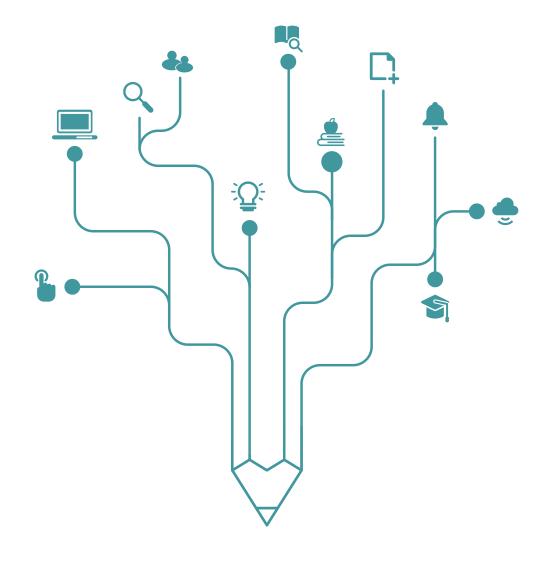# The Impact of Tax Treaties on Foreign Direct Investment: the Evidence Reconsidered

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The Impact of Tax Treaties on Foreign Direct Investment: the Evidence Reconsidered

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The existing empirical literature often reports a non-significant or even negative impact of tax treaties on foreign direct investment. Such mixed evidence stokes controversy over the validity of tax treaties. This paper reconsiders the empirical evidence for the relationship between tax treaties and FDI, using U.S. outbound FDI to 78 countries over the period 2007–2018. Unlike previous studies, this one explicitly controls for differences in the tax environments of recipient economies, including tax haven status, transfer pricing rules, CFC rules, anti-avoidance regulations and corporate income tax rates, in the estimation. Our results confirm the importance of controlling for country-specific tax environments, especially tax haven status and transfer pricing rules, to avoid omitted variable bias. We find that tax treaties positively contribute to FDI inflow in developing countries, while they have no statistically significant impacts to OECD countries. Recently-signed tax treaties still foster FDI but less than older ones do. Finally, our results indicate that, other things being equal, the weaker the transfer pricing regulations, the greater the amount of U.S direct investment into a recipient country.

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I. Introduction

Foreign direct investment (FDI hereafter) is generally regarded as an important driver of economic growth, a composite package of investment resources, technological know-how and managerial expertise (de Mello, 1997). Recognizing this, many countries compete to attract FDI by providing favorable incentives to foreign investors. In addition, countries join bilateral and/or multilateral economic agreements, such as tax treaties, investment treaties, and preferential trade agreements to assure foreign investors that they adhere to global norms in trade and investment practices.

Among these agreements, tax treaties are aimed at ameliorating tax-related impediments to cross-border trade and investment. While the primary objective of tax treaties is to avoid double taxation of income by more than one jurisdiction, they also cover other issues including the prevention of tax evasion, excessive taxation and tax discrimination. Since the League of Nations first proposed a model for modern tax treaties in 1928, the agreements have proliferated worldwide, and nowadays over 3,000 bilateral tax treaties are in effect. The pace at which tax treaties are being established has even accelerated since the mid-1990s (Leduc and Michielse, 2021).

Despite the proliferation of tax treaties, there has been a growing sense of skepticism regarding their effectiveness, especially in recent years (Kysar, 2019; Brooks and Krever, 2015). The contemporary architecture of bilateral tax treaties largely preserves principles and structure of the League of Nations model (Kobetsky, 2011). That model was developed when international transactions were usually carried out in tangible form, but the world economy has changed considerably since then. In the face of accelerated globalization and digitalization, the role of multinational companies has grown and international transactions increasingly take place in intangible forms.

Nowadays, the digital transformation of cross–border transactions has contributed to the emergence of various techniques for tax avoidance or tax evasion across countries. Multinational enterprises can abuse tax treaties by 'treaty shopping' to avoid taxation, causing so-called "double non-taxation" problems. Consequently, cross-border taxation issues are becoming more complex and the current tax treaty system has not sufficiently responded to these changes.

Tax treaties are designed to handle double taxation mainly by limiting a source country's taxation on income not derived via a permanent establishment within the country.[2] In other words, they shift the taxing rights from the source country to the investor's country of residence at the expense of tax revenue to the former. Hence, if capital inflows are greater than capital outflows for an economy, as is true for most developing countries, the cost of lost tax revenue may outweigh the potential benefits of forgoing taxing rights, unless tax treaties induce

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[2] The source country refers to the country that hosts the inward investment, while the residence country is the investor's country of residence.

a sufficient level of FDI inflow and other externalities that create jobs and sustained economic growth.[3]

Several researchers have empirically investigated the tax treaty–FDI nexus, but fail to provide conclusive evidence that tax treaties increase FDI flow. For example, Blonigen and Davis (2004) report that tax treaties had little impact or even a negative impact on U.S. inbound and outbound FDI between 1980 and 1999. Blonigen and Davis (2005) and Egger et al. (2006) provide similar qualitative results in a sample of OECD countries. On the other hand, Stein and Daude (2007) observe a positive effect of tax treaties on outgoing OECD FDI stocks for the period 1997–99. Neumayer (2007) examines a sample of developing countries and finds a positive impact of tax treaties on FDI inflow only in small or medium-sized developing countries. Such mixed findings have contributed to the controversy over the validity of tax treaties.

Against this backdrop, this paper aims to reconsider the empirical evidence for the impact of tax treaties on FDI. While the tax environments of recipient countries, such as their local tax systems and regulations, is inarguably a decisive factor in investment decisions, previous studies on the tax treaty–FDI nexus have failed to consider country-specific tax environments as a determinant of FDI, leading to omitted variable bias in the estimations.[4]

To explain this, consider tax treaties with tax haven countries. Tax havens do not tax foreign-sourced income, thus tax treaties do not really affect their tax systems. This implies that a country that enters into a tax treaty with a tax haven could potentially give up a significant amount of tax revenue. Consequently, countries may be reluctant to make tax treaties with tax havens. Even tax havens might hesitate to conclude tax treaties, due to the built-in obligation to provide tax information. For similar reasons, the likelihood of a tax agreement may varies depending on the tax regulations of partner countries. In this context, our analysis explicitly controls for the specific tax environments of recipient countries, including their tax haven status, the quality of their tax avoidance regulations, controlled foreign corporation rules (CFC rules hereafter) and transfer price rules. We find that the mixed evidence from previous studies may stem to some extent from omitted variable bias in the estimations.

In addition, while most of the existing literature analyzes the effectiveness of tax treaties during the 1980s and 1990s, this study deliberately targets a more recent period, 2007–2018. One of the striking findings in the existing literature is that tax treaties signed more recently tend to have a more negative impact on FDI flows than the older treaties. Blonigen and Davis (2004) and Egger et al. (2006) interpret this as evidence that new tax treaties or the

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[3] With heightened suspicion of the unfavorable revenue impacts of tax treaties, a number of countries have recently canceled or restructured their existing tax treaties, especially those with tax haven countries. For instance, Mongolia canceled its tax treaties with Luxembourg, the Netherlands and the UAE in 2012. In 2014, Uganda also suspended new treaty negotiations. Cyprus, Malta and Luxembourg recently agreed to amend the terms of their tax treaties with Russia. The key change is an increase in the withholding tax rates for dividends and interest.

[4] Please see Feld and Heckemeyer (2011) for an excellent meta-study on the relationship between taxation and FDI.

revision of old ones may reduce FDI flows, as they contain more sophisticated incentive schemes to limit FDI for tax avoidance purposes. If this claim is correct, our estimates for the more recent period should show even stringer negative impact of tax treaties on FDI. It is also plausible that the accelerated pace of globalization and digitalization may further undermine the effectiveness of tax treaties.

The paper is organized as follows. Section II provides a brief literature review on the relationship between tax treaties and FDI. Section III discusses our estimation strategy and describes the data used in this study. In section IV we present the estimation results based on our model. Some concluding remarks are provided in Section V.

II. Literature Review

As mentioned above, the empirical evidence on the effectiveness of tax treaties is largely mixed. Blonigen and Davis (2004) analyze the effect of tax treaties on both U.S. inward and outward FDI for the period 1980–1999, separating tax treaties signed before the sample period from those signed during the sample period. They find little evidence of an impact of tax treaties on FDI. In addition, their analysis indicates that new tax treaties may even have a negative impact on U.S. direct investment activities abroad. Blonigen and Davis (2005) find similar results for OECD countries over the period 1982–1992, suggesting that tax treaties serve as a mechanism for reducing tax evasion rather than boosting foreign investment. Egger et al. (2006) employ the propensity score matching (PSM) method to analyze the impact of bilateral direct investment on OECD countries during the period 1982–1992. They also show that tax treaties have a negative effect on direct investment abroad. Likewise, Davis (2003) examines 20 cases of U.S. tax treaty revision during the period 1966–2000 and reports that treaty renegotiations do not increase FDI.

On the other hand, Stein and Daude (2007) report that in the case of OECD direct investment abroad over the period 1997–1999, tax treaties affected which recipient countries were chosen. Neumayer (2007) analyzes a sample of developing countries and finds that FDI stocks were on average about 20 percent higher if a treaty was concluded during the sample period. However, these effects were confined to medium-income countries. Neumayer's results also suggest that countries that have more tax treaties with major developed countries have greater FDI inflows. Recently, Lejour (2014) applied a propensity score matching estimation to a sample of 34 OECD countries over the period 1985–2011. In the estimation, tax treaties are instrumentalized using exogenous geographic variables to control for endogeneity issues. Contrary to Blonigen and Davis (2005) and Egger et al. (2006), Lejour (2014) shows that tax treaties significantly contribute to FDI, and new treaties have an especially large effect. Finally, employing a quantile treatment model to U.S. FDI data over the period 1988–1999, Kumar and Millimet (2018) suggest that the impacts of tax treaties on FDI differ depending on the extent of FDI activity at the time of treaty conclusion. Specifically, tax treaties increase FDI at lower

quantiles of the FDI distribution, but decrease FDI at upper quantiles.

Potential reasons for the mixed findings on the effectiveness of tax treaties are as follows. First, tax treaties aim to prevent both double taxation and tax evasion. Consequently, tax treaties have conflicting effects, in that they promote direct investment by preventing double taxation, but reduce FDI through their anti–tax avoidance provisions.[5] Hence, empirical studies might observe negative impacts of tax treaties if they reduce the inflow of new direct investments for tax avoidance purposes more than they promote investment through double taxation prevention (Blonigen and Davis, 2004; Egger et al., 2006).

Second, as Baker (2014) argues, developed countries are equipped with organized legal frameworks and policies to prevent double taxation and tax avoidance. This mitigates the major benefits of signing tax treaties with partner countries, thus the effect of tax treaties on developed countries could be minimal. However, this finding does not explain why the effect of tax treaties could be negative.

Third, it cannot be ruled out that the ambiguous evidence stems from estimation problems that are inherent to the existing studies. This paper pays special attention to potential omitted variable bias in previous studies. As described above, the exclusion of variables related to countries' specific tax environments from the regression analyses may mean that tax treaties are correlated with the error terms, resulting in biased and inconsistent estimates.

III. Empirical Strategy and Data Description

1. Empirical Strategy

This paper examines the impact of tax treaties on U.S. outbound FDI destined to 78 countries over the period 2007–2018. In our empirical analysis, we consider the gravity model as a benchmark and augment it with other key predictors. Our conceptual framework can be summarized by the following equation:

$$fdi_{it} = f\left(GRA_{it},\ AC_{it},\ dtc_{it},\ Z_{it},\ TAX_{it}\right) \quad \cdots\cdots\cdots\cdots\cdots\cdots (1)$$

where FDI_{it} represents the volume of U.S. FDI destined to a country i in year t, GRA_{it} is the vector of gravity variables, such as GDP (GDP_{it}) and the physical distance between the U.S. and country i ($dist_i$). AC_{it} represents the absorptive capacity of recipient country i, dtc_{it} is a dummy variable indicating whether a bilateral tax treaty (double tax convention) is in effect between i and the U.S. in year t, and Z_{it} is the vector of other bilateral and multilateral

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[5] An increase in cross-border FDI flows is also expected when prevention of excessive taxation and tax discrimination are stipulated in tax treaties.

economic agreements in effect at time t. Finally, TAX_{it} represents the vector of tax environment variables for recipient country i.

Among the gravity variables, GDP is expected to be a robust determinant of FDI, as horizontal FDI is often destined to countries that boast large markets and great purchasing power.[6] While physical distance is inarguably a crucial factor that determines trade flows as it is indicative of trade costs, its impact on FDI flows is ambiguous. On one hand, physical distance could be an indicator of costs related to FDI activities such as transport, communication, market search and so on, implying that distance could affect FDI flows. On the other hand, firms often locate production in direct proximity to a foreign market to avoid distance-related costs. Therefore, other things being equal, it is plausible that the greater the distance, the greater the horizontal FDI incentives for firms.

As shown in Equation (1), we consider the absorptive capacity of a recipient country as a determinant of FDI flows. Markusen (2007) presents a theoretical model showing that FDI provides knowledge-intensive services to recipient countries for whom developing their own knowledge-intensive inputs would be cost prohibitive. At the same time, the absorptive capacity of recipient countries matters when multinationals decide on a location for FDI. In this paper, we use a recipient country's level of human capital (HC_{it}) and total factor productivity (TFP_{it}) as a proxy for its absorptive capacity.

The vector of Z_{it} includes dummy variables for tax information exchange agreements (TIEA hereafter), Free Trade Agreements (FTA hereafter) and WTO membership (WTO hereafter). TIEA allows for the exchange of tax information to address harmful tax practices. It can complement tax treaties or be used by countries for whom taxes on income or profits are low or even zero, making tax treaties inappropriate.[7] FTAs often contain investment provisions to foster FDI flows between member countries. More importantly, FTAs and WTO membership can assure foreign investors that recipient countries adhere to global norms in trade and investment practices.

Finally, TAX_{it} consists of several variables to capture country-specific tax environments; tax haven status (tax_hvn_i), transfer pricing rules (trn_prc_{it}), controlled foreign corporation (cfc_{it}) rules, anti-avoidance regulations ($anti\_avd_{it}$) and corporate income tax rates (tax_cp_{it}). Tax havens tend to attract a large amount of FDI relative to their market size, especially by enabling multinationals to attain tax rates that are effectively close

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[6] Horizontal FDI represents the overseas production of products and services similar to those a firm produces in its home market. It occurs when a firm directly serves a foreign market to avoid distance-related costs associated with exports.

[7] Kysar (2019) and Brooks & Krever (2015) claim that TIEA could be a good substitute for tax treaties that avoids changing the taxing jurisdiction. On the other hand, Sheppard (2009) casts doubt on the effectiveness of the current TIEA architecture.

to zero. These impacts are not confined to tax havens, but indeed to all countries with which an investing country has a tax treaty. Therefore, tax haven status should definitely be included in the estimation of a tax treaty–FDI nexus. Transfer pricing rules require firms to establish prices based on similar transactions between unrelated parties, and CFC rules prevent the artificial diversion of profits to a related company to minimize tax liability. Anti-avoidance regulations are designed to discourage or prevent tax avoidance in advance rather than addressing it after the fact.

Taking the abovementioned discussions into account, our estimation specification is as follows:

$$\ln\_fdi_{it} \equiv \beta_0 + \beta_1 \ln\_GDP_{it} + \beta_2 \ln\_pop_{it} + \beta_3 \ln\_dist_i + \beta_4 TFP_{it} + \beta_5 \ln\_HC_{it} + \beta_6 DTC_{it} + Z'_{it}\psi + TAX'_{it}\xi + T'_t\varpi + \varepsilon_{it} \quad \cdots\cdots\cdots\cdots (1)$$

where T_t represents the vector of year dummies, ψ, ξ and ϖ are vectors of coefficients, and ε_{it} is the error term. While we employ several different estimators including the ordinary least squares (OLS hereafter), the fixed effects estimator, and the random effects estimator, we consider the potential impact of time-invariant unobserved heterogeneity across countries using the fixed effects estimator.

2. Data Description

Our country panel data come from various data sources, including the U.S. Bureau of Economic Analysis (BEA hereafter), the Tax Treaty database, Penn World Tables and CEPII. A set of tax haven countries is made based on Garcia-Bernardo et al. (2017), and tax environment variables come from Shanz et al. (2017). Since our dependent variable is the U.S. outbound stock for each recipient country obtained from the U.S. BEA, we could avoid a sample selection problem since FDI flows were zero.8 We use the CEPII dataset to get gravity variables. TFP_{it} is measured as the PPP-adjusted TFP level relative to that of the U.S. This measure, along with the human capital index (HC_{it}), comes from Penn World Tables 9.0. For tax-related regulation variables such as anti-avoidance regulations, transfer pricing rules and CFC rules, the higher the value of these variables, the weaker the regulations of recipient country i. For example, if transfer pricing rules are not well-established or are not applied appropriately for country i, then the related dummy variable has a value of 1, implying that the likelihood of tax evasion or avoidance increases. Therefore, if the estimated coefficients for these variables are positive for country i, it means that the weaker the relevant regulations to

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8 In our sample, missing data of FDI stock account for less than 10% of the total observations, and are left out to protect the confidentiality of individual companies.

prevent tax evasion, the greater the amount of U.S direct investment into the country. In addition, as countries with low tax rates are more likely to attract FDI, we also include the corporate tax rate (tax_cp_{it}) of recipient country i in the estimation. Shanz et al. (2017) construct this variable in the following way: first they note the maximum observed tax rate among all the countries in their sample data, then they subtract each country's tax rate from it and divide that by the maximum rate. Thus, the corporate tax rate is normalized to a range between zero and one, with a higher value indicating a more attractive statutory tax rate. We use this variable in our regression and expect its estimated coefficient to be negative.

Defining which countries are tax havens is a complicated challenge. Traditional methods for identifying tax havens are based on differences in the tax and legal structures for base erosion and profit shifting (BEPS) practices.[9] Using this method, the EU includes 12 countries in its 2021 tax haven blacklist, mostly Caribbean and Channel Islands economies.[10] Likewise, the OECD defined a total of 35 locations as tax havens in 2000, but by 2017, only Trinidad & Tobago was still listed as a tax haven. Recently Garcia-Bernardo et al. (2017) identified a larger set of tax havens using analysis of big data on the ownership networks of 98 million global companies across countries. They identify a total of 55 tax haven countries, including some advanced countries that function as offshore financial centers (OFCs hereafter), such as the Netherlands, the U.K., Switzerland, Ireland and Singapore.[11] We adopt the approach of Garcia-Bernardo et al. (2017) to define tax havens.

As our panel data are collected from multiple sources produced by various institutions, there is underlying variation in the data coverage across data sources. As a result, our final panel data contain a total of 78 countries over the period 2007–2018. The country list is presented in Table 2.[12] As of 2018, the U.S. had a total of 60 tax treaties and 32 TIEA in effect. As shown in the table, our dataset comprises the majority of the countries that have a tax treaty with the U.S. Meanwhile, many TIEA treaty signatories are excluded from our sample due to the unavailability of information on taxation-related regulations and rules. Another observation is that the lion's share of these countries are tax havens that have neither a tax treaty nor a TIEA with the U.S.

Tables 3 and 4 contain summary statistics and correlations among variables,

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[9] BEPS refers to the tax strategies used by multinationals to shift profits from higher-tax countries to lower-tax countries.

[10] They are American Samoa, Anguilla, Dominica, Fiji, Guam, Palau, Panama, Samoa, the Seychelles, Trinidad and Tobago, the US Virgin Islands and Vanuatu.

[11] According to Garcia-Bernardo et al. (2017), these five advanced countries channel about 47% of offshore investments from tax havens.

[12] The tax treaty database (https://eoi-tax.com) contains information on only the most recent revisions of tax treaties. The original tax treaties for many countries, especially OECD countries, date from the 1930s to the 1970s. We revise the data on the dates that tax treaties went into effect based on Blonigen and Davies (2004).

respectively. Tax treaties are positively correlated with FDI flows, as are TIEA but with a much lower correlation coefficient. The correlations of FDI flows with tax environment variables are negative, meaning that the better and stronger the tax systems and rules, the larger the amount of FDI inflows. However, since these are simple correlation coefficients, if the regression analysis controls for other determinants of FDI, the relationship between these variables could change. Tax haven status is positively correlated with FDI, while physical distance seems to have less impact on investment than it does on international trade. Tax treaties are negatively correlated with TIEA and FTA.

IV. Empirical Results

In this section, we report our estimation results from several different estimators. Table 5 contains the empirical results of the OLS, fixed effects, and random effects models. As presented in Column (1), the negative coefficient for tax treaties emerges when we run the OLS regression only using the gravity and absorptive capacity variables, which is often the case in existing studies (Blonigen and Davis, 2004, 2005). The size of the estimated coefficient gets smaller if additional economic agreements are included in the estimation, but the negative sign remains, with high statistical significance (Column 2). In this regression, TIEA and FTA seemingly increase U.S. FDI into the partner countries. The effect of distance also becomes statistically nonsignificant. As we expect, the absorptive capacity variables all increase FDI.

On the other hand, as shown in Column (3), once we control for country-specific tax environments, the negative impact of tax treaties on FDI disappears. This implies that the omission of these variables in the estimation could lead to biased estimated coefficients and create a spurious inference about the impact of tax treaties on FDI. Even though the tax environments of recipient countries, such as their local tax systems and regulations, are inarguably decisive factors in investment decisions, previous studies have failed to consider country-specific tax environments as a determinant of FDI, leading to omitted variable bias in the estimations. Among the tax environment variables, tax haven status seems to be the most decisive factor affecting FDI flows. Other things being equal, tax havens' FDI stock from the U.S. tends to be about 2.3% higher than that of non–tax havens. The regression results also indicate that the weaker a country's CFC rules, the higher their FDI inflow from the U.S. One puzzling finding in this regression is the negative coefficient of the corporate tax rate. As mentioned above, a higher value of this variable indicates a more attractive statutory tax rate. Therefore, we can expect a positive coefficient for this variable if a lower tax burden increases FDI inflows from the U.S. However, our estimate finds the exact opposite, with strong statistical significance. We suspect that the OLS regression does not sufficiently control for cross-country characteristics to produce a sensible marginal effect of the independent variables.

One way to control for country-specific heterogeneity in the estimation is to use a fixed effects or random effects estimator. Our panel data allows for the use of these estimators in

order to control for time-invariant unobserved characteristics across countries. We report the estimation results using these estimators in Columns (4) and (5). As depicted in the table, the impact of tax treaties is statistically significant, with a positive sign for both the fixed effects and random effects estimations. Both models suggest that tax treaties increase FDI stock into a recipient country by about 0.5%. The estimated coefficients of the absorptive capacity variables are now nonsignificant. Similarly, the effect of FTA is statistically nonsignificant. Transfer pricing rules, instead of CFC rules, emerge as one of the key variables that determine the magnitude of FDI stock.

While our Hausman test suggests that the fixed effects model is the more appropriate one, the sizes of the estimated coefficients for tax treaties are very similar across the two models. A pitfall of the fixed effects estimator, however, is that one cannot examine time-invariant causes of the dependent variables separately, since time-invariant predictors, such as tax haven status and physical distance, are perfectly collinear with the individual fixed effects.

As discussed above, Blonigen and Davis (2004) and Egger et al. (2006) found that recently-signed tax treaties tend to decrease FDI flows. They claim that new tax treaties or the revision of old ones may reduce the incentive for FDI, as they contain a more sophisticated incentive scheme for limiting FDI for tax avoidance purposes. Given that our sample contains tax agreements concluded in more recent years, we may find even more negative impacts if this claim is correct.

In this context, we compare the impacts of recently-signed tax treaties with those of older ones and report the estimation results in Table 6. In Columns (1) and (2), we compare the effects of tax treaties that took effect before the 1980s and those that took effect thereafter. In the fixed effects model, in the case of tax agreements that took effect before the 1980s, the coefficient cannot be estimated because the agreements are perfectly collinear with the fixed effects. On the other hand, according to the random effects estimation results, both new and old tax treaties appear to have a positive effect on FDI in our sample. However, the size of the effect is smaller for the new treaties than the older ones. Columns (3) and (4) show the results of the re-estimation when the tax agreements are divided into those that went into effect before the 1990s and those that went into effect afterward. The results are qualitatively similar to those shown in columns (1) and (2). Therefore, our results suggest that tax treaties have a positive effect on direct investment regardless of the time they went into effect, but the investment promotion effect is somewhat reduced in the case of newer agreements.

Table 7 includes estimates of the effects of tax treaties when the sample is divided into OECD countries and non-OECD countries. Columns (1) and (2) include the results estimated for the entire sample after creating interaction terms between the tax treaty dummy and the OECD country dummy. In this case, the estimated coefficient represents the effect of tax agreements in other groups compared to non-OECD countries without tax treaties. [13]

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[13] All OECD countries except Chile, Columbia, Costa Rica and Croatia have tax treaties in effect with the United States. In addition, these countries entered into tax treaties before the mid-2000s, when our analysis begins.

According to the random effect analysis, the group of non-OECD countries with tax treaties has, on average, 0.87% higher FDI stock invested from the U.S. than the group of non-OECD countries that do not have tax treaties with the U.S. While OECD countries have positive estimated coefficients regardless of whether they have a tax treaty, it should be noted that the size of the estimated coefficient for the OECD group with tax treaties is smaller than that of the OECD group without tax treaties. This implies that among OECD countries, tax agreements may not have a positive effect on FDI inflows from the U.S.

To verify this, after dividing the entire sample into OECD countries and non-OECD countries, we separately estimate each subsample.[14] The results are presented in Columns (3) through (6). As shown in the table, we find that tax treaties appear to increase FDI among non-OECD countries. The estimated coefficient of tax treaties for the non-OECD sample is statistically significant, and tax treaties appear to increase the FDI stock invested from the U.S. by about 1%. On the other hand, there is no statistically significant effect of tax treaties on FDI in the OECD sample. Our results can be interpreted as evidence that, as Baker (2014) suggests, developed countries have various institutional mechanisms to prevent double taxation other than tax treaties, so it is possible that the net effect of tax agreements may not appear. Brooks and Krever (2015) also argue that tax treaties could be redundant in developed countries, taking into account that most advanced economies have domestic tax laws stipulating either an exemption for tax income derived from other countries or a tax credit for taxes paid in the source country.

We perform robustness tests of the regression results in the following way.[15] First, we use the approach of Garcia-Bernardo et al. (2017) to define tax havens, which includes several OECD countries. Since some OECD countries, notably the U.K. and the Netherlands, have more FDI stock invested from the U.S. than others, it is possible that they are outliers in the analysis, affecting the estimation results. Thus, we re-run the regression excluding the Netherlands, the U.K., Switzerland, Ireland and Singapore from the list of tax havens. We confirm that such a change does not greatly affect our results quantitatively or qualitatively. Second, we add more tax-related variables, such as country-specific tax withholding rates for dividends, interest, and royalties, as explanatory variables in the estimation. The estimated coefficients of these variables are largely nonsignificant. At the same time, our results suggest that a lower tax withholding rate levied on dividends attracts more FDI among the non-OECD sample, while a lower tax withholding rate levied on royalties increases FDI in the OECD

Consequently, in the fixed effects model, the effects of tax treaties on these countries are included in the fixed effects, thus separate coefficients cannot be estimated.

[14] When we run the regressions for the OECD and non-OECD subsamples separately, we find that the standard Hausman test cannot be used, as its asymptotic assumptions are not met. An alternative is to adopt the correlated random effects approach proposed by Mundlak (1978). We report the F-test statistics based on this approach in Table 7 and confirm that the fixed effects estimator is more appropriate.

[15] The results are available upon request.

sample.

IV. Conclusion

This paper empirically examines the relationship between tax treaties and foreign direct investment, using U.S. outbound FDI to 78 countries over the period 2007–2018. Our results suggest the importance of controlling for country-specific tax environments to avoid omitted variables bias in the estimation. Once these, along with other unobserved country-specific characteristics, are controlled, we find a positive impact of tax treaties among the non-OECD sample, but no statistically significant impact of tax treaties among the OECD sample. Our results indicate that recently-signed tax treaties increase FDI but with a smaller impact than the older ones.

As discussed above, the mixed empirical evidence about the effect of tax treaties on FDI has contributed to controversy over the validity of such treaties. For instance, Kysar (2019) suggests that the United States should cancel or scale down its tax treaties, given the lack of evidence for their overall positive effect. Brooks and Krever (2015) claim that tax treaties could be a 'poisoned chalice' for developing countries, encouraging such countries to give up their tax rights without receiving sufficient benefits such as increased FDI. Thuronyi (1999) even propose the establishment of a World Tax Organization to create a fairer global tax system. Taking into consideration the accelerated pace of globalization and digitalization, reform of the existing architecture of bilateral tax treaties may inevitably be needed. However, prior to any institutional reform, more extensive research on bilateral tax treaties is needed.

Based on the empirical results in this paper, we suggest the following agenda for future research. First, although this paper confirms the benign effect of tax treaties on FDI flows, it does not guarantee that the benefits are sufficiently large to outweigh the costs incurred from forfeiting taxation rights. Hence, a more detailed cost-benefit analysis is imperative. Second, estimations using either a wider set of data or more micro-level data would be helpful. Third, taking into consideration that many countries are parties to multiple tax treaties, analysis of the tax treaty network across countries is also needed. Finally, an in-depth study of the impact of the ongoing digital transformation on tax treaties should be performed.

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Table 1. Data sources and description

Variable	Description	Data Source
ln_fdi	Logged values of US outbound FDI flow at a historical-cost basis	US-Bureau of Economic Analysis
ln_gdp	Logged values of GDP (US$) at current prices	CEPII Database
ln_dist	Logged values of population-weighted distances	CEPII Database
dtc	= 1 for tax treaty in effect, otherwise 0	Tax Treaty Database
tiea	= 1 for TIEA in effect, otherwise 0	Tax Treaty Database
fta	= 1 for FTA in effect, otherwise 0	CEPII Database
wto	= 1 if GATT/WTO member, otherwise 0	CEPII Database
tax_hvn	= 1 for tax haven countries, otherwise 0	Garcia-Bernardo et al. (2017)
anti_avd	= 1 for no Anti-Avoidance rules, 0 if general/special rules	Shanz et al. (2017)
cfc_r	= 1 for no CFC rules, 0 for CFC rules	Shanz et al. (2017)
trn_prc	= 1 for no transfer pricing rules, 0 for Transfer pricing rules	Shanz et al. (2017)
tax_cp	Corporate Income Tax Rate	Shanz et al. (2017)

Table 2. Country List by Status of Tax Treaties and TIEA with U.S.

	In the Sample	**Out of the Sample**
Bilateral tax treaty with the U.S.	Australia, Austria, Belgium, Bulgaria, Canada, China, Cyprus*, the Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland*, Israel, Italy, Japan, Kazakhstan, Korea, Latvia, Lithuania, Luxembourg, Malta*, Mexico, Morocco, the Netherlands*, New Zealand, Norway, the Philippines, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland*, Thailand, Tunisia, Turkey, U.K.*, Ukraine, Venezuela	Bangladesh, Barbados*, Bermuda*, Iceland, Jamaica, Sri Lanka,. Pakistan, Trinidad and Tobago
TIEA with the U.S.	Brazil, Columbia, Costa Rica, the Dominican Republic, Mauritius, Mexico, the Netherlands*, Panama*, Peru	Antigua and Barbuda*, Aruba*, the Bahamas, Barbados*, Bermuda*, Curaçao, Dominica*, Gibraltar*, Grenada*, Guernsey*, Guyana, Honduras, the Isle of Man*, Jamaica, Jersey*, Liechtenstein*, the Marshall Islands*, Monaco*, Saint Lucia*, Saint Maarten*, Trinidad and Tobago, the British Virgin Islands*
No tax treaty nor TIEA with the U.S.	Angola, Argentina, Bahrain*, Botswana, Chile, Ecuador, Guatemala, Hong Kong*, Croatia, Kenya, Malaysia, Namibia, Nigeria, Nicaragua, Saudi Arabia, Singapore*, Uruguay, Zimbabwe	

Note: * indicates a tax haven country as identified by Garcia-Bernardo et al. (2017).

Table 3. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_fdi	1,023	8.394	2.656	0	13.75
ln_GDP	1,120	25.711	1.744	21.835	30.242
ln_dist	1,086	8.987	.475	7.64	9.709
ln_tfp	940	-.394	.301	-1.834	.372
ln_hc	1,012	1.032	.207	.322	1.424
DTC	1,120	.56	.497	0	1
TIEA	1,120	.095	.293	0	1
TFA	1,086	.171	.377	0	1
WTO	1,086	.908	.289	0	1
tax hvn	1,120	.182	.386	0	1
anti avd	1,112	.417	.388	0	1
CFC	1,112	.661	.474	0	1
trn prc	1,112	.248	.432	0	1
tax cp	1,112	.413	.219	0	1

Table 4. Correlation Matrix

Variables	ln_fdi	ln_GDP	ln_dist	ln_tfp	ln_hc	DTC	TIEA	FTA	WTO	Tax_hvn	anti-avd	CFC	trn_prc	Tax_cp
ln_y	1.000													
ln_gdp	0.762	1.000												
ln_dist	-0.045	0.050	1.000											
ln_tfp	0.371	0.122	-0.093	1.000										
ln_hc	0.371	0.277	-0.014	0.427	1.000									
DTC	0.315	0.427	0.072	0.195	0.429	1.000								
TIEA	0.049	-0.064	-0.434	-0.015	-0.088	-0.265	1.000							
FTA	0.037	-0.086	-0.436	0.013	-0.130	-0.264	0.437	1.000						
WTO	-0.018	-0.047	-0.038	0.101	-0.073	-0.085	0.034	0.057	1.000					
tax_hvn	0.194	-0.271	0.017	0.374	0.090	-0.158	0.174	0.095	0.050	1.000				
anti_avd	-0.429	-0.466	-0.090	-0.183	-0.446	-0.238	0.022	0.101	-0.119	0.002	1.000			
CFC	-0.359	-0.541	0.033	-0.236	-0.298	-0.402	0.039	0.028	0.010	0.368	0.309	1.000		
trn_prc	-0.269	-0.475	0.020	-0.035	-0.377	-0.330	0.002	0.095	0.055	0.351	0.305	0.408	1.000	
tax_cp	-0.188	-0.290	0.182	0.202	0.216	0.006	-0.143	-0.051	-0.053	0.298	0.059	0.256	0.128	1.000

Table 5. Estimation Results I: OLS, FE and RE Estimations

	(1) OLS	(2) OLS	(3) OLS	(4) Fixed Effects	(5) Random Effects
GDP	1.159***	1.146***	1.327***	0.407***	1.063***
	(0.039)	(0.039)	(0.046)	(0.144)	(0.083)
Distance	-0.326***	0.006	-0.115		-0.672**
	(0.093)	(0.113)	(0.108)		(0.325)
TFP	3.352***	3.363***	2.833***	-0.071	-0.073
	(0.293)	(0.296)	(0.263)	(0.416)	(0.370)
Human Capital	1.227***	1.278***	1.733***	0.459	1.269**
	(0.274)	(0.273)	(0.313)	(0.895)	(0.593)
Tax Treaties	-0.485***	-0.312***	-0.069	0.534***	0.562***
	(0.123)	(0.118)	(0.107)	(0.192)	(0.169)
TIEA		0.578***	0.113	0.016	-0.003
		(0.156)	(0.182)	(0.150)	(0.152)
FTA		0.467***	0.529***	-0.205	-0.194
		(0.126)	(0.130)	(0.173)	(0.164)
WTO Membership		-0.340	-0.461	-0.481*	-0.409
		(0.335)	(0.502)	(0.267)	(0.269)
Tax Havens			1.555***		2.059***
			(0.241)		(0.489)
Anti-Avoidance Rules			-0.193	0.185	0.001
			(0.166)	(0.152)	(0.148)
CFC Rules			0.698***	0.002	0.022
			(0.117)	(0.118)	(0.115)
Transfer Pricing Rules			0.399**	0.315***	0.395***
			(0.155)	(0.090)	(0.091)
Corporate Tax Rate			-1.309***	-0.549	-0.578
			(0.428)	(0.398)	(0.372)
Observations	863	863	863	863	863
R-squared	0.684	0.693	0.749		
(within)				0.171	0.149
(between)				0.544	0.724
(overall)				0.496	0.671
Hausman statistic				83.29***	

Note: 1) All the regressions include year dummies. 2) Figures in parentheses are heteroscedasticity-robust standard errors. 3) *, ** and *** indicates the significance at the 10%, 5% and 1% levels, respectively.

Table 6. Estimation Results II: Old versus New Tax Treaties

	(1) Fixed Effects	(2) Random Effects	(3) Fixed Effects	(4) Random Effects
GDP	0.374***	1.047***	0.374***	1.107***
	(0.143)	(0.074)	(0.143)	(0.073)
Distance	-	-0.664**	-	-0.722**
		(0.279)		(0.282)
TFP	-0.070	-0.327	-0.070	-0.220
	(0.412)	(0.358)	(0.412)	(0.357)
Human Capital	0.523	0.597	0.523	1.000*
	(0.886)	(0.555)	(0.886)	(0.543)
Tax Treaties (~1980s)	-	1.125***		
		(0.303)		
Tax Treaties(1990s~)	1.202***	0.760***		
	(0.248)	(0.199)		
Tax Treaties (~1990s)			-	0.715***
				(0.263)
Tax Treaties (2000s~)			1.202***	0.601***
			(0.248)	(0.212)
TIEA	0.014	0.007	0.014	-0.010
	(0.148)	(0.149)	(0.148)	(0.150)
FTA	-0.194	-0.164	-0.194	-0.211
	(0.171)	(0.159)	(0.171)	(0.160)
WTO Membership	-0.486*	-0.448*	-0.486*	-0.421
	(0.264)	(0.265)	(0.264)	(0.266)
Tax Havens	-	2.786***	-	2.765***
		(0.336)		(0.339)
Anti-Avoidance Rules	0.162	0.007	0.162	0.002
	(0.150)	(0.145)	(0.150)	(0.145)
CFC Rules	-0.006	-0.014	-0.006	-0.017
	(0.117)	(0.113)	(0.117)	(0.114)
Transfer Pricing Rules	0.301***	0.360***	0.301***	0.378***
	(0.089)	(0.090)	(0.089)	(0.090)
Corporate Tax Rate	-0.483	-0.752**	-0.483	-0.810**
	(0.395)	(0.360)	(0.395)	(0.362)
Observations	863	863	863	863
R-squared				
(within)	0.188	0.161	0.188	0.154
(between)	0.280	0.783	0.338	0.790
(overall)	0.262	0.739	0.327	0.749
Hausman statistic	60.27***		68.01***	

Note: 1) All the regressions include year dummies. 2) Figures in parentheses are heteroscedasticity-robust standard errors. 3) *, ** and *** indicates the significance at the 10%, 5% and 1% levels, respectively.

Table 7. Estimation Results (III): OECD Versus Non-OECD Sample

	Whole Sample		OECD Sample		Non-OECD Sample	
	(1) Fixed Effects	(2) Random Effects	(3) Fixed Effects	(4) Random Effects	(5) Fixed Effects	(6) Random Effects
GDP	0.358**	1.045***	1.215***	1.225***	-0.058	0.985***
	(0.143)	(0.074)	(0.238)	(0.098)	(0.211)	(0.101)
Distance	-	-0.568*	-	-0.743*	-	-0.433
		(0.292)		(0.399)		(0.361)
TFP	-0.091	-0.333	0.131	0.710	-0.455	-0.628
	(0.412)	(0.359)	(0.563)	(0.490)	(0.580)	(0.509)
Human Capital	0.495	0.515	-0.007	1.010	-0.214	0.551
	(0.886)	(0.595)	(2.000)	(1.035)	(1.166)	(0.744)
OECD (Tax Treaty=0)	0.346	1.344***				
	(0.286)	(0.402)				
Non-OECD (Tax Treaty=1)	1.194***	0.873***				
	(0.248)	(0.209)				
OECD (Tax Treaty=1)	-	1.092***				
		(0.307)				
Tax Treaties			-0.115	-0.193	1.006***	0.743***
			(0.225)	(0.221)	(0.286)	(0.228)
TIEA	0.012	0.017	0.299	0.228	0.006	0.098
	(0.148)	(0.149)	(0.189)	(0.194)	(0.219)	(0.220)
FTA	-0.193	-0.188	-0.262	-0.040	-0.366	-0.489*
	(0.171)	(0.159)	(0.188)	(0.174)	(0.302)	(0.277)
WTO Membership	-0.493*	-0.448*			-0.671**	-0.473
	(0.264)	(0.265)			(0.309)	(0.312)
Tax Havens	-	2.829***	-	3.256***	-	2.553***
		(0.341)		(0.424)		(0.455)
Anti-Avoidance Rules	0.162	0.025	0.230	0.241	0.086	-0.066
	(0.150)	(0.145)	(0.175)	(0.174)	(0.233)	(0.222)
CFC Rules	-0.003	-0.019	-0.038	0.050	-0.101	-0.174
	(0.117)	(0.113)	(0.138)	(0.134)	(0.181)	(0.176)
Transfer Pricing Rules	0.303***	0.369***	-0.245	-0.143	0.381***	0.408***
	(0.089)	(0.090)	(0.151)	(0.156)	(0.117)	(0.119)
Corporate Tax Rate	-0.479	-0.768**	0.258	-0.224	-1.646**	-1.117*
	(0.395)	(0.360)	(0.412)	(0.401)	(0.717)	(0.584)
Observations	863	863	400	400	463	463
R-squared						
(within)	0.189	0.164	0.254	0.242	0.246	0.192
(between)	0.292	0.788	0.548	0.814	0.000	0.716
(overall)	0.243	0.747	0.471	0.775	0.002	0.655
Hausman Statistic	55.43***		12.54***[4]		27.09***[4]	

Note: 1) All the regressions include year dummies. 2) Figures in parentheses are heteroscedasticity-robust standard errors. 3) *, ** and *** indicates the significance at the 10%, 5% and 1% levels, respectively. 4) F-test statistic based on the correlated random effects approach.