Ito index on financial openness	Chinn and Ito (2005); data kindly provided by Hiro Ito

Table 7 Descriptive statistics for the main variables

Variable	Observations	Mean	SD	Minimum	Maximum
ln (*FDI*1)	14,077	0.30	0.83	0	5.30
ln (*FDI*2)	3,726	1.13	1.28	0	5.30
GDP	14,077	23.26	1.70	19.14	28.07
ln (DiffGDPpc)	14,077	8.76	4.54	−10.15	11.21
Growth	14,077	3.46	5.58	−18.20	77.70
ln (Inflation)	14,077	3.02	1.66	−3.25	9.43
Openness	14,077	73.10	39.86	9.31	245.80
BIT	14,077	0.18	0.37	0	1
DTT	14,077	0.21	0.40	0	1
CommonCurrency	14,077	0.01	0.10	0	1
RTA	14,077	0.05	0.21	0	1
PolCon	14,077	0.25	0.20	0	0.68
CapOpen	13,747	−0.22	1.33	−1.75	2.62

Appendix 2

Source country sample

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

Developing source countries in italics

Appendix 3

Host country sample

Albania, Algeria, Angola, Argentina, Azerbaijan, Bangladesh, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cameroon, Chile, China, Colombia, Republic of Congo, Costa Rica, Côte d'Ivoire, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Gambia, Ghana, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Jordan, Kazakhstan, Kenya, Latvia, Lithuania, Madagascar, Malaysia, Mali, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Niger, Nigeria, Oman, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, Senegal, Seychelles, Slovakia, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe

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