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THE EFFECTS OF BILATERAL TAX TREATIES ON U.S. FDI ACTIVITY

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ABSTRACT

The effects of bilateral tax treaties on FDI activity have been unexplored, despite significant ongoing activities by countries to negotiate and ratify these treaties. This paper estimates the impact of bilateral tax treaties using both U.S. inbound and outbound FDI over the period 1966-1992. Our estimates suggest a statistically significant average annual increase of FDI activity for each additional year of a treaty which ranges from 2% to 8%, depending on the FDI activity measure and empirical framework we employ. Examination for nonlinear effects of treaty age on FDI activity suggests that while treaties have an immediate impact on FDI flows, there is a substantial lag before treaty adoption positively affects FDI stocks and affiliate sales. Finally, our results suggest that bilateral tax treaties have an effect on investment outside of the withholding tax rates they alter, which may include the commitment and risk reduction effects of these treaties.

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I. Introduction

Empirical studies on the effects of taxation on foreign direct investment (FDI) are as numerous and varied as the tax policies they study. Until this point, however, the impacts of bilateral tax treaties governing the taxation of FDI activity have been unexplored.[1] According to the Bureau of Economic Analysis (BEA, 1998a), the amount of foreign direct investment (FDI) covered by these treaties in 1998 was approximately $774 billion of U.S. investment abroad (outbound FDI) and $586 billion of foreign investment within the U.S. (inbound FDI). These amounts represented 78% of total U.S. outbound FDI and 96% of the total U.S. inbound FDI.

The most obvious factors affected by bilateral tax treaties are withholding tax rates levied on repatriations to residents of the treaty partner. Previous research by Altshuler and Newlon (1991), Hines (1992), Altshuler, Newlon, and Randolph (1995), and Mutti and Grubert (1996) indicates that changes in withholding taxes can affect both the timing of repatriation decisions and the mode of repatriation. While this clearly indicates that these treaties can affect profitability of existing foreign investors, it does not necessarily say anything about the effects of these changes on overall FDI activity. One concern is that these negotiated treaties stem primarily from rent-seeking lobbying efforts by current foreign investors to increase profitability, rather than from a desire by governments to reduce distortions and enhance efficiency. Thus, the first issue this paper addresses is to what extent do bilateral tax treaties affect the amount of FDI between the U.S. and another country? The answer is of particular importance in light of the efforts expended by the U.S. Treasury to negotiate the treaties, as well as the necessary ratification by the U.S. Senate. If tax treaties do not lead to greater FDI activity, one questions whether

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[1]Hines and Willard (1992) empirically examines the number of treaties a country signs as well as the tax concessions dictated by a particular treaty. However, they do not include the amount of FDI activity as an explanatory variable nor do they consider the effect of taxation on FDI. The United Nations (1998) has studied the effects of bilateral treaties for the promotion and protection of FDI. These treaties are generally geared towards increasing investment in developing nations by ensuring a favorable political and economic climate rather and do not address tax concerns.

these governmental activities stem purely from rent-seeking activities on the part of current foreign investors.

A second related issue is the mode by which tax treaties affect FDI activity. Besides changing withholding taxes levied on repatriations, bilateral tax treaties also act as a method for countries to coordinate non-numeric aspects of tax codes. Furthermore, treaties can act as a commitment between countries to protect and promote FDI. This reduction in investor uncertainty alone can increase the amount of FDI that occurs.

This paper makes a first attempt at addressing these two issues by estimating the impact of bilateral tax treaties on both U.S. inbound and U.S. outbound FDI over the period 1966-1992. We explore tax treaty effects on various measures of overall FDI activity, including sales of foreign affiliates, FDI stocks, and FDI flows. We also employ two main empirical frameworks for testing the determinants of FDI activity: 1) a traditional gravity specification, and 2) a recent empirical framework developed by Carr, Markusen and Maskus (forthcoming) and Markusen and Maskus (1999a,1999b) that more closely follows theoretical work on multinational enterprises.

Our initial estimates using a simple dummy variable to indicate the presence of a bilateral tax treaty shows little evidence for significant effects of these treaties. However, when we explore for vintage effects of U.S. bilateral tax treaties, we find robust evidence that these treaties significantly affect both U.S. inbound and outbound FDI activity as the treaty ages. In fact, our estimates suggest a statistically significant average annual increase of FDI activity for each additional year of treaty enforcement that ranges from 2% to 8%, depending on the FDI activity measure and empirical framework we employ. Examination for nonlinear effects of treaty age on FDI activity suggests that while treaties have an immediate impact on FDI flows, there are substantial lagged effects before treaty adoption positively affects FDI stocks and affiliate sales. These results are generally stronger and more robust for U.S. outbound FDI activity than inbound FDI activity. While changes in withholding taxes are

the prominent observable variables affected by tax treaties, our estimated treaty effects on FDI activity are not qualitatively changed once we control for changes in the withholding tax rates specified by treaties. Thus, our evidence suggests that bilateral tax treaties have an effect on investment outside of the withholding tax rates they specify, which may include commitment effects and risk reduction effects of these treaties. On a final note, our results suggest that the recently formulated empirical framework used by Carr, Markusen, and Maskus (forthcoming) and Markusen and Maskus (1999a, 1999b) consistently performs better than the gravity model for a variety of FDI activity measures and sample of countries.

This paper proceeds as follows. In Section II, we discuss U.S. tax treaties including their history, how they are formed, and their key functions. In Section III, we present our empirical methodology and results. Section IV concludes.

II. Tax Treaties

In this section, we briefly discuss the history and functions of bilateral tax treaties. Given our data's American focus, this section concentrates on the U.S., however most of the discussion applies to other countries as well. The process of creating an international tax treaty with the U.S. is the same as for other international treaties. The Assistant Secretary for Tax Policy and the International Tax Counsel, acting on behalf of the Department of the Treasury, undertake the actual treaty negotiation. After the treaty is signed by the President or his delegate, it proceeds to the Senate. There, the Senate Foreign Relations Committee holds hearings before the treaty proceeds to the full Senate for ratification.[2] Not all signed treaties receive Senate approval. For example the Bangladeshi treaty was signed in 1981 but

[2]Since tax treaties are federal instruments, they supercede state or local laws. Generally, the only limitation U.S. tax treaties place on state taxation is that a foreign corporation must be treated the same as a firm incorporated in another state (White, 1991).

failed in the Senate. Some treaties fail multiple times before they are finally ratified.[3] Once ratified, treaties usually remain in effect, although most contain provisions for termination after a six-month notification by either nation (Doernberg, 1997). Of those treaties allowed to lapse, the majority (Aruba, Malta, and the Netherlands-Antilles) were the result of insufficient attempts by partner nations to prevent treaty shopping, a practice in which investments are funneled through a treaty country by a third nation for the purpose of avoiding or reducing taxes.[4] As with many types of international agreements, the number of tax treaties the U.S. has in force is on the rise. Table 1, which lists U.S. treaty partners, shows that the pace of new treaty implementation is increasing. In fact, half of the treaties were ratified only in the past twenty years with over 20% of the current treaties implemented during the 1990's.

Tax treaties perform four primary functions. The first is to standardize tax definitions and solidify the tax jurisdictions of treaty partners. It is common practice that only income generated by foreigners through a permanent establishment in the host country is subject to host taxation. If the countries differ in their definitions of permanent establishments, this can lead to double taxation and inefficient capital flows (Hamada, 1966). The impact of differing tax definitions on FDI is explored theoretically by Janeba (1996). Hines (1988) finds that the 1986 Tax Reform Act, which revised U.S. definitions, had a significant effect on U.S. multinationals (MNEs). Since a common goal for tax treaties is to reduce double taxation and the inefficiencies it causes, standardization of tax definitions and jurisdictions is a powerful tool. Treaty tax definitions generally match those provided by the OECD's

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[3]The original draft of the U.S./Cyprus treaty was signed in 1981 but did not pass the Senate. An amended version also failed in 1985. In 1987, a final version of the treaty was signed but was not ratified until 1988.

[4]The treaty with South Africa was terminated as part of the Comprehensive Anti-Apartheid Act of 1987. It was reinstated in 1997. The U.S./U.S.S.R. treaty, which was officially terminated in 1992, has been extended to cover former Soviet block countries until individual treaties can be negotiated. The only terminated treaty which was not canceled by the U.S. was that with Honduras. This treaty eliminated withholding taxes on FDI by both countries. Due to the almost entirely one-way nature of FDI flows, Honduras felt that all gains from the treaty were accruing to the U.S. and terminated it in 1967 (Diamond and Diamond, 1998).

model tax treaty (OECD, 1997). A second role for a tax treaty is to promote the exchange of tax information. This improves a treaty partner's ability to enforce its enforcing tax laws. This provision is particularly relevant for multinational corporations due to their ability to engage in transfer pricing to avoid taxation.[5] The third goal of a tax treaties, especially recent treaties, is to prevent treaty shopping. Although there are many variations in the regulations regarding treaty shopping, the most common rules restrict treaty benefits if more than 50% of a corporation's stock is held by a third, non-treaty country's residents (Doernberg, 1997).

Finally, tax treaties affect the actual taxation of multinationals. They do so through the rules affecting double taxation relief and the withholding taxes levied on repatriations by FDI. Following the OECD model treaty guidelines, tax treaties with the U.S. specify that both countries must offer either foreign tax credits when calculating the domestic tax bill or exempt foreign-earned profits from domestic taxation.[6] This does not usually affect U.S. tax policy as it already provides foreign tax credits to its investors whether their income is earned in a treaty or a non-treaty country. It does, however, affect the taxation of some treaty members.[7]

In addition to the provisions for double taxation relief, the treaties provide maximum allowable withholding taxes on three types of remitted income: dividend payments, interest payments, and royalty

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[5]The U.S. has also entered into tax information exchange agreements with countries which are not tax treaty partners. Additionally, the U.S. has ratified the multilateral OECD Convention on Mutual Assistance in Tax Matters which provides for information exchange (OECD, 1989).

[6]Under a tax credit, the domestic tax bill is calculated by applying the standard domestic tax rate to the pre-foreign tax level of overseas profits. A credit against this amount is then applied up to the amount of the foreign taxes paid. If this credit exceeds the domestic tax liability, the firm is in an "excess credit" position and pays no additional taxes on these overseas profits. If the home tax bill is greater than the amount of the credit, the firm is in an "excess limit" position and pays the remaining amount to the home government.

[7]For instance, Belgium applies a reduced domestic tax rate to the foreign-earned profits of its residents. Under the U.S./Belgium treaty, however, income earned by Belgian firms in the U.S. is exempt from Belgian taxation.

payments. Although the treaties contain far too many special regulations to discuss in detail here, some common features deserve particular emphasis.[8] First, many treaties provide different dividend tax rates depending upon the recipient. Specifically, reduced dividend withholding taxes are often applied to payments made to a parent which holds a minimum share of the overseas affiliate's equity. For example, under the U.S./German treaty, a dividend payment to an unrelated entity is taxed at 10%, while a payment to the parent firm is taxed at 5%. The necessary level of holdings to receive the reduced tax rate varies from treaty to treaty. Some treaties, such as those with Italy and Canada, allow for three categories of holdings. In such cases, the greater the controlling interest the recipient has in the overseas operations, the lower the tax rate charged.

The taxes on interest and royalty remittances can also depend upon the recipient, although the distinction is generally dependant on the recipient's industry rather than their overseas holdings.[9] The U.S./Cyprus treaty, for example, reduces the tax on interest payments from 10% to zero if the payment is made to a bank, government, or financial institution. Oftentimes, natural resource industries receive smaller interest tax reductions than those offered to other firms. In most cases the U.S. offers a reduced royalty tax rate only for industrial royalties. Otherwise the standard non-treaty rate of 30% is applied. In summary, while there is a large amount of variation between the treaties, in almost all cases they lower at least some of the withholding tax rates imposed by treaty partners on one another's FDI.[10] There are no tax treaties which raise tax rates.

From the above discussion, the primary costs and benefits of entering into a tax treaty can be

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[8]For specifics, please refer to the treaties themselves which are reprinted by Diamond and Diamond (1998).

[9]One exception is the U.S. treaty with Trinidad and Tobago. In general, Trinidad and Tobago offer no relief on interest remittances and charge the standard rate of 30%. If the payment is to a bank, this rate is reduced to 25%. This tax rate is also reduced to 10% if the payment is made to a parent firm.

[10]One exception is the U.S./Pakistan treaty, where U.S. firms receive no tax break from Pakistan, although Pakistani firms do receive reduced tax rates from the U.S..

summarized as follows. Since a treaty can lower the overseas taxes, more income is repatriated to the home nation. At the same time, lower overseas tax rates can promote a more efficient global allocation of investment.[11] This gain is accompanied by potentially reduced tax receipts since treaties also lower the tax rates levied on inbound investment. This cost can be mitigated in two ways. First, improved information exchange may reduce tax evasion. Second, since under the treaty withholding taxes can be tailored to the specific investment from a treaty partner, it may be possible to set tax rates which encourage tax-sensitive inbound investment and actually raise total tax receipts.[12] With the major goals and functions of tax treaties in mind, we now turn to the data and estimate the effects that tax treaties have on bilateral FDI activity between the U.S. and other nations.

III. Empirical Analysis

A. Empirical Methodology

The stated goals of bilateral tax treaties is to reduce investment frictions which inhibit FDI activity across one or more dimensions, such as affiliate sales, FDI stock or profitability. With this clear theoretic impact in mind, the focus of our paper is to measure the effect of bilateral U.S. tax treaties on aggregate outbound and inbound U.S. FDI activity. For this reason, we begin with an accepted empirical model of bilateral FDI activity and test the effects of treaties within such a framework. The traditional empirical framework is a gravity model, similar to that used to explain trade flows. In this setting,

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[11]Note that a lower foreign tax rate does not guarantee a reduction in the firm's total tax bill. As noted by Altshuler and Newlon (1991), only firms in excess credit will benefit from this change. Thus, a decrease in the overseas tax rate may not improve capital flows in some cases. Also, as discussed by Ramaswami (1968) and Bond and Samuelson (1989), this effect may be to the detriment of the home country due to foreign factor market effects.

[12]As derived in Bond and Samuelson (1989) among others, the tax revenue maximizing tax rate on inbound FDI is $1/(1+\epsilon)$, where ϵ is the elasticity of inbound FDI supply. If ϵ varies across countries, the revenue maximizing tax rate will differ across countries. Since a treaty allows a country to lower its tax rate, this can actually raise tax revenues if the current tax rate is greater than the optimal tax on FDI from that particular country.

bilateral FDI activity is assumed to be a function of the involved countries gross domestic products (GDP), GDP per capita and control variables such as the distance between countries, trade frictions, and investment frictions. Studies employing this gravity specification to empirically model FDI activity include Grubert and Mutti (1991) and Brainard (1997). Thus, the initial framework we use is:

$$FDI_{ij} = f(RGDP_i, RGDP_j, RGDPCAP_i, RGDPCAP_j, DIST_{ij}, TT_{ij}, Z_{ij}) \quad (1)$$

where FDI is a measurement of FDI activity from country i to country j, RGDP is real gross domestic product, RGDPCAP is per capita real GDP, DIST is distance between countries, TT is a variable connected with a bilateral tax treaty between countries, and Z is a matrix of other control variables. While we have included RGDP and RGDPCAP for both the parent (country i) and potential host (country j), many studies only hypothesize relationships between host-country RGDP and RGDPCAP and parent country FDI.

While the gravity model has arguably been the most popular empirical framework, it lacks connection to a recognized formal theory of MNE activity. In contrast, recent papers by Carr, Markusen, and Maskus (forthcoming) and Markusen and Maskus (1999a, 1999b) establish empirical models of FDI activity that are arguably more grounded in the formal theories of MNE activity that have been developed in the past fifteen years. In particular, Markusen and Maskus provide an "unrestricted" empirical model of MNE/FDI activity that nests a number of alternative theories of MNE activity. The theories nested in their empirical framework include horizontal MNE models, vertical MNE models, and the knowledge-capital model which integrates the two. Markusen and Maskus (1999b) use their empirical model to examine affiliate sales of U.S. firms in other countries and foreign affiliate sales in the U.S. over the period 1986-1994. Their unrestricted specification fits their data quite well and, in general, finds support for the horizontal MNE theoretical model. Thus, as an alternative empirical framework for our analysis, we use the Markusen and Maskus (or M-M) empirical model that is modified to include bilateral tax

treaty effects:

$$FDI_{ij} = f(SUMGDP_{ij}, GDPDIFSQ_{ij}, D2SKDGDPD_{ij}, D2SKDSUMG_{ij}, D1SKDSUMG_{ij}, DIST_{ij}, TT_{ij}, Z_{ij}) \quad (2)$$

The first five independent variables in equation (2) are obviously the variables specific to the M-M framework. The first two terms are relatively straightforward, with SUMGDP defined as the sum of the two countries' real GDPs, and GDPDIFSQ defined as the squared difference between the two countries' real GDP. If horizontal MNEs are responsible for most FDI activity, then there is an expected positive correlation between SUMGDP and FDI activity and an expected negative correlation between GDPDIFSQ and FDI activity. The intuition is that with some positive level of trade frictions, larger and more similar sized markets better support the higher fixed costs associated with setting up production across countries (versus exporting) and lead to greater MNE activity.

The third, fourth and fifth terms on the right-hand side of equation (2) are more complicated interaction terms. D2SKDGDPD is an interaction term between 3 variables; D2, SKD, and GDPD. D2 is a dummy variable that takes the value of "1" if the parent country for MNE activity is relatively skilled-labor abundant to the host country, SKD is the difference in relative skilled-labor abundance between the two countries, and GDPD is the real GDP difference between the two countries.[13] Markusen and Maskus (1999b) argue that this coefficient will have a negative sign if the knowledge capital model is an accurate picture of MNE activity, and will be insignificant if the other alternative MNE models (horizontal and vertical) are more realistic. D2SKDSUMG is another interaction term that is perhaps the most important variable distinguishing between the alternative MNE models. This variable interacts D2 and SKD (as defined above) with SUMGDP. This variable is hypothesized to have a positive sign if the vertical or knowledge capital MNE models fit the data, but a negative sign if the horizontal MNE model

[13] In our regressions, this variable will almost always take the value of "1" when we examine U.S. outbound data, because this suggests the U.S. is relatively skilled-labor abundant relative to the host country. Likewise, it will often take the value of "0" when our dependent variable is inbound FDI activity because the U.S. is the host country in such a circumstance.

is a better fit. The main intuition behind these differences is that greater skill differences generate greater MNE activity in the vertical model. In contrast, greater skill differences negatively impact horizontal MNE formation as the cost of skilled labor goes up in the skilled labor country from increasing differences, making it more difficult to compete against national firms in the skilled-labor scarce country. The knowledge capital model has aspects of the vertical model that means skill differences can positively affect MNE activity as well. Finally, D1SKDSUMG identifies the symmetrically opposite effects of D2SKDSUMG for the situation when the parent country is relatively skilled-labor scarce. It does this by interacting a dummy variable that takes the value of "-1" when the parent is relatively skilled labor scarce and interacts it with SKD and SUMGDP.

To estimate tax treaty effects we first include a binary variable that takes the value of "1" when a U.S. treaty is in place for a given partner country and year. We expect this variable to be positive and the primary focus is on the magnitude of the marginal effects. Since the effects of treaties may increase or decrease over time, we also include the variable TREATYAGE in a number of specifications, which is the length of time a treaty has existed between the U.S. and a partner country as of a given year. We have no *a prioiri* hypothesis about the effect of TREATYAGE on FDI activity. We also examine nonlinear effects of treaty age by including a squared TREATYAGE term, TREATYAGESQ. A final set of estimates employs information on withholding tax rates that are specified under bilateral tax treaties, including the rates on 1) dividends to the parent company, 2) dividends to other investors, 3) interest, and 4) royalties.

Table 2 summarizes expected signs of the variables in both the gravity and M-M frameworks. While there are obvious similarities in the types of factors explaining FDI in the two frameworks, the differences turn out to be important and our results will find significant differences in overall performance between the two empirical models. To our knowledge, this empirical fitness comparison of the two frameworks with a common data set has not been done before and is an additional contribution of

this paper.

On a final note, we run these empirical models on separate samples of U.S. outbound and U.S. inbound FDI activity. While this does not change the expected signs of any variables in our framework, it allows us to examine whether bilateral tax treaties asymmetrically impact outbound FDI of U.S. firms versus FDI into the U.S. by foreign firms.

B. Data

Empirical FDI studies have always been hampered by data difficulties. Missing or incomplete data for one or more variables often leads researchers to examine cross-sectional data, with little or no time series dimension.[14] Data issues are also why researchers generally focus on U.S. data, as it is more complete and detailed than virtually any other countries' FDI statistics. Our approach is to collect data on inbound and outbound U.S. FDI activity for as many years as available across as many countries as available. As a result, we have an unbalanced panel of 65 countries spanning up to 27 years – from 1966 through 1992 – depending on the particular dependent variable we employ. The ending date of 1992 was primarily due to the final reported year of the Penn-World Tables, which was an important source for a number of our study's independent variables, while our ability to go back in time was typically constrained by reported years of U.S. FDI activity, our dependent variable. This section describes construction and sources for our various measures of FDI activity used as dependent variables and for our independent variables.

Following previous studies we initially use affiliate sales in the host country as our indicator of FDI activity. However, statistics on affiliate sales activity are not available for nearly as many years as

[14]Grubert and Mutti (1991) examine a cross-section of 33 countries for 1982, while Brainard (1997) samples U.S.-country-industry combinations across 63 tradeable industries and 27 countries for 1989. Markusen and Maskus (1999a, 1999b) examine an unbalanced panel data set of 36 U.S.-country pairs from 1986-1994.

two other indicators of FDI activity: FDI flows and FDI stock. FDI flow and stock data go back as far as 1966 in some cases, whereas affiliate sales data are only available back to the early 1980s. As one would guess, there are strong, statistically-significant correlations between affiliate sales and FDI stock: in our sample, the pairwise correlation is 0.88 for inbound FDI activity and 0.92 for FDI outbound. Likewise, the pairwise correlations for FDI flow and affiliate sales are high and statistically-significant (0.75 for inbound and 0.66 for outbound). Thus, we also use FDI stock and FDI flow as separate alternative dependent variables, as this allows us to almost double our sample observations. We note that there is an important difference in interpreting our results when we employ FDI stock or affiliate sales as the dependent variable versus FDI flows. A positive effect of bilateral treaties with the former measures indicates an increase in the level of FDI activity, whereas a positive effect on FDI flows, would suggest an increase in the growth rate of FDI activity. [15] All three FDI activity variables are collected from official BEA data available at the BEA's Internet site. We converted all FDI variables into thousands of real U.S. dollars, using the U.S. GDP deflator, as reported in the *Economic Report of the President*. A data appendix provides more details on these variables, as well as the other variables we employ in our study.

With respect to our independent variables, data on real GDP and real GDPCAP come from the Penn-World Tables. We also use these data to construct the Markusen and Maskus variables, SUMGDP, GDPDIFSQ, D2SKDGDPD, and D2SKDSUMG. The latter two variables also require data on skilled-labor levels and differences between countries. For this we rely on a relatively new database constructed by World Bank researchers on total mean years of education across countries from 1950-1990. We use the difference in total mean years of education between the parent and host country as our measure of SKD (skilled-labor abundance difference), and D2 takes the value of "1" when the parent country has a

[15] An additional measure of FDI activity, income net of taxes, was also available. This yielded similar qualitative results, although income appeared to increase somewhat more from a tax treaty than other measures. Since treaties lower taxes, this is not that surprising.

higher total mean years of education. This differs from the data used by Markusen and Maskus (1999) in construction of these variables related to skilled labor abundance. They use data from annual surveys conducted by the International Labour Organization to construct measures of skilled labor to total employment by country and year. These data were not available for many earlier years in our sample and, in addition, there were changes in how occupations were categorized into occupation types over time.

The main additional control variables we employ are distance (DISTANCE), trade openness (T_OPEN) and FDI openness (F_OPEN). Distance data come from the Bali Online Corporation (1999), while T_OPEN is taken from the Penn-World Tables. Markusen and Maskus (1999) use investment impediment indexes reported by the *World Competitiveness Report* of the World Economic Forum to measure F_OPEN. Since these data cover a relatively small set of years, we instead constructed an alternative F_OPEN measure defined as the host country's FDI stock divided by its GDP. This is similar in construction to commonly used trade openness measures. Finally, information on U.S. bilateral tax treaties and tax rates were collected from Diamond and Diamond (1998).

C. Initial Results

We begin our empirical analysis with initial estimates of the determinants of U.S. *inbound* FDI activity in Table 3. The six columns in Table 3 present estimates for determinants of affiliate sales, FDI stock, and FDI flows for both the gravity model and M-M model specifications. Given these regressions use U.S. inbound FDI data, subscript (i) refers to the foreign parent country and subscript (j) refers to the United States (the host country) in this table.

In general, the data fit the model reasonably well with R^2s around 0.60 for affiliate sales regressions and 0.30 for FDI stock and FDI flow regressions. Also, an F-test rejects the null of zero slopes at the one percent significance level for all six regressions. We also find that the M-M model

consistently fits the data better, with higher R^2s than the gravity model for comparable regressions.[16] In fact, the primary variables of the M-M model (SUMGDP, GDPDIFSQ, D2SKDGDPD, D2SKDSUMG, and D1SKDSUMG) all have their predicted signs and are often statistically significant. With respect to the gravity model, the coefficients on $RGDP_i$, $RGDPCAP_i$, and DISTANCE have the expected signs and are statistically significant, while the coefficients on $RGDP_j$ and $RGDPCAP_j$ are statistically insignificant or the wrong sign. This may not be particularly surprising, as $RGDP_j$ and $RGDPCAP_j$ are real GDP and real GDP per capita for the United States (the host country in these specifications); thus, there is no cross-sectional variation in these data, only time-series variation. In general, our trade and FDI openness control variables are not statistically significant in any of the regressions. Finally, our variable of interest capturing bilateral tax treaty effects shows little evidence of statistically significant effects. In fact, with respect to affiliate sales, both models estimate negative coefficients.

Table 4 provides comparable regression estimates to Table 3 using U.S. *outbound* FDI data. Thus, in Table 4, subscript (i) refers to the United States (the parent country) and subscript (j) refers to the foreign host countries in this table. Both models (gravity and M-M) fit U.S. *outbound* FDI data better than U.S. *inbound* data. The primary variables in the M-M model all have coefficients with correct sign that are statistically significant. Additionally, the slope coefficients on FDI and trade openness measures are consistent with expectations and often statistically significant, unlike for the U.S. inbound data. Again, the U.S. real GDP and GDP per capita variables (here, $RGDP_i$ and $RGDPCAP_i$) do not perform well in the gravity model framework.

With respect to the impact of tax treaties, the results diverge across the gravity and M-M specification. While the gravity model provides little evidence for tax treaty effects on U.S. outbound FDI activity, the M-M model indicates statistically significant effects on affiliate sales, FDI stock and

[16] This result is not driven by differences in sample observations - the M-M model performs better even when using identical samples. We note this because there are differences in missing data across different variables, which leads to slightly smaller samples for the M-M model regressions.

FDI flows. The estimated effects of tax treaties in the M-M model are an annual increase of $12.1 billion dollars in affiliate sales, $4.4 billion dollars in FDI stock and $367 million in FDI flows. With a sample mean of approximately $15 billion in annual affiliate sales, $3.5 billion in FDI stock, and $300 million in annual flows, these estimated effects of tax treaties are quite substantial.

To summarize our initial results, both the gravity and M-M empirical models fit U.S. FDI data reasonably well. The fit is generally better for the M-M model and for U.S. outbound data. On the other hand, the effects of tax treaties on FDI activity receive mixed results. We find statistically significant effects only with U.S. outbound FDI activity in the M-M model, though these estimated effects are large. We next explore alternative ways to estimate tax treaty effects on U.S. FDI activity that may not be captured by a simple dummy variable, as well as a variety of sensitivity checks.

D. Vintage effects

New treaties may require time to have an impact on FDI activity, particularly on affiliate sales and FDI stock, and our sample includes a fair number of recent treaty activity. In addition, one concern with the above estimates is simultaneity bias: FDI patterns may affect which countries the U.S. chooses to have as tax-treaty partners. To address both of these concerns we next examine whether the treaty effects on FDI activity grow over time. Thus, we include a variable that measures a treaty's age (TREATYAGE) instead of the simple binary variable employed in the analysis above.[17] Tables 5 and 6 display results from regressions that are comparable to those in Tables 3 and 4, except the specification uses TREATYAGE rather than TREATY to estimate treaty effects.

Qualitatively, the results in Tables 5 and 6 are identical to those in Tables 3 and 4, with the

[17]An alternative way to estimate these vintage effects is through lags of the treaty dummy variable. However, as we show below, it is likely that these lagged effects go back a substantial number of periods. Thus, estimating separate coefficients for many-period lags would lead to a substantial loss in number of observations and degrees of freedom.

important exception that the TREATYAGE coefficient is always positive and generally statistically significant for both outbound and inbound data across both the gravity and M-M model. The marginal effects are economically meaningful as well, with each additional year of a treaty increasing the FDI activity from 2% to 8% of the dependent variable's average, depending on the empirical model and dependent variable used. For example, the gravity model estimates of U.S. affiliate sales abroad in column 1 of Table 6 indicate that each additional treaty year is correlated with an additional $538 million in affiliate sales, which is 3.6% of the $15 billion annual average affiliate sales per country observation. While the gravity and M-M models give consistently identical results, as before, the M-M model outperforms the gravity model. Thus, to condense our results, we only report M-M model estimates in the rest of the paper.

The estimates with TREATYAGE assume linear lagged effects, which may be inappropriate. Thus, we next include a squared treaty age term (TREATYAGESQ), to capture nonlinear effects.[18] Table 7 reports coefficient estimates on the TREATYAGE and TREATYAGESQ variables when we estimate the M-M model on inbound and outbound data for our three measures of FDI activity. For the sake of space, we do not report the other coefficient estimates in this table. For the inbound data, the coefficient on TREATYAGE is negative across our three measures of FDI activity, while the coefficient on TREATYAGESQ is positive. The marginal impact of TREATYAGE, taking into account both terms, suggests that there is a substantial lag effect of tax treaties on inbound U.S. FDI activity. However, these terms, individually and jointly, are not statistically significant in the case of U.S. inbound affiliate sales and FDI flows, suggesting that a specification with only TREATYAGE (in Table 5) is more appropriate. In contrast, this nonlinear specification fits U.S. inbound FDI stock data very well, with both TREATYAGE terms statistically significant. The marginal effects of TREATYAGE suggest a

[18] Inclusion of a cubed term did not qualitatively affect our estimates and was often statistically insignificant.

substantial lagged effect of these treaties on inward FDI stock in the United States with an initial negative impact that does not become positive until after twelve years.

The U.S. outbound FDI data presents a more interesting picture. In the case of affiliate sales and FDI stock, the TREATYAGESQ term is positive and statistically significant (with both terms joint statistically significant), while for U.S. outbound FDI flows, only TREATYAGE is positive and statistically significant . The marginal effects suggested by the coefficients is that U.S. tax treaties have an immediate positive impact on U.S. outbound flows, a positive and growing effect on FDI stock after one year, and a growing effect on affiliate sales that become positive after the sixth year of the treaty. Thus, our estimates suggest that the effects of treaties for affiliate sales and FDI stock are not just immediate, but grow over a substantial length of time.

However, an alternative explanation for these results is that these lagged effects of treaties are really picking up cross-sectional variation: the older U.S. tax treaties are primarily with OECD countries, whereas more recent treaties tend to be with smaller, less-developed countries. Thus, even after controlling for observed factors, we could get this "artificial" lagged effect of tax treaties if FDI activity is simply more substantial with OECD countries where we have had U.S. treaties since the 1950s. The next section explores the effect of (unobserved) hetereogeneity in our data.

On a final note, we obtain qualitatively similar results for the effect of tax treaties on FDI activity when we specify our dependent variable as number of foreign affiliates. This suggests that the increased activity is not just from firms already in place before the tax treaty occurs, but involves creation of FDI activity by new investors. This provides further evidence that these tax treaties are not solely for existing investors and makes a rent-seeking story for the origination of these treaties less likely. This, in turn, is further evidence that simultaneity bias is not substantial in our estimates.

E. Exploring for Hetereogeneity with Alternative Samples

There are two ways we examine the effect of heterogeneity in U.S. treaty partners on our estimates. First, we construct a sample that excludes all observations involving European countries, Canada and Japan and re-estimate our FDI activity regressions. These excluded countries account for the majority of U.S. international transactions (including FDI activities) and also account for the majority of countries that have had bilateral tax treaties with the U.S. for over 30 years as of the end of our sample in 1992. This addresses our concern that these "old" treaty partners are driving the significant TREATYAGE estimates we present above. Secondly, we control for unobserved country-partner hetereogeneity through country-partner-specific fixed effects. This latter approach is a more general way to address hetereogeneity issues.

Table 8 reports coefficient estimates for our treaty variables when using inbound and outbound data in the M-M empirical framework for a smaller sample that excludes "old" treaty partners (Europe, Canada, and Japan). In particular, the first two rows of Table 8 present the estimates when only TREATY is included in an M-M model regression, the second two rows present estimates when only TREATYAGE is included, and the final four rows present estimates of TREATYAGE and TREATYAGESQ variables when these are the only two treaty variables. Coefficient estimates on other control variables in the regressions are not reported for the sake of space, but the primary M-M variables continue to have correct signs and statistical significance in general. We do note that the sample size decreases by about 30% for each regression and the R^2 statistics fall by 50%, in general.

Despite these substantial changes in sample size and fit, the treaty effects presented in Table 8 are quite similar to those for the overall sample. When only TREATY is included in the regression, we often do not get statistically significant effects of treaties on various FDI activities, which is consistent with our results in Tables 3 and 4 for the overall sample. However, when we turn to the TREATYAGE specification, there is a statistically significant effect of bilateral tax treaties on all three measures of FDI

activities as a treaty ages. As with the full sample estimates in Tables 5 and 6, the coefficient estimates on TREATYAGE for this reduced sample are not only statistically significant, but economically meaningful as well. Whereas each additional year of a treaty increases FDI activity from 2% to 8% of the dependent variable's average in the full sample, with this sample each additional year increases FDI activity from 6% to 14% of the dependent variable's average. A difference between this sample and the full sample is that there is little evidence of nonlinear TREATYAGE effects, except for outbound affiliate sales. In other words, the coefficients on TREATYAGE and TREATYAGESQ have similar signs across the two samples, but the combined effects are not statistically significant for this reduced sample.

A second alternative to control for cross-sectional effects is to include country-partner-fixed effects so that identification comes only from within-cross-sectional variation. The inclusion of these fixed effects in our estimates is far from innocuous in our sample because a number of countries in our sample never have a treaty with the U.S. during the time period of our data. Thus, identification of our estimates cannot come from these cross-sectional units. Second, many other countries have a treaty for the entire period of sample and lead to similar problems, if we include TREATY as our variable of interest. This is alleviated if we focus on TREATYAGE as a variable which changes over time.

Table 9 reports coefficient estimates for our treaty variables when using inbound and outbound data in the M-M empirical framework estimated with country-partner-fixed effects. The first two rows of Table 9 present the estimates when only TREATYAGE is included, and the final four rows present estimates of TREATYAGE and TREATYAGESQ variables when these are the only two treaty variables. Again, we find results similar to the full sample estimates. For FDI stocks, the non-linear lag effects appear far longer than in the full sample results, amounting to about a 35 year lag for inbound investment and a 28 year lag for outbound investment. Similar significant non-linear effects are found for affiliate sales. No significant results were found for FDI flows.

F. Tax Rates

As discussed above, a primary function of tax treaties is to specify withholding taxes for payments made to partner country recipients. Since these tax rates are easily quantifiable, it is interesting to examine whether, after accounting for variations in withholding taxes, tax treaties continue to impact FDI. To this end, we present the results in Table 10, which contains results from OLS estimation of M-M model of FDI stock but also includes tax rate variables. The estimates for the M-M variables are consistent with those in Table 5 and are omitted for space. We performed this analysis only for inbound investment, as this minimizes the influence of non-observed factors in the host market, since the host is the U.S. in every case. This estimation was also done with affiliate sales and FDI flows. Broadly similar results were found in those specifications. When TREATY is included, the parental dividend, interest, and royalty tax rates have the negative and significant signs one might expect. Curiously, the dividend tax on payments made to non-parents is positive and significant, suggesting that a higher U.S. tax leads to more inbound FDI. This result holds whether this tax is included singly or with the other taxes and when TREATYAGE is used instead of treaty. This surprising result may be driven by the fact that most treaties offer preferential tax rates only for dividends paid out to recipients who meet minimum equity holding requirements. This preferential rate would lead a parent firm to increase its equity holdings to meet this requirement while reducing other forms of affiliate financing such as U.S. debt. Since debt is not counted as FDI by the BEA, this reclassification would cause an increase in FDI, even though it may not change the actual control of assets located in the U.S.. The final column of Table 10 includes the difference between the dividend tax on payments to others less the dividend tax on payments to the parent. When TREATY is included, this difference has a positive and significant effect on FDI stock, suggesting that financing story above may indeed be driving this curious result. When TREATYAGE is used instead of TREATY, we find that the coefficients on the tax rates can flip signs depending on the specification. This is most likely due to the high degree of correlation between the various tax measures.

When all four measures are included, the results are similar to those when TREATY is used, although the interest tax is now significantly negative (as expected) while the royalty tax is significantly positive. Finally, the results for the non-tax treaty components are significant in every case and, as in the above results, indicate that FDI is most commonly associated with older treaties.

IV. Conclusion

With this paper, we have made a first attempt at quantifying the impact of bilateral treaties governing the taxation of foreign direct investment. The overarching result is that tax treaties do have a positive and significant effect on FDI, at least after some time has elapsed. Our results suggest that implementing a bilateral tax treaty can increase FDI activity between 2 and 8 percent for each additional year a treaty is in place, depending on the specification. In estimating this effect, we have performed two additional functions. First, we find that the recent empirical framework used by Carr, Markusen, and Maskus (forthcoming) and Markusen and Maskus (1999a, 1999b) perform significantly better than the gravity model setup used by Brainard (1997). Second, we find that treaties have significant effects above and beyond the tax rates they specify. This suggests that treaties can increase investment not only by reducing taxes, but by solidifying tax policies and promoting cooperation between nations. Thus, governments may not have to sacrifice tax receipts in order to promote FDI which is a common concern for developing nations. While there remains a great deal to be explored in the area of tax treaties and FDI, it is our hope that paper provides a stimulus for future research.

Table 1: List of U.S. Tax Treaties.

Aruba (1986-1996)	India (1990-)	Phillippines (1977-)
Australia (1953-)	Indonesia (1989-)	Poland (1976-)
Austria (1956-)	Ireland (1952-)	Portugal (1994-)
Barbados (1984-)	Israel (1993-)	Romania (1976-)
Belgium (1948-)	Italy (1955-)	Russia (1993-)
Canada (1941-)	Jamaica (1981-)	Trinidad and Tobago (1971-)
China (1985-)	Japan (1954-)	Slovak Republic (1994-)
Cyprus (1988-)	Kazakhstan (1993-)	South Africa (1953-1987, 1997-)
Czech Republic (1995-)	Korea, Republic of (1977-)	Spain (1991-)
Denmark (1948-)	Luxembourg (1963-)	Sweden (1940-)
Egypt (1981-)	Malta (1981-1997)	Switzerland (1951-)
Finland (1952-)	Mexico (1993-)	Tunisia (1986-)
France (1940-)	Morocco (1978-)	Turkey (1997-)
Germany (1954-)*	Netherlands (1949-)	Ukraine (1994-)
Greece (1965-)	Netherlands Antilles (1948-1987)	United Kingdom (1945-)
Honduras (1956-1966)	New Zealand (1948-)	U.S.S.R. (1977-1992)**
Hungary (1980-)	Norway (1951-)	
Iceland (1976-)	Pakistan (1958-)	

NOTES: * Extended to cover reunified Germany 1990. ** Treaty provisions extended to former members until individual treaties can be negotiated.

Table 2: Expected Signs of Independent Variables.

Independent Variables	Expected Signs	
Gravity Model Variables:		
RGDPi	+	
RGDPj	+	
RGDPCAPi	+	
RGDPCAPj	+	
DISTANCEij	-	Gravity model
	?	MNE models
Markusen-Maskus Variables:		
SUMGDP	+	if Horizontal or Knowledge-Capital MNE models
	0	if Vertical MNE model
GDPDIFSQ	-	if Horizontal or Knowledge-Capital MNE models
	0	if Vertical MNE model
D2SKDGDPD	-	if Knowledge-Capital MNE model
	0	if Horizontal or Vertical MNE models
D2SKDSUMG	+	if Vertical or Knowledge-Capital MNE models
	-	if Horizontal MNE model
D1SKDSUMG	0	if Vertical or Knowledge-Capital MNE models
	-	if Horizontal MNE model
Tax Treaty Variables:		
TREATY	+	
TREATYAGE	?	
Other Control Variables:		
T_OPENi	-	if Vertical or Knowledge-Capital MNE models
	0	if Horizontal MNE model
	?	if Gravity model
T_OPENj	+	
F_OPENj	+	

Table 3: OLS estimates of treaty effects on U.S. **INBOUND** FDI activity using various measures of FDI activity and empirical models.

	Dependent Variables and Empirical Models					
	Affiliate Sales		FDI Stock		FDI Flow	
Regressors	Gravity	M-M	Gravity	M-M	Gravity	M-M
RGDPi	0.064**		0.014**		0.002**	
	(0.010)		(0.002)		(0.001)	
RGDPj	- 0.014		- 0.007		- 0.009**	
	(0.071)		(0.017)		(0.003)	
RGDPCAPi	3.257**		0.669**		0.092**	
	(0.484)		(0.095)		(0.019)	
RGDPCAPj	3.622		1.585		2.481**	
	(15.23)		(4.484)		(0.803)	
SUMGDPij		0.043*		0.007**		0.002**
		(0.017)		(0.002)		(0.000)
GDPDIFSQij		- 3.79E-09		- 1.23E-09**		- 1.23E-10**
		(2.13E-09)		(2.96E-10)		(4.76E-11)
D2SKDGDPDij		- 1.058*		- 0.295		- 0.058
		(0.489)		(0.318)		(0.050)
D2SKDSUMGij		- 1.052*		- 0.292		- 0.057
		(0.482)		(0.314)		(0.049)
D1SKDSUMGij		- 0.002**		- 3.85E-04**		- 7.40E-05**
		(0.000)		(5.79E-05)		(1.44E-05)
DISTij	- 1.508**	- 1.145**	- 0.444**	- 0.396**	- 0.032	- 0.005
	(0.386)	(0.432)	(0.088)	(0.094)	(0.020)	(0.023)
F_OPEN	256108	111982	127624	199476*	65678.4*	- 8123.5
	(1051473)	(878500)	(169480)	(100828)	(30146.2)	(15182.0)
T_OPENi	- 38.827	- 17.797	- 0.873	3.499	- 0.244	- 0.497
	(20.192)	(14.142)	(4.418)	(4.253)	(0.761)	(0.674)
T_OPENj	- 926.67	- 156.00	- 37.924	89.684	- 86.461	- 20.062
	(2839.69)	(2669.8)	(234.98)	(221.61)	(45.502)	(45.547)
TREATY	- 4712.33	- 3654.51	662.69	1045.86	71.635	- 130.50
	(3819.09)	(3805.24)	(758.85)	(778.97)	(149.05)	(179.17)
R-squared	0.56	0.63	0.34	0.38	0.27	0.30
F Test	23.61**	25.46**	16.58**	13.22**	8.95**	7.29**
Sample Size	417	388	792	719	676	622

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 4: OLS estimates of treaty effects on U.S. **OUTBOUND** FDI activity using various measures of FDI activity and empirical models.

	Dependent Variables and Empirical Models					
	Affiliate Sales		FDI Stock		FDI Flow	
Regressors	Gravity	M-M	Gravity	M-M	Gravity	M-M
RGDPi	0.020 (0.030)		- 0.004 (0.003)		- 0.001** (3.12E-04)	
RGDPj	0.050** (0.006)		0.009** (0.001)		0.001** (1.21E-04)	
RGDPCAPi	- 6.878 (8.437)		0.764 (1.039)		0.328** (0.115)	
RGDPCAPj	3.103** (0.360)		0.850** (0.075)		0.055** (0.007)	
SUMGDPij		0.048** (0.006)		0.008** (0.001)		4.29E-04** (1.33E-04)
GDPDIFSQij		- 8.25E-09** (8.11E-10)		- 1.29E-09** (1.62E-10)		- 9.05E-11** (1.73E-11)
D2SKDGDPDij		0.008** (0.001)		0.001** (0000)		5.31E-05* (2.10E-05)
D2SKDSUMGij		- 0.008** (0.001)		- 0.001** (0.000)		- 6.13E-05** (2.08E-05)
D1SKDSUMGij		- 0.003** (0.001)		- 9.94E-04** (1.08E-05)		- 5.64E-05** (1.19E-05)
DISTij	- 1.449** (0.316)	- 2.418** (0.388)	- 0.745** (0.092)	- 0.957** (0.102)	- 0.052** (0.009)	- 0.065** (0.010)
F_OPEN	32152** (8904.6)	84479.8** (12556.0)	24870** (3236.9)	43448** (4438.0)	2004.9** (289.28)	3312.81** (407.22)
T_OPENi	115.00 (1666.4)	3561.2** (1293.2)	193.41* (97.100)	240.52** (105.50)	26.775** (10.957)	30.014** (11.938)
T_OPENj	- 75.92** (21.37)	-115.57** (27.490)	- 41.785** (5.269)	- 63.412** (7.340)	- 2.870** (0.502)	- 4.584** (0.695)
TREATY	- 2762.9 (2079.4)	12114.9** (1689.5)	-255.35 (412.05)	4354.53** (479.66)	69.252 (38.928)	367.16** (48.045)
R-squared	0.60	0.71	0.44	0.47	0.30	0.31
F Test	69.14**	35.67**	47.35**	31.43**	23.55**	17.46**
Sample Size	654	582	1508	1338	1508	1262

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 5: OLS estimates of treaty effects (with TREATYAGE variable) on U.S. **INBOUND** FDI activity using various measures of FDI activity and empirical models.

	Dependent Variables and Empirical Models					
	Affiliate Sales		FDI Stock		FDI Flow	
Regressors	Gravity	M-M	Gravity	M-M	Gravity	M-M
RGDPi	0.064**		0.014**		0.002**	
	(0.010)		(0.002)		(0.001)	
RGDPj	- 0.011		- 0.008		- 0.009**	
	(0.071)		(0.017)		(0.003)	
RGDPCAPi	1.484**		0.012		0.093**	
	(0.466)		(0.011)		(0.020)	
RGDPCAPj	3.610		1.847		2.539**	
	(15.15)		(4.369)		(0.806)	
SUMGDPij		0.045**		0.006**		0.002**
		(0.017)		(0.002)		(0.000)
GDPDIFSQij		- 3.08E-09		- 1.17E-09**		- 1.13E-10*
		(2.11E-09)		(2.89E-10)		(4.69E-11)
D2SKDGDPDij		- 1.006*		- 0.308		- 0.056
		(0.471)		(0.319)		(0.049)
D2SKDSUMGij		- 1.001*		- 0.306		- 0.055
		(0.464)		(0.314)		(0.048)
D1SKDSUMGij		- 0.002**		- 2.27E-04**		- 5.67E-05**
		(0.000)		(5.12E-05)		(1.37E-05)
DISTij	- 1.719**	- 1.289**	- 0.522**	- 0.384**	- 0.041*	- 0.007
	(0.351)	(0.398)	(0.089)	(0.089)	(0.020)	(0.021)
F_OPEN	116847	- 160249	127012	171424*	65911.9*	- 11573.1
	(1046151)	(870302)	(165140)	(97569)	(30111.2)	(15076.4)
T_OPENi	14.544	- 8.289	16.631**	6.442	2.004*	- 0.200
	(20.094)	(15.564)	(5.097)	(4.336)	(0.886)	(0.702)
T_OPENj	- 422.63	48.290	- 23.787	94.873	- 85.154	- 22.465
	(2777.53)	(2677.1)	(227.51)	(215.19)	(44.453)	(44.768)
TREATYAGE	454.61**	226.53*	230.01**	161.11**	28.272**	10.963
	(97.458)	(101.90)	(40.576)	(28.454)	(7.085)	(5.623)
R-squared	0.57	0.64	0.38	0.40	0.29	0.30
F Test	24.36**	31.18**	17.71**	13.61**	8.84**	7.35**
Sample Size	417	388	792	719	676	622

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 6: OLS estimates of treaty effects (with TREATYAGE variable) on U.S. **OUTBOUND** FDI activity using various measures of FDI activity and empirical models.

	Dependent Variables and Empirical Models					
	Affiliate Sales		FDI Stock		FDI Flow	
Regressors	Gravity	M-M	Gravity	M-M	Gravity	M-M
RGDPi	0.014 (0.029)		- 0.004 (0.003)		- 0.001** (3.12E-04)	
RGDPj	0.048** (0.006)		0.009** (0.001)		0.001** (1.18E-04)	
RGDPCAPi	- 5.284 (8.236)		1.050 (1.015)		0.342** (0.115)	
RGDPCAPj	1.360** (0.303)		0.340** (0.056)		0.028** (0.006)	
SUMGDPij		0.044** (0.005)		0.006** (0.001)		3.39E-04** (1.24E-04)
GDPDIFSQij		- 7.82E-09** (7.05E-10)		- 1.24E-09** (1.40E-10)		- 8.75E-11** (1.64E-11)
D2SKDGDPDij		0.007** (0.001)		0.001** (1.77E-04)		4.73E-05* (1.94E-05)
D2SKDSUMGij		- 0.007** (0.001)		- 0.001** (1.71E-04)		- 4.66E-05** (1.88E-05)
D1SKDSUMGij		- 0.003** (0.001)		- 9.23E-04** (9.60E-06)		- 4.94E-05** (1.08E-05)
DISTij	- 1.652** (0.313)	- 2.284** (0.327)	- 0.805** (0.094)	- 0.912** (0.093)	- 0.054** (0.009)	- 0.061** (0.009)
F_OPEN	37003** (9702.8)	94260** (11181.6)	24971** (3160.2)	43837** (4139.7)	2002.0** (286.88)	3310.52** (398.71)
T_OPENi	358.30 (1621.6)	3007.0** (1157.3)	192.19* (95.221)	205.18** (97.758)	25.578** (10.807)	25.737* (11.541)
T_OPENj	- 41.65* (20.24)	-119.68** (23.670)	- 31.951** (4.683)	- 59.659** (6.691)	- 2.324** (0.472)	- 4.319** (0.662)
TREATYAGE	537.73** (87.015)	775.79** (70.743)	178.72** (23.243)	282.57** (22.581)	11.644** (2.428)	19.309** (2.298)
R-squared	0.62	0.76	0.47	0.54	0.31	0.33
F Test	64.09**	51.33**	53.09	34.82**	24.95**	17.57 **
Sample Size	654	582	1508	1338	1508	1262

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 7: OLS estimates of nonlinear TREATYAGE effects on U.S. inbound and outbound FDI activity using various measures of FDI activity and the M-M empirical specification.

	Affiliate Sales	FDI Stock	FDI Flow
Inbound:			
TREATYAGE	- 340.59	- 292.97**	- 10.254
	(338.32)	(111.94)	(18.668)
TREATYAGESQ	14.089	11.779**	0.544
	(8.628)	(3.209)	(0.527)
Outbound:			
TREATYAGE	- 364.01	- 4.634	18.199**
	(284.86)	(79.701)	(6.778)
TREATYAGESQ	28.298**	7.772**	0.030
	(8.106)	(2.385)	(0.197)

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 8: OLS estimates of nonlinear TREATYAGE effects on U.S. inbound and outbound FDI activity using various measures of FDI activity and the M-M empirical specification (excluding Europe, Canada, and Japan).

	Affiliate Sales	FDI Stock	FDI Flow
Regressions with only TREATY:			
Inbound: TREATY	1170.75*	258.24*	69.510
	(460.29)	(102.01)	(36.313)
Outbound: TREATY	204.73	454.31*	1273.09**
	(727.33)	(200.59)	(191.45)
Regressions with only TREATYAGE:			
Inbound: TREATYAGE	160.45**	28.054**	6.262*
	(44.058)	(8.529)	(2.794)
Outbound: TREATYAGE	296.58**	72.228**	5.467**
	(60.434)	(13.565)	(1.670)
Regressions with TREATYAGE and TREATYAGESQ:			
Inbound: TREATYAGE	- 9.380	- 5.436	9.540
	(86.194)	(21.483)	(5.506)
TREATYAGESQ	4.735	1.003	0.544
	(3.184)	(0.796)	(0.527)
Outbound: TREATYAGE	- 331.88*	70.435	2.440
	(155.48)	(42.684)	(5.795)
TREATYAGESQ	19.896**	0.042	0.096
	(6.067)	(1.397)	(0.207)

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 9: Country-partner-fixed estimates of TREATYAGE effects on U.S. inbound and outbound FDI activity using various measures of FDI activity and the M-M empirical specification.

	Affiliate Sales	FDI Stock	FDI Flow
Regressions with only TREATYAGE:			
Inbound: TREATYAGE	372.07	393.34**	- 33.378
	(324.18)	(81.942)	(23.973)
Outbound: TREATYAGE	452.11**	159.08**	- 9.437
	(141.78)	(25.101)	(5.962)
Regressions with TREATYAGE and TREATYAGESQ:			
Inbound: TREATYAGE	- 2749.88**	- 603.55**	- 12.770
	(783.97)	(186.93)	(48.790)
TREATYAGESQ	48.639**	17.159**	- 0.342
	(10.387)	(3.433)	(1.044)
Outbound: TREATYAGE	- 793.22**	- 168.08**	- 8.734
	(189.23)	(60.106)	(13.602)
TREATYAGESQ	22.306**	6.048**	- 0.013
	(6.067)	(1.413)	(0.300)

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

Table 10: OLS estimates of TREATY and TREATYAGE effects on U.S. inbound FDI stock using various withholding taxes and the M-M empirical specification.

	FDI Stock	FDI Stock	FDI Stock	FDI Stock	FDI Stock	FDI Stock
TREATY	2792.695*	-6764.67**	-3698.99*	-10900.66**	-9179.106**	-3584.234**
	(1230.688)	(2349.113)	(1725.292)	(3097.231)	(3426.712)	(1303.72)
Dividend-Other	142.1831				607.7706**	
	(112.8857)				(200.8004)	
Dividend-Parent		-389.412**			-392.3965**	
		(12.0817)			(134.7587)	
Interest			-248.5692**		-202.993	
			(96.93025)		(109.7988)	
Royalty				-482.0816**	-239.9675*	
				(124.409)	(96.90069)	
DIVDIFF						595.7837**
						(142.1564)
TREATYAGE	302.0352**	273.2846**	211.5645**	310.819**	354.3212**	149.755**
	(42.22686)	(37.4294)	(31.90577)	(44.52361)	(51.56955)	(28.72566)
Dividend-Other	440.653**				927.0559**	
	(90.15105)				(217.3003)	
Dividend-Parent		207.075**			-321.3654*	
		(51.35818)			(133.4505)	
Interest			98.38827		-402.2639**	
			(53.32475)		(123.5212)	
Royalty				209.1628**	387.1403**	
				(46.43965)	(101.666)	
DIVDIFF						51.18
						(87.47795)

NOTES: Robust standard errors are in parentheses, with ** and * denoting statistical significance (two-tailed test) at the 1 and 5 percent levels, respectively.

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A1. Data Appendix

BEA Data on FDI Activity

The FDI activity data reported by the BEA is subject to two types of censorship. First, if revealing the bilateral FDI activity would reveal the information of a single firm, only this information is reported due to confidentiality requirements. These observations were dropped. Second, if the FDI activity lies between -$500,000 and $500,000, only this information is given. These observations were set to zero. This censorship then left us with an unbalanced panel which covered different time periods for different activity measures. Outbound FDI stocks and outbound flows were at most available from 1966-1992 while their inbound counterparts were available from 1980-1992. Outbound sales data for 1983-1992 was obtained. Inbound sales covered the period 1984-1992. All measures are for non-financial institutions and can be found at http://www.bea.doc.gov/bea/di1.htm.

Tax Treaties and Tax Rates

Information on tax data all came from the tax treaties themselves as reported by Diamond and Diamond (1998). Treaty effectiveness dates were based on when they actually became effective as opposed to when they were signed. If a treaty initially became effective before July 1 year, it was considered effective in that year. Otherwise, it was coded so that it was initially effective in the following year. Similar coding was used for treaty termination dates.

The tax rates used in all cases were the levels specified by the treaties. These did not always correspond exactly with the rates reported by Price-Waterhouse's *Corporate Taxes: A Worldwide Summary*, however it is unclear whether this is the result of differences in actual tax policy, the specific rates reported, or typographical errors. Since the goal of our work is to estimate the effects of treaties, we proceeded with the treaty-specified rates. The dividend taxes used were for manufacturing industries. The parental dividend tax used was the most favorable rate, which corresponds to the greatest necessary equity holding by the recipient. The interest tax used was for payments to non-financial recipients. The royalty rate was that for industrial royalties.

FDI Openness

FDI openness was calculated as the U.S. dollar value of FDI stock divided by a country's GDP. FDI stock data were collected from United Nations' *World Investment Directory* published in various volumes over various years in the 1990s. Official statistics on FDI stock vary considerably and, in fact, are not available for many countries. In these cases FDI stock was estimated (both by the UN and us) by cumulating FDI flows from as early a year as possible. An appendix that details source and method of FDI stock data estimation for each country is available from the authors upon request. Nominal GDP figures were taken from the International Monetary Fund (2000).

Other Data

Our GDP (both total and per capita) and openness measures are those from version 5.6 of the Penn-World Tables, which are available online at http://datacentre.chass.utoronto.ca:5680/pwt/. For a detail discussion of these measures, see Summers and Heston (1991).

Our education variable is the mean years of education for both males and females. This data is

published by the World Bank and is discussed by Nehru and Dhareshwar (1993). The availability of this variable was the cause of the difference in the number of observations between the gravity and M-M specifications. The countries in our cross-section, as well as the availability of education data, are reported in Table A1.

Distance was measure as the distance between capital cities as reported by the Bali Online Corporation. This distance calculator can be found at http://www.indo.com.

Summary Statistics

Summary statistics for the entire data set are reported in Table A2. Because of missing data which led to deleted observations, the summary statistics vary between the gravity and M-M specifications as well as across different measures of FDI activity. Despite this, the differences across specifications are minor.

Table A1: Countries used in at least one estimation specification

Australia	Egypt	Kenya	Phillippines
Austria	El Salvador	Lesotho*	Rwanda
Bangladesh	Finland	Luxembourg	Sierra Leone
Belgium	France	Madagascar	Singapore
Bolivia	Gabon*	Malawi	South Africa*
Brazil	Germany	Malaysia	Spain
Burkina Faso*	Ghana	Mauritania*	Sri Lanka
Burundi*	Guatemala	Mauritius	Sweden
Cameroon	Guinea*	Mexico	Switzerland
Canada	Honduras	Morocco	Thailand
Chad*	Hong Kong*	Mozambique	Togo*
Chile	Iceland	Namibia*	Tunisia
China	India	Netherlands	Turkey
Colombia	Indonesia	New Zealand	Uganda
Congo*	Iran	Nigeria	United Kingdom
Costa Rica	Ireland	Norway	Uruguay
Cyprus	Israel	Pakistan	Venezuela
Denmark	Italy	Panama	Zimbabwe
Dominican Republic*	Ivory Coast	Paraguay	
Ecuador	Japan	Peru	

NOTES: * Education data unavailable; not included in M-M specifications.

Table A2: Summary Statistics for the Entire Data Set

	Mean	Median	Std. Deviation	Minimum	Maximum	Observations
Sales-Out	14054.18	1478.203	32013.72	0	179958.7	702
Sales-In	16149.98	712.3074	40105.73	0	267401.3	425
Stock-out	3282.979	402.8901	8381.612	-1145.187	66888.71	1851
Stock-in	3385.721	23.61482	11173.48	-119.4962	90554.57	811
Flows-out	281.039	31.72929	761.6521	-1891.345	10350.17	1723
Flows-in	560.1547	4.137513	2071.528	-1696.615	24229.33	685
RGDP	120370.7	26717.76	235926.9	445.816	1873020	2075
RGDP-US	3453398	3463851	680976.1	2391005	4575975	2106
RGDPCAP	4559.286	2678	4298.187	300	17524	2075
RGDPCAP-US	15173.44	15290	1836.313	12164	18095	2106
SUMGDP	3567807	3513959	755915.9	2391482	6448995	2075
GDPDIFSQ	1.15e+13	1.09e+13	4.72e+12	3.59e+12	2.09e+13	2075
D2SKDGDPD-In	-133908.8	0	1139478	-1.26e+07	0	1736
D2SKDSUMG-In	135530	0	1152893	0	1.27e+07	1736
D1SKDSUMG-In	2.00e+07	1.97e+07	9638812	0	4.61e+07	1736
D2SKDGDPD-Out	1.88e+07	1.86e+07	9249375	0	4.34e+07	1736
D2SKDSUMG-Out	2.00e+07	1.97e+07	9638812	0	4.61e+07	1736
D1SKDSUMG-Out	135530	0	115289.	0	1.27e+07	1736
Distance	5450.987	5258.5	2347.104	455	10163	2106
FDI Openness	30983689	.0574711	.1581039	-.2295737	3.419681	1676
FDI Openness-US	.0352083	.0322	.021096	.012	.0714	1872
Openness-US	16.73185	17.8	3.967776	9.86	21.9	2106
Openness	62.51847	52.855	46.10281	4.99	423.41	2106
Average education	5.434317	5.221	2.73989	.313	15.717	1755
Avg. education- US	11.08859	10.958	.3621717	10.669	11.615	2106
Treaty	.2962963	0	.4567317	0	1	2106
Treaty Age	7.431149	0	13.22516	0	52	2106
Treaty Age^2	230.0437	0	483.831	0	2704	2106
Dividend tax-other	25.91406	30	6.645608	0	30	2106
Dividend tax-parent	23.5793	30	10.2004	0	30	2106
Interest Tax	23.09117	30	11.4998	0	30	2106
Royalty Tax	22.26496	30	12.29093	0	30	2106
Dividend Difference	2.334758	0	4.240232	0	25	2106