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Do double taxation treaties increase foreign direct investment to developing countries?

Developing countries invest time and other scarce resources to negotiate and conclude double taxation treaties (DTTs) with developed countries. They also accept a loss of tax revenue as such treaties typically favour residence-based over source-based taxation and developing countries are typically net capital importers. The incurred costs can only pay off if developing countries can expect to receive more foreign direct investment (FDI) in return. This is the first study to provide evidence that developing countries that have signed a DTT with the US or a higher number of DTTs with important capital exporters actually do receive more FDI from the US and in total. However, DTTs are only effective in the group of middle-, not low-income developing countries.

1. INTRODUCTION

Developing countries[1] sign double taxation treaties (DTTs) in order to attract more foreign direct investment (FDI). They succumb to restrictions on their ability to tax corporate income from foreign investors, which can only pay off if more FDI is the reward.[2] But do DTTs attract more FDI to developing countries? This is the topic of the analysis provided here.

There are reasons to presume that DTTs can increase FDI. Double taxation occurs if a multinational company (MNC) pays tax on the same corporate income earned from economic activity in a foreign country twice: once to the tax authorities of the foreign country, which is host to the economic activity, and once to the tax authorities of the home country, in which the company is domiciled. By burdening economic activity in a foreign country twice, double taxation can represent an obstacle or barrier to foreign investment, thus distorting the efficient allocation of scarce financial resources across countries of the world. Yet, DTTs can also dampen FDI in as much as they reduce tax avoidance, tax evasion and other more or less legal tax-saving strategies such as transfer pricing by multinational companies (MNCs) (Blonigen and Davies 2002; Egger et al. 2004). The 2003 Revision to the Commentary to the treaty model of the Organisation for Economic Co-operation and Development (OECD) explicitly mentions prevention of tax avoidance as an objective of DTTs (Arnold 2004). However, this has to be seen in the context of 'increased opportunities for tax avoidance' (Arnold 2004: 244) made possible by the growing and increasingly complex web of DTTs among countries in the first place.

Despite the large and increasing number of DTTs concluded, there exists little evidence on the question addressed by this study. This is surprising given that the question is of great importance to developing countries. They invest time and other

scarce resources to negotiate, conclude, sign and ratify DTTs. Also, such treaties typically imply a non-trivial restriction on their authority to tax corporate income from foreign investors. If no increase in FDI can be expected, then the effort spent concluding DTTs would be wasted and the costs imposed would fail to be recovered.

This article is structured as follows. The next section describes the well-known fact of increasing importance of foreign investment to developing countries and illustrates the growth of DTTs. We then review the existing empirical studies, present our research design and report results. The final section concludes. In brief, we find that DTTs are effective in attracting FDI, but only in the group of middle-, not low-income developing countries.

2. DTTs AND FDI

FDI has dramatically increased in the past several decades to become a major force in the worldwide allocation of funds and technology. Prior to 1970, world trade generally grew at a greater pace than that of FDI, but in the decades since then the flow of FDI has grown at more than twice the pace of the growth of worldwide exports. By the early 1990s, the sales of worldwide exports would be eclipsed by the sales of foreign affiliates of MNCs (Dunning 1998). Not only has the flow of FDI increased worldwide, but the importance of FDI as a source of funds to developing countries in particular has also significantly increased. Private international flows of financial resources have become increasingly important to developing countries. In the 1980s tight budgets, the debt crisis and an overall decreased interest in providing traditional development aid lead to a decline in official development assistance from the developed world. When capital flows to developing nations began to rise again in the latter part of that decade, the flows would increasingly be composed of FDI

(Zebregs 1998). Only very recently have aid flows slightly increased again in the wake of the so-called Monterrey Consensus. However, in 2003 FDI was the largest component of the net resource flows to developing countries and this is bound to remain the case for some time to come (UNCTAD 2003). Although the developed countries remain both the dominating source and the major recipient of FDI, their dominance has decreased over time with developing countries in 2003 receiving almost 31% of FDI as opposed to only about 20% in the 1980s (UNCTAD 2004). Indeed, FDI inflows per unit of GDP are much higher in many developing countries than in developed ones (ibid.). It was during this same period that DTTs between developed and developing countries proliferated and in light of the importance of FDI, particularly to developing nations, the extent to which these two phenomena are causally related warrants careful scrutiny.

In their aim to increase FDI inflows, developing countries have resorted to bilateral treaties to signal their commitment to stable, correct and often favourable treatment of foreign investors. By signing DTTs, developing countries provide foreign investors with security and stability as regards the issue of taxation in addition to the relief from double taxation. By signing bilateral investment treaties (BITs), developing countries commit to granting certain relative standards such as national treatment (foreign investors may not be treated any worse than national investors, but may be treated better and, in fact, often are) and most-favoured nation treatment (privileges granted to one foreign investor must be granted to all foreign investors). They also agree to guarantee certain absolute standards of treatment such as fair and equitable treatment for foreign investors in accordance with international standards after the investment has taken place. BITs typically ban discriminatory treatment against foreign investors and include guarantees of compensation for expropriated

property or funds, and free transfer and repatriation of capital and profits. Further, the BIT parties agree to submit to binding dispute settlement should a dispute concerning these provisions arise (UNCTAD 1998).

Efforts aimed at avoiding double taxation go back a long time in history and the first DTTs were concluded much before the first BITs were signed. According to Easson (2000: 619), the treaty between Austria-Hungary and Prussia from 1899 represents the first modern DTT, whereas the first BIT was signed between Germany and Pakistan in 1959. Multilateral organizations such as the League of Nations (and later the United Nations) and the Organisation for European Economic Co-operation (later known as the Organisation for Economic Co-operation and Development) also promoted DTTs from an early stage. Until the late 1960s, DTTs were mainly concluded among developed countries, but since then an increasing number of treaties has been concluded between developed and developing countries (and, to a smaller extent, among developing countries) (Easson 2000). This resembles the spread and diffusion of BITs around the world (Fitzgerald 2002; Neumayer and Spess 2005). By the end of the 1960s there were 322 treaties, which rose to 674 by the end of the 1970s and to 1143 by the end of the 1980s. The number of DTTs worldwide grew rapidly in the 1990s and by 2002 there would be 2,255 DTTs worldwide (UNCTAD 2003). In 2002, China topped the list of developing countries, having concluded 21 DTTs with OECD countries, followed by the Czech and Slovak Republics, India, Poland and South Korea with 20 treaties each, Hungary and Romania (19), Russia (18), Bulgaria, Indonesia, Malaysia, Mexico, Philippines, South Africa and Thailand (17), Argentina, Latvia and Pakistan (16), Brazil, Estonia, Lithuania, Morocco and Tunisia (15). Most of these are major hosts of FDI. However, in the middle range are also countries like Zambia (12), Bangladesh (10), Barbados, Côte d'Ivoire and

Zimbabwe (8) that are not particularly known as major recipients of FDI. At the bottom end are a great many countries that have concluded either zero or few DTTs. The appendix lists the number of DTTs with OECD countries in 2002 for all the countries in the sample. For reasons to be explained later, countries are grouped as low- and middle-income developing countries.

There are two model treaties for DTTs available, which are regularly updated and on which treaty partners can base their treaty if they wish to do so: one from the OECD, the other one from the United Nations. Not surprisingly, the OECD model treaty clearly favours residence taxation, which benefits developed countries since it is mainly developed country investors who invest in developing countries, not the other way around and residence taxation favours countries with net positive foreign asset positions. The UN model treaty, on the other hand, provides more room for source-based taxation, which is more beneficial to developing countries for the same reason. Critics argue, however, that the UN model treaty is not sufficiently different from the OECD model treaty and is still biased against developing country interests (Figueroa 1992). Also, the vast majority of DTTs are based more on the OECD model (Arnold, Sasseville and Zolt 2002).

There are of course substantial differences in the way different developed countries tax their multinational companies abroad, a detailed discussion of which is, unfortunately, beyond the scope of this article. For example, Collins and Shackelford (1995, 2002) compare and contrast the tax burden imposed by Canada, Japan, Germany, the United Kingdom and the United States on their MNCs. There are also differences among developed countries in the DTTs they typically conclude. For example, most developed countries include "tax sparing" arrangements, to be explained in the next section, with poor developing countries in their DTTs, whereas

the United States does not (Hines 1998). Vogel (1997) provides a detailed analysis of German and American DTTs and how they compare to the OECD and UN model conventions.

Few would argue that double taxation represents the major impediment to foreign direct investment in developing countries. And yet, all other things equal, the avoidance of double taxation can make a country more attractive to foreign investors who often have a choice among multiple locations. As Egger et al. (2004: 1) have put it: 'One of the most visible obstacles to cross border investment is the double taxation of foreign-earned income.' Investors like stability and the legal and fiscal certainty that comes with a DTT can re-assure foreign investors that profits from their investment are not doubly reduced by taxation in both host and residence country (United Nations 2001). As is the case with BITs, the conclusion of DTTs also sends a certain signal to foreign investors that goes beyond the mere issue of taxation, allowing the developing country partner to acquire 'international economic recognition' (Dagan 1999: 32) or, in the words of Rosenbloom (1982, cited in Reese 1987: 380), a 'badge of international economic respectability'. Certainly, policy makers in developing countries must believe that the conclusion of DTTs increases inward FDI as otherwise they would not flog to the negotiation table signing more and more such treaties. This is because, as already mentioned, the vast majority of DTTs concluded between developed and developing countries limit source-based taxation, which means that developing countries can only collect tax revenues from foreign investors to a limited extent. For DTTs among developed countries this does not matter so much as FDI flows more or less equally in both directions. Economic relations between developed and developing countries are highly unequal, however,

with the developed country being almost exclusively the country of residence and the developing country almost exclusively the host country.

The reduction in tax revenue following limits on source-based taxation clearly represents a cost to developing countries. This is the more so as developing countries typically have very unequal income distributions that governments stripped of financial resources will find difficult to address via transfer payments (Fitzgerald 2002). Dagan (1999: 939) goes as far as arguing that DTTs serve the 'cynical goal' of 'redistributing tax revenues from poorer to the richer signatory countries' (similarly Figueroa 1992). However, the tax loss is somewhat mitigated if the finding of Chisik and Davies (2004) holds true beyond the seven developing countries included in their sample. They show that country-pairs with highly asymmetric FDI patterns, typical for developed–developing country pairs, tend to negotiate higher withholding taxes. More importantly, any loss of tax revenue can be justified if the wider economic benefits of attracting more FDI, such as knowledge and technology spill-overs, higher economic growth, employment and living standards, exceed these costs (Reese 1987). In order to materialise, however, more FDI actually needs to be attracted with the help of DTTs. Some, like Figueroa (1992), argue that taxes do not enter foreign investor's investment decisions, which would mean that by implication DTTs are ineffective in raising FDI flows. However, both Gastanaga, Nugent and Pashamova (1998) in their analysis of FDI flows to developing countries and Desai, Foley and Hines (2002) in their analysis of investment decisions by American-owned foreign affiliates abroad find that taxes have a noticeable and statistically significantly negative impact on investment. If taxes are important to foreign investors and DTTs reduce double taxation, can it be shown that DTTs have a positive effect on FDI? Existing studies, to be reviewed next, paint a somewhat pessimistic picture.

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3. REVIEW OF STUDIES ON THE EFFECT OF DTTs ON FDI

Blonigen and Davies (2002) in an analysis of bilateral FDI outflows and outbound stocks from OECD countries to other countries over the period 1982 to 1992 find that the existence of DTTs is associated with larger bilateral FDI flows and stocks in ordinary least squares (OLS) estimation. However, when older DTTs, which have often been concluded many years *before* the start of the study period, are distinguished from newer DTTs, which were concluded *during* the period of study, then it appears that these newer treaties have no positive effect on FDI in OLS estimation. In fixed-effects estimation, based on the within-variation of the data only such that old treaties concluded before the start of the sample become irrelevant, the effect is even negative. Similarly, Blonigen and Davies (2004) in an analysis of US inbound and outbound FDI over the period 1980 to 1999 find that treaties concluded by the US during this period had no statistically significant effect at best and a negative effect at worst on inbound and outbound FDI stocks.[3] Davies (2004) confirms the non-significant and negative findings of both studies and, additionally, finds non-significant results if looking explicitly at treaty renegotiations. Egger et al. (2004) also find a negative effect of newly implemented DTTs in a differences-in-differences analysis of two years prior and two years after treaty conclusion using dyadic FDI data over the period 1985 to 2000.

In contrast to the findings reported above, two other studies find evidence suggesting indirectly that DTTs might work. First, Hines (1998) looks at the effect of "tax sparing" agreements rather than DTTs on Japanese FDI location. "Tax sparing" occurs when capital exporting countries exempt from taxation any extra income its firms earn from tax reduction incentives in foreign countries. The DTTs of most

developed countries, with the notable exception of the US, with many, but not all, developing countries contain such agreements. In comparing Japanese and US investment patterns in 1990, Hines (1998) estimates that FDI in developing countries with whom a "tax sparing" agreement exists is 1.4 to 2.4 times higher than what it would have been otherwise. Second, Di Giovanni (2005) analyses merger and acquisition (M&A) deals rather than FDI over the period 1990 to 1999. He comes to the interesting finding that the existence of a DTT is associated with higher cross-border M&A flows.

The major problem with existing studies that directly address the effect of DTTs on FDI is twofold: First, the simultaneous presence of both OECD and developing countries in the sample, as in Blonigen and Davies (2002, 2004) and Egger et al. (2004) can be problematic as FDI allocation decisions are likely to be based on drastically different motivations in both groups of countries (Blonigen and Wang 2004). Second, the use of dyadic FDI data, which is otherwise a strength, necessarily leads to a sample that is restrictive and non-representative for OECD countries other than the US. This would not matter so much if the sample of countries, for which data are available, was a random one. This is not the case, however, since bilateral FDI data exist for practically all OECD countries, but for developing countries by and large only if their per capita income is relatively high or their population size is large. This excludes the very set of poor to lower middle-income and small to medium-sized developing countries, for which the conclusion of a DTT can be an important instrument to woo foreign investors. The only exception to this problem is the United States, for which quite comprehensive dyadic data for a wide range of developing countries are available.

Our research design aspires to overcome both problems. First, we use a sample that contains only developing countries to account for the fact that FDI allocation decisions in this group of countries is likely to be driven by different motivations than FDI allocation within OECD countries.[4] Second, for the one developed country for which comprehensive outbound FDI data exist, namely the United States, we create a more representative sample of developing countries that also covers a longer time period than is the case in Blonigen and Davies (2004). The larger sample is partly due to extending the sample backwards from 1980 to 1970 and forwards from 1999 to 2001 and partly because our control variables seem to have less missing data than the ones used by Blonigen and Davies (2004). Third, as already mentioned, for other developed countries no truly representative dyadic sample can be created due to lack of dyadic FDI data. In order to circumvent this problem, we use non-dyadic FDI data, which are available for a large sample. This poses the immediate problem that we can no longer directly infer whether the FDI is covered by a DTT or not. To deal with this problem indirectly, we will use a measure of weighted cumulative DTTs a developing country has signed with OECD countries, where each DTT is weighted by the share of outward FDI flow the OECD country accounts for relative to total world outward FDI flow.[5] The weighting is to account for differences in the size of potential FDI share, for which a developing country has double taxation provisions in place. Clearly, in an ideal world it would be better to have comprehensive dyadic FDI data for OECD countries other than the US, so one could do without weighting. However, in the absence of such data, we believe that the benefit of deriving results from a much larger and more representative sample outweighs the cost of accounting for the potential FDI inflow covered by DTTs indirectly via the weighting procedure described above.

4. RESEARCH DESIGN

(a) Dependent variable

For the United States outward FDI model, we use data on outbound FDI stocks over the period 1970 to 2001 from the US Bureau of Economic Analysis (http://www.bea.doc.gov/bea/di1.htm), converted to constant US$ of 1996 with the help of the US GDP deflator.[6] We estimate the model in stocks rather than flows as this is common usage in the existing literature on US DTTs. We use absolute FDI stocks because if one were to use FDI stocks as a percentage of host country's GDP instead, the measure would capture changes in the relative importance of foreign investment to the host country, but not changes in stocks directly. For the non-dyadic FDI model, we use both total inbound FDI stocks of developing countries as well as FDI inflows to developing countries in constant US$ of 1996 (data from UNCTAD 2005). The reason for using both stocks and flows is that UNCTAD (2005) provides non-dyadic FDI stock data only from 1980 onwards, whereas non-dyadic flow data are available from 1970 onwards. Also, a large part of the literature that analyses non-dyadic FDI is estimated in FDI flows rather than stocks.

Quite possibly, the worldwide increase in the rate of the conclusion of DTTs is partly responsible for the increase in overall FDI going to developing countries. However, there is always the danger that one finds a statistically significant relationship between two trending variables that is spurious. We deal with this potential problem in two ways. First, for the regressions on absolute FDI stocks or flows we employ year-specific time dummies to absorb any year-to-year variation in total FDI unaccounted for by our explanatory variables and common to all developing

countries, which should mitigate potential spuriousness of any significant results. Second, to test the effect of DTTs on the attractiveness of a developing country *relative to* other developing countries even more directly, we include as an alternative dependent variable the share of FDI stock (flow) relative to total stock (flow) in all developing countries. Since the share variables are not trending over time (they are bound from above and below and their mean is almost constant over time), no year-specific time dummies are needed in these sets of estimations. We take the natural log of the dependent variables to reduce the skewness of its distribution. This increases the model fit substantially.

(b) Explanatory variables

Our main explanatory variable for the regressions with the US FDI outbound stock in developing countries as dependent variable is a dummy variable for the existence of a DTT. For the estimations on non-dyadic FDI, this is replaced by the cumulative number of DTTs a developing country has signed with OECD countries, weighted by the share of outward FDI flow the OECD country accounts for relative to total world outward FDI flow. Data are taken from UNCTAD (2005) with information on DTTs for several OECD countries provided directly by UNCTAD's International Arrangements Section. As mentioned above, the weighting is to account for differences in the size of potential FDI share, for which a developing country has double taxation provisions in place. We exclude DTTs signed between developing countries since these represent a rather recent development and FDI stocks among developing countries are relatively small over the entire study period, even though FDI flows between developing countries have increased substantially lately, possibly accounting for up to one-third of FDI flows to developing countries in the 1990s

(UNCTAD 2004: 20). In principle, it would be useful to distinguish among DTTs in more detail. However, this would not only imply an enormous research effort given the existence of hundreds of DTTs between developed and developing countries, it is also next to impossible to do so in a quantitative way. Even the agreed-upon tax withholding rates, which are quantifiable, typically only specify maximum allowable rates, not effective rates, rendering them uninformative (Blonigen and Davies 2002).

Our control variables are identical to the ones used in Neumayer and Spess (2005) and are very similar to the ones used by Halward-Driemeier (2003) and Tobin and Rose-Ackerman (2005) who analyse the impact of BITs on FDI to developing countries. They are also among the ones more consistently found to be determinants of FDI (Chakrabarti 2001). First of all, we include a dummy variable for the presence of a BIT with the United States in the set of regressions with the US outbound FDI stock as dependent variable. For the non-dyadic FDI regressions, we use the weighted cumulative number of BITs a developing country has signed with developed countries, applying the same weighting procedure as for DTTs. The investor protection provisions contained in BITs are meant to increase FDI to signatory developing countries and Neumayer and Spess (2005) find evidence that they work. Further, we include the natural log of per capita income, the log of total population size and the economic growth rate as indicators of market size and market potential (data from World Bank 2003a). Developing countries, which have concluded a free trade agreement with a developed country, might receive more FDI as it is easier to export goods back into the developed or other countries. Such agreements sometimes also contain provisions on policies that might be beneficial to foreign investors. We account for this with two variables. One is a dummy variable indicating whether a country is a member of the World Trade Organization. The other is a variable

counting the number of bilateral trade agreements a developing country has concluded with the US, the European Community/European Union or Japan, weighted by their respective shares of world trade.[7] Data on agreements are taken from WTO (2004) and EU (2004), trade share data come from WTO (2006). Note that for the estimation results with US outbound FDI stock as the dependent variable, only bilateral trade agreements with the US enter this variable and no weighting is necessary. The inflation rate is a proxy variable for macroeconomic stability. Data are taken from World Bank (2003a). We employ a measure of natural resource intensity to control for the fact that, all other things equal, abundant natural resources are a major attractor to foreign investors. Our measure is equal to the sum of rents from mineral resource and fossil fuel energy depletion divided by gross national income, as reported in World Bank (2003b). Rents are estimated as (P–AC)*R, that is, as price minus average cost multiplied by the amount of resource extracted, an amount known as total Hotelling (1931) rent in the natural resource economics literature.

There is a long tradition of studies analysing the effect of political stability and institutional quality on FDI (see, for example, Schneider and Frey 1985; Alesina and Perotti 1996; Wheeler and Mody 2000; Globerman and Shapiro 2002; Louie and Rousslang 2002). We use the political constraints (POLCON) index developed by Henisz (2000), mainly because in comparison to alternative measures of institutional quality it has far larger availability across time and countries. Henisz has designed his index as an indicator of the ability of political institutions to make credible commitments to an existing policy regime, which he argues is the most relevant political variable of interest to investors. Building on a simple spatial model of political interaction, the index makes use of the structure of government in a given country and the political views represented by the different levels of government (i.e.

the executive and the lower and upper legislative chambers). It measures the extent to which political actors are constrained in their choice of future policies by the existence of other political actors with veto power who will have to consent. Using information on party composition of the executive and the legislative branches allows taking into account how alignment across branches of government and the extent of preference heterogeneity within each legislative branch impacts the feasibility of policy change. Scores range from 0, which indicates that the executive has total political discretion and could change existing policies at any point of time, to 1, which indicates that a change of existing policies is totally infeasible. Of course, in practice agreement is always feasible, so the maximum score is less than 1.

(c) Estimation technique

One could use a random-effects or fixed-effects estimator. We suspect that there are factors making a country attractive to foreign investors that are not captured by our explanatory variables and that are (approximately) time-invariant, such as colonial history, culture, language, climate, geographical distance to the centres of the Western developed world, legal restrictions on inward FDI etc. These are also likely to be correlated with the explanatory variables, which would render random-effects estimation biased. We report Hausman test results below, which confirms this suspicion and make fixed-effects estimation the preferred specification. Both random- and fixed-effects estimation results are based on robust standard errors (using Huber/White estimators of variance). To mitigate potential reverse causality problems, we lag all explanatory variables by one year. Ideally, one would like to tackle this problem more comprehensively with the help of instrumental variable regression. However, practically all explanatory variables are potentially subject to

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reverse causality and it would be simply impossible to find adequate and valid instruments. Table 1 provides summary descriptive variable information. Variance inflation analysis did not suggest reason for concern with multicollinearity problems. As in any regression analysis, there is of course always the possibility of omitted variable bias. For example, we cannot account for over-time changes in domestic legislation or fiscal policies encouraging or discouraging FDI other than what is captured by BITs and DTTs as there is no comprehensive information available. However, we see no reason why this or any other potentially omitted variable should be systematically correlated with our explanatory variables to an extent that our results would be significantly biased.

< Insert Table 1 around here >

5. RESULTS

Table 2 presents estimation results for the logged outbound stock of FDI in US$ of 1996 from the United States to developing countries. Column I is based on a random-effects specification. The existence of a double taxation treaty is associated with a higher FDI stock. The treaty effect is estimated to be around 34 per cent. Richer, more populous, resource-abundant countries and those with good institutional quality and with a trade agreement with the US also have a higher FDI stock. Somewhat surprisingly, fast-growing economies and WTO members have a lower stock. Neither the inflation rate nor the presence of a bilateral investment treaty matter.

The random-effects estimation results are problematic on two accounts. First, the Hausman test clearly rejects the random-effects assumptions. Second, on a conceptual level, for the DTT variable, random-effects estimation fails to tell us whether the conclusion of a double taxation treaty is associated with a higher FDI stock. Instead,

what the results show is that the presence of a DTT is associated with a higher stock. However, the DTT might have been concluded before the period of analysis started and the variable might be correlated with country-specific effects. It is therefore important to check whether the statistically significantly positive effect of the DTT variable upholds in fixed-effects estimation. Based on the within-variation of the data only, any effect has to derive from treaties concluded during the period of study in fixed-effects estimation.

Column II estimates the same model with fixed effects, whereas column III replaces the dependent variable with the share of FDI stock, also with fixed effects (non-reported Hausman tests again clearly rejected the random-effects assumption for this alternative dependent variable). Results suggest that the effect of DTTs is not driven by their correlation with country specific fixed effects. Instead, the conclusion of a DTT during the sample period is associated with an FDI stock that is around 22 per cent higher and an FDI stock share that is around 20 per cent higher. Results on the control variables are mostly consistent across the set of estimations. Population size is an important exception. Keeping in mind that the fixed effects estimation is based on the within-variation of the data in each country only, this can be interpreted to the effect that countries with a larger population size have a higher FDI stock as suggested by the random-effects estimation results, but as a country's population grows, its FDI stock and FDI stock share become smaller rather than bigger conditional on the other explanatory variables and the country-specific fixed effects.

< Insert Table 2 around here >

In table 3, we turn to the analysis of non-dyadic FDI data. Random-effects estimation results on FDI stocks in column I suggest that countries with a higher cumulative number of DTTs and BITs, and richer countries with larger populations

have a higher stock of FDI. So do countries that are more intensive in natural resource extraction, that exhibit greater institutional quality as measured by POLCON, that are WTO members and ones that have a higher number of trade agreements with developed countries. The economic growth and inflation rate are statistically insignificant. The Hausman test again rejects the random effects assumption. The same is true for all the alternative dependent variables, which is why we concentrate on fixed-effects estimation from now on. The fixed-effects estimation results on FDI stocks are rather similar to the random-effects ones (column II). In particular, higher cumulative numbers of DTTs and BITs remain positively associated with higher FDI stocks. The population variable switches signs again, whereas a higher inflation rate now has a negative effect. In column III, we replace the dependent variable with the share of FDI stock, but results remain largely consistent.

As mentioned already, FDI flows are available for a longer time period than FDI stocks and the literature on non-dyadic FDI is often estimated in flows. In columns IV and V the log of FDI stock and FDI stock share is therefore replaced by the log of FDI inflows and FDI inflow share. Results are remarkably consistent with the previous ones for FDI stocks. In particular, higher cumulative numbers of DTTs and BITs remain positively associated with higher FDI flows. The main difference is that faster growing economies attract higher flows, whereas the WTO membership dummy variable loses its statistical significance.

< Insert Table 3 around here >

In tables 4 and 5 we explore whether the effect of DTTs holds up for two subsets of developing countries, namely low-income versus middle-income countries, using country classification according to World Bank criteria (see appendix). The tables report the set of fixed-effects estimation results for both sub-samples of countries.

From table 4, it is clear that the positive effect of DTTs on FDI is exclusive to the group of middle-income countries.[8] Similarly, from table 5, it is clear that the positive effect of the cumulative number of DTTs on non-dyadic FDI stocks and inflows is also exclusive to the group of middle-income developing countries, even though the variable is close to marginal statistical significance for low-income countries in the FDI flow models.[9] One must keep in mind, of course, that with few exceptions, such as China and India, countries in the low-income group have concluded few, if any, DTTs with developed countries, whereas countries in the group of middle-income countries have many more DTTs in existence. The average value of the weighted treaty variable in the year 2001 in the group of middle-income countries is almost double the average of the low-income group (38.3 versus 20).

6. CONCLUSION

Developing countries that sign a DTT with the United States benefit from a higher FDI stock and share of FDI stock originating from US investors. Unfortunately, due to lack of data, no representative sample of dyadic FDI data for other capital exporting developed countries can be constructed. However, our estimation results with non-dyadic FDI and a cumulative number of DTT treaty variable weighted by the relative importance of the developed country treaty partner as a capital exporter suggest that the effect is a general one. Developing countries with more DTTs with major capital exporting developed countries benefit from a higher overall FDI stock and share of stock and receive more FDI inflows as well as a higher share of inflows. The message to developing countries therefore is that succumbing to the restrictions on their authority to tax corporate income from foreign investors typically contained in DTTs does have the desired payoff in terms of higher FDI. To our knowledge, ours

is the first study to provide robust empirical evidence that DTTs increase FDI to developing countries. However, once we split the sample of developing countries into low-income and middle-income ones, we found that DTTs are only effective in the group of middle-income countries. Future research should study in more detail why this is the case.

Statistical significance is not equivalent to substantive importance. We therefore need to know how strong is the effect of the DTT variables on FDI. How much more FDI can a developing country expect if it signed a DTT with the US or aggressively engages in a program to sign DTTs with developed countries? For the US FDI model, the estimated coefficient would suggest that concluding a DTT with the US is predicted to increase the FDI stock from US investors by 22 per cent and the FDI stock share by 20 per cent. These are large, but not implausibly high, effects. For non-dyadic FDI, we look at a one standard deviation increase in the DTT variable. This is equivalent to an increase of around 32.2 in the weighted cumulative DTT variable, which runs from 0 to 99.3 and is close to the sample mean of 29.9, but almost twice the sample median of 17.7. In the year 2002, a standard deviation increase would be approximately equivalent to signing a DTT with the United States and a country like Canada or Spain or equivalent to signing a DTT with Italy, France, Netherlands and Japan. Based on the estimations in table 3, a country experiencing a one standard deviation increase in the DTT variable, is predicted to increase its FDI stock by about 6 per cent, its share of FDI stock by about 9 per cent and its FDI inflow as well as FDI share relative to the total inflow to developing countries by about 29 per cent. Clearly, these are non-negligible increases following a substantial increase in DTT activity. But whether the demonstrated benefits of signing up to DTTs in the form of increased FDI are higher than the substantial costs developing countries incur in negotiating,

signing and concluding DTTs together with the loss in tax revenues is impossible to tell. What we do know is that DTTs fulfil the purpose of attracting FDI and those developing countries that have signed more DTTs with major capital exporting developed countries are likely to have received more FDI in return.

NOTES

[1] For the purpose of this article, the category of developing countries refers to all countries other than the United States and Canada, Western Europe, Japan, Australia and New Zealand.

[2] For the purpose of this article, we presume that a higher FDI inflow is beneficial to the host nation. This presumption can of course be contested (De Soysa and Oneal 1999). It can also be contingent on the existence of other political or institutional factors. For example, Hermes and Lensink (2003) find that a well-developed financial system is an important precondition for FDI to have a stimulating effect on economic growth. High FDI inflows can also have effects on, for example, regional inequality that might be undesirable (see Zhang and Zhang (2003) for evidence on China).

[3] Louie and Roussland (2002) find a non-significant effect of DTTs on the rates of return that American companies require for their foreign investment in the years 1992, 1994 and 1996.

[4] Note that we treat Mexico, South Korea and Turkey as well as the Eastern European countries of Czech and Slovak Republic, Hungary and Poland as developing countries despite their recent membership in the OECD.

[5] Ideally, one would want to weight not by the total FDI outflow from OECD countries, but by the FDI outflow that goes to developing countries only. However, this information is again not available for many OECD countries over a long time period.

[6] Dropping resource depletion as a control variable from the model would even allow one to extend the sample back to 1966. Results are hardly affected by doing so. Note that since we use year dummies in the estimations, other than for the summary descriptive statistics it makes no difference to the results reported below whether the dependent variable is held in nominal or in real terms since the deflator is of course absorbed in the year dummies for the FDI in absolute amounts variables or is cancelled out in the FDI share variables.

[7] We do not include the Lomé Conventions or the follow-on Cotonou Agreement between the EU and 77 countries from Africa, the Caribbean and the Pacific (ACP) since it is highly unlikely that these had a major impact on FDI.

[8] None of the low-income countries has a bilateral trade agreement with the US such that the variable is dropped from the estimations in the relevant regressions.

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[9] Again, none of the low-income countries has a bilateral trade agreement with either US, European Union or Japan.

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Table 1. Descriptive statistical variable information.

United States FDI sample:

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
ln FDI stock	2086	5.15	5.35	2.47	-0.11	10.83
ln FDI stock share	2086	-6.35	-6.03	2.50	-12.43	-1.38
DTT with US	2086	0.39	0	0.49	0	1
BIT with US	2086	0.16	0	0.37	0	1
ln GDP p.c.	2086	8.03	8.16	0.81	5.64	9.72
ln Population	2086	16.03	16.03	1.82	10.62	20.99
Econ. Growth	2086	0.01	0.02	0.06	-0.28	0.64
Inflation	2086	71.36	9.51	768.16	-31.52	26762
Resource rents	2086	6.04	1.2	10.09	0	66.60
Trade agreement with US	2086	0.00	0	0.06	0	1
WTO membership	2086	0.73	1	0.44	0	1
POLCON	2086	0.20	0.14	0.20	0	0.67

Non-dyadic sample:

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
ln FDI stock	2084	6.64	6.63	2.08	-3.15	12.81
ln FDI stock share	2084	-6.47	-11.28	2.02	-16.50	-1.41
ln FDI flow	2767	3.92	4.07	2.52	-4.69	10.78
ln FDI flow share	2767	-7.06	-6.89	2.45	-16.98	-1.17
DTTs (weighted)	2767	29.92	17.72	32.16	0	99.28
BITs (weighted)	2767	23.97	14.62	26.98	0	99.34
ln GDP p.c.	2767	7.93	8.02	0.83	5.64	9.72
ln Population	2767	15.72	15.80	1.88	10.62	20.99
Econ. Growth	2767	0.01	0.01	0.07	-0.42	0.78
Inflation	2767	65.78	9.13	684.46	-31.52	26762
Resource rents	2767	5.55	0.8	9.76	0	66.60
Bilateral trade agr. (weighted)	2767	2.54	0	9.59	0	52.05
WTO membership	2767	0.67	1	0.47	0	1
POLCON	2767	0.18	0.08	0.20	0	0.67

Table 2. Estimation results (United States FDI outbound stock in developing countries).

	I	II	III
	(Random)	(Fixed)	(Fixed)
DTT	0.343	0.224	0.201
	(5.21)***	(3.74)***	(3.37)***
BIT	-0.007	-0.026	0.030
	(0.11)	(0.43)	(0.52)
ln GDP p.c.	1.507	1.201	1.296
	(16.30)***	(12.12)***	(15.29)***
ln Population	0.607	-2.157	-1.835
	(7.46)***	(7.05)***	(15.01)***
Econ. growth	-0.810	-0.757	-0.714
	(2.60)***	(2.53)**	(2.42)**
Inflation	-0.000	-0.000	-0.000
	(0.06)	(0.25)	(0.35)
Resource rents	0.017	0.016	0.013
	(3.89)***	(3.66)***	(3.13)***
Bilateral trade agreement	0.760	0.618	0.691
	(5.22)***	(4.72)***	(5.31)***
WTO membership	-0.119	-0.148	-0.088
	(1.81)*	(2.31)**	(1.40)
POLCON	0.250	0.319	0.417
	(1.95)*	(2.59)***	(3.34)***
Observations	2086	2086	2086
Countries	114	114	114
Time dummies	yes	yes	no
R-squared	0.58	0.37	0.25
Hausman test	95.57		
	(0.0000)		

Notes: Dependent variable is logged FDI stock in columns I and II and logged FDI stock share in column III. Absolute z- and t-values in parentheses. Hausman test is asymptotically χ^2 distributed with p-values in brackets.

* significant at .1 level ** at .05 level *** at .01 level.

Table 3. Estimation results (FDI non-dyadic stocks and inflows in developing countries).

	I (Random)	II (Fixed)	III (Fixed)	IV (Fixed)	V (Fixed)
DTTs (weighted)	0.004	0.002	0.003	0.009	0.009
	(3.34)***	(1.91)*	(2.59)***	(3.48)***	(3.54)***
BITs (weighted)	0.005	0.004	0.004	0.016	0.012
	(4.62)***	(3.78)***	(3.34)***	(6.14)***	(5.42)***
ln GDP p.c.	1.072	0.814	0.820	0.462	0.288
	(12.55)***	(7.29)***	(8.42)***	(2.29)**	(1.55)
ln Population	0.577	-1.407	-0.990	-1.554	-2.786
	(11.57)***	(3.53)***	(5.06)***	(3.13)***	(12.66)***
Econ. growth	0.151	0.190	0.157	1.128	1.337
	(0.53)	(0.68)	(0.58)	(1.80)*	(2.16)**
Inflation	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.47)	(2.20)**	(2.23)**	(3.18)***	(3.28)***
Resource rents	0.024	0.022	0.018	0.030	0.027
	(6.06)***	(4.53)***	(3.92)***	(3.71)***	(3.48)***
Bilateral trade agreements (weighted)	0.009	0.011	0.010	0.014	0.015
	(2.08)**	(2.57)**	(2.12)**	(1.85)*	(1.99)**
WTO membership	0.268	0.182	0.170	0.169	0.103
	(5.15)***	(3.40)***	(3.14)***	(1.54)	(0.98)
POLCON	0.201	0.157	0.152	0.534	0.426
	(2.12)**	(1.60)	(1.54)	(2.23)**	(1.82)*
Observations	2115	2115	2145	2767	2767
Countries	120	120	120	120	120
Time dummies	yes	yes	no	yes	no
R-squared	0.68	0.50	0.14	0.22	0.09
Hausman test	79.48				
	(0.0000)				

Notes: Dependent variable is logged FDI stock in columns I and II, logged FDI stock share in column III, logged FDI flows in column IV and logged FDI flow share in column V. Absolute z- and t-values in parentheses. Hausman test is asymptotically χ^2 distributed with p-values in brackets. * significant at .1 level ** at .05 level *** at .01 level.

Table 4. Fixed-effects estimation results for separate low-income and middle-income developing country samples (United States FDI outbound stock).

	I	II	III	IV
DTT	-0.184	0.276	-0.201	0.154
	(1.21)	(4.12)***	(1.39)	(2.22)**
BIT	0.432	-0.199	0.364	-0.122
	(3.43)***	(2.98)***	(3.04)***	(1.87)*
ln GDP p.c.	1.574	1.086	1.468	1.099
	(8.86)***	(8.99)***	(9.91)***	(10.27)***
ln Population	-1.879	-1.826	-2.584	-2.581
	(2.23)**	(4.89)***	(15.44)***	(13.53)***
Econ. growth	-1.816	0.031	-1.492	0.119
	(4.10)***	(0.08)	(3.45)***	(0.31)
Inflation	-0.000	-0.000	-0.000	-0.000
	(0.36)	(0.13)	(0.23)	(0.80)
Resource rents	0.014	0.017	0.015	0.010
	(1.82)*	(3.15)***	(1.86)*	(2.07)**
Bilateral trade agreement		0.495		0.645
		(4.00)***		(6.47)***
WTO membership	-0.511	-0.070	-0.433	0.085
	(2.53)**	(1.03)	(2.07)**	(1.27)
POLCON	-0.195	0.474	0.266	0.608
	(0.74)	(3.48)***	(1.03)	(4.15)***
Income group	Low	Middle	Low	Middle
Observations	785	1301	785	1301
Countries	46	68	46	68
Time dummies	yes	yes	no	no
R-squared	0.33	0.44	0.46	0.24

Notes: Dependent variable is logged FDI stock in columns I and II and logged FDI stock share in columns III and IV. Absolute t-values in parentheses.

* significant at .1 level ** at .05 level *** at .01 level.

Table 5. Fixed-effects estimation results for separate low- and middle-income developing country samples (FDI non-dyadic stocks and inflows).

	I	II	III	IV	V	VI	VII	VIII
DTTs (weighted)	-0.000	0.005	-0.000	0.006	0.008	0.008	0.009	0.008
	(0.03)	(3.47)***	(0.12)	(4.07)***	(1.58)	(2.89)***	(1.61)	(2.97)***
BITs (weighted)	0.003	0.005	0.006	0.006	0.006	0.020	0.000	0.017
	(1.51)	(3.33)***	(3.11)***	(3.95)***	(1.22)	(5.97)***	(0.07)	(6.11)***
ln GDP p.c.	1.152	0.653	1.311	1.073	1.281	-0.158	0.972	-0.310
	(6.36)***	(3.77)***	(7.61)***	(7.02)***	(3.86)***	(0.57)	(2.79)***	(1.36)
ln Population	-1.491	-1.891	-0.602	-1.085	1.557	-1.671	-2.653	-2.146
	(2.29)**	(3.38)***	(3.00)***	(2.45)**	(1.13)	(2.63)***	(8.61)***	(5.04)***
Econ. growth	0.008	0.079	0.096	0.055	0.417	1.603	0.740	1.860
	(0.02)	(0.20)	(0.23)	(0.14)	(0.38)	(2.35)**	(0.69)	(2.76)***
Inflation	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.57)	(1.80)*	(1.17)	(1.36)	(3.09)***	(1.02)	(3.24)***	(1.04)
Resource rents	0.007	0.030	0.004	0.025	-0.004	0.057	-0.004	0.052
	(1.46)	(4.07)***	(0.84)	(3.17)***	(0.37)	(5.15)***	(0.34)	(4.98)***
Bilateral trade agr. (weighted)		0.013		0.013		0.009		0.010
		(2.94)***		(3.21)***		(1.28)		(1.40)
WTO membership	1.028	-0.087	1.042	-0.030	0.735	-0.113	0.663	-0.142
	(8.52)***	(1.34)	(8.58)***	(0.47)	(3.15)***	(0.90)	(3.02)***	(1.18)
POLCON	0.113	-0.079	0.162	0.042	0.460	0.334	0.369	0.336
	(0.71)	(0.63)	(1.14)	(0.30)	(1.06)	(1.19)	(0.91)	(1.21)
Income group	Low	Middle	Low	Middle	Low	Middle	Low	Middle
Observations	911	1204	919	1226	1179	1588	1179	1588
Countries	50	70	50	70	50	70	50	70
Time dummies	yes	yes	no	no	yes	yes	no	no
R-squared	0.53	0.52	0.23	0.15	0.14	0.31	0.12	0.10

Notes: Dependent variable is logged FDI stock in columns I and II, logged FDI stock share in columns III and IV, logged FDI flows in columns V and VI and logged FDI flow share in columns VII and VIII. Absolute t-values in parentheses.

* significant at .1 level ** at .05 level *** at .01 level.

Appendix 1. List of countries included in sample with number of DTTs with OECD countries in 2002 in brackets.

Low-income countries (Gross National Income in 2001 less than or equal to $745): Angola (0), Armenia (4), Azerbaijan (3), Bangladesh (10), Benin (2), Burkina Faso (1), Burundi (0), Cambodia (3), Cameroon (0), Central African Republic (1), Chad (0), China (21), Comoros (1), Congo (Dem. Rep.) (0), Congo (Rep.) (2), Côte d'Ivoire (8), Ethiopia (1), Gambia (4), Ghana (2), Guinea (0), Guinea-Bissau (0), Haiti (0), Honduras (1), India (20), Indonesia (17), Kenya (7), Kyrgyz Republic (2), Lesotho (1), Madagascar (1), Malawi (6), Mali (1), Mauritania (1), Moldova (1), Mozambique (1), Nepal (1), Nicaragua (0), Niger (1), Nigeria (6), Pakistan (16), Rwanda (0), São Tomé and Principe (0), Senegal (4), Sierra Leone (2), Tanzania (5), Togo (1), Uganda (4), Vietnam (12), Yemen (0), Zambia (12), Zimbabwe (8).

Middle-income countries (Gross National Income in 2001 more than $745): Albania (5), Algeria (6), Antigua and Barbuda (4), Argentina (16), Barbados (8), Belarus (4), Belize (4), Bolivia (6), Botswana (2), Brazil (15), Bulgaria (17), Cape Verde (1), Chile (3), Colombia (1), Costa Rica (2), Croatia (6), Czech Republic (20), Dominica (5), Dominican Republic (1), Ecuador (5), Egypt (14), El Salvador (1), Equatorial Guinea (0), Estonia (15), Fiji (5), Gabon (1), Georgia (3), Grenada (3), Guatemala (0), Guyana (3), Hungary (19), Iran (4), Jamaica (7), Jordan (4), Kazakhstan (10), Korea (Rep.) (20), Latvia (16), Lebanon (4), Lithuania (15), Macedonia FYR (6), Malaysia (17), Mauritius (6), Mexico (17), Morocco (15), Namibia (4), Panama (2), Papua New Guinea (3), Paraguay (0), Peru (2), Philippines (17), Poland (20), Romania (19), Russian Federation (18), Seychelles (3), Slovak

Republic (20), South Africa (17), Sri Lanka (14), St. Kitts and Nevis (4), St. Lucia (3), St. Vincent and the Grenadines (4), Swaziland (2), Syria (1), Thailand (17), Trinidad and Tobago (9), Tunisia (15), Turkey (12), Ukraine (10), Uruguay (2), Uzbekistan (8), Venezuela (11).