Treaty Shopping, Race to the Bottom, and Treaty Cascades

Jing Qian*

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Abstract

Bilateral tax treaties (BTTs) enable multinational enterprises to engage in treaty shopping and lead to a drain on government tax revenue. Despite this, BTTs continue to proliferate with increasingly generous provisions, raising the puzzle of why governments are seemingly incentivized to perpetuate a system that creates tax avoidance opportunities for multinational enterprises through treaty shopping. This paper argues that the risk of treaty shopping, wherein investors exploit cheaper indirect routes through conduit countries for international payments, is a crucial driver of BTT network expansion. To address this risk, governments sign new BTTs with more favorable terms, leading to a vicious cycle that generates treaty cascades and a race to the bottom in withholding tax rates. Using original and comprehensive data on the universe of tax treaties and corporate tax codes covering more than 170 countries from 1980 to 2020, this paper provides empirical support for this argument. The results reveal that governments facing treaty-shopping risks are more likely to enter new BTTs and agree to lower withholding tax rates. These findings highlight the need for coordinated international efforts to address treaty shopping and shed light on international economic cooperation.

*Jing Qian, Postgraduate Research Associate, Princeton University; Email: jingq@princeton.edu.

1 Introduction

The operations of multinational corporations (MNCs) on a global scale present a challenge in terms of double taxation. This results from the fact that both the host and home country governments can seek to tax their common tax base – namely, profits, capital gains, and cross-border transactions by MNCs. Inevitably, this double tax burden on foreign investors severely hinders cross-border movements of capital, goods, and services.

In light of the challenges posed by double taxation, governments have turned to bilateral tax treaties (BTTs), which have been considered an indispensable solution for decades (Rixen 2008). The fundamental functions of BTTs are to divide the common tax base, distribute tax revenue between contracting states, and provide coordinated international tax codes.[1] BTTs have quickly become a welcomed policy tool, with thousands of such tax treaties signed and entered into force across the globe.

However, BTTs might not be necessary, if their only goal is to alleviate double taxation. While negotiating and signing tax treaties, governments have also adopted unilateral measures to prevent double taxation.[2] In a lot of cases, tax treaties do not provide additional foreign tax relief mechanisms compared with those in the national tax codes of the contracting states.[3]

Nevertheless, BTTs introduce additional problems for national governments. With reduced international withholding tax rates provided by BTTs, investors can utilize the tax treaty network for tax avoidance purposes using treaty shopping: routing cross-border payments through conduit countries (Weyzig 2013). Recent research estimates that such treaty-shopping practices might result in direct revenue foregone up to 27.4 billion USD for the 2009-2016 period (Janskỳ et al. 2021). For Sub-Saharan African countries, the revenue loss due to treaty shopping amounts to 15 percent of the corporate income tax revenue (Beer

1. Jurisdictions that are not sovereign states can also enter BTTs, such as the Crown Dependencies of the United Kingdom (Jersey and Guernsey) and Special Administration Region of China (Hong Kong and Macau). Throughout the paper, I use terms like "states", "countries", and "jurisdictions" interchangeably to refer to these units.

2. For example, the United States has a foreign tax credit system, where U.S. MNCs can use their taxes paid to foreign governments as a credit against their U.S. tax payments.

3. The foreign tax relief provision in tax treaties, in a lot of cases, is almost the same as in national tax codes. See Dagan (2000, 72–73). See also Rixen (2008, 73).

and Loeprick 2018). Moreover, treaty shopping is also instrumental to other tax avoidance schemes such as international profit shifting (Rixen 2011; Zucman 2014), which leads to $200 to 300 billion in revenue loss every year (Garcia-Bernardo and Janskỳ 2022).

Still, governments continue signing additional BTTs with new contracting partners, despite the unclear benefits of preventing double taxation, the high cost of tax revenue loss, and loopholes for treaty shopping and tax avoidance. While there were less than 600 BTTs signed between countries until 1980, the total number of BTTs has quickly increased to almost 4,000 in 2020.[4]

Moreover, not only has the tax treaty network proliferated, but BTTs are also getting deeper, in terms of the preferential tax treatments for international withholding tax rates. Since the 1980s, the average treaty withholding tax rates for dividends, interest, and royalties payments have almost plummeted by half. For example, for BTTs signed in 1982, the average treaty withholding tax rate for dividends is about 13.5%, while the average rate for BTTs signed in 2013 is merely 6.3%.[5]

What explains the growth of the tax treaty network, featured by further reduced rates for international withholding taxes? The existing literature mainly focuses on the competition among countries for foreign direct investment (FDI) as the driver for BTT formation (Barthel and Neumayer 2012; Petkova et al. 2020a; Petkova 2021). Countries wish to conclude tax treaties because they believe this would bring them a competitive advantage in attracting foreign investments.

In this paper, I argue that tax treaty shopping leads to a race to the bottom in international withholding tax rates, and ultimately creates treaty cascades. To do so, I first introduce a new concept: *the risk of treaty shopping*. A government is at risk of treaty shopping when there exists a cheaper indirect route so that MNCs can make indirect payments through a third conduit territory to minimize their tax burden. Such tax arbitrage means that the conduit country will get a share of the tax revenue, at the cost of fiscal revenue loss for the host country's government. In order to retain the tax revenue, the host country government

4. Author calculation based on the original BTT dataset, see Section 4 for a detailed description of data sources.

5. The trend is similar for treaty withholding tax rates on interest and royalties, see Figure 2.

has to cut the direct withholding tax rate with the home country by signing new BTTs with more generous terms.

However, signing additional BTTs with lower withholding tax rates creates a vicious cycle by opening the door to treaty-shopping problems for other countries. Consequently, other countries have to do the same thing: signing new tax treaties, possibly with even more generous withholding tax cuts. Ultimately, this leads to *treaty cascades*: the proliferation of BTTs and a race to the bottom in treaty withholding tax rates.

To assess the argument, I have built two original datasets with the most comprehensive coverage on BTTs and international withholding taxes. Firstly, I manually collected the statutory withholding tax rates of more than 170 economies for the period of 1980 to 2020, utilizing a unique data source of the annual worldwide corporate tax summaries published by the "Big Four" accounting firms. Secondly, I compiled the list of all the BTTs that countries have entered into (3900+), along with all the amending protocols. I further recorded the treaty withholding tax rates for all the BTTs that are effective or signed during the sample period (1980 - 2020). To do so, I combined multiple existing yet incomplete datasets, and collected the remaining information directly from tax treaty documents. Together, these two original datasets provide essential data for understanding the dynamics between tax treaty shopping and BTT formation. With the most expansive coverage compared to existing studies, these datasets enable a more comprehensive and nuanced analysis of the impact of tax treaty shopping on the formation of BTTs.

Using the original datasets, I provide a series of empirical evidence that supports the argument that tax treaty shopping leads to more tax treaties with lower withholding tax rates. Firstly, I provide consistent and robust evidence showing that countries facing the risk of treaty shopping are more likely to enter into BTTs. The effect is particularly strong for countries with lower state capacity to regulate treaty shopping through other legal provisions, and for countries where investors can choose from a larger number of conduits for treaty shopping. These findings suggest that tax treaty shopping is an important driver of BTT formation, particularly in cases where regulation is challenging.

Secondly, analysis of the treaty withholding tax rates reveals that countries facing the

risk of treaty shopping tend to negotiate BTTs with lower withholding tax rates. These rates are often closely aligned with the lowest withholding tax rates that can be obtained through treaty shopping by making payments indirectly through conduit countries. This suggests that the cheapest indirect rate may be influencing the negotiation of treaty withholding rates.

Lastly, I provide descriptive evidence showing that there has been a gradual fragmentation of the countries that serve as conduits for tax treaty shopping, with an increasing number of countries potentially being used in this capacity. However, despite this fragmentation, a small set of countries still remain the most significant drivers of tax treaty shopping.

Together, these findings shed light on the impact of tax treaty shopping on the formation of BTTs and suggest that tax treaty shopping has led to the negotiation of BTTs providing lower withholding tax rates, with important implications for international tax policy.

This paper builds upon the emerging literature on international taxation and tax treaties. While earlier studies on the effect of BTTs on FDI tend to neglect the network feature of BTTs (Egger et al. 2006; Davies et al. 2009; Neumayer 2007; Barthel et al. 2010), recent scholarship have focused on the network effects of BTTs on FDI, and found that the position of countries in the BTT network is an important predictor of FDI (Hong 2018; 't Riet and Lejour 2018; Petkova et al. 2020b). However, the impact of the BTT network on governments' policy autonomy is relatively understudied. A notable exception is Arel-Bundock (2017), who finds that treaty shopping constraints states' fiscal autonomy and affects direct treaty withholding tax rates using cross-sectional data. However, the analysis does not fully examine the actual dynamics between treaty shopping and BTT formation. This paper contributes to this literature by providing an comprehensive explanation for the formation of the tax treaty network as a direct consequence of treaty shopping with original datasets covering the period of 1980 to 2020. In addition, the findings of this paper also advances our understanding of treaty and forum shopping in other issue areas such as trade liberalization, foreign investor protection, and beyond (Betz et al. 2021; Gray 2020; Busch 2007; Pratt 2022).

More broadly, this paper also contributes to the literature on capital mobility and the

race to the bottom in taxation. On the one hand, while political scientists have long pointed out the potential problem of race to the bottom in capital taxation as a result of capital mobility (Swank 2006; Basinger and Hallerberg 2004; Plümper et al. 2009), this literature usually only considers cases that investors decide where to locate their tangible assets, depending on the economic and political environments of potential investing destinations. However, the case of international withholding taxes is different, as it involves purely financial transactions across borders rather than tangible assets. Investors can decide how to make such international payments more freely, in order to reduce their tax burden, while governments have less room to maneuver. By examining the relationship between tax treaty shopping and BTT formation, this paper offers insights into the dynamics of the race to the bottom in international taxation and provides insights for policymakers.

Moreover, the bilateral nature of BTTs and the preferential treatments of withholding tax rates that governments provide to treaty partners create unique policy constraints that are distinct from standard tax competition (Arel-Bundock 2017). Such constraints induced by treaty shopping are even more severe compared to traditional tax competition, resulting in spillover effects in other policy areas such as investment arbitration (Thrall 2021a). The network feature of international taxation, combined with the bilateral nature of BTTs, presents governments with a dilemma: efforts to prevent treaty shopping may lead to greater risks of treaty shopping, resulting in a downward spiral of withholding tax rates and treaty cascades. As a result, countries face systematic challenges in curbing tax treaty shopping induced by dyadic dynamics of treaty-shopping opportunities. This paper joins the an emerging literature that examines global finance with a network approach (Oatley et al. 2013; Bauerle Danzman et al. 2017), and contributes to revealing the complexities of the network feature of international taxation and the limits of policy autonomy in the case of international taxation. When it comes to international withholding taxes, states might not have much "room to move" (Mosley 2000, 2005).

2 International Withholding Tax and Treaty Shopping

Since the end of the First World War, BTTs have been adopted as the solution to prevent double taxation (Rixen 2011). Modern tax treaties are similar, mainly following the Model Tax Convention published by the OECD or the United Nations. A typical BTT contains seven chapters, focusing on the distribution of income and capital gains between the contracting states.[6] Together, the thousands of tax treaties serve as the building blocks of the international tax system (Avi-Yonah 2003).

Because dividing the common tax base between the contracting states is essentially a distribution issue, both the source and resident countries want to retain a bigger share of the tax revenue.[7] The solution that countries agreed upon in the early period of designing international tax rules, is a compromise. The source country has the primary right to tax active business income, while passive investment income is primarily taxed by the resident country (Avi-Yonah 2007).

Passive income, such as dividends, interest, and royalties, is subject to withholding taxes by the source country. This means that the payer has to deduct the corresponding amount of taxes from such payments to be remitted to the tax authority (Arel-Bundock 2017). While countries have set the withholding tax rates in their national tax codes (*statutory rate*), BTTs often contain provisions of preferential withholding tax rates, mainly by putting a limit on the withholding tax rate that can be charged by contracting states between each other.

The preferential withholding tax rates encoded in BTTs imply that investors might face drastically different tax rates for the same kind of payments made to recipients in different jurisdictions. For example, while the U.S. Internal Revenue Code (IRC) requires a 30 percent of withholding tax on U.S. source payments to foreign persons,[8] the withholding tax rate on payments made to recipients in China is reduced to not exceed 10 percent, according to Article 9 in the BTT signed between the U.S. and China in 1984.[9] In contrast, since there

6. See, for example, OECD (2017) and United Nations (2021).

7. In international taxation, "source" country refers to the country where the income or profit is generated, and the "resident" country refers to the country where the individual or company is considered a tax resident.

8. Internal Revenue Code 1441, available at https://www.law.cornell.edu/uscode/text/26/1441, last accessed July 2, 2022.

9. United States-The People's Republic of China Income Tax Convention, Article 9 to 11, available at https://www.irs.gov/pub/irs-trty/china.pdf, last accessed, July 2, 2022.

is no BTT between the U.S. and Malaysia, U.S. payers are charged 30 percent withholding taxes for their payments to Malaysia.

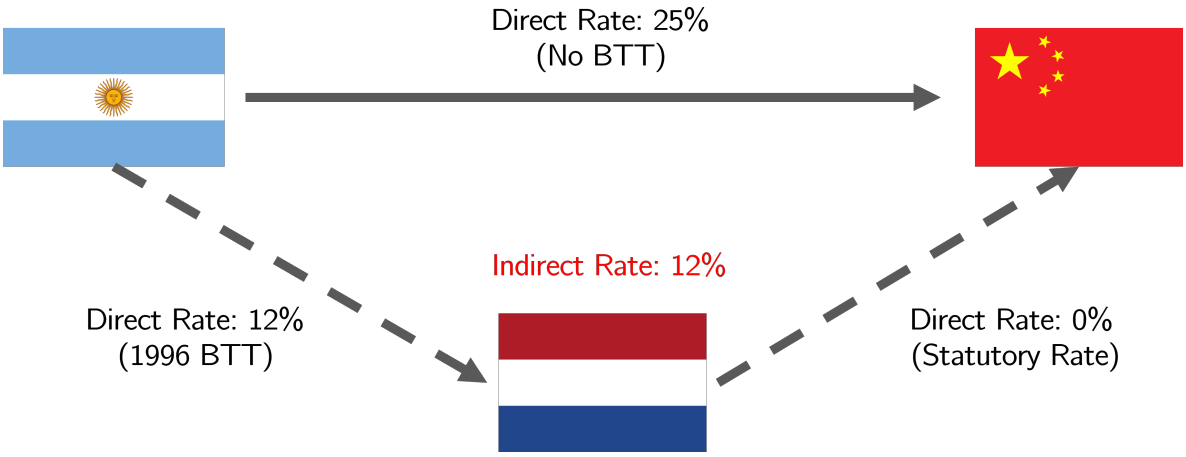
The differential withholding tax rates faced by investors create incentives for tax arbitrage, as every taxpayer wants to minimize the tax burden. As passive income is purely financial transactions, investors can easily route the payments through intermediate countries, especially through low tax conduit countries with an extensive tax treaty network. Such schemes, known as tax treaty shopping, are often adopted by MNCs to lower their withholding tax burden (Keen et al. 2014).

For instance, consider the illustrative example shown in Figure 1 considering the withholding taxes on interest payments from Argentina to China, as of 2017. If investors make the payment directly from Argentina to China, the withholding tax would be 25%,[10] which is the statutory withholding tax rate on interest payments specified in Argentinian tax code, since there is no BTT between Argentina and China in that year. However, if the payment was made directly through the Netherlands, the combined withholding tax rate could be reduced to 12%, less than half of the direct rate. The reduction consists of two parts: 1) the direct rate from Argentina to Netherlands, which is 12% as in the 1996 Argentina - Netherlands BTT; 2) the direct rate from Netherlands to China, which is 0% since the Netherlands does not levy withholding tax on interest payments.[11] In this case, the Netherlands serves as the conduit country to enable treaty shopping with its extensive BTT network and favorable withholding tax rates.

10. The 2017 Argentinian interest withholding tax rate has two brackets, namely 15.05% and 35%, with the median tax bracket being used to calculate the 25% tax rate. Refer to Appendix A.2 for more information.

11. Although the 2013 China-Netherlands BTT has been in effect since 2015, the treaty withholding tax rate on interest is 10%, which is higher than the Dutch statutory rate of 0%, so the latter applies.

Figure 1: Tax-Treaty Shopping Example: Interest Payment from Argentina to China (2017)



Note: This figure provides an illustrative example of tax treaty shopping for interest payment from Argentina to China, with the Netherlands serving as the conduit country. The withholding tax rate on payments made directly from the Argentina to China is 25%, while the indirect tax rate for payments made through the Netherlands is 12%.

Such treaty-shopping practices are common strategies for MNCs to avoid taxes. Recent studies have found that the opportunity of treaty-shopping is a crucial factor for the ownership structure of MNCs (Thrall 2021a). For example, focusing on dividend withholding taxes, scholars have found that MNCs often set up holding companies in conduit countries to reduce their tax burden on dividend payments (Hong 2018; Mintz and Weichenrieder 2010; Lewellen and Robinson 2014).

Although tax treaties might lead to treaty shopping and cost governments of their tax revenue, countries around the world continue to sign tax treaties with each other and grant preferential treatments to treaty partners. Arguably, a key function of tax treaties is to prevent double taxation, but scholars and policy advisers have long been questioning the necessity of tax treaties in solving the problem of double taxation.[12]

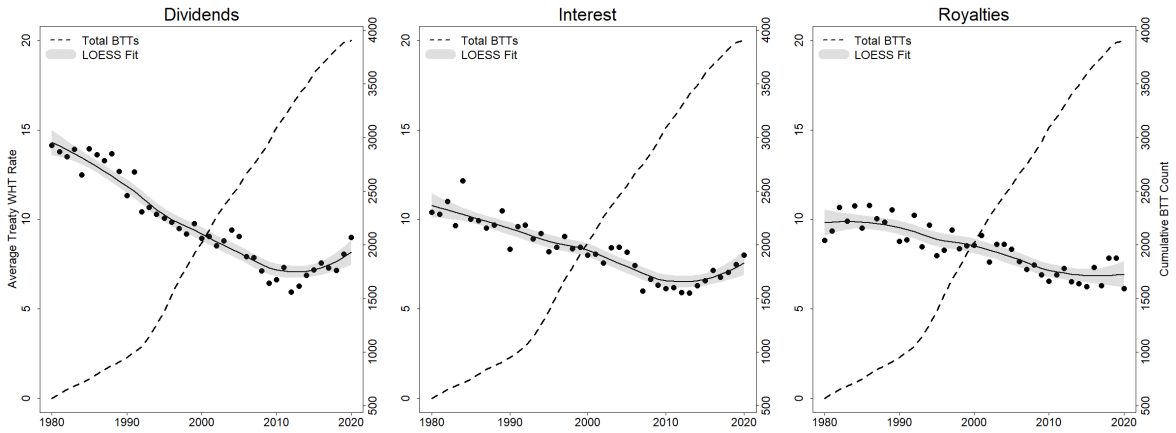
Moreover, even without considering treaty shopping, governments still lose tax revenues by cutting the withholding tax rates, which is an important revenue source, especially for developing country governments.[13] As Figure 2 depicts, the treaty withholding tax rates

12. For detailed discussion, see Dagan (2000). See also McGauran (2013)

13. For example, Keen et al. (2014) estimates that U.S. tax treaties have cost their non-OECD country counterparts about $1.6 billion in 2010. And it is estimated that the loss of tax revenue due to limitations on withholding tax amount is up to 0.17% of GDP for the Philippines and Mongolia, and the revenue loss persists

have been steadily decreasing as countries enter into more BTTs. This trend highlights the potential for further tax revenue loss for contracting states of BTTs.

Figure 2: Total BTTs and Average Treaty Withholding Rates: 1980 - 2020



Note: This figure plots the total number of BTTs countries have signed (right axis) and average withholding tax rate specified in treaties signed in a certain year (left axis) for dividends, interest, and royalties. The solid line and the shaded area represent the locally estimated scatterplot smoothing (LOESS) estimates and corresponding 95% confidence intervals for the average withholding tax rates. Data based on original dataset introduced in Section 4.1. As the total number of BTTs have increased rapidly, the average withholding tax rates have declined steadily.

Existing studies mainly attribute the continuing proliferation of BTTs to countries' desire for foreign investment, especially in developing countries. Specifically, because countries that have formed BTTs with capital-exporting countries can gain competitive advantages over their competitors, governments have the incentive to conclude tax treaties if their peers have already done so (Barthel and Neumayer 2012). Further, while negotiating and designing the specific terms in BTTs, such as the treaty withholding tax rates, countries are also influenced by the tax treaties that their potential contracting partner has signed with other countries (Petkova et al. 2020a; Petkova 2021).

However, the findings from empirical studies on the effects of BTTs on foreign investment are, at best, mixed.[14] Perhaps, the exact reason is the neglect of a key feature of the

even the elasticity is taken into consideration (Beer and Loeprick 2018; Balabushko et al. 2017).

14. For example, Egger et al. (2006) report negative effects of BTTs on FDI, Davies et al. (2009) report insignificant effects, and Barthel et al. (2010) report positive effects. In addition, Neumayer (2007) finds that the positive effects only exist among middle-income developing countries.

BTT network: treaty shopping. Even without a tax treaty between their home country and the potential investment destination, foreign investors can still take advantage of the preferential provisions of BTTs by making international payments indirectly. In this sense, some BTTs are "irrelevant" because the investors can benefit from the tax treaty network anyway (Petkova et al. 2020b).

What explains this puzzling expansion of the tax treaty network, given that its necessity to prevent double taxation is questionable, its benefit to attract foreign investment is unclear, but its fiscal cost to governments is real and serious? In the next section, I provide an explanation for the proliferation of BTTs by focusing on the risk of treaty shopping and subsequent treaty cascades.

3 Argument: Treaty Shopping and Treaty Cascades

In this section, I present a simple theoretical framework to explain the puzzling expansion of the BTT network, featured by the race to the bottom in treaty withholding tax rates. The argument centers around the concept of the *risk of treaty shopping* – the possibility of investors taking advantage of a cheaper indirect route through a conduit country to minimize their withholding tax burden while making cross-border payments.

In essence, the framework provides three implications:

1. *Risk of treaty shopping*: The necessary condition for the risk of treaty shopping is that the host country has a BTT with the conduit country.

2. *Race to the bottom*: The host country's best response to mitigate the risk of treaty shopping is to sign a BTT directly with the home country, offering lower withholding tax rates to make treaty shopping no longer profitable.

3. *Treaty cascades*: The formation of such new BTTs creates new risks of treaty shopping for other countries (1), triggering a cascade effect that ultimately leads to the formation of more BTTs with even lower withholding tax rates (2).

3.1 Setup

Consider the case where an investor residing in country i needs to make a payment (dividends, interest, or royalties payments) to a recipient in country j.[15] In this case, country i is the *host* country, country j is the *home* country.

The payment can either be made directly from i to j or indirectly through a third *conduit* country k by exploiting more favorable treaty withholding tax rates (i.e., treaty shopping).[16] Let $w_i \in [0, 1]$ denote the *statutory* withholding tax rate on such payments, according to the tax codes of country i. If there is a BTT between country i and country j which is effective as of the time, let w_{ij} denote the *treaty* withholding rate for payments from country i to country j.[17] Then, the *direct* withholding rate for such payments, τ_{ij}, can be defined as:

$$\tau_{ij} = (1 - \text{BTT}_{ij})w_i + \text{BTT}_{ij} \min\{w_i, w_{ij}\} \tag{1}$$

where BTT_{ij} is an indicator variable equals one if there is an effective BTT between i and j.

In cases where the payment is made indirectly through the conduit country k, the investor needs to bear two pieces of taxes: τ_{ik} and τ_{kj}. Therefore, the *indirect* withholding tax rate through country k is:

$$\tau_{ikj} = 1 - (1 - \tau_{ik})(1 - \tau_{kj}) \tag{2}$$

While any country $k \notin \{i, j\}$ can serve as a potential conduit country, in cases of indirect payment, the investor will choose to route the transaction through the conduit country that can minimize the overall withholding tax burden. Let τ^*_{ij} denote the *minimal indirect* withholding tax rate if the payment is made through a conduit country:

$$\tau^*_{ij} = \min_{\forall k \notin \{i,j\}} \{\tau_{ikj}\} \tag{3}$$

15. Here, "residing in country i" means the investor is a resident of country i *for tax purposes*, which is different from similar concepts such as country of residence or nationality.

16. Although the payer can also make indirect payments through more than one conduit countries, a recent study by Hong (2018) has found that only 3% of country pairs would need more than one conduit countries.

17. In cases where the treaty rate is higher than the statutory rate, the statutory rate applies.

Therefore, country k^* is defined as the *optimal conduit* country if $\tau_{ik^*j} = \tau^*_{ij}$.

3.2 Risk of treaty shopping

Investors make indirect payments to reduce the tax burden, so the combined indirect tax rate must be lower than the direct tax rate:[18]

$$\tau_{ij} > \tau_{ik^*j} \tag{4}$$

Plug in τ_{ij} and τ_{ik^*j} with equations (1) to (3), there are eight possibilities, depending on the treaty status between i, k^*, and j. Since the host country i has no control over the withholding tax rate from k^* to j, we can replace w_{k^*} and w_{k^*j} with τ_{k^*j}, regardless of whether there is an effective tax treaty between k^* and j.

If the host country i does not have a tax treaty with the optimal conduit country k^* (i.e., $\text{BTT}_{ik^*} = 0$), treaty shopping is never preferred because τ_{ij} is always weakly smaller than τ_{ik^*j}:

$$\tau_{ij} = w_i \leq 1 - (1 - w_i)(1 - \tau_{k^*j}) = \tau_{ik^*j} \qquad \text{if } \text{BTT}_{ij} = \text{BTT}_{ik^*} = 0 \tag{5}$$

$$\tau_{ij} = \min\{w_i, w_{ij}\} \leq w_i \leq 1 - (1 - w_i)(1 - \tau_{k^*j}) = \tau_{ik^*j} \qquad \text{if } \text{BTT}_{ij} = 1,\ \text{BTT}_{ik^*} = 0 \tag{6}$$

Thus, the host country is at risk of treaty shopping ($\tau_{ij} > \tau_{ik^*j}$) only if there is an effective tax treaty between the host country and the optimal conduit country ($\text{BTT}_{ik^*} = 1$).

The intuition for the result above is straightforward: making indirect payments requires the investor to bear an additional burden of withholding taxes from the optimal conduit country k^* to the receiving country j, which is bounded from below by zero. If there is no BTT between the host country and the conduit country, payments from the sending

18. If the direct rate equals the indirect rate ($\tau_{ij} = \tau_{ik^*j}$), I assume that investors would rather make payments directly, as treaty shopping typically involves additional costs, such as fees for setting up shell companies, etc. The actual costs are unknown but tend to be small. For example, Findley et al. (2014) find that shell companies can be established through a quick online process in some jurisdictions, and costs from hundreds to several thousand dollars. Recent research mentions slightly higher costs of tens of thousands dollars, see Betz et al. (2021) and Thrall (2021a).

country i to the conduit country k^* will be weakly higher than the direct rate. Therefore, it is impossible for the combined tax rate to be lower than the direct tax rate in such cases.

3.3 Treaty Shopping and Withholding Tax Revenue Loss

I define the risk of treaty shopping for country i in relation to country j as the situation where the cheapest indirect withholding tax rate τ_{ik^*j} is strictly lower than the direct withholding tax rate τ_{ij}, where k^* is the optimal conduit country. This can be expressed as:

$$\text{Risk}_{ij} = \mathbb{1}\{\tau_{ij} > \tau_{ik^*j}\} \tag{7}$$

Considering the share of tax revenue collected by country i when the payment is made directly versus the case that the payment is made indirectly through the conduit k^*, when there is the risk of treaty shopping, we have:

$$\tau_{ij} > \tau_{ik^*j} \Rightarrow \tag{8}$$

$$\tau_{ij} > 1 - (1 - \tau_{ik^*})(1 - \tau_{k^*j}) \Rightarrow \tag{9}$$

$$\tau_{ij} \geq \tau_{ij} - (1 - \tau_{ik^*}\tau_{k^*j}) > \tau_{ik^*} \Rightarrow \tag{10}$$

$$\tau_{ij} > \tau_{ik^*} \tag{11}$$

The result above means that the share of tax revenue for the host country i is smaller in the case of treaty shopping (τ_{ik^*}), compared with when the payment is made directly (τ_{ij}). Therefore, tax treaty shopping leads to withholding tax revenue loss for the host country.

3.4 Optimal Response to the Risk of Treaty Shopping

When a host country i is at risk of treaty shopping, its best response is to reduce the direct tax rate τ_{ij}, in order to avoid losing withholding tax revenue because the payment would be made indirectly through the conduit country. There are two ways to achieve this:

First, the host country can choose to lower its statutory tax rate w_i. However, this may

result in a revenue loss for withholding taxes on payments made to all other destinations without an effective BTT in place, including those without the risk of treaty shopping.[19] The resulting tax revenue loss might be even larger than the country would be able to recover by closing the treaty-shopping route. Therefore, it may not be practical for the government to decrease its statutory tax rate for the risk of treaty shopping regarding a specific partner country.

Secondly, the host country can reduce the tax rate only for payments from i to j without affecting the tax rate for payments made to other jurisdictions. This requires that the host country signs a BTT with the home country.

Additionally, the host country needs to set the treaty tax rate w_{ij} accordingly, to maximize its own tax revenue, while ensuring that tax treaty shopping is no longer preferable. The optimal tax treaty rate w^*_{ij} can be calculated as:

$$w^*_{ij} = \max\{w_{ij};\ w_{ij} \leq \tau_{ik^*j}\} \Rightarrow w^*_{ij} = 1 - (1 - \tau_{ik^*})(1 - \tau_{k^*j}) \tag{12}$$

Equation (12) suggests that the optimal tax treaty rate to maximize country i's tax revenue, when i is at risk of treaty shopping, equals the cheapest indirect rate. Taken into consideration the potential costs for making indirect payments through the conduit country,[20] the treaty rate should be equal to or slightly higher than the cheapest indirect rate.

To summarize, the optimal response for a country at risk of treaty shopping has two components: 1) Sign a tax treaty directly with the home country; 2) Reduce the tax treaty rate to be lower than the statutory rate, but equal to or slightly higher than the optimal indirect rate.

3.5 Treaty Cascades

The above analyses suggest a vicious cycle of tax treaty formation, which I refer to as *treaty cascades*. When a country is at risk of treaty shopping, it has to sign new BTTs with lower treaty tax rates. However, as BTTs between the host and the home countries are the nec-

19. The tax revenue for payments to countries with a BTT might also be reduced, if the new statutory rate is lower than the treaty rate.

20. See footnote 18.

essary condition for treaty shopping, this implies that the aforementioned country is now a potential conduit country. Therefore, the solution for one country implies the challenge for another, ultimately leading to the expansion of the tax treaty network and a race to the bottom in treaty withholding tax rates.

3.6 Hypotheses

The theory above implies the following key observable implications to be empirically examined in the next sections.

- H1: Countries are more likely to sign a BTT if they are at risk of treaty shopping.
- H2: When signing a BTT, countries set the treaty withholding tax rate lower if they are at risk of treaty shopping.
- H3: The new BTTs that countries enter into could be again used for tax treaty shopping in the future.

4 Original Datasets on International Withholding Tax

The examination of the hypotheses requires detailed data on both tax treaties and statutory withholding tax rates for an extended period of time. However, neither data is publicly available. Therefore, existing studies on tax treaty shopping mainly use cross-sectional data with limited coverage (Arel-Bundock 2017; Hong 2018; 't Riet and Lejour 2018; Thrall 2021a). While these studies can provide a snapshot of the tax treaty network for a certain year, our understanding of the evolution of the tax treaty network and the resulting tax treaty-shopping risks, are deeply constrained due to the limited data.

In this section, I introduce the following two original datasets that provide valuable information to further our understanding of the international taxation system through the lens of tax treaty shopping.

1. The universe of bilateral tax treaties (1900-2020)

2. The statutory withholding tax rates (1980-2020)

The data collected for this study provides the most comprehensive information on international taxation in terms of international withholding tax rates, covering more than 170 economies for more than four decades.

Combined, these data allow us to calculate the effective withholding tax rate for dividend, interest, and royalties for any given country dyad since the 1980s, a prerequisite to examine the relationship between tax treaty shopping and tax treaty formation.

4.1 Original Data on BTTs

Despite the fact that the modern international tax regime is built mainly upon bilateral tax treaties, information on BTTs is extremely limited and scattered, especially when compared to other issues areas in international economic cooperation like international trade and foreign investment protection.[21] There is no institution that maintains a list of BTTs to begin with.[22]

To overcome this constraint, I construct a comprehensive dataset that includes the basic information on the universe of bilateral tax treaties, as well as the treaty withholding tax rates for most of these treaties. To do so, I utilize available information across a wide range of academic, governmental, and business sources, and manually collect data from tax treaty documents. Specifically, the data collection involves the following steps (for details, see Appendix A.1):

1. Construct the list of the universe of BTTs and amendments.

2. Determine the years that a certain treaty is applicable for each of the contracting state.

3. Collect data on treaty withholding tax rates for dividends, interest, and royalties.

21. For example, for preferential trade agreements (PTAs) and bilateral investment treaties (BITs), international organizations such as the World Trade Organization (WTO) or the United Nations Conference on Trade and Development (UNCTAD) usually maintain the list of all existing agreements.

22. Although the OECD has been actively promoting the reform of the international tax regime, it does not maintain a list of all BTTs.

The dataset records basic information of over 3,900 bilateral tax treaties and about 900 amendments signed among more than 190 jurisdictions for over a century.[23] For the purpose of this paper, it also contains the treaty withholding tax rates for around 3500 tax treaties and 800 amendments, for three types of payments (dividends, interest, royalties). It represents the most comprehensive source for studying clauses on withholding tax rates in bilateral tax treaties.

4.2 Original Data on Statutory Withholding Tax Rates

The other, if not bigger, challenge in examining tax treaty shopping lies in the lack of data on jurisdictions' statutory withholding tax rates. This data is essential to measure the effective withholding tax rates between country dyad either with or without a BTT in force.[24] However, most available data sources used by scholars only include the most recent withholding tax rates, with information on the historical rates often omitted.

To overcome this challenge, I rely on the annual corporate tax summary reports published by the largest accounting firms in the world. With local offices and tax professionals in most countries, these "Big 4" accounting firms have the unique advantage of collecting and providing consistent and comparable data on national tax codes across countries and years. These tax summary reports have been increasingly used by scholars as an unique source for data on various tax rates, but often at a smaller scale, for only a few years or countries in a certain region (Castañeda-Angarita 2014; Petkova et al. 2020b; Thrall 2021a; 't Riet and Lejour 2018; Hong 2018). In addition, recent study by Jones et al. (2018) has revealed the importance of Big 4 accounting firms in helping MNEs to design and manage tax avoidance schemes. To that end, these reports provide a complete and relevant summary of the worldwide tax codes for the reference of foreign investors.

Specifically, I manually collect data on the statutory withholding tax rates for a sample

23. The first tax treaty in the database is the German (Prussia) - Hungary (Austro-Hungary) Income Tax Treaty signed on June 21, 1899. The first tax treaty is often considered to be the 1869 tax treaty between Prussia and Saxony, see Evers (2013).

24. As explained in Section 3, the effective rate is the lower of the statutory and the treaty rate if there is a BTT in force, and just the statutory rate in the absence of a BTT. In addition, certain BTTs do not specify the limit of withholding tax rates, and the statutory rate would apply in these cases.

of more than 170 jurisdictions for the period of 1980 to 2020.[25] These data are recorded from the *Worldwide Cooperate Tax Summary* by PricewaterhouseCoopers (PwC) for 1980 - 2004, and the *Worldwide Cooperate Tax Guide* by Ernst & Young (EY) for 2004 - 2020. Details on the data collection procedure are reported in Appendix A.2.

5 Research Design

5.1 Computing the Risk of Treaty Shopping

The two original datasets introduced above provide the essential data for calculating the direct withholding tax rate (τ_{ij}) for all dyads within the sample jurisdictions. The data covers all payment types, including dividends, interest, and royalties, and spans the time period from 1980 to 2020. Specifically, the direct withholding tax rate for payments from country i to country j in year t is computed as follows:

$$\tau_{ijt} = \begin{cases} w_{it} & \text{if } \mathrm{BTT}_{ijt} = 0 \\ \min\{w_{it}, w_{ijt}\} & \text{if } \mathrm{BTT}_{ijt} = 1 \end{cases} \tag{13}$$

where w_{it} is the statutory withholding tax rate of country i in year t, w_{ijt} is the treaty withholding tax rate, and BTT_{ijt} is an indicator variable equal to 1 if there is an effective BTT between the two countries in year t.

To ensure consistency with previous research, I follow the approach of Arel-Bundock (2017) by using the median tax bracket in cases where there are multiple rates for the same payment type.[26] Furthermore, I also take into consideration other factors that affect the direct withholding tax rate, including multilateral/regional tax treaties, EU directives, and most-favored nation (MFN) clauses. These factors are discussed in more detail in Appendix A.4.

With the direct withholding tax rate τ_{ijt}, the cheapest indirect withholding rate τ_{ik^*jt} and the risk of treaty shopping Risk_{ijt} are calculated based on the specification in Section 3, as

25. The coverage varies and generally increase over time. For details, see Figure A.1 in Appendix A.2.
26. The choice of median tax brackets is expected to have minimal influence, as discussed in Appendix A.3.

follows:

$$\tau_{ik^*jt} = \min_{\forall k \notin \{i,j\}} \{\tau_{ikjt}\} = \min_{\forall k \notin \{i,j\}} \{1 - (1 - \tau_{ik^*t})(1 - \tau_{k^*jt})\} \tag{14}$$

$$\text{Risk}_{ijt} = \mathbb{1}\{\tau_{ijt} > \tau_{ik^*jt}\} \tag{15}$$

In addition to the binary measure of Risk_{ijt} used for the main findings reported in the next section, I also employ an alternative operationalization by calculating the difference between the direct and the cheapest indirect withholding tax rates. The results, as detailed in Appendix C.3, align consistently with the main findings.

5.2 Dependent Variable and Method

The primary outcome of interest in this study is the formation of a bilateral tax treaty (BTT Formation_{ijt}) between countries i and j in year t. As discussed in Section 3, when a country is at risk of treaty shopping, the optimal response is to conclude a BTT with the respective country to prevent revenue loss. Bilateral tax treaties provide the opportunity for governments to offer a preferential withholding tax rate only to the treaty partner country, making treaty shopping less beneficial and helping to retain tax revenue that would otherwise be lost. The dependent variable is derived from the BTT dataset introduced in Section 4.1.

Since the objective of the analysis is to examine whether the risk of treaty shopping would increase the likelihood for a country dyad forming a BTT, the outcome variable is characterized as the spell of time until a BTT has been formed, measured in years. To this end, an event history analysis model is suitable to model the relationship between the outcome and the explanatory variable. Specifically, the Cox proportional hazard model is used, which is a widely used method to study the formation of bilateral treaties (Barthel and Neumayer 2012; Elkins et al. 2006).

5.3 Control Variables

To account for the potential effect of country-level characteristics on the likelihood of BTT formation, I include a set of country-level control variables. First, I include GDP per capita, GDP growth, and population (all logged), taken from the World Development Indicators, to control for the level of economic development and size of countries.[27] To capture the level of globalization, I include trade openness (measured as the percentage of total trade to GDP) and net FDI inflow (% GDP), both obtained from the World Bank.[28] Moreover, I include the corporate income tax rates, collected by the Tax Foundation, to account for the general corporate taxation regime.[29] Lastly, as prior research has suggested that international economic cooperation depends on the domestic political regime,[30] I include the Polity2 Index from the Polity Project.[31]

Additionally, I include a set of dyad-level variables to capture the proximity between countries. This includes the distance between countries (measured between capitals), indicators of whether the countries share the same language, are contiguous, and have historical colonial links, all taken from the GeoDist database by the CEPII.[32] To account for the level of bilateral economic exchanges, I include the level of bilateral trade (% GDP), using data from the IMF Direction of Trade Statistics (DOTS). As the proximity to sign a BTT might be affected by other economic agreements (Thrall 2021b), I include indicators of existing bilateral investment treaties (BITS) and preferential trade agreements (PTAs).[33]

Finally, the proximity to form additional BTTs might be influenced by the "learning effect" as states update their belief in the impact of BTTs and adapt their negotiation positions (Hearson 2018). To account for this, I include the cumulative number of BTTs signed by both the host and home countries.

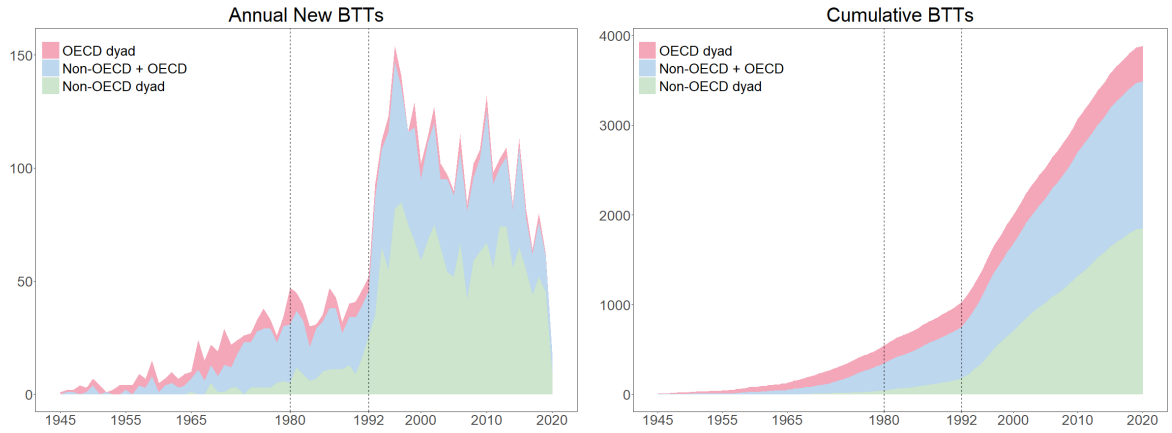
27. World Development Indicators, World Bank, https://datacatalog.worldbank.org/dataset/world-development-indicators.
28. https://data.worldbank.org
29. https://taxfoundation.org/publications/corporate-tax-rates-around-the-world/
30. See, for example, Mansfield et al. (2002).
31. The Polity Project, https://www.systemicpeace.org/polityproject.html.
32. http://www.cepii.fr/anglaisgraph/bdd/distances.htm
33. Data on bilateral investment treaties from the UNCTAD International Investment Agreements Navigator, https://investmentpolicy.unctad.org/international-investment-agreements. Preferential Trade Agreements data from the Design of Trade Agreements (DESTA) Database, see Dür et al. (2014).

5.4 Sample

The main sample consists of directed dyad-year observations covering the period from 1980 to 2020.[34] The two original datasets cover up to 173 jurisdictions for 41 years, resulting in a complete sample of 1,219,996 observations. However, due to missing national tax codes and certain tax treaty documents, the baseline sample includes 711,115 observations and 2,216 BTTs signed during the sample period.[35] The number of observations is further reduced due to missing control variables.

Figure 3 illustrates the annual number of new and cumulative BTTs between 1945 and 2020, classified by OECD membership status. The total number of BTTs increased rapidly since 1992, mainly due to the end of the Cold War. The period of 1980 to 2020, which is covered in the sample analysis, includes the majority of the BTTs that countries have entered into and almost all the BTTs signed between non-OECD countries.

Figure 3: Annual New and Cumulative BTTs by OECD Status (1945 - 2020)



Note: This figure displays the annual new BTTs (left panel) and cumulative BTTs (right panel) signed by jurisdictions between 1945 and 2020, depending on whether either or both the contracting states are OECD members. For consistency, OECD members only includes the 24 countries that joined in the 1960s and 1970s.

34. Directed dyad is chosen as the key explanatory variable, $\text{Risk}_{ij,t-1}$, is measured at this level.
35. For details on the pattern of missingness, see Appendix A.

6 Results

6.1 Risk of Treaty Shopping and Treaty Formation (H1)

To test the hypothesis that the risk of treaty shopping increases the likelihood of BTT formation (H1), I estimate the Cox proportional hazards model using the variables specified in the previous section.

Table 1 reports the baseline results for each type of payment (dividends, interests, and royalties) separately. The explanatory variable and control variables are lagged by one year, and the control variables are added incrementally due to missing data. The columns within each panel represent the results from different model specifications.

The results in Table 1 support the hypothesis that the risk of treaty shopping increases the likelihood of BTT formation. The coefficients of the key explanatory variable are consistently positive and statistically significant across different panels and specifications.

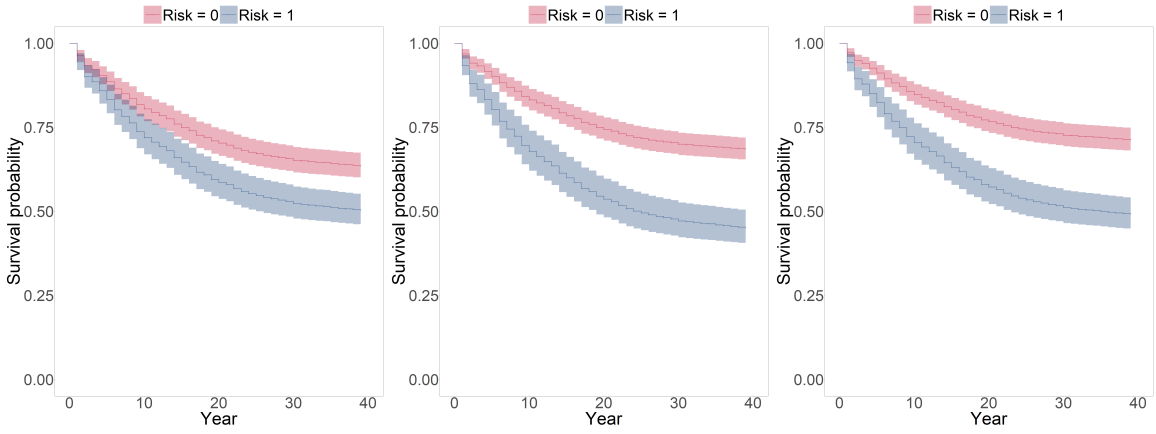
To visualize the effect of the risk of treaty shopping on the hazard of BTT formation over time, Figure 4 presents the estimated survival probabilities from the Cox proportional hazards model. The plot shows that, holding all else constant, the survival probability declines over time, indicating a higher probability of BTT formation. However, the decline is steeper for country dyads facing the risk of treaty shopping, suggesting that the risk of treaty shopping increases the likelihood of BTT formation for those countries.

Table 1: Risk of Treaty Shopping and Treaty Formation

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.673***	0.381***	0.488***	0.147***	0.149***
	(0.031)	(0.038)	(0.044)	(0.052)	(0.052)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.819***	0.469***	0.582***	0.342***	0.352***
	(0.031)	(0.039)	(0.046)	(0.051)	(0.051)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.963***	0.536***	0.523***	0.407***	0.420***
	(0.035)	(0.043)	(0.050)	(0.057)	(0.057)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects. Complete regression tables are reported in Appendix B.1. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 4: Survival Probability by Risk of Treaty Shopping



(a) Dividends (b) Interest (c) Royalties

Note: This plot shows the predicted survival probability (probability of not signing a BTT) and corresponding 95% confidence interval, depending on whether the host country is facing the risk of treaty shopping. The x-axis represents the year relative to the start of the sample in 1980. The results corresponds to the specification based on Column (5) of Table 2, where control variables are set at the group average (regional fixed effects are excluded).

6.1.1 Robustness Checks

In order to assess the robustness of the main finding reported in Table 1, I carry out several checks, which are discussed in detail in Appendix C. The results of these tests confirm the robustness of the main finding.

First, I estimate the Cox proportional hazards model using undirected dyad-year level observations, instead of directed dyads. To estimate the Cox proportional hazards model using undirected dyad-year level observations, I aggregate the risk of treaty shopping for the two countries in each dyad. I use two methods for aggregation: the sum of their respective risks and a factor variable indicating the presence of risk for either or both countries. The results, reported in Appendix C.1, confirm the robustness of the main finding.

Second, I construct a combined measure of treaty-shopping risk that aggregates different types of payments. The combined measure is computed in two ways: 1) as the sum of risks across payment types; and 2) as an indicator of risk for at least one payment type. The results, presented in Table C.3, support the main finding.

Third, I replace the key explanatory variable with an alternative measure capturing the potential gain of treaty shopping for investors, calculated as the difference between the direct withholding tax rate and the cheapest indirect withholding tax rate.[36] This alternative measure approximates the percentage amount of withholding taxes that investors can save by routing the payment through a conduit country. The results, displayed in Table C.4, are qualitatively consistent with the main finding.

Next, I examine whether the findings depend on the type of potential conduits, especially tax haven countries. To do so, I dis-aggregate the key explanatory variable $Risk_{ijt}$, based on whether the potential conduit is listed on major tax haven lists as complied by Gravelle (2009). The results, shown in Appendix C.4, suggests that the risk of treaty shopping, regardless of whether the potential conduit is a tax haven or not, has a positive impact on the likelihood of subsequent BTT formation.

Moreover, to account for the potential joint effect of country-level control variables, I adapt the specification by including the product of these variables instead of adding them individually for the host and home countries, following the approach in Barthel and Neumayer (2012). The results, presented in Appendix C.5, are consistent with the findings in Table 1.

Finally, instead of using the Polity2 Index to account for the domestic political regime, I use the electoral democracy indicator from the V-Dem project.[37] Appendix C.6 shows that the main finding is robust to alternative measure of countries' political regimes.

6.1.2 Challenges in Addressing Treaty Shopping Through Alternative Means

To explore the heterogeneity in the relationship between the risk of treaty shopping and BTT formation, I investigate why some countries sign BTTs to address treaty-shopping risks while others do not. While signing a BTT directly with another country is one way to address treaty-shopping concerns, states can also utilize legal and regulatory procedures to deny tax treaty benefits when investors route payments through conduit countries for lower withholding tax rates. For example, the United States has included the Limitation on

36. If the cheapest indirect rate is higher than the direct rate, the potential gain is set to 0.
37. See https://www.v-dem.net

Benefits (LOB) Clauses in its model tax treaty and most of its recent BTTs (Borrego 2016).

However, with the exception of the U.S. BTTs, such anti-avoidance rules are rare in tax treaties, especially for developing countries. For low and lower-middle income countries, only 11.4% of the BTTs that they have entered into contain some sorts of anti-avoidance rules, such as Principal Purpose Test (PPT) or LOB clauses.[38] In addition, the inclusion of anti-avoidance rules is also a very recent phenomenon – more than 95% of tax treaties concluded by developing countries before 2000 do not have such provisions.

Moreover, these attempts to deny treaty benefits can result in high costs that might not be offset by the potential tax revenue retained through the process. Governments must initiate the investigation and provide evidence proving the practice of treaty shopping on each potential case, which requires both resources and personnel. Additionally, even with evidence supporting the existence of treaty shopping, government's rulings might be challenged by investors, who could initiate disputes through arbitration or the Mutual Agreement Procedure (MAP).[39] Consequently, governments might be constrained to enforce legal provisions, similar as in the case of trade tariffs (Betz 2019).

To investigate the degree of challenges encountered when governments attempt to address treaty-shopping practices, I examine heterogeneity across different cases by focusing on three factors that approximate the challenges in distinct aspects. First, I explore whether differences in state capacity influence the extent to which treaty shopping impacts BTT formation by introducing the interaction term between the GDP per capita of the host country and the Risk_{ijt} measure. The results, reported in Table D.1, suggest that countries with lower state capacity are more likely to form BTTs to address treaty-shopping risks.

Second, I replace the indicator of the risk of treaty shopping with the number of conduits available. This measure reflects the number of countries that can potentially be used as conduits to secure the cheapest indirect withholding rate for payments made from the host to the home country. This variable can be considered as a proxy for the overall costs associated

38. Data from the Tax Treaties Explorer, available at https://www.treaties.tax.

39. For example, the 2017 OECD Model Tax Convention includes the Mutual Agreement Procedure (Article 25) that allow taxpayers seek assistance from either contracting states in cases of treaty-related tax disputes. See OECD (2017). For discussion of arbitration and MAP in tax treaties, see, e.g., Park (2001), Züger (2001), and Ault (2013).

with monitoring and investigating treaty-shopping incidences. As shown in Table D.2, an increase in the number of conduits is associated with a higher likelihood of governments signing BTTs, suggesting that governments may prefer to close treaty-shopping opportunities through BTT formation in cases where the costs of such monitoring and investigation outweigh the potential tax revenue retained.

Last, there might a "learning effect" in understanding the real effects of BTTs, and countries adapt their strategies as they get more experienced in international tax policies (Hearson 2018). In such cases, states that have already formed a large number of BTTs might be more capable than those have only concluded a few such treaties to address tax-treaty shopping through legal or regulatory tools. As Table D.3 suggests, this might actually be the case. When facing the risk of tax-treaty shopping, countries that signed fewer BTTs are more likely to form an additional tax treaty directly with their counterpart states.

6.1.3 Competing Explanation: Spatial Dependence

Lastly, I address a possible alternative explanation of the expansion of the BTT network: spatial dependence of states on other focal countries. Scholars have found the decision to enter bilateral economic agreements can be explained by the treaty-making behavior of other countries, usually summarized with spatial weights (Elkins et al. 2006; Neumayer and Plümper 2010; Barthel and Neumayer 2012; Chaudoin et al. 2015).

To address this competing explanation, I replicate the results of Barthel and Neumayer (2012), who found that the decision to form a BTT is influenced by the number of BTTs concluded by the country's regional peers, as well by countries with similar export product structure. Using the replication data, I introduce the measure of treaty-shopping risk and re-estimate their model. The results, presented in Table E.1, show that *both* the spatial dependence and the treaty-shopping risk are significant predictors of BTT formation. This suggests that the risk of treaty shopping is a crucial factor in BTT formation, even after controlling for the effects of spatial dependence.

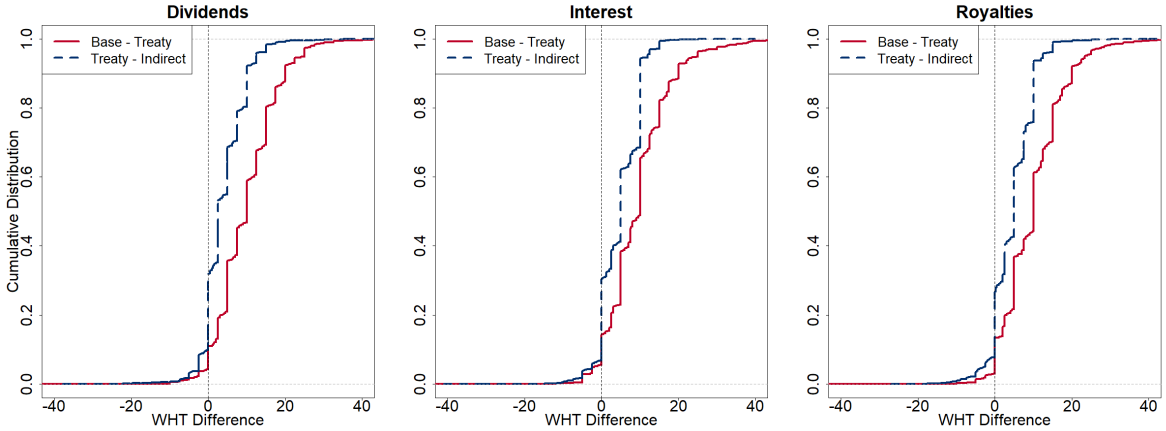
6.2 Treaty Shopping and Treaty Withholding Tax Rate (H2)

While the risk of tax treaty shopping increases the likelihood that countries form BTTs, does it also affect the withholding tax rates specified in those treaties? In this part, I examine the second observable implication based on the argument of this paper by focusing on the treaty withholding tax rates as specified in the BTTs.

If countries form BTTs to retain tax revenue by making tax treaty shopping no longer beneficial, they need to do so by setting the treaty rate closer to the cheapest indirect rate. Therefore, governments can retain part of the tax revenue that would otherwise be lost due to treaty shopping, and it is no longer beneficial for investors to make payments through conduit countries.

To test the hypothesis that treaty shopping leads to lower treaty withholding tax rates, I provide two sets of results. First, focusing on the dyads that face the risk of treaty shopping, Figure 5 displays the difference of the treaty rate in relation to the statutory rate and the cheapest indirect rate. In comparison, the treaty rate is closer to the indirect rate than it is compared with the statutory rate, suggesting that countries facing treaty shopping refer to the cheapest indirect rate when negotiating the BTTs. In addition, as Section 3 states, the best response for countries with treaty shopping risks is to set the treaty rate close to and slightly higher than the indirect rate. The patterns in Figure 5 also support this argument: the majority of the difference between the BTT rates and indirect rates are distributed just slightly above zero.

Figure 5: Comparison of Treaty WHT Rates with Base and Indirect Rates



Note: This figure plots the empirical cumulative distribution function (CDF) for the difference between 1) the statutory withholding tax rate and the treaty withholding tax rate; and 2) the treaty withholding tax rate and the cheapest indirect rate. The statutory withholding tax rate and the cheapest indirect rate are measured at the year before BTT signing. The sample is directed-dyad observations at the year of BTT formation and only includes dyads that the host country faces the risk of treaty shopping in the year before.

Second, I examine the relationship between treaty-shopping risks and the treaty withholding tax rates for all the BTTs signed during 1980 to 2020. The results, estimated with ordinary least squares regression, are presented in Table 2. The dependant variable is the "depth" of BTTs, measured as the difference between the statutory withholding tax rate and the treaty withholding tax rate, separately for each type of payments. Therefore, larger values indicate that the country makes bigger concessions in the tax treaty.

As shown in Table 2, the estimated coefficients of $\text{Risk}_{ij,t-1}$ are positive and statistically significant across different model specifications. This indicates that countries make larger concessions, in terms of setting lower treaty withholding rates, if they are facing the risk of tax treaty shopping.

Table 2: Risk of Treaty Shopping and Treaty Depth

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	9.560***	8.292***	7.749***	7.795***	7.765***
	(1.494)	(1.293)	(1.348)	(1.453)	(1.472)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	4078	3305	2483	2162	2162
Adjusted R^2	0.738	0.774	0.792	0.787	0.789
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	6.617***	6.388***	5.923***	5.736***	5.708***
	(1.307)	(1.109)	(1.068)	(1.068)	(1.058)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	4051	3276	2455	2139	2139
Adjusted R^2	0.736	0.762	0.781	0.783	0.784
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	4.593***	3.943***	3.619***	3.857***	3.693***
	(1.01)	(1.018)	(1.085)	(1.12)	(1.074)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	4075	3300	2477	2161	2161
Adjusted R^2	0.754	0.773	0.782	0.787	0.789

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year. Complete regression tables are reported in Appendix B.2.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6.3 Emergence of New Conduit Countries (H3)

So far, the analysis has yielded evidence that supports the first two hypotheses: 1) countries facing the risk of treaty shopping are more likely to enter into BTTs; 2) upon signing BTTs, these countries set lower treaty withholding tax rates. However, the third hypothesis suggests that the new BTTs signed by countries to address treaty shopping may inadvertently exacerbate the problem by creating additional opportunities for treaty shopping.

To test the third hypothesis, I examine the composition of potential conduit countries over time. Specifically, I investigate which countries could potentially be used as the optimal conduits when treaty shopping offers lower indirect withholding tax rates. To calculate the proportion of potential treaty-shopping routes that each country could serve as a conduit for, I compute the share of the number of distinct directed country dyads for which a particular country could be used as a conduit, out of the total number of country dyads that face the risk of treaty shopping, for each year between 1980 and 2020. This measure provides an estimate of the country's "share of the conduit market." To obtain this share, I first identify the countries at risk of treaty shopping and then determine which other countries they could route their payments through to receive the lowest possible indirect withholding tax rate. Formally, the measure is computed as follows:

$$\text{Share}_k = \frac{\sum_{i \neq k} \sum_{j \neq i,k} \mathbb{1}\{\tau_{ikj} = \min_{k'} \tau_{ik'j}\} \times \text{Risk}_{ij}}{\sum_{i \neq j} \text{Risk}_{ij}} \tag{16}$$

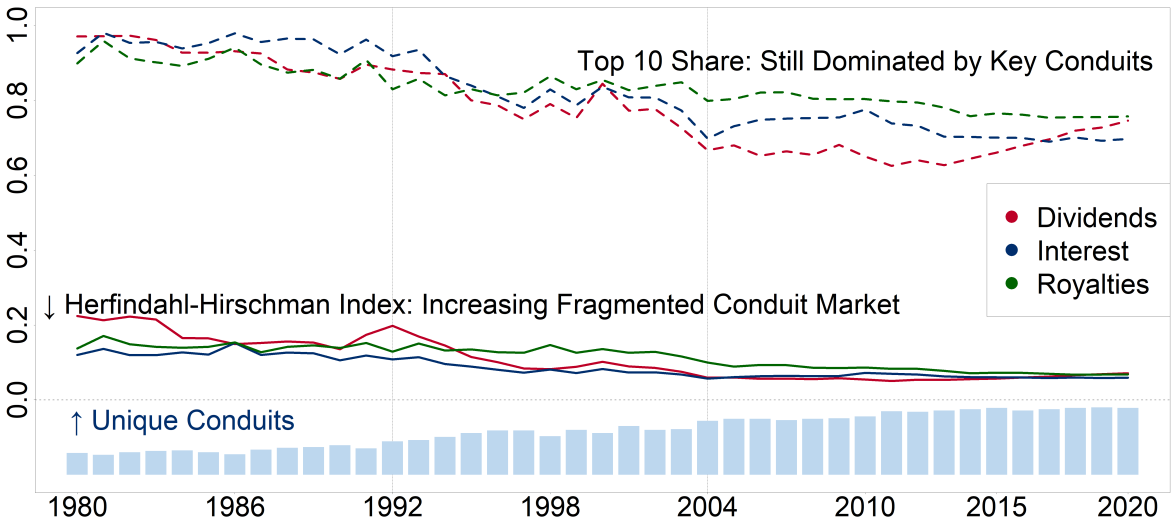
Figure 6 displays two different measures to assess the evolving composition of the "conduit market" over time. The first measure, displayed by the solid lines, is the Herfindahl-Hirschman Index (HHI), which reflects the degree of fragmentation in the market.[40] The decreasing HHI over the sample period suggests that the number of countries that could serve as conduits for treaty shopping, as well as their share, is increasing. This finding supports the third hypothesis that BTTs signed to address treaty shopping may lead to additional treaty-shopping opportunities.

However, the dominance of certain conduit countries complicates the picture of the conduit market, as illustrated in Figure 6 and Table 3. Despite the increasing fragmentation, a

40. HHI is calculated by: $\sum_i \text{Share}_i^2$, with Share_i defined in equation 16.

small number of countries still account for the vast majority of treaty-shopping routes. The total share of the top 10 conduit countries (by share) remains high, as indicated by the dashed lines in Figure 6.

Figure 6: Treaty Shopping Conduits: Fragmented but Dominated by Key Countries



Note: This figure depicts the evolution of the treaty shopping "conduit market" from 1980 to 2020, with solid lines representing the market concentration level measured by the Herfindahl-Hirschman Index and dashed lines indicating the total share of the top 10 conduit countries. The colors correspond to different payment types. The light blue bars shows the number of unique countries that could be potentially used as conduits for tax treaty shopping, which is also on the rise. While the figure shows a trend towards a more fragmented market, it remains dominated by a few key countries, as evidenced by the high total share of the top 10 conduit countries. The dashed vertical lines represent two important years: the year of 1992 when the BTT network began to expand rapidly (see Figure 3), and the year of 2004 that the sample coverage has increased due to the switch of data sources (Figure A.1).

Table 3 lists the top 10 conduit countries for each payment type, ordered by the average share over the entire sample period. The list includes well-known conduits for treaty shopping such as Ireland, Netherlands, Mauritius, and Luxembourg. However, some countries that are not typically considered as conduits also appear in the top 10, such as France for royalty payments. The reason is that France tends to offer very low withholding tax rates on royalties in its tax treaties, and sometimes exempts such taxes for its BTT partners.[41]

41. For example, the 2013 France - Andorra BTT provides a withholding tax rate on royalties at 5%, which is exempted for royalties arising from copyrights. The 1996 France - Russia tax treaty states that the host country could not levy withholding taxes on royalty payments.

Similarly, a number of Nordic countries, including Norway, Sweden, and Denmark, may be attractive conduits due to their exemption of withholding taxes on interest or royalty payments in their domestic tax codes.

In summary, these trends suggest that entering into new BTTs with lower treaty withholding tax rates to address treaty shopping may inadvertently open up new treaty-shopping routes. This could potentially allow investors to utilize more countries for tax treaty shopping, further complicating efforts to curb this practice. Despite the gradual fragmentation of the treaty-shopping conduit market, the dominance of key conduits with favorable tax treatments highlights the challenges involved in effectively addressing tax treaty shopping. These trends underscore the need for coordinated international efforts to combat treaty shopping and promote fair taxation, given the complexity and challenges inherent in the modern international tax regime that relies on bilateral agreements.

Table 3: Top 10 Potential Conduit Countries by Payment Type

	Dividends		Interest		Royalties	
Rank	Country	Share	Country	Share	Country	Share
1	United Kingdom	19.69%	Netherlands	10.67%	Netherlands	17.33%
2	Ireland	9.21%	Sweden	10.61%	Switzerland	17.32%
3	Singapore	7.76%	Austria	9.37%	Norway	15.51%
4	Malaysia	7.58%	Norway	9.36%	Hungary	5.57%
5	United Arab Emirates	6.95%	Denmark	8.93%	Denmark	4.86%
6	Mauritius	5.75%	Finland	8.8%	United Arab Emirates	4.79%
7	Qatar	5.75%	United Arab Emirates	6.01%	Malta	4.74%
8	Kuwait	4.54%	Luxembourg	5.55%	France	4.52%
9	Hungary	4.53%	Kuwait	5.49%	Luxembourg	3.24%
10	Slovakia	4.26%	Hungary	5.48%	United Kingdom	3.09%
	Total	76.03%	Total	80.28%	Total	80.94%

Notes: This table shows the top 10 countries in terms of the share of the conduit market, as defined in equation 16, over the entire sample period of 1980 - 2020. Overall, these countries account for the vast majority of all treaty shopping routes.

7 Conclusion

This paper provides a comprehensive explanation for the expansion of the tax treaty network, which is characterized by a gradual reduction in withholding tax rates. The network feature of bilateral tax treaties creates opportunities for treaty shopping, whereby international payments are made indirectly through conduit countries to reduce the withholding tax rates. To address the challenges of treaty shopping and preserve tax revenue, countries enter into new BTTs and offer lower withholding tax rates.

Drawing on original datasets covering more than 170 countries over four decades, this study provides an in-depth analysis of the relationship between tax treaty shopping and BTT formation. The findings reveal that countries facing the risk of treaty shopping are more likely to enter into BTTs and offer lower treaty withholding tax rates to discourage treaty shopping. However, these measures can sometimes create new routes for treaty shopping, as more countries become potential conduits for indirect payments across jurisdictions. While a key set of conduit countries continue to drive tax treaty shopping, the emergence of new potential conduits further complicates efforts to address treaty shopping.

This paper makes an important contribution to the growing literature on international taxation in political science. While existing scholarship suggests that political factors can moderate the race-to-the-bottom in capital taxation (Basinger and Hallerberg 2004; Plümper et al. 2009; Jensen 2013), the increasing use of shell subsidiaries in conduit countries by firms to minimize tax burden has created new challenges for governments (Arel-Bundock 2017; Thrall 2021a). The networked nature of international taxation has created a dilemma for governments: they must sign new BTTs and reduce withholding tax rates in order to address the risks posed by treaty shopping, but doing so can also increase the risks of future treaty shopping.

However, this paper's findings also reveal profound heterogeneity across countries in terms of their ability to address tax treaty shopping. Countries with lower state capacity and a large number of potential conduit countries face more severe challenges. Therefore, future research should explore effective ways for governments to address tax treaty shopping, particularly in such challenging situations. Understanding the variation in govern-

ment responses to the risk of treaty shopping would be enlightening.

Moving beyond treaty shopping, this study sheds light on the broader literature on tax avoidance and profit shifting by multinational corporations. While it is widely acknowledged that tax avoidance costs governments a significant share of tax revenue (Zucman 2021), there has been little research on why governments are often unable or unwilling to address this problem. Various tax-planning schemes used by multinational corporations, such as debt financing and profit shifting, are directly influenced by international withholding taxes. Consequently, the risk of treaty shopping not only leads to an otherwise unnecessary reduction in withholding tax rates, but might also facilitates tax avoidance in the long term. Ironically, although BTTs could have acted as a "second line of defense" against tax avoidance (Balabushko et al. 2017), they might inadvertently exacerbate the problem.

Moreover, the rise of intangible assets in the global economy (Haskel and Westlake 2018) has made it increasingly difficult for governments to verify whether firms are complying with the arm's length principle in related-party transactions. On this regard, the limitations on withholding taxes, such as those on royalties, means that multinational corporations can almost effortlessly relocate their intangible assets worldwide and use royalty payments for profit shifting. In fact, treaty shopping is one of the most important concerns of the OECD's Base Erosion and Profit Shifting (BEPS) project (OECD 2015), and is a major factor behind the Multilateral Instrument (MLI) framework.[42]

Given the significant political and economic implications of tax avoidance and profit shifting, it is crucial for governments to address these issues in a concerted and effective manner, rather than bilaterally as they have done for decades. Future research should focus on effective policy interventions that can address these challenges. Ultimately, it is critical for governments to work together to tackle this problem, which is vital for the sustainability of public finances and the stability of the global economy.

42. See https://www.oecd.org/tax/treaties/multilateral-convention-to-implement-tax-treaty-related-measures-to-prevent-beps.htm

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A Additional Information on Original Data Collection

This section explains in detail the procedures of the collection of the two original datasets as described in Section 4.

A.1 Collection of Data on BTTs

A.1.1 List of the universe of BTTs

To construct the sample of all BTTs, I use the procedure to identify the tax treaties that each jurisdiction has entered into:

1. Collect the preliminary list from the IBFD Tax Research Platform using the following filter specification:
    - Type: Treaties & Models
    - Treaty Subject: Income/Capital
    - Bilateral/Multilateral: Bilateral
2. Cross-check the list of BTTs gathered from the IBFD with other data sources, including:
    - Tax summary reports by accounting firms (Ernst & Young, PwC, etc.)
    - Government tax treaty web pages
    - Online tax formation platforms (Orbitax, etc.)
    - Tax treaties explorer[1]
3. Remove non-comprehensive tax treaties[2] and add those are missing from the IBFD database.

1. Available at https://www.treaties.tax/

2. Non-comprehensive tax treaties refers to those only cover taxes for individuals or economic activities in certain industries. Unlike comprehensive BTTs, these treaties do not include articles on the limit of withholding tax rates. Examples including the Bermuda - Finland Agreement for the Avoidance of Double Taxation on Individuals (2009), and the Italy-Switzerland Agreement on the Taxation of Frontier Workers (2020).

4. Identify and collect the list of all amending protocols for each tax treaty in the sample.[3]

5. For each tax treaty included in the sample, the following basic information is recorded:[4]

   (a) Contracting parties

   (b) Date of Signature

   (c) Current Status: Not In Force/In Force/Terminated

   (d) Date of Entry into Force*

   (e) Date of Effective*

   (f) Date of Termination*

For the purpose of this project, as the data on statutory withholding tax rates only covers the period of 1980-2020, only tax treaties that meet the following criteria will be included. First, the treaty is signed among the jurisdictions that are in the sample of the statutory withholding tax rates data. Second, the treaty is not terminated before 1980.

A.1.2 Tax treaty applicability

To determine whether a certain tax treaty (protocol) is applicable for a given contracting state, I calculate the first and last years that the treaty is effective, separately for the following cases:

1. Treaties without amendments

   (a) Start year of applicability: The first year that the treaty is applicable for the jurisdiction is the *later year*[5] of (i) Date of entry into force[6]; and (ii) Date of effective for the country[7].

3. For the purpose of this paper, "amending protocol" includes protocols and exchange of letters that requires mutual agreement, but exclude other unilateral documents such as technical explanation reports.

4. * indicates fields that depends on the status of the treaty. Information on the date of ratification is found for some treaties, but are not generally available and not recorded.

5. This is due to the fact that some treaties might apply retrospectively and become effective before it enters into force, in such cases the year of entry into force is used.

6. This is usually the date of the exchange of instruments of ratification.

7. Some treaties become effective in different years for two parties, therefore the beginning year of applicability is not always the same for the two contracting countries. Also, some treaties are effective in different stages for different articles, and only the articles pertaining withholding tax rates are considered for the purpose of this paper.

(b) End year of applicability: If the treaty is terminated, the last year that the treaty is applicable for the jurisdiction is the year *before* the date of termination, as most treaties are formally terminated on the first day of the calendar year.[8]

2. Treaties with amendments

   (a) Original treaty:

      i. Start year of applicability: Same as in paragraph 1a above.

      ii. End year of applicability: The year *before* the next amending protocol is effective.[9]

   (b) Amended treaty:

      i. Start year of applicability: Determined in the same way as in paragraph 1a above for the corresponding amending protocol.

      ii. End year of applicability: Depending on whether the amending protocol is the latest one for the original treaty

         - Not latest protocol: Determined in the same way as in paragraph 2(a)ii above for the corresponding amending protocol.
         - Latest protocol: Same as in paragraph 1b if the treaty is terminated.

Special cases: Legacy treaties Determining the applicability of tax treaties can be challenging, especially when dealing with "legacy treaties". Such treaties mainly fall into two categories:

1. Treaties signed by predecessors (e.g., the Soviet Union) and inherited by their successors (former Soviet states).

2. Treaties signed by former colonizers (e.g., the United Kingdom) and extended to former colonies after independence.

8. In rare cases, the exact year of termination is unavailable. In such cases, the year of termination is imputed by (a) the year before a new treaty between the two parties becomes effective, or (b) the first year that the treaty cease to be mentioned in tax summary reports by accounting firms.

9. For example, the 1989 India - Japan BTT was amended by a protocol signed in 2006 and effective the same year. In this case, the end year of applicability for the original treaty is 2005.

While most such "legacy treaties" contain clear statements from the contracting states in terms of its applicability, some do not, especially for the 19 tax treaties signed by the former Soviet Union. Thus, the applicability of these treaties after the collapse of the Soviet Union is determined based on an extensive search of the positions taken by each former Soviet state and contracting state.

A.1.3 Treaty withholding tax rates

The last step is to collect data on the the maximum withholding tax rates as specified in each tax treaty for each contracting state and for each type of transaction (dividends, interest, and royalties).[10] For this purpose, I implement the following procedure:

First, I collect data on the treaty withholding tax rates from the following two, both limited, database:

1. Tax Treaties Explorer: Includes information for tax treaties and amendments involve at least one developing country.[11]

2. IBFD Treaty Withholding Rates Table: Record withholding tax rates for tax treaties (or latest amendments) that are effective as of 2022.[12]

These two data sources provide valuable starting point for data on treaty withholding tax rates, but both are limited and only include a subset of all the treaties and amendments as identified in Section A.1.1. The Tax Treaties Explorer does not contain information on tax treaties signed between developed countries, and the IBFD data lacks treaty withholding tax rates for 1) terminated tax treaties; and 2) original treaties amended by protocols. Together, the two data sources contain information for about 60% of the tax treaties in the sample.

Second, for treaties are not included, I manually collect the treaty withholding tax rates in the following steps:

10. Some treaties contains "asymmetrical" withholding tax rates: the maximum rate is different for the two contracting states. Therefore, the data is collected on the host country-treaty level.

11. Specifically, it includes all treaties signed by 118 countries comprising: those that are or were until recently low and lower-middle income countries, all countries in Africa, and all members of the Intergovernmental Group of 24. See https://www.treaties.tax/en/faq/

12. Data downloaded from the IBFD in 2022 which contains information effective as of 01 Jan 2022 for most jurisdictions.

1. If the treaty text is available, the treaty withholding tax rate is recorded directly from the corresponding (amended) articles.[13]

2. If the treaty text is missing, I refer to the tax summary reports for the years that the tax treaty (or the amendment) is applicable.

3. In rare cases, a treaty has multiple amendments and the text for a particular amendment is missing. In these cases, the treaty withholding rate for the missing amendment is assumed to be the same as that specified in the previous or original treaty and the subsequent protocol, but only if these rates are identical.

Table A.1: Percentage of Data Sources for Treaty Withholding Tax Rates

Source	**Percentage**
Original Treaty Documents	33.82%
Tax Treaties Explorer & IBFD WHT Table	21.71%
Tax Treaties Explorer	21.61%
IBFD WHT Table	16.21%
Other Sources	3.76%
Not Found	2.89%

Note: "IBFD WHT Table" refers to the IBFD Treaty Withholding Rates Table. "Other Sources" including tax summary reports by accounting firms, imputation from amending protocols, etc.

For each type of the transaction, wherever applicable, I record all the treaty rates separately for each of the different sub-type, following the categories specified in the Tax Treaties Explorer. Specifically:

- Dividends:

    1. Base rate for portfolio dividends (no minimum capital or share requirement)

13. Whenever possible, I use the English version of the treaty text for data collection. In cases where the treaty is only available in other languages, the text is translated into English using Google Translate or DeepL. If the non-English treaty document is scanned and/or the language is not supported, it is considered that the treaty text is missing. In rare cases, the English version can be found on online tax information platforms (Orbitax) and is used to record the treaty rate.

2. Rate for qualifying dividends (with minimum capital or share requirement)

- Interest

  1. Base rate for interest payments
  2. Special rate for interest payments involving financial institutions

- Royalties

  1. Base rate for royalty payments
  2. Special rate for copyright payments
  3. Special rate for payment for the use of equipment

A.2 Collection of Statutory Withholding Tax Rates Data

A.2.1 Data source

Consistent historical data on the statutory withholding tax rates is generally not available. For example, Tax Treaties Explorer does not record such information, and the IBFD Treaty Withholding Rates Table only contain the most recent statutory withholding tax rate. For this reason, the data is collected completely manual using the tax summary reports published by leading accounting firms for the period of 1980 - 2020.

Specifically, I combine data from the following two sources, each covers a different period, to assemble the dataset:

1. 1980 - 2004: *Worldwide Corporate Tax Summary* (WCTS) by PricewaterhouseCoopers (PwC)[14]
2. 2004 - 2020: *Worldwide Corporate Tax Guide* (WCTG) by Ernst & Young

These reports, published on annual basis, are prepared by the local offices of PWC and EY, and contain information on the corporate tax codes. Recent studies requiring data on

14. PwC is previously known as Price Waterhouse before merging with Coopers & Lybrand in 1998. The report is previously published under the title "Corporate Taxes: A Worldwide Summary", but the content and format are the same.

statutory withholding tax rates often refers to a subset of these data sources for data collection.[15] While the EY WCTG is available PDF forms online, the PwC WCTS is only found in physical form.

A.2.2 Sample coverage

The dataset includes up to 173 jurisdictions that have been included in the EY WCTG for at least once. A few jurisdictions that are only included in the PwC WCTS, but not in the EY WCTG are excluded.

The coverage of jurisdictions increases overtime, possibly as PwC has significantly expanded its global operation. For 1980, only 74 jurisdictions is included in PwC WCTS, while the number increases to 96 in 1990. The EY WCTG has a generally large sample that covers around 150 - 160 jurisdictions, partly because it is used for the more recent period. Figure A.1 below displays the missingness pattern of the dataset.

Figure A.1: Sample Coverage of Statutory Withholding Tax Rates

Note: This figure displays the extent of coverage of the original dataset on statutory withholding tax rates for the period of 1980 to 2020. Rows represent each jurisdiction in the sample, and columns represent the years. Blue cells indicate the availability of data, while white cells indicate missing data.

15. For example, Hong (2018), 't Riet and Lejour (2018), and Petkova et al. (2020).

A.2.3 Data collection

For each jurisdiction in the sample, I collect data on the statutory withholding tax rate for dividends, interest, and royalties from the corresponding chapter. As the structure of the EY WCTG and the PwC WCTS are slightly different, I explain the data collection process separately below:

For PwC WCTS (1980 - 2004), data is collected from the "Withholding taxes" section in the chapter for each jurisdiction. While the section often contains different withholding tax rates, for the purpose of this paper, only the rates applicable to non-resident corporations are collected. For example, Figure A.2 shows the withholding tax rates for Malaysia in 1993, as recorded in the WCTS. The statutory withholding tax rates that are included in the dataset are: Dividends - 0; Interest - 0 or 20; Royalties - 15.

Figure A.2: Example – PwC WCTS 1993 – Malaysia

Recipient	Dividends (1) %	Interest (2) %	Royalties and certain rentals (3) %
Resident corporations	Nil	Nil	Nil
Resident individuals	Nil	Nil or 5	Nil
Nonresident corporations and individuals:			
Nontreaty	Nil	Nil or 20	15

For EY WCTG (2004 - 2020), information on the statutory withholding tax rates are often available in two sections: "At a glance" and "Treaty withholding tax rates".[16] Whenever available, I record the information from both sections for comparison. For data in the "Treaty withholding tax rates" section, I collect the rates that is applicable to non-treaty countries.[17] For example, Figure A.3 shows the two sections for Myanmar in 2014, as recorded in the WCTG. The difficulty in collecting data from the WCTG lies in the fact that, unlike the PwC WCTS, it generally does not differentiate withholding rates that is only applicable to

16. While the "At a glance" section is available for each jurisdiction chapter in the WCTG, not every jurisdiction chapter contains the "Treaty withholding tax rates" section.

17. Note that the treaty withholding tax rates recorded in this section often reports the lower of the treaty rate and the statutory rate, which is not the actual treaty rate as specified in the tax treaties. For example, see the right panel of Figure A.3.

residents or individuals, especially for jurisdictions that only have the "At a glance" section. Therefore, I also record all the footnotes for the withholding rates, and determine the actual rate that is applicable to non-resident corporations.

Figure A.3: Example – EY WCTG 2014 – Myanmar

A. At a glance

Corporate Income Tax Rate (%)	25
Capital Gains Tax Rate (%)	10/40 (a)
Branch Tax Rate (%)	35
Withholding Tax (%)	
Dividends	0
Interest	15 (b)(c)
Royalties from Patents, Know-how, etc.	20 (b)(d)

(a) Section: At a glance

F. Treaty withholding tax rates

The rates in the following table reflect the lower of the treaty rate and the rate under domestic tax law.

	Dividends %	Interest %	Royalties %
India	0	15 (a)(b)	20 (f)
Korea (South)	0	15 (a)(b)	20 (g)(h)
Laos	0	15 (a)(b)	20 (f)
Malaysia	0	15 (a)(b)	20 (f)
Singapore	0	15 (a)(c)	20 (g)(h)
Thailand	0	15 (a)(b)	20 (h)(i)(j)
United Kingdom	0	15 (d)	20 (e)
Vietnam	0	15 (a)(b)	20 (f)
Non-treaty countries	0	15	20

(b) Section: Treaty withholding tax rates

A.2.4 Imputation and alteration, and cross-check

For certain country-year, the withholding rate is missing either because the jurisdiction is not covered by the summary report for that year.[18] In these cases, the statutory withholding tax rates are imputed when *both* following two conditions are met:

1. The withholding tax rate for the same jurisdiction is available for at least one year before and after the missing year.

2. The withholding tax rates immediately before and after the missing year are the same.

Table A.2 below illustrate the process with the example of the withholding tax rates on royalties of Mexico. The rate is missing for both 1998 and 2000. For the year of 2000, the missing rate is imputed because the rate in 1999 and 2001 are the same. In contrast, the rate for 1998 is not imputed because the rate has changed from 1997 to 1999.[19]

18. The PwC WCTS is missing for the years of 1981, 1986, 1998, and 2000 as the hard copy is not available.
19. In rare cases, the footnote of the withholding tax rates mentions the reason and year of the rate change, and the missing rates, if any, would be imputed based on this additional information.

Table A.2: Withholding Tax Rate on Royalties in Mexico

Jurisdiction	Year	Rate	Missing	Imputed
Mexico	1997	15 or 35		
Mexico	1998		Yes	No
Mexico	1999	15 or 40		
Mexico	2000	15 or 40	Yes	Yes
Mexico	2001	15 or 40		

Moreover, especially in the case of the EY WCTG (2004 - 2020), certain special rates are removed if they only applies to a pre-specified group of recipients. In addition to the cases that a certain tax rate is only applicable to individuals and/or residents, other common examples involve the EU directives on withholding tax rates. For example, the withholding tax rate on dividends of the Czech Republic in 2010, as recorded by the EY WCTG, is "0% or 15%". However, the footnote to the rate further explains that the 0% rate is only applicable under the principles of the EU Parent-Subsidiary Directive, and the "15%" rate is applicable in general cases. Therefore, the corresponding rate recorded in the dataset is just "15%". EU directives, as well as other multilateral or regional arrangements, can taken into consideration separately, as explained in Appendix A.4.

Finally, whenever possible, the statutory withholding tax rate is cross-checked with multiple sources. For example, both the EY WCTG and PwC WCTS are available for the year of 2004, and the IBFD Treaty Withholding Tables includes information on the most recent tax rate. The information from these sources are used to compare and ensure the accuracy of the recorded tax rates in the dataset.

A.3 Operationalization

In this section, I further explains the steps and empirical decisions made in order to measure the parameters of interest specified in Section 3.

A.3.1 Special rates in tax treaties

Some tax treaties include special withholding tax rates and need to be adjusted before subsequent calculation. There are mainly two different types:

1. Treaty rates based on statutory rates: In cases where some BTTs do not specify the maximum withholding tax rates but instead depend on the statutory rates of the contracting states,[20] the corresponding treaty rates are calculated based on the rules specified in the tax treaty and using the statutory withholding tax rates for the given country-year.[21]

2. Special exemption or reduced rates: Many tax treaties provides exemptions or reduced tax treaties for certain types of payments that typically apply only under very limited conditions. Most often, this happens in the case of interest withholding tax rates, where interest payments made to governments or public authority, central banks, and export credit institutions are exempted. Such kinds of special rates are excluded from the subsequent calculation because they are not applicable to general foreign investors, which is the focus of this paper.

A.3.2 Summarizing multiple rates

Given that the statutory and treaty withholding tax rates for a certain type of payment often contains multiple rates, depending on the feature of the payment/payer/recipient, we need a summary measure to calculate and compare the rate across time and jurisdictions. To do so, I undertake the following steps.

First, I document all withholding tax rates for a given type of payment. If there are instances where multiple rates exist, which is rare, I only retain the unique rates and remove the duplicates. This approach is based on the recognition that tax brackets for the same

20. In most cases, this happens in the case that no maximum withholding tax rates are specified, thus the statutory rates applied. In rare cases, the discounted treaty rate depends on the statutory rate. For example, the 1966 Denmark - Philippines tax agreement states that, under certain conditions, "The Philippine withholding tax on dividends paid to a resident or corporation of Denmark by a corporation of the Philippines may be reduced by 1/3 of the regular tax".

21. In the case mentioned in Footnote 20, the treaty withholding rate on dividends for Philippines in a given year would be calculated as 2/3 of the statutory rate for Philippines in that year.

payment type frequently vary across countries, and it is challenging to reconcile tax brackets in statutory tax rates with those specified in tax treaties.

Second, for all the unique withholding tax rates, I took the median as the summary measure for a given country-year-payment (statutory rates) or host-partner-year-payment level unit. This method is consistent with the approach taken in Arel-Bundock (2017). Since the vast majority of withholding tax rates consist of only one or two unique rates, the decision to use median tax brackets is unlikely to significantly affect the results.[22]

A.4 Other Factors Affecting the Direct Withholding Tax Rate

In addition to the statutory and treaty withholding tax rates, several other factors might affect the calculation of the direct withholding tax rate w_{ij}, which is then used to calculate the risk of tax treaty shopping.

A.4.1 Multilateral tax treaties

The international tax regime primarily consists of bilateral tax agreements, with only a few multilateral tax agreements, mostly regional, in place. While it is beyond the scope of this paper to analyze the factors influencing entry into multilateral tax treaties, their corresponding treaty withholding tax rates must be taken into account.[23]

In total, there are eleven multilateral tax treaties identified from the IBFD and the Tax Treaties Explorer. Of these, six are included in this study as they are effective for at least one year during the sample period (1980-2020) and have specified maximum withholding tax rates for at least one payment type.[24] The included treaties are as follows:

1. African and Malagasy Common Organisation (OCAM)

2. Economic Community of West African States (ECOWAS)

22. For statutory withholding tax rates, 84.7% consist of only one rate, and 11.9% have two unique rates. For treaty withholding tax rates, the corresponding figures are 90% and 9.7%.

23. For a discussion on multilateral tax treaties, see Nakayama (2021).

24. The following multilateral tax treaties are excluded: Pacific Alliance (not in force); East African Community (not in force); Arab Economic Union Council (no limit on withholding tax); Arab Maghreb Union (no limit on withholding tax); Andean Community (no limit on withholding tax).

3. Central African Economic and Monetary Community (CEMAC)

4. West African Economic and Monetary Union (WAEMU)

5. Caribbean Community (CARICOM)

6. Nordic Convention[25]

Whenever applicable, the treaty withholding tax rates under the aforementioned multilateral agreements are included in the calculation of the effective direct withholding tax rate and the cheapest indirect rate. However, the multilateral tax treaties are not taken into consideration in calculating the outcome variables.

A.4.2 EU Directives

The European Union (EU) has passed legislation in the form of European Council Directives to provide exemptions for withholding tax rates on payments made between EU member states. The following two directives are considered:

1. Parent-Subsidiary Directive (90/435/EEC; 2011/96/EU)

2. Interest and Royalties Directive (2003/49/EC)

The exempted withholding tax rates provided in the EC directives are included in the calculation of direct withholding tax rates, based on the year when they are applicable for each EU member state. The special transition periods under the Interest and Royalties Directive for some member states, as well as the Swiss-EU agreement to include Switzerland in these directives, are also taken into consideration.

A.4.3 Most favored nation clauses

The third factor affects the calculation of the direct withholding tax rates is the inclusion of "most-favoured national clauses" (MFN) in bilateral tax agreements, which operate similar to those in trade agreements. These provisions specify that when a contracting state signs a

25. Including different versions signed in 1983, 1987, 1989, and 1996, and corresponding amending protocols.

new tax treaty with a lower withholding tax rate, the same lower rate must also be applicable to the other party of the original treaty.[26]

It can be challenging to find information on the inclusion and activation of MFN clauses, and they are sometimes not even included in the original tax agreements. To identify these clauses, I rely on the information contained in the footnotes of the IBFD Treaty Withholding Rates Table. As mentioned above in Appendix A.1, one caveat is that the IBFD tables does not contain information on terminated tax treaties.

To gather information on the activation of MFN clauses, I collect data from the IBFD tables, including the type of payment, the activation treaty[27], and the original and updated treaty withholding tax rates. I consider the effective year of the activation treaty as the start year of applicability for the MFN-reduced rate.

For example, in the 1996 Ecuador - Belgium tax treaty, a MFN clause on dividend withholding tax rates is included. This clause is activated by the 2013 China - Ecuador tax treaty, which provides lower treaty withholding tax rates for dividend payments (5%) than the ones provided in the 1996 treaty (15%). As the China - Ecuador BTT is effective since 2015, the treaty withholding tax rate on dividends between Ecuador and Belgium is set to be 5% starting from 2015.

In total, I recorded 30 incidents of MFN clause activation for dividends, 82 for interest, and 174 for royalties.

26. For a discussion of MFN clauses, see, e.g., Schuch (1996).

27. An "activation treaty" is a new treaty with a lower withholding tax rate signed by one of the contracting parties of the original tax treaty that includes the MFN clause.

B Regression Results

This section reports the complete regression tables for Table 1 and Table 2 in Section 6.

B.1 Complete Results for Table 1

Table B.1: Full Results of Table 1, Column (1)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.673***		
	(0.031)		
Risk of Treaty Shopping: Interest (t-1)		0.819***	
		(0.031)	
Risk of Treaty Shopping: Royalties (t-1)			0.963***
			(0.035)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	711115	711115	711115
BTTs covered	2216	2216	2216

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.2: Full Results of Table 1, Column (2)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.381***		
	(0.038)		
Risk of Treaty Shopping: Interest (t-1)		0.469***	
		(0.039)	
Risk of Treaty Shopping: Royalties (t-1)			0.536***
			(0.043)
Host GDP pc (log)	0.333***	0.352***	0.352***
	(0.015)	(0.015)	(0.015)
Host GDP growth (log)	0.010**	0.008**	0.010**
	(0.004)	(0.004)	(0.004)
Host Population (log)	0.281***	0.234***	0.241***
	(0.012)	(0.013)	(0.013)
Host Trade Openness	0.004***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)
Host FDI Inflow (% GDP)	0.003*	0.004**	0.002
	(0.001)	(0.001)	(0.001)
Host Corporate Tax Rate	-0.015***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)
Host Polity	-0.018***	-0.017***	-0.018***
	(0.003)	(0.003)	(0.003)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	488566	488566	488566
BTTs covered	1800	1800	1800

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.3: Full Results of Table 1, Column (3)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.488***		
	(0.044)		
Risk of Treaty Shopping: Interest (t-1)		0.582***	
		(0.046)	
Risk of Treaty Shopping: Royalties (t-1)			0.523***
			(0.050)
Host GDP pc (log)	0.433***	0.453***	0.458***
	(0.017)	(0.017)	(0.017)
Host GDP growth (log)	0.015***	0.012***	0.015***
	(0.004)	(0.004)	(0.004)
Host Population (log)	0.371***	0.312***	0.332***
	(0.015)	(0.016)	(0.015)
Host Trade Openness	0.005***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)
Host FDI Inflow (% GDP)	0.004**	0.005***	0.003*
	(0.002)	(0.002)	(0.001)
Host Corporate Tax Rate	-0.022***	-0.020***	-0.021***
	(0.002)	(0.002)	(0.002)
Host Polity	-0.017***	-0.016***	-0.016***
	(0.003)	(0.003)	(0.003)
Home GDP pc (log)	0.462***	0.460***	0.451***
	(0.017)	(0.017)	(0.017)
Home GDP growth (log)	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)
Home Population (log)	0.382***	0.375***	0.372***
	(0.015)	(0.015)	(0.015)
Home Trade Openness	0.005***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)
Home FDI Inflow (% GDP)	0.003**	0.003**	0.003**
	(0.002)	(0.002)	(0.002)
Home Corporate Tax Rate	-0.018***	-0.018***	-0.018***
	(0.002)	(0.002)	(0.002)
Home Polity	-0.004	-0.005	-0.005
	(0.003)	(0.003)	(0.003)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	267153	267153	267153
BTTs covered	1285	1285	1285

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.4: Full Results of Table 1, Column (4)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.147***		
	(0.052)		
Risk of Treaty Shopping: Interest (t-1)		0.342***	
		(0.051)	
Risk of Treaty Shopping: Royalties (t-1)			0.407***
			(0.057)
Host GDP pc (log)	0.042	0.062	0.061
	(0.032)	(0.032)	(0.032)
Host GDP growth (log)	0.013***	0.012***	0.014***
	(0.004)	(0.004)	(0.004)
Host Population (log)	0.169***	0.140***	0.147***
	(0.027)	(0.028)	(0.028)
Host Trade Openness	0.003***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)
Host FDI Inflow (% GDP)	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)
Host Corporate Tax Rate	-0.014***	-0.014***	-0.014***
	(0.003)	(0.003)	(0.003)
Host Polity	-0.014***	-0.016***	-0.015***
	(0.005)	(0.005)	(0.005)
Home GDP pc (log)	0.060	0.073*	0.067
	(0.031)	(0.031)	(0.031)
Home GDP growth (log)	0.013***	0.013***	0.013***
	(0.004)	(0.004)	(0.004)
Home Population (log)	0.179***	0.180***	0.178***
	(0.027)	(0.027)	(0.027)
Home Trade Openness	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Home FDI Inflow (% GDP)	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
Home Corporate Tax Rate	-0.013***	-0.013***	-0.012***
	(0.003)	(0.003)	(0.003)
Home Polity	-0.010**	-0.010*	-0.009*
	(0.005)	(0.005)	(0.005)
Distance (log)	-0.355***	-0.373***	-0.382***
	(0.042)	(0.042)	(0.042)
Common Language	0.275**	0.260**	0.271**
	(0.079)	(0.079)	(0.079)
Contiguous	-0.854***	-0.821***	-0.829***
	(0.142)	(0.142)	(0.142)
Colonial Link	0.093	0.102	0.090
	(0.130)	(0.129)	(0.129)
Bilateral Trade (% GDP)	0.172***	0.172***	0.177***
	(0.017)	(0.017)	(0.017)
PTA	0.027	0.024	0.017
	(0.051)	(0.051)	(0.051)
BIT	0.848***	0.849***	0.855***
	(0.047)	(0.047)	(0.047)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	158684	158684	158684
BTTs covered	1119	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.5: Full Results of Table 1, Column (5)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.149***		
	(0.052)		
Risk of Treaty Shopping: Interest (t-1)		0.352***	
		(0.051)	
Risk of Treaty Shopping: Royalties (t-1)			0.420***
			(0.057)
Host GDP pc (log)	0.040	0.057	0.057
	(0.035)	(0.035)	(0.035)
Host GDP growth (log)	0.013***	0.012***	0.014***
	(0.004)	(0.004)	(0.004)
Host Population (log)	0.171***	0.141***	0.149***
	(0.030)	(0.030)	(0.030)
Host Trade Openness	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Host FDI Inflow (% GDP)	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)
Host Corporate Tax Rate	-0.014***	-0.014***	-0.014***
	(0.003)	(0.003)	(0.003)
Host Polity	-0.014***	-0.016***	-0.015***
	(0.005)	(0.005)	(0.005)
Home GDP pc (log)	0.042	0.047	0.039
	(0.034)	(0.034)	(0.034)
Home GDP growth (log)	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)
Home Population (log)	0.164***	0.160***	0.155***
	(0.030)	(0.030)	(0.030)
Home Trade Openness	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Home FDI Inflow (% GDP)	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
Home Corporate Tax Rate	-0.013***	-0.012***	-0.012***
	(0.003)	(0.003)	(0.003)
Home Polity	-0.010**	-0.010**	-0.010*
	(0.005)	(0.005)	(0.005)
Distance (log)	-0.355***	-0.375***	-0.384***
	(0.042)	(0.042)	(0.042)
Common Language	0.281**	0.269**	0.281**
	(0.079)	(0.079)	(0.079)
Contiguous	-0.864***	-0.835***	-0.843***
	(0.142)	(0.142)	(0.142)
Colonial Link	0.087	0.093	0.081
	(0.130)	(0.130)	(0.129)
Bilateral Trade (% GDP)	0.171***	0.171***	0.176***
	(0.017)	(0.017)	(0.017)
PTA	0.024	0.020	0.012
	(0.051)	(0.051)	(0.051)
BIT	0.843***	0.841***	0.846***
	(0.047)	(0.047)	(0.047)
Host Cumulative BTT	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Home Cumulative BTT	0.002	0.002	0.002*
	(0.001)	(0.001)	(0.001)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	158684	158684	158684
BTTs covered	1119	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

B.2 Complete Results for Table 2

Table B.6: Full Results of Table 2, Column (1)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	9.560***		
	(1.494)		
Risk of Treaty Shopping: Interest (t-1)		6.617***	
		(1.307)	
Risk of Treaty Shopping: Royalties (t-1)			4.593***
			(1.010)
Host FE	✓	✓	✓
Home FE	✓	✓	✓
Year FE	✓	✓	✓
Observations	4,078	4,051	4,075
Adjusted R^2	0.738	0.736	0.754

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.7: Full Results of Table 2, Column (2)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	8.292***		
	(1.293)		
Risk of Treaty Shopping: Interest (t-1)		6.388***	
		(1.109)	
Risk of Treaty Shopping: Royalties (t-1)			3.943***
			(1.018)
Host GDP pc (log)	−5.476***	−5.643***	−4.923***
	(1.236)	(1.968)	(1.413)
Host GDP growth (log)	0.043	0.046	−0.004
	(0.046)	(0.037)	(0.026)
Host Population (log)	−5.422**	−7.443*	−7.550*
	(2.577)	(4.031)	(4.140)
Host Trade Openness	−0.013	−0.004	−0.011
	(0.014)	(0.015)	(0.017)
Host FDI Inflow (% GDP)	−0.071***	−0.061***	−0.001
	(0.022)	(0.019)	(0.009)
Host Corporate Tax Rate	−0.057	0.100**	0.082
	(0.049)	(0.048)	(0.060)
Host Polity	0.046	0.070	0.165
	(0.140)	(0.100)	(0.143)
Host FE	✓	✓	✓
Home FE	✓	✓	✓
Year FE	✓	✓	✓
Observations	3,305	3,276	3,300
Adjusted R^2	0.774	0.762	0.773

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.8: Full Results of Table 2, Column (3)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	7.749***		
	(1.348)		
Risk of Treaty Shopping: Interest (t-1)		5.923***	
		(1.068)	
Risk of Treaty Shopping: Royalties (t-1)			3.619***
			(1.085)
Host GDP pc (log)	−4.965***	−5.805***	−4.862***
	(1.107)	(1.735)	(1.456)
Host GDP growth (log)	0.034	0.019	−0.013
	(0.052)	(0.033)	(0.031)
Host Population (log)	−3.307*	−7.360**	−7.252*
	(1.972)	(3.744)	(3.830)
Host Trade Openness	−0.010	−0.005	−0.014
	(0.014)	(0.013)	(0.015)
Host FDI Inflow (% GDP)	−0.065***	−0.057***	−0.007
	(0.018)	(0.021)	(0.010)
Host Corporate Tax Rate	−0.081*	0.118***	0.064
	(0.048)	(0.045)	(0.052)
Host Polity	0.087	0.042	0.186
	(0.104)	(0.104)	(0.171)
Home GDP pc (log)	−0.573	−0.944	−0.178
	(0.893)	(0.688)	(0.647)
Home GDP growth (log)	0.011	−0.036	−0.020
	(0.024)	(0.022)	(0.024)
Home Population (log)	0.236	−3.685***	−0.961
	(1.209)	(1.309)	(1.146)
Home Trade Openness	0.004	0.002	−0.005
	(0.006)	(0.006)	(0.007)
Home FDI Inflow (% GDP)	0.011*	0.023***	−0.004
	(0.006)	(0.006)	(0.009)
Home Corporate Tax Rate	−0.015	0.011	0.012
	(0.019)	(0.020)	(0.016)
Home Polity	−0.021	0.012	0.001
	(0.072)	(0.066)	(0.063)
Host FE	✓	✓	✓
Home FE	✓	✓	✓
Year FE	✓	✓	✓
Observations	2,483	2,455	2,477
Adjusted R^2	0.792	0.781	0.782

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.9: Full Results of Table 2, Column (4)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	7.795***		
	(1.453)		
Risk of Treaty Shopping: Interest (t-1)		5.736***	
		(1.068)	
Risk of Treaty Shopping: Royalties (t-1)			3.857***
			(1.120)
Host GDP pc (log)	−4.403***	−5.769***	−4.992***
	(1.151)	(1.840)	(1.485)
Host GDP growth (log)	0.008	0.018	−0.006
	(0.060)	(0.037)	(0.036)
Host Population (log)	−2.804	−8.591**	−8.194**
	(2.113)	(3.958)	(4.014)
Host Trade Openness	−0.010	−0.001	−0.012
	(0.016)	(0.014)	(0.017)
Host FDI Inflow (% GDP)	−0.069***	−0.056***	−0.001
	(0.018)	(0.021)	(0.010)
Host Corporate Tax Rate	−0.091	0.120**	0.072
	(0.057)	(0.051)	(0.060)
Host Polity	0.098	0.077	0.247
	(0.120)	(0.112)	(0.185)
Home GDP pc (log)	−0.134	−0.683	−0.119
	(0.931)	(0.706)	(0.678)
Home GDP growth (log)	−0.001	−0.037	−0.007
	(0.027)	(0.024)	(0.031)
Home Population (log)	0.081	−3.665***	−0.944
	(1.386)	(1.388)	(1.274)
Home Trade Openness	0.004	0.002	−0.006
	(0.007)	(0.007)	(0.008)
Home FDI Inflow (% GDP)	0.008	0.025***	−0.002
	(0.007)	(0.006)	(0.009)
Home Corporate Tax Rate	−0.027	0.005	0.012
	(0.020)	(0.025)	(0.018)
Home Polity	−0.084	0.006	0.035
	(0.074)	(0.072)	(0.064)
Distance (log)	−0.146	−0.129	0.033
	(0.279)	(0.298)	(0.270)
Common Language	0.728	−0.342	0.096
	(0.471)	(0.564)	(0.488)
Contiguous	0.169	1.545	2.103***
	(0.652)	(0.947)	(0.754)
Colonial Link	0.646	0.128	−0.777
	(0.711)	(0.844)	(0.824)
Bilateral Trade (% GDP)	−0.114	−0.191**	−0.051
	(0.082)	(0.092)	(0.087)
PTA	−0.400	−0.193	−0.626**
	(0.373)	(0.333)	(0.312)
BIT	0.246	0.114	0.287
	(0.266)	(0.242)	(0.210)
Host FE	✓	✓	✓
Home FE	✓	✓	✓
Year FE	✓	✓	✓
Observations	2,162	2,139	2,161
Adjusted R^2	0.787	0.783	0.787

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.10: Full Results of Table 2, Column (5)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	7.765***		
	(1.472)		
Risk of Treaty Shopping: Interest (t-1)		5.708***	
		(1.058)	
Risk of Treaty Shopping: Royalties (t-1)			3.693***
			(1.074)
Host GDP pc (log)	−4.724***	−6.157***	−5.885***
	(1.164)	(1.642)	(1.474)
Host GDP growth (log)	0.005	0.015	−0.012
	(0.060)	(0.035)	(0.037)
Host Population (log)	−3.004	−8.941**	−8.869**
	(2.125)	(3.864)	(3.964)
Host Trade Openness	−0.013	−0.004	−0.018
	(0.018)	(0.014)	(0.015)
Host FDI Inflow (% GDP)	−0.067***	−0.055***	0.002
	(0.017)	(0.020)	(0.010)
Host Corporate Tax Rate	−0.084	0.127**	0.088
	(0.060)	(0.051)	(0.057)
Host Polity	0.111	0.088	0.264
	(0.117)	(0.113)	(0.183)
Home GDP pc (log)	0.480	−0.714	0.031
	(1.014)	(0.843)	(0.692)
Home GDP growth (log)	−0.00001	−0.036	−0.004
	(0.027)	(0.024)	(0.030)
Home Population (log)	0.460	−3.757***	−1.018
	(1.435)	(1.453)	(1.289)
Home Trade Openness	0.009	0.003	−0.004
	(0.007)	(0.007)	(0.008)
Home FDI Inflow (% GDP)	0.006	0.025***	−0.003
	(0.006)	(0.007)	(0.009)
Home Corporate Tax Rate	−0.038*	0.005	0.009
	(0.021)	(0.024)	(0.019)
Home Polity	−0.094	0.003	0.026
	(0.074)	(0.069)	(0.064)
Distance (log)	−0.134	−0.148	0.007
	(0.270)	(0.294)	(0.270)
Common Language	0.703	−0.337	0.104
	(0.467)	(0.561)	(0.492)
Contiguous	0.149	1.575*	2.150***
	(0.630)	(0.948)	(0.762)
Colonial Link	0.692	0.111	−0.804
	(0.709)	(0.851)	(0.863)
Bilateral Trade (% GDP)	−0.115	−0.188**	−0.045
	(0.084)	(0.093)	(0.089)
PTA	−0.408	−0.186	−0.605**
	(0.373)	(0.329)	(0.298)
BIT	0.246	0.122	0.301
	(0.269)	(0.242)	(0.206)
Host Cumulative BTT	0.017	0.029	0.061*
	(0.029)	(0.038)	(0.034)
Home Cumulative BTT	−0.042***	0.006	−0.003
	(0.015)	(0.018)	(0.016)
Host FE	✓	✓	✓
Home FE	✓	✓	✓
Year FE	✓	✓	✓
Observations	2,162	2,139	2,161
Adjusted R^2	0.789	0.784	0.789

Notes: Directed-dyad level observations for 1980 - 2020. Only includes observations for the dyad-year that a bilateral tax treaty is signed. Results from ordinary least squares regression. Robust standard errors clustered at host country level reported in parentheses. All models include host country, home country, and year fixed effects. The dependant variable is the difference between the statutory withholding tax rate and the newly-signed treaty withholding tax rate for the given type of transaction. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C Robustness Checks

This section reports the results for the various robustness checks conducted for the main result in Table 1:

In Section C.1, I use an undirected dyad sample, instead of the directed-dyad one used in the main paper. Since the key explanatory variable $\text{Risk}_{ij,t-1}$ is measured at directed-dyad level, I aggregate it in two ways. First, I use the sum of $\text{Risk}_{ij,t-1}$ and $\text{Risk}_{ji,t-1}$, and the results are reported in Table C.1. Second, I convert the sum into a factor variable and estimate the effect separately for dyads where the risk is one-way or two-way, the results are reported in Table C.2. The results are in line with the main results in the paper, and further suggest that country dyads are more likely to enter BTTs if both countries are facing the risk of treaty shopping regarding the other state.

Section C.2 reports the result where the explanatory variable is aggregated across the three payment types. Still, the aggregation is conducted in two different ways: 1) the sum of $\text{Risk}_{ij,t-1}$ of all three types; and 2) an indicator variable that equals 1 if $\text{Risk}_{ij,t-1}$ is 1 for at least one payment type.

In Section C.3, I consider the effect of the potential gain of treaty shopping by investors: the difference between the direct and cheapest indirect rate. For dyads where the cheapest indirect rate is still higher than the direct rate, the difference is floored at zero. The results in Table C.4 shows that as the difference between the direct and indirect rates increases, countries are more likely to enter BTTs.

Section C.4 considers the different types of potential conduits: tax-haven countries versus non-haven ones, using major tax haven lists complied by the Congressional Research Service (Gravelle 2009).[1] The results reported in Table C.5 shows that the impact of treaty-shopping risks on BTT formation is similar, regardless whether the potential conduit country is classified as a tax haven or not.

Lastly, Section C.5 includes the product of country-year level control variables, following the approach in Barthel and Neumayer (2012). The finding is robust to this alternative model

1. In cases where there exists multiple potential conduits, I consider whether *any* of them is listed on tax haven lists.

specification.

C.1 Undirected Dyad

Table C.1: Undirected Dyad and Risk of Treaty Shopping (Additive)

	Panel A: Dividends			
	(1)	(2)	(3)	(4)
Risk of Treaty Shopping (Added, t-1)	0.604***	0.520***	0.165***	0.177***
	(0.035)	(0.047)	(0.054)	(0.054)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050
	Panel B: Interest			
	(1)	(3)	(4)	(5)
Risk of Treaty Shopping (Added, t-1)	0.815***	0.593***	0.357***	0.369***
	(0.036)	(0.048)	(0.053)	(0.053)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050
	Panel C: Royalties			
	(1)	(3)	(4)	(5)
Risk of Treaty Shopping (Added, t-1)	0.871***	0.516***	0.429***	0.438***
	(0.038)	(0.051)	(0.058)	(0.058)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050

Notes: Undirected dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects. Complete regression tables available upon request.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.2: Undirected Dyad and Risk of Treaty Shopping (Factor)

	Panel A: Dividends			
	(1)	(2)	(3)	(4)
Risk of Treaty Shopping (One-way, t-1)	0.508***	0.344***	0.035	0.065
	(0.064)	(0.084)	(0.094)	(0.095)
Risk of Treaty Shopping (Two-way, t-1)	1.184***	0.985***	0.289**	0.317***
	(0.069)	(0.094)	(0.109)	(0.110)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050
	Panel B: Interest			
	(1)	(3)	(4)	(5)
Risk of Treaty Shopping (One-way, t-1)	0.925***	0.685***	0.539***	0.564***
	(0.074)	(0.100)	(0.110)	(0.113)
Risk of Treaty Shopping (Two-way, t-1)	1.674***	1.232***	0.806***	0.839***
	(0.077)	(0.106)	(0.119)	(0.121)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050
	Panel C: Royalties			
	(1)	(3)	(4)	(5)
Risk of Treaty Shopping (One-way, t-1)	1.052***	0.866***	1.104***	1.159***
	(0.099)	(0.144)	(0.175)	(0.179)
Risk of Treaty Shopping (Two-way, t-1)	1.855***	1.280***	1.354***	1.409***
	(0.097)	(0.145)	(0.178)	(0.181)
Host country controls		✓	✓	✓
Partner country controls		✓	✓	✓
Dyad controls			✓	✓
Cumulative BTTs				✓
Observations	259950	123663	75302	75302
BTTs covered	1792	1204	1050	1050

Notes: Undirected dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects. Complete regression tables available upon request.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.2 Combined Risk of Treaty Shopping Across Types

Table C.3: Combined Risk Across Types

	Panel A: Combined Risk - Added				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (Added, t-1)	0.388***	0.261***	0.297***	0.189***	0.194***
	(0.013)	(0.017)	(0.020)	(0.024)	(0.024)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel B: Combined Risk - Indicator				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (Indicator, t-1)	1.220***	0.858***	0.819***	0.504***	0.515***
	(0.042)	(0.055)	(0.062)	(0.073)	(0.073)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects. Complete regression tables available upon request.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.3 Potential Gain of Treaty Shopping

Table C.4: Potential Gain of Treaty Shopping and Treaty Formation

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Gain of Treaty Shopping	0.034***	0.014***	0.017***	0.004	0.004
	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Gain of Treaty Shopping	0.036***	0.017***	0.023***	0.008***	0.008***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Gain of Treaty Shopping	0.036***	0.014***	0.019***	0.011***	0.012***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects. Complete regression tables available upon request.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.4 Type of Potential Conduits: Tax Havens vs. Non-Havens

Table C.5: Treaty Shopping and BTT Formation: Type of Conduits

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping: Non-Haven (t-1)	0.619***	0.351***	0.435***	0.126**	0.128**
	(0.036)	(0.044)	(0.052)	(0.059)	(0.059)
Risk of Treaty Shopping: Haven (t-1)	0.734***	0.413***	0.544***	0.170***	0.172***
	(0.037)	(0.044)	(0.052)	(0.060)	(0.060)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping: Non-Haven (t-1)	0.737***	0.493***	0.597***	0.336***	0.346***
	(0.034)	(0.041)	(0.049)	(0.055)	(0.055)
Risk of Treaty Shopping: Haven (t-1)	1.000***	0.415***	0.552***	0.354***	0.362***
	(0.041)	(0.050)	(0.058)	(0.063)	(0.064)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping: Non-Haven (t-1)	0.956***	0.650***	0.492***	0.445***	0.457***
	(0.039)	(0.047)	(0.055)	(0.062)	(0.062)
Risk of Treaty Shopping: Haven (t-1)	0.970***	0.411***	0.558***	0.363***	0.375***
	(0.039)	(0.049)	(0.057)	(0.065)	(0.065)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.5 Use Product of Country-Level Controls

Table C.6: Use Product of Country-Level Controls

	Panel A: Dividends		
	(1)	(2)	(3)
Risk of Treaty Shopping (t-1)	0.378***	0.117**	0.122**
	(0.041)	(0.050)	(0.050)
Host-Home Controls (Product)	✓	✓	✓
Dyad controls		✓	✓
Cumulative BTTs			✓
Observations	267153	158684	158684
BTTs covered	1285	1119	1119
	Panel B: Interest		
	(1)	(2)	(3)
Risk of Treaty Shopping (t-1)	0.508***	0.315***	0.333***
	(0.043)	(0.049)	(0.050)
Host-Home Controls (Product)	✓	✓	✓
Dyad controls		✓	✓
Cumulative BTTs			✓
Observations	267153	158684	158684
BTTs covered	1285	1119	1119
	Panel C: Royalties		
	(1)	(2)	(3)
Risk of Treaty Shopping (t-1)	0.471***	0.387***	0.406***
	(0.047)	(0.056)	(0.056)
Host-Home Controls (Product)	✓	✓	✓
Dyad controls		✓	✓
Cumulative BTTs			✓
Observations	267153	158684	158684
BTTs covered	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Complete regression tables available upon request. Column (2) and Column (3) include host and home country region fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.7: Full Results of Table C.6, Column (1)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.3777***		
	(0.0409)		
Risk of Treaty Shopping: Interest (t-1)		0.5084***	
		(0.0430)	
Risk of Treaty Shopping: Royalties (t-1)			0.4712***
			(0.0473)
Product: GDP pc (log)	0.0495***	0.0503***	0.0501***
	(0.0013)	(0.0013)	(0.0013)
Product: GDP growth (log)	0.0034***	0.0032***	0.0034***
	(0.0004)	(0.0004)	(0.0004)
Product: Population (log)	0.0216***	0.0201***	0.0204***
	(0.0006)	(0.0006)	(0.0006)
Product: Trade Openness (log)	0.0001***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Product: FDI Inflow (% GDP)	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)
Product: Corporate Tax Rate	-0.0004***	-0.0004***	-0.0004***
	(0.0001)	(0.0001)	(0.0001)
Product: Polity	-0.0002	-0.0002	-0.0002
	(0.0003)	(0.0003)	(0.0003)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	267153	267153	267153
BTTs covered	1285	1285	1285

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.8: Full Results of Table C.6, Column (2)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.1169**		
	(0.0502)		
Risk of Treaty Shopping: Interest (t-1)		0.3146***	
		(0.0495)	
Risk of Treaty Shopping: Royalties (t-1)			0.3873***
			(0.0556)
Product: GDP pc (log)	0.0050	0.0068	0.0064
	(0.0028)	(0.0028)	(0.0028)
Product: GDP growth (log)	0.0041***	0.0039***	0.0041***
	(0.0005)	(0.0005)	(0.0005)
Product: Population (log)	0.0100***	0.0094***	0.0094***
	(0.0013)	(0.0013)	(0.0013)
Product: Trade Openness (log)	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Product: FDI Inflow (% GDP)	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)
Product: Corporate Tax Rate	-0.0003***	-0.0003***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)
Product: Polity	-0.0003	-0.0004	-0.0003
	(0.0004)	(0.0004)	(0.0004)
Distance (log)	-0.3533***	-0.3739***	-0.3809***
	(0.0397)	(0.0399)	(0.0400)
Common Language	0.2890**	0.2752**	0.2843**
	(0.0790)	(0.0788)	(0.0787)
Contiguous	-0.8414***	-0.8101***	-0.8155***
	(0.1427)	(0.1430)	(0.1427)
Colonial Link	0.0841	0.0964	0.0846
	(0.1307)	(0.1302)	(0.1300)
Bilateral Trade (% GDP)	0.1692***	0.1682***	0.1743***
	(0.0163)	(0.0163)	(0.0164)
PTA	0.0069	0.0019	-0.0022
	(0.0508)	(0.0507)	(0.0508)
BIT	0.8426***	0.8418***	0.8457***
	(0.0469)	(0.0469)	(0.0469)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	158684	158684	158684
BTTs covered	1119	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.9: Full Results of Table C.6, Column (3)

	(1)	(2)	(3)
Risk of Treaty Shopping: Dividends (t-1)	0.1217**		
	(0.0503)		
Risk of Treaty Shopping: Interest (t-1)		0.3326***	
		(0.0501)	
Risk of Treaty Shopping: Royalties (t-1)			0.4063***
			(0.0562)
Product: GDP pc (log)	0.0038	0.0051	0.0046
	(0.0030)	(0.0030)	(0.0030)
Product: GDP growth (log)	0.0041***	0.0040***	0.0041***
	(0.0005)	(0.0005)	(0.0005)
Product: Population (log)	0.0096***	0.0089***	0.0088***
	(0.0013)	(0.0013)	(0.0013)
Product: Trade Openness (log)	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Product: FDI Inflow (% GDP)	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)
Product: Corporate Tax Rate	-0.0003***	-0.0003***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)
Product: Polity	-0.0003	-0.0004	-0.0004
	(0.0004)	(0.0004)	(0.0004)
Distance (log)	-0.3557***	-0.3796***	-0.3870***
	(0.0397)	(0.0400)	(0.0401)
Common Language	0.2953**	0.2829**	0.2936**
	(0.0793)	(0.0790)	(0.0790)
Contiguous	-0.8536***	-0.8265***	-0.8333***
	(0.1432)	(0.1435)	(0.1432)
Colonial Link	0.0800	0.0920	0.0799
	(0.1309)	(0.1305)	(0.1303)
Bilateral Trade (% GDP)	0.1679***	0.1664***	0.1728***
	(0.0163)	(0.0163)	(0.0164)
PTA	0.0028	-0.0039	-0.0086
	(0.0509)	(0.0508)	(0.0509)
BIT	0.8376***	0.8343***	0.8371***
	(0.0471)	(0.0472)	(0.0472)
Host Cumulative BTT	0.0002	0.0003	0.0004
	(0.0010)	(0.0010)	(0.0010)
Home Cumulative BTT	0.0016	0.0024*	0.0024*
	(0.0010)	(0.0010)	(0.0010)
Host Region FE	✓	✓	✓
Home Region FE	✓	✓	✓
Observations	158684	158684	158684
BTTs covered	1119	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.6 Use V-Dem Instead of Polity Index

Table C.10: Treaty Shopping and BTT Formation: V-Dem Index

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.673***	0.400***	0.470***	0.172***	0.172***
	(0.031)	(0.038)	(0.043)	(0.050)	(0.050)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	530951	310923	183306	183306
BTTs covered	2216	1905	1457	1261	1261
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.819***	0.512***	0.636***	0.433***	0.454***
	(0.031)	(0.037)	(0.042)	(0.048)	(0.048)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	530951	310923	183306	183306
BTTs covered	2216	1905	1457	1261	1261
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.963***	0.583***	0.554***	0.463***	0.490***
	(0.035)	(0.041)	(0.046)	(0.053)	(0.053)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	530951	310923	183306	183306
BTTs covered	2216	1905	1457	1261	1261

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

D Heterogeneity

This section reports the results for the heterogeneity analysis introduced in Section 6.1.2. In Table D.1, I include the interaction term of $\text{Risk}_{ij,t-1}$ and GDP $\text{pc}_{ij,t-1}$, where the latter variable is used as a proxy to capture countries' state capacity to regulate treaty shopping through legal provisions. The coefficients of the interaction term are consistently negative and statistically significant across different model specifications and payment types, which suggest that low-income countries are more likely to enter BTTs in order to address treaty shopping due to low state capacity.

Next, in Table D.2 I replace the key explanatory variable with the (logged) number of potential conduits that could provide the cheapest indirect rate that is below the direct rate. Formally, it is defined as:

$$\text{Conduit}_{ij} = \sum_{k \neq i,j} = \mathbb{1}\{t_{ikj} = \min_{k'} t_{ik'j}\}$$

This measurement intends to capture the difficulty for the host country to regulate treaty shopping through legal or regulatory procedures, which is assumed to be positively correlated with the number of conduits. The results in Table D.2 indicates that countries are more likely to enter BTTs if there are more conduits for treaty shopping.

Table D.1: Treaty Shopping and BTT Formation: The Role of State Capacity

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.932***	3.119***	2.656***	2.266***	2.250***
	(0.212)	(0.273)	(0.324)	(0.329)	(0.329)
GDP pc (log)	0.218***	0.539***	0.594***	0.179***	0.176***
	(0.018)	(0.025)	(0.029)	(0.038)	(0.041)
Risk × GDP pc	-0.039*	-0.311***	-0.247***	-0.240***	-0.238***
	(0.023)	(0.030)	(0.036)	(0.037)	(0.037)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	648674	488566	267153	158684	158684
BTTs covered	2092	1800	1285	1119	1119
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	1.855***	3.895***	3.768***	1.722***	1.722***
	(0.221)	(0.260)	(0.313)	(0.330)	(0.335)
GDP pc (log)	0.300***	0.594***	0.687***	0.155***	0.160***
	(0.018)	(0.023)	(0.029)	(0.039)	(0.043)
Risk × GDP pc	-0.114***	-0.376***	-0.353***	-0.151***	-0.150***
	(0.024)	(0.028)	(0.034)	(0.035)	(0.036)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	648674	488566	267153	158684	158684
BTTs covered	2092	1800	1285	1119	1119
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	2.531***	4.960***	3.985***	1.650***	1.623***
	(0.248)	(0.292)	(0.346)	(0.366)	(0.368)
GDP pc (log)	0.353***	0.706***	0.737***	0.149***	0.148***
	(0.022)	(0.027)	(0.033)	(0.041)	(0.044)
Risk × GDP pc	-0.171***	-0.483***	-0.380***	-0.134***	-0.130***
	(0.026)	(0.031)	(0.037)	(0.039)	(0.039)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	648674	488566	267153	158684	158684
BTTs covered	2092	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D.2: Treaty Shopping and BTT Formation: Number of Potential Conduits

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Number of Candidate Conduits (log, t-1)	0.580***	0.228***	0.347***	0.051	0.053
	(0.025)	(0.030)	(0.035)	(0.041)	(0.041)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Number of Candidate Conduits (log, t-1)	0.531***	0.228***	0.286***	0.161***	0.166***
	(0.018)	(0.023)	(0.026)	(0.029)	(0.029)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Number of Candidate Conduits (log, t-1)	0.768***	0.395***	0.407***	0.219***	0.227***
	(0.022)	(0.029)	(0.034)	(0.037)	(0.037)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	158684
BTTs covered	2216	1800	1285	1119	1119

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D.3: Treaty Shopping and BTT Formation: The Role of Experience

	Panel A: Dividends				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.795***	0.898***	0.749***	0.594***	0.586***
	(0.046)	(0.056)	(0.066)	(0.077)	(0.076)
Host Cumulative BTT	0.023***	0.014***	0.017***	0.005***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Risk × Host Cumulative BTT	-0.014***	-0.014***	-0.010***	-0.010***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	160072
BTTs covered	2216	1800	1285	1119	1131
	Panel B: Interest				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	0.833***	0.837***	0.792***	0.530***	0.556***
	(0.047)	(0.057)	(0.067)	(0.076)	(0.075)
Host Cumulative BTT	0.019***	0.011***	0.016***	0.003	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Risk × Host Cumulative BTT	-0.009***	-0.010***	-0.008***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	160072
BTTs covered	2216	1800	1285	1119	1131
	Panel C: Royalties				
	(1)	(2)	(3)	(4)	(5)
Risk of Treaty Shopping (t-1)	1.098***	1.057***	0.817***	0.680***	0.697***
	(0.048)	(0.061)	(0.070)	(0.081)	(0.080)
Host Cumulative BTT	0.024***	0.016***	0.019***	0.004**	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Risk × Host Cumulative BTT	-0.015***	-0.015***	-0.010***	-0.006***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Host country controls		✓	✓	✓	✓
Partner country controls			✓	✓	✓
Dyad controls				✓	✓
Cumulative BTTs					✓
Observations	711115	488566	267153	158684	160072
BTTs covered	2216	1800	1285	1119	1131

Notes: Directed dyad-year level observations for 1980 - 2020. Results from Cox-Proportional Hazards Model with coefficients displayed. Efron approximation used for tied events. The event of interest is the formation of bilateral tax treaties between country dyads. Robust standard errors clustered on country dyads are reported in parantheses. All covariates, except for time-invariant ones, are lagged by one year. Column (4) and Column (5) include host and home country region fixed effects.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

E Competing Explanation

Lastly, I address a potential competing explanation: countries enter BTTs due to their spatial dependence on other focal countries and the desire to compete with these countries to attract foreign capital (Barthel and Neumayer 2012). To do so, I replicate the main results reported in Table 3 of Barthel and Neumayer (2012, 653) and introduce into their specification the key explanatory variable of this paper: $\text{Risk}_{ij,t-1}$. The sample size is smaller because the datasets used in this paper and the Barthel and Neumayer (2012) only overlaps for the 1980 - 2005 period. Also, since Barthel and Neumayer (2012) use an undirected-dyad setting, the treaty-shopping risks are added between the country dyad, similarly as in Table C.1.

The results reported in Table E.1 are qualitatively the same as in the main paper, though the coefficients for the treaty shopping measure based on interest payments are not statistically significant at conventional levels.

Table E.1: Replication of Barthel and Neumayer (2012)

Column I of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.285***	0.066	0.450***
	(0.073)	(0.073)	(0.083)
Contagion: Common Region	1.667***	1.744***	1.498***
	(0.331)	(0.332)	(0.331)
Observations	53197	53197	53197
BTTs covered	287	287	287
Column II of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.313***	0.114	0.499***
	(0.072)	(0.072)	(0.083)
Contagion: Export Market Similarity	6.936	11.141	5.172
	(7.469)	(7.464)	(7.475)
Observations	52491	52491	52491
BTTs covered	288	288	288
Column III of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.326***	0.097	0.493***
	(0.074)	(0.074)	(0.086)
Contagion: Export Product Similarity	15.414***	16.390***	16.576***
	(4.565)	(4.583)	(4.628)
Observations	50645	50645	50645
BTTs covered	269	269	269
Column IV of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.284***	0.068	0.455***
	(0.073)	(0.073)	(0.084)
Contagion: Common Region	1.727***	1.773***	1.572***
	(0.341)	(0.345)	(0.340)
Contagion: Export Market Similarity	-2.433	0.454	-3.552
	(7.388)	(7.438)	(7.436)
Observations	52434	52434	52434
BTTs covered	286	286	286
Column V of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.296***	0.062	0.450***
	(0.075)	(0.075)	(0.087)
Contagion: Common Region	1.530***	1.604***	1.370***
	(0.342)	(0.344)	(0.343)
Contagion: Export Product Similarity	14.533***	15.222***	15.663***
	(4.578)	(4.592)	(4.637)
Observations	50593	50593	50593
BTTs covered	268	268	268
Column VI of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.321***	0.102	0.493***
	(0.075)	(0.074)	(0.087)
Contagion: Export Market Similarity	3.303	7.526	2.295
	(7.602)	(7.610)	(7.608)
Contagion: Export Product Similarity	15.137***	15.883***	16.284***
	(4.594)	(4.619)	(4.652)
Observations	49896	49896	49896
BTTs covered	269	269	269
Column VII of Table 3	(1) Dividends	(2) Interest	(3) Royalties
Risk of Treaty Shopping (Added, t-1)	0.299***	0.062	0.457***
	(0.075)	(0.076)	(0.087)
Contagion: Common Region	1.629***	1.674***	1.479***
	(0.352)	(0.357)	(0.352)
Contagion: Export Market Similarity	-5.830	-2.780	-6.304
	(7.528)	(7.592)	(7.584)
Contagion: Export Product Similarity	14.462***	15.023***	15.532***
	(4.595)	(4.615)	(4.650)
Observations	49844	49844	49844
BTTs covered	267	267	267

Notes: Undirected-dyad level observations for 1980 - 2005. Results using the replication dataset of Barthel and Neumayer (2012), following the model specification they presented in Table 3 (page 653), with all covariates included. We introduce into this model our variable `Risk of Treaty Shopping`. Robust standard errors clustered on country dyads. Breslow approximation for tied events. All covariates, except for time-invariant ones, are lagged by one year. Complete regression tables available upon request.

*** $p < 0.01$, ** $p < 0.05$, * $p <$

Appendix References

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