Anchors, not Havens: Spillovers in Tax Treaty Bargaining

Kunka Petkova[a] Andrzej Stasio[a]*, Martin Zagler[a,b,]

[a]WU Vienna University of Economics and Business
[b]UPO University of Eastern Piedmont

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Abstract

This paper investigates spillovers in tax treaty bargaining. Tax treaties are often seen as a means to mitigate fierce tax competition. We challenge this view by demonstrating that past treaties with peers reduce negotiated withholding tax rates and thereby the overall tax burden. We focus on the four distinct treaty withholding tax rates on passive income - portfolio dividends, participation dividends, interest and royalties, and collect these rates for nearly 3,000 tax treaties and amending protocols signed between 1930 and 2012. Further, we test the hypothesis that treaty rates are a product of a bargaining game between the two signatory countries, and are bound by treaty rates negotiated by any of the two signatory countries with the peers of the other one. We find a positive relationship between the spatial interaction terms and the negotiated treaty rates. This relationship is most significant for the withholding tax rates on interest and royalties. We also note that the effect is strongest if OECD countries are involved, whereas existing treaties with tax havens matter little.

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*Corresponding author: andrzej.stasio@wu.ac.at

1 Introduction

The practice of countries signing double tax treaties (DTTs) is not recent. Already in 1899, Prussia and Austria-Hungary entered into the first ever double tax treaty. Although the economic consequences of DTTs remain inconclusive (Blonigen & Davies, 2004; Egger, Larch, Pfaffermayr, & Winner, 2006; Neumayer, 2007; Petkova, Stasio, & Zagler, 2018), the number of countries engaging in DTTs continues to grow. While this trend can be characterised, at most, as a steady raise in the first half of the century, the last two decades have seen a surge in the number of concluded double taxation conventions. Nevertheless, empirical literature on tax treaty formation is limited to just a few studies and leaves certain parts of the international tax treaty policy unexplored. This paper fills this void by studying spatial spillovers in tax treaty bargaining.

We build on two novel papers by Chisik and Davies (2004) and Barthel and Neumayer (2012) and suggest that bargaining over treaty rates is characterised by spatial interdependencies in the global tax treaties network. We focus on the four distinct treaty withholding tax (WHT) rates on passive income - portfolio dividends, participation dividends, interest and royalties, and collect these rates for nearly 3,000 DTTs and amending protocols signed between 1930 and 2012. In a bargaining framework, we hypothesise that treaty rates are a product of gravity and specific source and target contagion. In particular, treaty rates will be influenced by the terms of tax treaties between a source (home) country's peers and the specific target (host) country: *specific source contagion*. Similarly, treaty rates will be affected by the rates negotiated between a target (host) country's peers and the specific source (home) country: *specific target contagion*.

We indeed find a positive relationship between the spatial interaction terms and the negotiated treaty rates. This relationship is strongest for the withholding tax rates on interest and royalties. Once accounted for sample selection bias, we also find statistically significant correlations in the case of portfolio dividends. Our results suggest that tax competition goes beyond capital and corporate tax rates and extends to other tax policy instruments. In particular, countries compete with their peers through treaty withholding tax rates on passive income, in an attempt to attract mobile capital and achieve a pivotal position in the global network of tax treaties. These results remain robust to a rich set of fixed effects, including source, target, year as well as host- and home-region-year fixed effects, sample selection and alternative definitions of spatial weighting.

Further analysis reveals that while tax havens have only a very limited impact on spillovers in tax treaty bargaining, OECD countries are the driving force behind tax competition through treaty withholding tax rates. Furthermore, the OECD Model Tax Convention serves as an anchor to limit competition over treaty WHT rates. Finally, we find stronger and statistically significant relationship between the spatial interaction terms and all four types of withholding tax rates when measuring the spillover effects of only most recent treaties. This last finding suggests a dynamic dimension to tax competition.

Our paper contributes to various strands of research. First, we extend the literature

on tax treaty formation. Despite an early contribution by Chisik and Davies (2004), tax treaty bargaining remains a largely unexplored topic. In particular, little is known about tax treaty bargaining beyond a bilateral context. Simultaneously, while Ligthart et al. (2011) comprehensively review the reasons for countries to conclude tax treaties in a gravity framework, Barthel and Neumayer (2012) show that also spatial diffusion is an important factor in tax treaty formation. However, their findings are limited to the diffusion of double taxation treaties as such and do not extend to their content. Our paper fills this void by extending the tax treaty bargaining framework with including spatial dependence on treaty withholding tax rates.

Second, our findings bear some important implications for the study of spillovers in international taxation. In light of the international efforts to combat base erosion and profit shifting, past research focuses on spillover effects via treaty shopping and other profit shifting channels (IMF, 2014). In contrast, we show that spatial spillovers have the potential to impact also the conditions of tax policy instruments. Even though countries are free to set their tax rates when concluding a new tax treaty, their freedom to do so is restricted by the existing tax treaties of their peers being already in place. This implies a scope limitation with regard to setting own tax treaty rates and the possible loss of sovereignty of countries.

Lastly, we show that tax competition goes beyond corporate and capital income tax rates. Despite the fact that corporate and capital income taxes still tend to be the rule rather than exception, several authors find strong international interdependence in capital-tax policy (Hays, 2003; Basinger & Hallerberg, 2004; Franzese & Hays, 2007; Crabbé, 2013). While the absence of a race-to-the-bottom can be best explained by domestic political-economic and exogenous global contexts, international tax competition does exist. Yet, all of these studies focus exclusively on capital and corporate income taxes as a means of international tax competition. To our knowledge, this paper is the first one to show that tax competition extends beyond corporate and capital income taxes to treaty withholding tax rates.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on tax treaty formation. Section 3 discusses our sample and research methodology. We present our main results in section 4 and the different robustness tests in section 5. Section 6 concludes.

2 Tax treaty formation

Traditionally, double tax treaties have been serving as an important policy tool to promote international economic activity by preventing international double taxation. However, over the years, DTTs have come to pursue additional goals such as providing legal certainty, preventing tax discrimination in the state of investment and exchange of information for tax matters. Most recently, DTTs serve to mitigate tax avoidance practices and protect

the domestic tax base.

Against these different goals, Ligthart et al. (2011) empirically study the determinants of DTT formation for a large sample of more than 17,000 country pairs covering the 1950 - 2006 period. Using a gravity framework, they conclude that countries sign DTTs primarily to reduce international double taxation and, to a lesser extent, to provide a legal instrument for the exchange of information in tax matters. In support of this finding, Davies (2003), argues that the main role of DTCs lies in the harmonisation and the lowering of withholding tax rates on international capital income. OECD countries are encouraged to conclude a double tax convention for limiting the exercise of taxing powers by the source state. Reciprocity in flows of income and capital is expected to level out any potential loss of taxing powers between such states.

Yet, many researchers argue that double taxation can be - and more often than not is - prevented unilaterally (Rixen & Schwarz, 2009; Petkova et al., 2018). Moreover, with an asymmetric investment position, the lowering of withholding tax rates in treaties using the ordinary credit method leads to a revenue transfer from the net capital importer to the net capital exporter (Rixen & Schwarz, 2009).[1]

Chisik and Davies (2004) discuss how these distributional implications can affect withholding taxes in the framework of tax treaty bargaining. They predict that more asymmetric countries will conclude treaties with higher withholding tax rates. This theory is then tested using data on U.S. and OECD bilateral tax treaties, and the results broadly support their predictions. Rixen and Schwarz (2009) confirm this finding using data on German tax treaties and show that these conclusions hold also for the definition of permanent establishment measured as the minimum number of months necessary to qualify as a "construction permanent establishment".

The paper by Hearson (2018) replicates the work on tax treaty negotiation outcomes by Rixen and Schwarz (2009) and Barthel and Neumayer (2012), integrating fiscal and tax treaty content data, in order to add further nuance to the understanding of developing countries decision-making over tax treaty negotiations. Developing countries that depend more on corporate income taxes are more likely to sign tax treaties with wealthier countries and more likely to negotiate higher WHT rates in those treaties. What is more, policymakers in countries that depend more on corporate taxes are willing to support a policy of signing tax treaties, so long as higher WHT rates are negotiated, while ignoring other, less easily understood parts of the treaty.

To our knowledge, Barthel and Neumayer (2012) are the only authors to analyse spatial diffusion in tax treaty formation. They show that the probability of two countries entering into a DTT increases with specific source and target contagion. In other words, the likelihood of two countries signing a tax treaty raises with the source (home) country's peers having a tax treaty with a given target (host) country and, conversely, target (host) coun-

[1] Under the credit method, foreign paid withholding taxes are credited against domestic corporate tax liability. With a home country corporate tax rate higher than source country withholding tax rate, the benefits of a lower withholding tax rate are offset by a higher home country tax liability.

try's peers having a tax treaty with the specific source (home) country. These results are robust to specifying the spatial weight matrix as common region, export market similarity and export product similarity.

However, little is known about tax treaty bargaining in a global network of tax treaties. At the same time, recent studies by Van't Riet and Lejour (2018), Hong (2018) and Petkova et al. (2018) underscore the importance of considering tax treaties not merely as bilateral, but rather as part of a global network. Whereas the first two papers show that the international FDI flows can be partially explained by countries' position in the tax treaty network, the last one argues that the impact of DTTs on FDI depends on their relevance vis-á-vis the domestic law of the signatory states and all other treaties in the network.

Our paper fills this void by studying tax treaty bargaining in a global network of tax treaties. In particular, consistent with prior literature, we hypothesise that treaty withholding tax rates are a function of gravity and FDI positions of the two signatory states and - extending the spatial diffusion framework of Barthel and Neumayer (2012) - specific source and target contagion. Our null hypothesis is that there is no positive relationship between the spatial interaction term and the rates negotiated between the source and target country. A positive relationship would not only point to past tax treaty rates serving as a reference point for future treaty negotiations, but would be indicative of tax competition on treaty withholding rates.

3 Data and research methodology

To answer this question, we collect data on four distinct treaty withholding tax rates on passive income - portfolio dividends, participation dividends, interest, and royalties - from nearly 3,000 DTTs and amending protocols signed between 1930 and 2012. In particular, we assume a 100% owned subsidiary for the rate on participations dividends and collect interest rates commonly applied on inter-company loans and rates applicable to patent royalties, as to ensure comparability between observations. We collect data on treaties signed, terminated and renegotiated during our time sample. In this way, the spatial interaction term always consists of treaty rates in force.

Because treaty rates can be asymmetric, we collect data for every pair ij as well as ji, in which i is the source and j the target country. Despite not modelling our dyads as directed from the more developed country to the less developed one, as suggested by prior literature, asymmetric treaty rates imply directed dyads from source (home) to target (host) country. The following example illustrates this point: assume a tax treaty between Austria (source) and Canada (target) having Germany and the U.S as their corresponding neighbors. Here, specific source contagion captures the Canadian withholding tax rate in its tax treaty with Germany. Conversely, specific target contagion captures the U.S. withholding tax rate in its tax treaty with Austria. However, reverting the pair to Canada (source) - Austria (target) does not only mirror the spatial contagion terms but also changes the reference

country and the rate. Specific source contagion measures Austrian withholding tax rate in its relations to Germany, while specific target contagion measures the German withholding tax rate in its relations to Canada. If any of the two "peer" treaties between Canada and Germany and between Austria and the U.S. provides for asymmetric rates, the specific source and target contagion terms will not have the same magnitude.

Our economic and geography data, including GDP and GDP per capita, contiguity and the Head and Mayer measure of market similarity come all from CEPII (Head, Mayer, & Ries, 2010; Mayer, 2009). We construct our indicators for common intermediate and sub-geographical regions in accordance with the most recent UN M49 standard.

We estimate a pooled cross section across all years in our sample in the following form:

$$\begin{aligned} WHT_{ij,t} = \alpha + \beta_i X_{i,t} + \beta_j X_{j,t} + \rho_i WHT_{kj,t-n}\Omega_i \\ + \rho_j WHT_{im,t-n}\Omega_j + \gamma D_{ij,t} + \theta_i + \phi_j + \eta_t + \upsilon_{it} + \omega_{jt} + \epsilon \end{aligned} \tag{1}$$

where $WHT_{ij,t}$ is the negotiated withholding tax rate between source country i and target country j in year of treaty conclusion t - we repeat this estimation for all types of withholding tax rates, as well as for the average one among them and the minimum one; $X_{i,t-n}$ and $X_{j,t-n}$ are vectors of source, respectively target specific factors that affect their bargaining position, especially GDP and GDP per capita as well as an unweighted average of the corresponding withholding tax rates across all former treaties signed by both countries; $WHT_{kj,t-n}\Omega_i$ is the spatial interaction term between the spatial weight matrix of the source country i and a withholding tax rates matrix of target country j with all other potential source countries l, n years before treaty year t - *source lag*; by analogy, $WHT_{im,t-n}\Omega_j$ is the spatial interaction term between the spatial weight matrix of the target country j and a withholding tax rates matrix of source country i with all other potential targets m - *target lag*, n years before treaty year t; D is a vector of variables characterising the bilateral relationship between source i and target j; θ_i and ϕ_j are source, respectively target-country fixed effects; η_t is a vector of year dummies; υ_{it} and ω_{jt} are source-region-year, respectively target-region-year fixed effects; and ϵ is the error term.

We alleviate the concerns about the endogeneity of both spatial interaction terms by exploiting the time dimension of tax treaty bargaining. In particular, we lag both spatial interaction terms n years before treaty conclusion in year t - i.e. before the corresponding withholding tax rate is being observed - and assume that while past treaty rates can affect the yet to be negotiated ones, this relationship does not reverse. Hence, we can estimate our model by OLS and there is no need to resort to ML. We define two countries as spatially connected if they share the same geographical region at the intermediate level according to the UN M49 standard.[2]

Controlling for the unweighted average of the respective withholding tax rate across all former treaties signed by both the source and target country serves two purposes. First,

[2]Intermediate geographical regions are one level above geographical contiguity. Our findings hold also for spatial weight matrixes based on contiguity or sub-global level - one level above intermediate geographical regions.

it proxies for the overall tax treaty policy objectives of both countries. Second, it ensures that the spatial interactions terms capture an effect that goes beyond a simple average and are indeed driven by the spatial dimension.

4 Results

Throughout all of our main results we estimate our model defining the time lag of the spatial contagion variables with $n = 2$. We estimate our model using only control variables in Table 1. This will serve as a benchmark for the results with spatial lags. We find that the unweighted average rate of each category across all former treaties signed by source and target countries is a good predictor for the negotiated withholding tax rates on interest and royalties. The negative coefficients on the source and target GDP per capita in case of royalties suggest that wealthier countries tend to negotiate lower withholding tax rates. Lastly, we note that the lower number of observations in case of participations dividends is caused by the fact that not all treaties provide for a lower dividend withholding tax rate for significant participations.

We estimate Table 2 using the same controls as in Table 1, but replace the unweighted source and target country averages with source and target spatial lags. While the number of observations drops in half - since not all treaty-country-pairs have a spatial lag - we find spatial correlation of interest and royalties withholding tax rates, whose coefficients are both more significant and stronger in magnitude than those of the unweighted country averages. Moreover, we observe now that the negotiated withholding tax rates increase with GDP, but decrease with GDP per capita. Many of the world biggest economies remain net capital-importers and have therefore an incentive to levy higher source withholding taxes. However, as the countries get richer and shift towards a net capital-exporting position, they have a preferences for a more limited taxation at source.

In Table 3, we present the full model including all of our control variables and both the unweighted country averages, as well as spatial lags. The results are consistent with those in the previous two tables. While the unweighted country average remains a fairly good predictor of negotiated withholding tax rates on royalties, the spatial dependence in interest and royalty WHT rates is much stronger and goes beyond a simple average across all former treaties. This is even more evident in the case of treaty rates on interest, in which only the source and target spatial lags remain significant. Our findings suggest that past treaty rates function as an anchor for future WHT rates and, through this channel, drive spatial tax competition on treaty withholding taxes on passive income. This last finding bears some important policy implications. Whilst countries remain free to set their tax rates when concluding a new tax treaty, their freedom to do so is effectively restricted by the existing tax treaties of their peers being already in place. Thus, countries loose some of their sovereignty with regard to own tax treaty policy. Moreover, this is the first indication that international tax competition extends beyond capital and corporate income

taxes to treaty withholding taxes as an instrument of tax policy. We explore the different patterns of spatial dependence in Tables 4 to 15 and perform a number of robustness tests in Tables 15 to 22.

Further, we continue our analysis addressing the role of OECD countries and OECD model convention in spatial dependance. We extend our main model in Table 4 Columns (1) to (4) with three dummies taking the value of 1 if the source country is an OECD country (*oecd_source*); taking the value of 1 if the target country is an OECD country (*oecd_target*); and taking the value of 1 if both countries are OECD countries (*oecd_pair*). The results on the dummy variables suggest that treaty rates on portfolio dividends tend to be lower if the source country is an OECD one. More specifically, the non-OECD host country will levy a lower withholding tax rate under the tax treaty if the home country is an OECD member, although the results are small in magnitude. We find similar results for participation dividends and royalties if both the source and target country are an OECD member.

We interact the source spatial lag with the OECD source and pair dummies and the target spatial lag with the OECD target and pair dummies in Table 5. The results suggest that much of the spatial dependance is in fact driven by the OECD countries. The spatial dependence is still strongest for treaty rates on interest and royalties, but increases with both countries being OECD members. We also find some specific target contagion in the negotiated rates on portfolio dividends as well as specific source contagion, but only if both countries belong to the OECD group.

We study the role of the OECD model tax convention by extending our main model with a dummy indicator that takes the value of unity if the negotiated withholding tax rate equals the OECD model tax convention rate (*model_rate_dummy*), as well as two interaction terms between the OECD model rate dummy and the source and target lags (*source_lag_model* and *target_lag_model*).[3] Table 6 presents these results. With highly significant results on the OECD model rate dummy, the results point to OECD model rates being a good predictor of negotiated withholding tax rates. With a single exception for royalties source lag interaction term, the interaction terms between the OECD model rate dummy and the two spatial lags are all significant and negative. At the same time, we observe significant and positive coefficients on our two spatial lag variables across all types of withholding tax rates. We interpret these results as the OECD model tax convention serving as an anchor to limit competition over treaty WHT rates. In other words, countries can either engage in a power game negotiating the treaty withholding tax rates or resort the rates suggested by the OECD model tax convention.

Next, we focus on the role of tax havens as drivers of spatial dependance in Table 7 and as drivers of treaty rates in Tables 8 to 10. In Table 7, we follow a similar approach to Table 6, extending our main model with a set of dummies for tax haven source and target country

[3]The OECD model tax conventions suggests a 15% withholding tax on portfolio dividends; 5% withholding tax on participation dividends; 10% withholding tax on interest payments; and 0% withholding on royalties.

and a tax haven country-pair, as well as their respective interaction terms with the source and target spatial lag. Note that with a constant definition of a tax haven, the source and target tax haven dummies will be absorbed by our rich set of fixed effects. Nevertheless, we can still measure the impact of a tax haven country-pair (*haven_pair*) and the interaction effects (*source_lag#haven_source*, *source_lag#haven_pair*, *target_lag#haven_target* and *target_lag#haven_pair*). While the main results remain largely unchanged, we observe now that tax haven country-pairs have a small tendency to conclude lower rates on portfolio dividends. Moreover, tax havens seem to intensify the competition on royalties withholding tax rates.

Tables 8 to 10 look at the indirect effects of non-tax haven countries having a tax treaty with a tax haven in their network prior to negotiated the observable treaty rate. In Table 8, we extend our main model with a dummy indicating whether the source - *source_havens_treaty* - respectively the target - *target_havens_treaty* - country has signed a treaty with a tax haven prior to negotiating the treaty rate. In Table 9, we extend our main model with a count variable for the number of tax treaties with tax havens signed by the source - *source_havens_treaties* - respectively target - *target_havens_treaties* - country. Finally, in Table 10, we include the average treaty rate of each type of withholding tax negotiated with tax havens prior to treaty conclusion - *source_havens_avg* and *target_havens_avg*.

Whilst the average treaty rates with tax havens do not show any significant results, the negotiated withholding tax rates on portfolio dividends and interest decrease with the number of tax treaties signed with tax havens by both the source and target country. A simple indicator variable on tax haven treaties signed by target countries shows similar results. However, we must note that most of these results are very small in magnitude, especially compared to the estimates on the OECD countries. Tax havens seem to have thus only a limited role in driving the international tax competition on treaty withholding rates. By contrast, our earlier results suggest that tax competition is in fact driven by the OECD countries.

Tables 11 to 14 study the dynamics of spillover effects. It is plausible that countries follow recent treaties more closely than old ones, concluded many years ago. To investigate this, we restrict the time span over which a treaty can spillover through the network to 30 years in intervals of 5 years. Whilst the estimation on the 5-year dynamic spillover suffers from small sample sizes, the number of observation quickly approaches the full model, which assumes unlimited spillover over time. The results reveal the dynamic nature of spatial spillovers. Whereas the results on interest and royalty payments remain consistent over time, both portfolio and participation dividends show a more complex mechanism. Excluding the oldest - and presumably least relevant - treaties from spatial lag, leads to statistically significant source and target spillovers in the case portfolio dividends. Bargaining over participation dividend withholding rates turns out even more dynamic, yielding statistically significant results when the spillover is limited up to 20 years.

5 Robustness tests

We perform a number of robustness tests in Tables 15 to 22 in order to validate our main results. Since treaty rates are observable only for country-pairs with a concluded tax treaty, our dataset might be subject to sample selection. Therefore, we re-estimate our model following the Heckman two-step procedure. The selection sample consists of all country-pairs with an observed tax treaty rate of each respective type in the year of treaty conclusion t, and all country-pairs without an observed tax treaty rate in the year 2012. In this way, we allow every country-pair to conclude a tax treaty over the entire covered time span. In case of country-pairs that have concluded multiple tax treaties in our sample, we keep only the most recent ones. For country-pairs that have terminated an already concluded treaty, but not renegotiated a new one, we keep the treaty observation.[4]

In order to satisfy the exclusion restriction, we extend the first stage model with an indicator variable for common language. Ligthart et al. (2011) show that common language is a significant determinant of double taxation treaties. In contrast, we do not expect that common language is likely to affect the bargaining position and through that the negotiated withholding tax rates. The first stage estimation results confirm that common language is a valid predictor of treaty conclusion in three of the four cases. More importantly, the results suggest that the OLS estimations on portfolio dividend and interest withholding tax rates may show sample selection bias. Once corrected for sample selection, we continue to observe strong spatial interdependence on negotiated interest and royalties withholding tax rates. However, we observe now also highly significant source and target spatial lags on portfolio dividends rates, despite being of smaller magnitude that those on interest and royalties rates.

Further, to ensure that our results are not driven by the definition of the spatial lag, we alternate the time dimension of our spatial lags, taking the spatial lag values 3, 4 or 5 years before the treaty year t in Tables 16 to 18. All of our main results remain intact. Next, we change the definition of similarity between countries to contiguity (Table 19) and common sub-region (Table 20).[5] While some of the controls are no longer significant using the contiguity measure of similarity, we find very similar results for our spatial lags both in Table 19 and 20, thereby confirming strong spatial dependance for treaty rates on interest and royalties. Lastly, we define countries as similar in accordance with their market potential following the Head and Mayers (2010) methodology and find robust results for negotiated royalty rates (Table 21).

As a further check on our results being driven by the spatial dimension, we construct placebo source and target spatial lags assigning countries a random intermediate region and

[4] In an alternative specification - available upon request - we keep the most recent observation for all country-pairs. The results do not show any noticeable differences.

[5] Contiguity is one geographical level below intermediate regions. Sub-regions are one geographical level above intermediate regions.

thereby changing its peers.[6] Except for the placebo specific target lag on treaty interest rates, none of the placebo spatial lags turns significant (Table 22). With the placebo specific target lag being negative and significant only at the 10% level, we are confident about the robustness of our main results.

Finally, we extend our main model with additional control variables for exemption treaty relief method, renegotiated and multilateral tax treaties and "gravity-style" variables, including former colony status and common legal origin.[7] We account for double taxation relief granted through the exemption method, because of the different incentives faced by the source country. Whereas the double taxation relief through the credit method results merely in a shift of taxing rights from the capital-importing to the capital-exporting country, the exemption relief method allows the investor to fully capture the benefits of lower host-country withholding taxes.[8] Consequently, double taxation relief through exemption may be more effective in attracting FDI and increases the desirability of a double taxation treaty, even at lower withholding tax rates. We control for renegotiated and multilateral tax treaties in light of the potential learning effects that occur during the lifetime of prior tax treaties and the harmonised withholding taxes under multilateral tax treaties. Finally, we speculate that countries may allow themselves more negotiation room when concluding treaties with countries with which they share a special relationship, either through colonial past or common legal origin. All of our results remain qualitatively unchanged and our main conclusions hold.

6 Conclusions

This paper has investigated spillovers in tax treaty bargaining. Tax treaties are often seen as a means to mitigate fierce tax competition. We have challenged this view by demonstrating that past treaties with peers reduce negotiated withholding tax rates and thereby the overall tax burden. We focus on the four distinct treaty withholding tax rates on passive income - portfolio dividends, participation dividends, interest and royalties, and collect these rates for nearly 3,000 tax treaties and amending protocols signed between 1930 and 2012. Further, we tested the hypothesis that treaty rates are a product of a bargaining game between the two signatory countries, and are bound by treaty rates negotiated by any of the two signatory countries with the peers of the other one.

We find a positive relationship between the spatial interaction terms and the negotiated treaty rates. This relationship is strongest for the withholding tax rates on interest

[6] Since our main results hold using a spatial lag defining similarity at the sub-region - see also Table 20 - we condition the random draw on countries being assigned an intermediate region within different sub-regions.

[7] Results available upon request.

[8] In contrast to the (ordinary) credit method, under the exemption method, foreign dividends are exempt from home country corporate taxation altogether. Hence, the host country tax liability is final and a reduction in host country withholding taxes comes directly at the benefit of the private investor

and royalties. Once accounted for sample selection, we also find a statistically significant relationship for the withholding tax rates on portfolio dividends. We also note that the effect is strongest if OECD countries are involved, whereas existing treaties with tax havens matter little. Moreover, our results imply that tax competition extends beyond capital and corporate taxes to other tax policy instruments. However, our findings suggest that countries can avoid competing over treaty withholding tax rates by resorting to the OECD Model Tax Convention.

Taken together, one of the main findings of our paper is the scope limitation with regard to setting the own tax treaty rates and the potential loss of sovereignty of countries. Even though they are free to set their tax rates, while concluding a new tax treaty, their freedom is bound by the existing tax treaties of their peers being already in force.

Table 1: Source and Target Average Withholding Tax

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_avg	-0.0739	0.0889	0.1280**	0.1290**
	(0.0652)	(0.1250)	(0.0527)	(0.0501)
target_avg	-0.00688	0.1920	0.1250**	0.1260**
	(0.0697)	(0.1250)	(0.0529)	(0.0489)
LNgdp_source	-0.0158	0.0082	0.0071	0.0112
	(0.0118)	(0.0158)	(0.0085)	(0.0094)
LNgdp_target	-0.0012	0.0090	0.0089	0.0123
	(0.0118)	(0.0156)	(0.0085)	(0.0094)
LNgdpcap_source	0.0094	-0.0022	-0.0070	-0.0162*
	(0.0116)	(0.0169)	(0.00827)	(0.00929)
LNgdpcap_target	0.0025	-0.0030	-0.0094	-0.0164*
	(0.0117)	(0.0160)	(0.0082)	(0.0093)
Observations	4,348	2,218	4,401	4,499
R-squared	0.683	0.730	0.759	0.742
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Source and Target Spatial Lag

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0326	0.0652	0.1770***	0.1740***
	(0.0355)	(0.0703)	(0.0299)	(0.0298)
target_lag	0.0398	0.0869	0.1770***	0.1770***
	(0.0301)	(0.0742)	(0.0293)	(0.0293)
LNgdp_source	-0.0087	-0.0475	0.0212*	0.0296**
	(0.0158)	(0.0489)	(0.0114)	(0.0141)
LNgdp_target	0.0187	-0.0333	0.0223*	0.0305**
	(0.0171)	(0.0500)	(0.0114)	(0.0140)
LNgdpcap_source	-0.0057	0.0531	-0.0211**	-0.0355***
	(0.0153)	(0.0520)	(0.0106)	(0.0136)
LNgdpcap_target	-0.0211	0.0410	-0.0210**	-0.0359***
	(0.0164)	(0.0505)	(0.0106)	(0.0136)
Observations	2,257	930	2,322	2,399
R-squared	0.715	0.639	0.802	0.773
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Spatial Dependence

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties	(5) Avg.Rate	(6) Min.Rate
source_lag	0.0326	0.0511	0.1710***	0.1610***	0.0895***	0.1250***
	(0.0361)	(0.0710)	(0.0304)	(0.0300)	(0.0258)	(0.0300)
target_lag	0.0464	0.0682	0.1700***	0.1670***	0.0759***	0.1030***
	(0.0305)	(0.0739)	(0.0297)	(0.0296)	(0.0236)	(0.0270)
source_avg	-0.1070	0.4180	0.1350	0.1710*	0.0832	0.0175
	(0.0933)	(0.2950)	(0.0983)	(0.0898)	(0.0681)	(0.0976)
target_avg	-0.0286	0.3920	0.1280	0.1940**	0.1150	0.1840*
	(0.1070)	(0.3130)	(0.0984)	(0.0908)	(0.0743)	(0.0982)
LNgdp_source	-0.0085	-0.0538	0.0210*	0.0327**	0.0098	0.0170*
	(0.0159)	(0.0508)	(0.0114)	(0.0141)	(0.0084)	(0.0100)
LNgdp_target	0.0185	-0.0413	0.0222*	0.0338**	0.0214**	0.0290***
	(0.0172)	(0.0529)	(0.0114)	(0.0141)	(0.0090)	(0.0108)
LNgdpcap_source	-0.0063	0.0581	-0.0221**	-0.0390***	-0.0157*	-0.0239**
	(0.0154)	(0.0536)	(0.0107)	(0.0137)	(0.0082)	(0.0098)
LNgdpcap_target	-0.0211	0.0460	-0.0220**	-0.0396***	-0.0236***	-0.0339***
	(0.0165)	(0.0522)	(0.0107)	(0.0137)	(0.0087)	(0.0105)
Observations	2,257	928	2,322	2,399	2,453	2,453
R-squared	0.715	0.635	0.802	0.774	0.819	0.802
Source FE	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: OECD Countries - Dummies

VARIABLES	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0326	0.0471	0.1690***	0.1590***
	(0.0360)	(0.0723)	(0.0306)	(0.0300)
target_lag	0.0441	0.0625	0.1690***	0.1660***
	(0.0304)	(0.0754)	(0.0298)	(0.0296)
source_avg	-0.1160	0.4500	0.1410	0.1640*
	(0.0937)	(0.2990)	(0.0996)	(0.0918)
target_avg	-0.0407	0.416	0.1350	0.1880**
	(0.1060)	(0.3220)	(0.0997)	(0.0929)
oecd_source	-0.0138**	0.0007	-0.0032	-0.0042
	(0.0070)	(0.0205)	(0.0066)	(0.0061)
oecd_target	-0.0111	0.0032	-0.0029	-0.0039
	(0.0071)	(0.0186)	(0.0066)	(0.0061)
oecd_pair	-0.0046	-0.0121*	-0.0062	-0.0087**
	(0.0040)	(0.0071)	(0.0038)	(0.0037)
LNgdp_source	-0.0099	-0.0542	0.0192*	0.0301**
	(0.0159)	(0.0498)	(0.0113)	(0.0140)
LNgdp_target	0.0160	-0.0417	0.0204*	0.0312**
	(0.0171)	(0.0519)	(0.0113)	(0.0140)
LNgdpcap_source	-0.0043	0.0581	-0.0204*	-0.0364***
	(0.0154)	(0.0524)	(0.0107)	(0.0136)
LNgdpcap_target	-0.0183	0.0459	-0.0203*	-0.0370***
	(0.0164)	(0.0513)	(0.0107)	(0.0136)
Observations	2,257	928	2,322	2,399
R-squared	0.717	0.637	0.803	0.775
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: OECD Countries - Interaction Terms

VARIABLES	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	-0.0463	0.0854	0.0459	-0.0100
	(0.0427)	(0.0878)	(0.0362)	(0.0348)
target_lag	0.0691*	0.0377	0.0419	0.0107
	(0.0394)	(0.1030)	(0.0360)	(0.0340)
source_avg	-0.1000	0.4450	0.1070	0.1230
	(0.0950)	(0.3010)	(0.0951)	(0.0890)
target_avg	-0.0425	0.4100	0.1070	0.1400
	(0.1050)	(0.3250)	(0.0950)	(0.0891)
oecd_source	-0.0192**	0.0080	-0.0142*	-0.0245***
	(0.0090)	(0.0216)	(0.0075)	(0.0072)
oecd_target	-0.0095	0.0031	-0.0144*	-0.0231***
	(0.0096)	(0.0204)	(0.0075)	(0.0072)
oecd_pair	-0.0172	-0.0202	-0.0217***	-0.0271***
	(0.0164)	(0.0164)	(0.0071)	(0.0063)
source_lag#oecd_source	0.0625	-0.1280	0.1530***	0.2140***
	(0.0507)	(0.146)	(0.0473)	(0.0496)
source_lag#oecd_pair	0.1980**	0.0827	0.1260**	0.2520***
	(0.0791)	(0.2020)	(0.0611)	(0.0678)
target_lag#oecd_target	-0.0113	0.0058	0.1580***	0.1990***
	(0.0556)	(0.1500)	(0.0470)	(0.0499)
target_lag#oecd_pair	-0.1230	0.0702	0.1240**	0.2260***
	(0.0823)	(0.1800)	(0.0616)	(0.0682)
LNgdp_source	-0.0138	-0.0554	0.0196*	0.0264*
	(0.0160)	(0.0499)	(0.0111)	(0.0135)
LNgdp_target	0.0180	-0.0437	0.0204*	0.0272**
	(0.0170)	(0.0521)	(0.0111)	(0.0135)
LNgdpcap_source	-0.0002	0.0592	-0.0217**	-0.0330**
	(0.0155)	(0.0526)	(0.0104)	(0.0131)
LNgdpcap_target	-0.0211	0.0479	-0.0212**	-0.0337***
	(0.0163)	(0.0516)	(0.0105)	(0.0130)
Observations	2,257	928	2,322	2,399
R-squared	0.723	0.637	0.813	0.792
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: OECD Model Tax Convention

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.1450***	0.1830**	0.3170***	0.0650***
	(0.0503)	(0.0851)	(0.0354)	(0.0239)
target_lag	0.0656**	0.2450**	0.3280***	0.0761***
	(0.0324)	(0.1010)	(0.0346)	(0.0231)
source_avg	0.0209	0.4170	0.0601	0.0987*
	(0.0820)	(0.2670)	(0.0747)	(0.0594)
target_avg	0.1450*	0.3110	0.0599	0.1110*
	(0.0872)	(0.2710)	(0.0747)	(0.0596)
LNgdp_o	-0.0166	-0.0624	0.0088	0.0187**
	(0.0127)	(0.0500)	(0.0094)	(0.0087)
LNgdp_d	-0.0005	-0.0549	0.0106	0.0186**
	(0.0133)	(0.0521)	(0.0094)	(0.0087)
LNgdpcap_o	0.0082	0.0657	-0.0063	-0.0256***
	(0.0124)	(0.0536)	(0.0088)	(0.0085)
LNgdpcap_d	-0.0007	0.0609	-0.0066	-0.0250***
	(0.0130)	(0.0518)	(0.0088)	(0.0084)
model_rate_dummy	0.0964***	0.0582***	0.1040***	-0.0659***
	(0.0079)	(0.0085)	(0.0031)	(0.0027)
source_lag_model	-0.2630***	-0.2690***	-0.4260***	-0.0471
	(0.0464)	(0.0908)	(0.0365)	(0.0348)
target_lag_model	-0.0789*	-0.3240***	-0.4350***	-0.0577*
	(0.0407)	(0.0939)	(0.0364)	(0.0346)
Observations	2,257	928	2,322	2,399
R-squared	0.835	0.678	0.886	0.890
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Tax Havens - Interaction Terms

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0415	0.0708	0.1640***	0.1450***
	(0.0407)	(0.0764)	(0.0312)	(0.0304)
target_lag	0.0359	0.0789	0.1620***	0.1510***
	(0.0314)	(0.0768)	(0.0304)	(0.0303)
source_avg	-0.1050	0.4200	0.1370	0.1750*
	(0.0931)	(0.3020)	(0.0979)	(0.0895)
target_avg	-0.0251	0.3890	0.1300	0.1970**
	(0.1060)	(0.3180)	(0.0980)	(0.0900)
haven_pair	-0.0362*	0.0183	-0.0072	-0.0062
	(0.0210)	(0.0254)	(0.0095)	(0.0094)
source_lag#haven_source	-0.0274	-0.1070	0.0188	0.1360***
	(0.0643)	(0.1200)	(0.0518)	(0.0510)
source_lag#haven_pair	-0.0639	-0.3000	0.1600	0.0840
	(0.133)	(0.540)	(0.0976)	(0.0887)
target_lag#haven_target	0.0240	-0.1880	0.0304	0.1370***
	(0.0820)	(0.1670)	(0.0515)	(0.0493)
target_lag#haven_pair	0.4010**	-0.0958	0.1590	0.1220
	(0.1570)	(0.4230)	(0.0988)	(0.0893)
LNgdp_o	-0.0079	-0.0543	0.0191*	0.0321**
	(0.0161)	(0.0509)	(0.0114)	(0.0140)
LNgdp_d	0.0197	-0.0445	0.0204*	0.0335**
	(0.0170)	(0.0539)	(0.0114)	(0.0139)
LNgdpcap_o	-0.0067	0.0593	-0.0205*	-0.0392***
	(0.0156)	(0.0539)	(0.0107)	(0.0135)
LNgdpcap_d	-0.0218	0.0493	-0.0204*	-0.0400***
	(0.0163)	(0.0532)	(0.0108)	(0.0135)
Observations	2,257	928	2,322	2,399
R-squared	0.717	0.636	0.804	0.776
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Indirect Tax Havens Side: Treaty Network Effects I

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0329	0.0563	0.1720***	0.1600***
	(0.0361)	(0.0710)	(0.0306)	(0.0300)
target_lag	0.0467	0.0760	0.1720***	0.1670***
	(0.0304)	(0.0741)	(0.0298)	(0.0296)
source_avg	-0.1130	0.4200	0.1290	0.1710*
	(0.0952)	(0.3000)	(0.0970)	(0.0898)
target_avg	-0.0440	0.4080	0.1190	0.1930**
	(0.1090)	(0.3200)	(0.0970)	(0.0907)
source_havens_treaty	-0.0022	0.0057	-0.0050	0.0015
	(0.0044)	(0.0060)	(0.0041)	(0.0043)
target_havens_treaty	-0.0039	0.0092	-0.0073*	0.0022
	(0.0045)	(0.0070)	(0.0041)	(0.0042)
LNgdp_o	-0.0073	-0.0542	0.0229**	0.0320**
	(0.0159)	(0.0509)	(0.0115)	(0.0142)
LNgdp_d	0.0196	-0.0424	0.0245**	0.0331**
	(0.0172)	(0.0530)	(0.0115)	(0.0142)
LNgdpcap_o	-0.0073	0.0577	-0.0237**	-0.0384***
	(0.0154)	(0.0535)	(0.0107)	(0.0137)
LNgdpcap_d	-0.0219	0.0455	-0.0236**	-0.0390***
	(0.0165)	(0.0520)	(0.0107)	(0.0137)
Observations	2,257	928	2,322	2,399
R-squared	0.715	0.636	0.803	0.774
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Indirect Tax Havens Side: Treaty Network Effects II

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0364	0.0528	0.1710***	0.1600***
	(0.0360)	(0.0722)	(0.0305)	(0.0300)
target_lag	0.0516*	0.0663	0.1700***	0.1670***
	(0.0304)	(0.0740)	(0.0297)	(0.0296)
source_avg	-0.1850*	0.4350	0.1030	0.1630*
	(0.0976)	(0.3000)	(0.0989)	(0.0908)
target_avg	-0.0876	0.4010	0.0931	0.1850**
	(0.1110)	(0.3170)	(0.0990)	(0.0917)
source_havens_treaties	-0.0033***	-0.0025	-0.0015*	-0.0011
	(0.0010)	(0.0020)	(0.0008)	(0.0008)
target_havens_treaties	-0.0026***	-0.0024	-0.0017**	-0.0012
	(0.0010)	(0.0022)	(0.0008)	(0.0008)
LNgdp_source	-0.0008	-0.0537	0.0249**	0.0355**
	(0.0160)	(0.0502)	(0.0115)	(0.0141)
LNgdp_target	0.0249	-0.0401	0.0265**	0.0367***
	(0.0173)	(0.0520)	(0.0115)	(0.0141)
LNgdpcap_source	-0.0109	0.0608	-0.0242**	-0.0407***
	(0.0153)	(0.0541)	(0.0107)	(0.0136)
LNgdpcap_target	-0.0251	0.0484	-0.0241**	-0.0413***
	(0.0165)	(0.0529)	(0.0107)	(0.0136)
Observations	2,257	928	2,322	2,399
R-squared	0.719	0.637	0.803	0.775
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Tax Havens Network Treaties: Average Rate

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0715	0.0031	0.1390***	0.1810***
	(0.0469)	(0.1230)	(0.0359)	(0.0352)
target_lag	0.0772*	0.1020	0.1360***	0.1900***
	(0.0395)	(0.1070)	(0.0344)	(0.0343)
source_avg	-0.1550	0.4720	0.0609	0.0020
	(0.1970)	(0.5380)	(0.1600)	(0.1430)
target_avg	0.0629	0.4300	0.0420	-0.0154
	(0.2110)	(0.5520)	(0.1610)	(0.1430)
source_havens_avg	0.0426	0.5210	0.0598	-0.0201
	(0.0748)	(0.4110)	(0.0704)	(0.0811)
target_havens_avg	0.0692	0.5260	0.0500	-0.0142
	(0.0653)	(0.4310)	(0.0704)	(0.0806)
LNgdp_source	-0.0039	-0.2040	0.0416***	0.0436***
	(0.0222)	(0.1330)	(0.0142)	(0.0154)
LNgdp_target	0.0207	-0.1940	0.0414***	0.0424***
	(0.0254)	(0.1310)	(0.0142)	(0.0154)
LNgdpcap_source	-0.0170	0.1920	-0.0413***	-0.0527***
	(0.0223)	(0.1250)	(0.0138)	(0.0148)
LNgdpcap_target	-0.0211	0.1870	-0.0406***	-0.0512***
	(0.0250)	(0.1250)	(0.0138)	(0.0149)
Observations	1,658	619	1,761	1,878
R-squared	0.742	0.595	0.828	0.797
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11: Dynamic Spillovers Portfolio Dividends

	(1) S=5	(2) S=10	(3) S=15	(4) S=20	(5) S=25	(6) S=30	(7) S=∞
source_lag	0.0437	0.1000*	0.0898**	0.0522	0.0559	0.0593*	0.0326
	(0.0695)	(0.0567)	(0.0358)	(0.0349)	(0.0356)	(0.0358)	(0.0361)
target_lag	0.0715	0.0421	0.0620**	0.0665**	0.0565*	0.0624**	0.0464
	(0.0553)	(0.0409)	(0.0294)	(0.0285)	(0.0300)	(0.0307)	(0.0305)
source_avg	-0.3650**	-0.1520	-0.1760*	-0.1590*	-0.1270	-0.1060	-0.1070
	(0.1710)	(0.1310)	(0.0939)	(0.0963)	(0.0967)	(0.0957)	(0.0933)
target_avg	-0.2440*	-0.1820	-0.0963	-0.1030	-0.0818	-0.0417	-0.0286
	(0.1470)	(0.1370)	(0.1120)	(0.1090)	(0.1070)	(0.1090)	(0.1070)
LNgdp_o	0.0210	0.0104	0.0062	-0.0050	-0.0074	-0.0083	-0.0085
	(0.0274)	(0.0207)	(0.0155)	(0.0157)	(0.0156)	(0.0157)	(0.0159)
LNgdp_d	0.0232	0.0267	0.0250	0.0235	0.0201	0.0179	0.0185
	(0.0279)	(0.0222)	(0.0173)	(0.0170)	(0.0169)	(0.0170)	(0.0172)
LNgdpcap_o	-0.0220	-0.0214	-0.0178	-0.0102	-0.0078	-0.0067	-0.0063
	(0.0257)	(0.0198)	(0.0150)	(0.0152)	(0.0149)	(0.0152)	(0.0154)
LNgdpcap_d	-0.0207	-0.0308	-0.0262	-0.0258	-0.0222	-0.0205	-0.0211
	(0.0252)	(0.0212)	(0.0165)	(0.0164)	(0.0163)	(0.0163)	(0.0165)
Observations	854	1,515	1,917	2,105	2,175	2,218	2,257
R-squared	0.802	0.727	0.732	0.722	0.716	0.716	0.715
Source FE	YES	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
S.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES
T.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 12: Dynamic Spillovers Participation Dividends

	(1) S=5	(2) S=10	(3) S=15	(4) S=20	(5) S=25	(6) S=30	(7) S=∞
source_lag	0.3080	0.1840	0.2210**	0.2050*	0.1410	0.1300	0.0511
	(0.2020)	(0.1150)	(0.1110)	(0.1160)	(0.0967)	(0.0942)	(0.0710)
target_lag	0.4010**	0.1660	0.1860*	0.1870*	0.1240	0.0859	0.0682
	(0.1900)	(0.1060)	(0.1090)	(0.1070)	(0.0960)	(0.0950)	(0.0739)
source_avg	0.3260	0.6830	0.3050	0.2730	0.3300	0.4200	0.4180
	(0.8740)	(0.5130)	(0.3970)	(0.3380)	(0.3200)	(0.2950)	(0.2950)
target_avg	0.5540	0.7260	0.3960	0.2610	0.3190	0.3620	0.3920
	(0.835)	(0.5560)	(0.4120)	(0.3340)	(0.3300)	(0.3080)	(0.3130)
LNgdp_o	-0.1400	-0.1160	-0.0395	-0.0427	-0.0435	-0.0499	-0.0538
	(0.1200)	(0.0954)	(0.0578)	(0.0531)	(0.0526)	(0.0522)	(0.0508)
LNgdp_d	-0.1360	-0.1070	-0.0294	-0.0316	-0.0358	-0.0413	-0.0413
	(0.1210)	(0.0993)	(0.0594)	(0.0546)	(0.0563)	(0.0550)	(0.0529)
LNgdpcap_o	0.1530	0.1050	0.0485	0.0518	0.0506	0.0551	0.0581
	(0.1120)	(0.0868)	(0.0589)	(0.0557)	(0.0556)	(0.0551)	(0.0536)
LNgdpcap_d	0.1540	0.0991	0.0406	0.0377	0.0394	0.0443	0.0460
	(0.1120)	(0.0919)	(0.0607)	(0.0539)	(0.0547)	(0.0538)	(0.0522)
Observations	376	587	736	847	870	898	928
R-squared	0.690	0.627	0.613	0.637	0.646	0.639	0.635
Source FE	YES	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
S.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES
T.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Dynamic Spillovers Interest

	(1) S=5	(2) S=10	(3) S=15	(4) S=20	(5) S=25	(6) S=30	(7) S=∞
source_lag	-0.0354	0.0733*	0.1260***	0.129***	0.1590***	0.1810***	0.1710***
	(0.0510)	(0.0382)	(0.0331)	(0.0308)	(0.0313)	(0.0303)	(0.0304)
target_lag	-0.0216	0.0882**	0.1330***	0.1350***	0.1640***	0.1790***	0.1700***
	(0.0523)	(0.0383)	(0.0324)	(0.0306)	(0.0306)	(0.0296)	(0.0297)
source_avg	0.3000*	0.2470**	0.1640	0.1550	0.1070	0.1130	0.1350
	(0.1610)	(0.1150)	(0.1040)	(0.1030)	(0.1000)	(0.0986)	(0.0983)
target_avg	0.3030*	0.2530**	0.1630	0.1560	0.1050	0.1080	0.1280
	(0.1600)	(0.1150)	(0.1040)	(0.1030)	(0.1000)	(0.0985)	(0.0984)
LNgdp_o	0.0038	0.0325**	0.0143	0.0126	0.0190*	0.0186*	0.0210*
	(0.0182)	(0.0128)	(0.0118)	(0.0115)	(0.0113)	(0.0112)	(0.0114)
LNgdp_d	0.0050	0.0328**	0.0148	0.0138	0.0203*	0.0198*	0.0222*
	(0.0179)	(0.0128)	(0.0118)	(0.0115)	(0.0113)	(0.0112)	(0.0114)
LNgdpcap_o	-0.0133	-0.0292**	-0.0147	-0.0131	-0.0192*	-0.0195*	-0.0221**
	(0.0154)	(0.0123)	(0.0112)	(0.0109)	(0.0106)	(0.0106)	(0.0107)
LNgdpcap_d	-0.0134	-0.0290**	-0.0146	-0.0129	-0.0190*	-0.0194*	-0.0220**
	(0.0153)	(0.0123)	(0.0112)	(0.0109)	(0.0106)	(0.0106)	(0.0107)
Observations	902	1,604	1,994	2,183	2,257	2,301	2,322
R-squared	0.836	0.832	0.804	0.804	0.806	0.806	0.802
Source FE	YES	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
S.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES
T.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 14: Dynamic Spillovers Royalties

	(1) S=5	(2) S=10	(3) S=15	(4) S=20	(5) S=25	(6) S=30	(7) S=∞
source_lag	0.1050**	0.1660***	0.1440***	0.1370***	0.1590***	0.1690***	0.1610***
	(0.0477)	(0.0337)	(0.0327)	(0.0305)	(0.0304)	(0.0297)	(0.0300)
target_lag	0.0981**	0.1530***	0.1390***	0.1420***	0.1630***	0.1760***	0.1670***
	(0.0471)	(0.0343)	(0.0313)	(0.0301)	(0.0299)	(0.0293)	(0.0296)
source_avg	-0.0898	0.0653	0.1860**	0.2240**	0.1400	0.1560*	0.1710*
	(0.160)	(0.0981)	(0.0916)	(0.0879)	(0.0889)	(0.0910)	(0.0898)
target_avg	-0.0977	0.0847	0.2040**	0.2490***	0.1620*	0.1800*	0.1940**
	(0.160)	(0.0982)	(0.0917)	(0.0882)	(0.0898)	(0.0920)	(0.0908)
LNgdp_o	0.0329	0.0407***	0.0327**	0.0264**	0.0285**	0.0300**	0.0327**
	(0.0210)	(0.0154)	(0.0136)	(0.0131)	(0.0137)	(0.0140)	(0.0141)
LNgdp_d	0.0328	0.0416***	0.0333**	0.0274**	0.0296**	0.0310**	0.0338**
	(0.0210)	(0.0154)	(0.0136)	(0.0131)	(0.0136)	(0.0140)	(0.0141)
LNgdpcap_o	-0.0471**	-0.0510***	-0.0387***	-0.0346***	-0.0368***	-0.0373***	-0.0390***
	(0.0199)	(0.0152)	(0.0132)	(0.0128)	(0.0133)	(0.0136)	(0.0137)
LNgdpcap_d	-0.0470**	-0.0513***	-0.0386***	-0.0350***	-0.0374***	-0.0378***	-0.0396***
	(0.0200)	(0.0152)	(0.0132)	(0.0128)	(0.0133)	(0.0136)	(0.0137)
Observations	904	1,604	2,030	2,229	2,303	2,365	2,399
R-squared	0.839	0.822	0.781	0.783	0.781	0.777	0.774
Source FE	YES	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
S.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES
T.Region#Y.FE	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 15: Robustness: Heckman Sample Selection

	First stage probit				Second stage OLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Port. Div.	Part. Div.	Interest	Royalties	Port. Div.	Part. Div.	Interest	Royalties
source_lag	-2.2266	-7.6657	-3.6465	-1.1118	0.0513**	0.0544	0.1682***	0.1763***
	(2.9388)	(6.6946)	(3.7507)	(3.4876)	(0.0225)	(0.0635)	(0.0219)	(0.0238)
target_lag	0.0588	-5.5415	-4.4853	-0.6374	0.0700***	0.0648	0.1553***	0.1746***
	(2.8804)	(6.3977)	(3.7724)	(3.4667)	(0.0236)	(0.0569)	(0.0218)	(0.0239)
source_avg	-51.1386	-116.2218***	-22.1538	-51.1163*	-0.0299	0.5814***	0.0394	0.1531**
	(33.3260)	(34.2132)	(84.9154)	(30.7396)	(0.0970)	(0.2177)	(0.0777)	(0.0761)
target_avg	-54.7268	-114.8414***	-22.4930	-58.9628*	0.2138**	0.5044**	0.0257	0.1799**
	(36.5162)	(34.8915)	(84.7484)	(32.9056)	(0.0987)	(0.2374)	(0.0778)	(0.0763)
LNgdp_source	0.6312	0.1938	0.3528	-2.0503	-0.0039	-0.0708***	0.0231**	0.0405***
	(1.8211)	(2.9921)	(9.1499)	(2.4634)	(0.0115)	(0.0262)	(0.0103)	(0.0103)
LNgdp_target	0.9404	0.9699	0.3779	-2.2580	0.0136	-0.0621**	0.0231**	0.0408***
	(1.8493)	(3.1300)	(9.0837)	(2.5219)	(0.0114)	(0.0267)	(0.0103)	(0.0103)
LNgdpcap_source	-1.3427	0.0848	0.0325	2.1089	-0.0128	0.0707***	-0.0249**	-0.0461***
	(1.8021)	(2.8009)	(8.6231)	(2.4727)	(0.0108)	(0.0244)	(0.0098)	(0.0098)
LNgdpcap_target	-1.5147	0.7345	0.0200	2.0237	-0.0184*	0.0597**	-0.0241**	-0.0465***
	(1.7451)	(2.8482)	(8.5506)	(2.4890)	(0.0109)	(0.0247)	(0.0098)	(0.0098)
comlang_off	0.6023*	0.9145	0.8905**	0.6125*				
	(0.3128)	(0.6801)	(0.3594)	(0.3140)				
Observations	4,508	2,337	4,511	4,601	2,367	1,079	2,425	2,480
Mills ratio	0.0264***	0.0036	-0.0149*	-0.0078				
	(0.0066)	(0.0060)	(0.0079)	(0.0079)				
Source FE	YES	YES	YES	YES	YES	YES	YES	YES
Target FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: Heckman's consistent standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 16: Robustness: Spatial Lag n=3

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0354	0.0848	0.1860***	0.1500***
	(0.0376)	(0.0855)	(0.0306)	(0.0311)
target_lag	0.0321	0.1080	0.1810***	0.1510***
	(0.0321)	(0.0788)	(0.0296)	(0.0305)
source_avg	-0.0246	0.2190	0.0075	0.0283
	(0.0926)	(0.3100)	(0.0995)	(0.0869)
target_avg	-0.0275	0.1080	-0.0071	0.0357
	(0.1050)	(0.2860)	(0.0999)	(0.0878)
LNgdp_source	-0.0119	-0.0481	0.0262**	0.0286*
	(0.0169)	(0.0618)	(0.0122)	(0.0154)
LNgdp_target	0.0211	-0.0116	0.0286**	0.0305**
	(0.0181)	(0.0509)	(0.0121)	(0.0154)
LNgdpcap_source	-0.0030	0.0548	-0.0270**	-0.0341**
	(0.0162)	(0.0637)	(0.0114)	(0.0149)
LNgdpcap_target	-0.0228	0.0196	-0.0274**	-0.0353**
	(0.0174)	(0.0496)	(0.0114)	(0.0149)
Observations	2,061	819	2,124	2,197
R-squared	0.729	0.644	0.806	0.779
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 17: Robustness: Spatial Lag n=4

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0645*	0.0675	0.1770***	0.1480***
	(0.0345)	(0.1120)	(0.0331)	(0.0349)
target_lag	0.0475	0.1150	0.1730***	0.1510***
	(0.0333)	(0.1120)	(0.0321)	(0.0334)
source_avg	-0.1120	0.1840	-0.0836	-0.0475
	(0.0879)	(0.2880)	(0.1060)	(0.0857)
target_avg	-0.0458	-0.0526	-0.0892	-0.0410
	(0.1090)	(0.2700)	(0.1060)	(0.0866)
LNgdp_source	-0.0161	-0.0644	0.0211	0.0256
	(0.0179)	(0.0777)	(0.0133)	(0.0162)
LNgdp_target	0.0220	-0.0371	0.0234*	0.0277*
	(0.0198)	(0.0734)	(0.0133)	(0.0162)
LNgdpcap_source	0.0010	0.0726	-0.0203	-0.0313**
	(0.0175)	(0.0777)	(0.0125)	(0.0157)
LNgdpcap_target	-0.0233	0.0518	-0.0205	-0.0326**
	(0.0192)	(0.0714)	(0.0125)	(0.0157)
Observations	1,880	706	1,928	2,003
R-squared	0.740	0.641	0.809	0.788
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 18: Robustness: Spatial Lag n=5

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0414	0.1010	0.1820***	0.1350***
	(0.0338)	(0.1460)	(0.0352)	(0.0355)
target_lag	0.0223	0.2410	0.1850***	0.1440***
	(0.0329)	(0.2130)	(0.0338)	(0.0341)
source_avg	-0.0969	0.2130	-0.1830*	-0.0735
	(0.0843)	(0.3260)	(0.1110)	(0.0906)
target_avg	0.0287	-0.1390	-0.1830*	-0.0661
	(0.1080)	(0.3750)	(0.1110)	(0.0911)
LNgdp_source	-0.0150	-0.0541	0.0234*	0.0354**
	(0.0191)	(0.0826)	(0.0138)	(0.0172)
LNgdp_target	0.0193	-0.0249	0.0263*	0.0351**
	(0.0216)	(0.0765)	(0.0137)	(0.0172)
LNgdpcap_source	0.0019	0.0707	-0.0228*	-0.0374**
	(0.0186)	(0.0842)	(0.0126)	(0.0168)
LNgdpcap_target	-0.0204	0.0521	-0.0239*	-0.0364**
	(0.0209)	(0.0757)	(0.0126)	(0.0168)
Observations	1,738	617	1,781	1,853
R-squared	0.739	0.653	0.810	0.789
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 19: Robustness: Spatial Lag Contiguity

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0429	0.1230	0.1230***	0.1730***
	(0.0421)	(0.1510)	(0.0349)	(0.0354)
target_lag	0.0227	0.1910	0.1130***	0.1710***
	(0.0299)	(0.1590)	(0.0340)	(0.0359)
source_avg	-0.0544	1.0610	0.1400	0.0598
	(0.1740)	(0.7200)	(0.1390)	(0.1290)
target_avg	-0.0606	0.8750	0.1250	0.0278
	(0.1750)	(0.6340)	(0.1390)	(0.1280)
LNgdp_source	-0.0636***	-0.4000	0.0100	0.0074
	(0.0231)	(0.2910)	(0.0194)	(0.0181)
LNgdp_target	-0.0374	-0.4390	0.0115	0.0055
	(0.0248)	(0.3190)	(0.0193)	(0.0181)
LNgdpcap_source	0.0615***	0.4030	-0.0130	-0.0192
	(0.0229)	(0.2950)	(0.0191)	(0.0180)
LNgdpcap_target	0.0413*	0.4420	-0.0144	-0.0168
	(0.0242)	(0.3190)	(0.0189)	(0.0180)
Observations	1,365	474	1,407	1,439
R-squared	0.708	0.564	0.814	0.812
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 20: Robustness: Spatial Lag Sub Regions

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0344	0.0337	0.1650***	0.1490***
	(0.0346)	(0.0672)	(0.0292)	(0.0285)
target_lag	0.0500*	0.0834	0.1630***	0.1540***
	(0.0297)	(0.0657)	(0.0284)	(0.0282)
source_avg	-0.0914	0.388	0.1400	0.1950**
	(0.0919)	(0.292)	(0.0966)	(0.0881)
target_avg	0.0026	0.3860	0.1330	0.2170**
	(0.1050)	(0.3120)	(0.0968)	(0.0891)
LNgdp_source	-0.0147	-0.0555	0.0208*	0.0289**
	(0.0157)	(0.0504)	(0.0112)	(0.0139)
LNgdp_target	0.0111	-0.0426	0.0219*	0.0300**
	(0.0167)	(0.0532)	(0.0112)	(0.0139)
LNgdpcap_source	0.0002	0.0583	-0.0219**	-0.0362***
	(0.0151)	(0.0534)	(0.0106)	(0.0134)
LNgdpcap_target	-0.0130	0.0461	-0.0218**	-0.0368***
	(0.0160)	(0.0523)	(0.0106)	(0.0134)
Observations	2,413	973	2,480	2,587
R-squared	0.720	0.637	0.811	0.781
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 21: Robustness: Spatial Lag Market Similarity

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
source_lag	0.0331	0.0179	0.0254	0.0897***
	(0.0415)	(0.0479)	(0.0320)	(0.0302)
target_lag	-0.0049	0.0218	0.0084	0.0821***
	(0.0324)	(0.0426)	(0.0313)	(0.0299)
source_avg	-0.0991	0.1130	0.1880**	0.1120
	(0.0937)	(0.1620)	(0.0751)	(0.0720)
target_avg	0.1120	0.3300**	0.1570*	0.1350*
	(0.1090)	(0.1590)	(0.0830)	(0.0743)
LNgdp_source	-0.0055	0.0954**	0.0038	-0.0512**
	(0.0291)	(0.0384)	(0.0236)	(0.0227)
LNgdp_target	0.0636*	0.1430***	0.0114	-0.0478**
	(0.0327)	(0.0384)	(0.0237)	(0.0228)
LNgdpcap_source	-0.0034	-0.0892**	-0.0019	0.0527**
	(0.0290)	(0.0375)	(0.0232)	(0.0225)
LNgdpcap_target	-0.0565*	-0.1350***	-0.0106	0.0486**
	(0.0328)	(0.0377)	(0.0233)	(0.0226)
Observations	3,101	1,511	3,137	3,207
R-squared	0.683	0.831	0.760	0.758
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 22: Robustness: Placebo Spatial Lag

	(1) Port. Div.	(2) Part. Div.	(3) Interest	(4) Royalties
placebo_source_lag	0.0162	-0.1900	0.0188	-0.0490
	(0.0479)	(0.3440)	(0.0479)	(0.0525)
placebo_target_lag	0.0165	0.1430	-0.0879*	0.0389
	(0.0390)	(0.2250)	(0.0452)	(0.0477)
source_avg	-0.0340	2.3660	0.2670	-0.1650
	(0.1970)	(2.2010)	(0.2060)	(0.1610)
target_avg	0.3010	-0.6880	0.1400	0.1170
	(0.2540)	(2.6970)	(0.2430)	(0.2280)
LNgdp_source	-0.0074	0.0184	0.0013	0.0080
	(0.0228)	(0.1860)	(0.0206)	(0.0169)
LNgdp_target	-0.0230	0.2840	0.0195	0.0182
	(0.0290)	(0.2210)	(0.0222)	(0.0236)
LNgdpcap_source	0.0085	-0.0464	0.0060	0.0004
	(0.0229)	(0.1940)	(0.0199)	(0.0175)
LNgdpcap_target	0.0041	-0.2550	-0.0273	-0.0320
	(0.0274)	(0.1750)	(0.0194)	(0.0222)
Observations	1,045	229	1,101	1,114
R-squared	0.802	0.789	0.814	0.811
Source FE	YES	YES	YES	YES
Target FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
SourceRegion#Year FE	YES	YES	YES	YES
TargetRegion#Year FE	YES	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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