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Summary

This study focuses on asymmetric tax treaties and investigates the impact of OECD member states' double tax relief method and of treaty tax sparing provisions on investments in developing countries, while considering network effects. In addition, it analyses the impact of a residence country's tax relief method on the source country's tax policy. Our results suggest that having a treaty between the OECD member state and the developing country, which improves the investor's conditions in terms of tax burden by changing the unilateral tax relief method, increases FDI to the developing country. The positive effect prevails when investigated within investments made through the direct route from home to host. Furthermore, results suggest that OECD member states offer tax sparing provisions mostly to less-developed economies, which already receive very low, if any, foreign direct investment. Finally, we find that developing countries set higher CIT when the OECD member state relieves double taxation through the exemption method, as compared to when it offers a foreign tax credit, while the inclusion of tax sparing agreements has a positive effect on the CIT.

Keywords: asymmetric tax treaties, FDI, double tax relief method, tax sparing, treaty network, CIT.

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Acronyms

BIT	Bilateral investment treaty
CIT	Corporate income tax
DTT	Double taxation treaties
FDI	Foreign direct investment
MNE	Multinational enterprise
MTC	Model tax conventions
PE	Permanent establishment
PPML	Poisson-pseudo-maximum-likelihood
UNCTAD	United Nations Conference on Trade and Development
WHT	Withholding tax

Introduction

Developing countries negotiate double taxation treaties (DTTs) with developed economies despite their investment flows being asymmetric, with one treaty partner experiencing more inward than outward investment vis-à-vis the other partner. Tax competition between developing countries is why the so-called 'asymmetric treaty network'[1] has grown since the 1980s (McGauran 2013). Indeed, only 10 per cent of all currently existing treaties of lower income countries were signed before 1980, and half the treaties have been signed in the last 20 years. Still, this implies that the other half is more than 20 years old and has never been revised (Hearson, Carreras and Custers 2021: 8).

Tax treaties allocate taxing rights on business income, income from moveable property and from immovable property. Today's global treaty network shows a tendency towards residence taxation, which implies that, if following their national law, source states can levy taxes without any limitations; the tax treaty shifts the taxing rights to the residence state because in many instances tax treaties limit the source state's taxing rights (Daurer 2014: 696). The large majority of DTTs are drafted along the lines of either the OECD or the UN Model Tax Conventions (MTC). Both these model conventions (albeit the UN Convention to a lesser degree) tend to shift taxing powers from the source state to the residence state of a company, and contain restrictive source-based taxing rights, although in varying proportions (Braun and Zagler 2018; Eyitayo-Oyesode 2020).

The revenue cost of source tax limitations imposed by tax treaties will largely depend on the capital flows between the countries. The revenue disparity is probably insignificant between two developed countries since each signatory state serves simultaneously as a host country for foreign investment and as a residence country for its own residents. This is not the case between two treaty partners with asymmetric investment flows. A distributional conflict between net capital importers and exporters arises as the lowering of withholding tax rates, limiting the extent of source taxation, involves a revenue transfer from the net capital importer to the net capital exporter.

Consequently, the reason why developing countries sign tax treaties with developed economies becomes questionable; this is particularly the case for OECD model-based tax treaties. While fostering outbound investment and thus encouraging the international expansion of domestic companies may arguably be more relevant for capital-exporting countries, for capital importers, encouraging inbound investment may be more the focus, with policy makers wishing to attract foreign direct investment (FDI) entailing the transfer of skills and technologies and fostering economic growth (Braun and Zagler 2014). As Lang and Owens (2014) suggest, the expectation of increased capital inflows after the signature of DTTs is the most prominent reason why developing countries enter into an asymmetric DTT. Immediate loss of revenue due to investment flows asymmetry may be ameliorated if entry into the tax treaty results in additional foreign investment that contributes to the growth of the recipient country's economy. Given the asymmetric nature of DTTs, lower income countries should be careful about the type of treaty they intend to sign, and whether to renegotiate older treaties that may have been drafted under different premises.

A dramatic increase of FDI during the 1990s led to a boom in economic research studying the forces affecting FDI, in particular the effect of double taxation treaties on FDI. Whereas studies using aggregate country and country-pair-level data tend to find negative or no effect (e.g., Blonigen and Davies 2004; 2005; Davies 2003; Egger, Larch, Pfaffermayr and Winner 2006; Coupé, Orlova and Skiba 2009), there is a tendency for studies based on micro-data to find some positive effects of DTTs (e.g., Davies, Norbäck, and Tekin-Koru 2009; Egger and

[1] With 'asymmetric tax treaties', we refer to tax treaties between countries with asymmetric investment flows.

Merlo 2011; Blonigen, Oldenski and Sly 2014; Marques and Pinho 2014). Petkova, Stasio and Zagler (2020) overcome the ambiguous results on the effects of DTTs on FDI, suggesting that there is always a positive effect of double tax treaties on FDI, as long as they offer to investors a financial advantage by reducing the direct tax distance both over domestic law and the entire existing treaty network.

Furthermore, while the sample of most existing studies on the impact of DTTs on FDI flows includes both developed and developing countries as potential host countries, the grouping of both types of countries in an empirical analysis can be problematic because the investment location decisions in developed and developing countries are likely to be determined by very different factors (Blonigen and Wang 2004; Neumayer 2007). This limitation is overcome only in Neumayer (2007), Baker (2014) and Braun and Fuentes (2016).

Modelling the impact of tax treaties on investment into low and middle income countries is challenging, given complications such as treaty shopping, reverse causality, and data availability. With the exception of Petkova *et al.* (2020), previous research does not take into account aspects of home, conduit, and host tax systems, i.e., treating the DTTs as a dummy variable. Previous research considers even less the complexity of DTTs, their domestic and international interactions, and the heterogeneity of the treaty content. In this study, we aim to fill this gap by looking at the heterogeneity of the treaty content, in particular the double taxation relief method and the inclusion of tax sparing agreements in asymmetric tax treaties. We investigate the impact of the tax relief method and of tax sparing provisions on FDI in developing countries, while taking into account treaty network effects. Furthermore, our study investigates, to the best of our knowledge for the first time, the impact of the residence country's tax relief method on the source country's domestic tax policy.

Using a sample of tax treaties between 37 OECD member states and 71 low and middle income countries over the period 2005–2016, and bilateral FDI stock data from the United Nations Conference on Trade and Development (UNCTAD) for the same observation period, our study investigates three main research questions: (i) Does the relief method in the residence country (OECD member state) matter for the foreign direct investments in the source country (developing)? (ii) Do the tax sparing provisions affect foreign direct investment to developing countries? (iii) Does the residence country's tax relief method restrain the source country's domestic tax policy?

On the grounds of the theory in Petkova *et al*. 2020, we investigate each of the research questions empirically, using a Poisson-pseudo-maximum-likelihood (PPML) estimator for the analysis of research questions (i) and (ii) and an OLS-fixed effects model for analysing research question (iii). We use as dependent variable the bilateral FDI stocks in millions of dollars from the OECD member state to the developing country between 2005–2016 to investigate research questions (i) and (ii), and the corporate income tax rates in the developing countries between 2005–2016 to investigate research question (iii). In our empirical analysis, the sample is restricted to country-pair-year observations for which there is an effective tax treaty in a specific year.

Our results suggest that the double tax relief method in the OECD member state is a determinant for the foreign direct investments in developing countries. Having a treaty between the OECD member state and the developing country, which improves the investor's conditions in terms of tax burden by changing the unilateral (domestic) tax relief method that the OECD member state would otherwise apply, results in an additional gain for the investor, and increases foreign direct investment to the developing treaty partner country. The positive effects prevail when investigated within investments made through the direct route from the OECD member state to the developing country, rather than through an eventual indirect route through conduit countries. In addition, we can only capture a negative between effect of

the tax sparing agreements included in the asymmetric tax treaty, on FDI stocks in developing economies. This result suggests that OECD member states offer tax sparing provisions mostly to less-developed economies, which already receive very low, if any, foreign direct investment.

Finally, our empirical analysis extends to the investigation of the impact of the residence country's tax relief method on the source country's corporate income tax (CIT) rate. In this regard, results suggest that developing countries set higher corporate income tax rates when the OECD member state treaty partner relieves double taxation through the exemption method, as compared to when it offers a foreign tax credit. This result would suggest that OECD member states offer the exemption method to developing countries, which impose high corporate income tax rates, while they offer nothing but a foreign tax credit to repatriated profits sourced in developing countries with low corporate income tax rates. Finally, we find a positive effect of the inclusion of tax sparing agreements on the corporate income tax rate in developing countries.

The remainder of the study is organised as follows. Section 1 discusses the benefits of tax treaties and the reason why countries negotiate them. Section 2 focuses on asymmetric tax treaties and discusses their costs and benefits for net capital importers. Section 3 reviews the literature. Section 4 presents the research questions. Section 5 explains the dataset used and shows descriptive statistics. Empirical investigation of the first two research questions is disclosed in section 6, with results discussed in section 6.2. Further empirical analysis on the third research question is discussed in section 7, with results shown in section 7.2. Section 8 explains the robustness tests conducted, while their results are shown in the appendix. Section 9 concludes.

1 Double taxation treaties: costs and benefits

The primary purpose of tax treaties is commonly stated or understood to be 'for the avoidance of double taxation'[2] of income arising from cross-border transactions (Pickering 2013: 6), i.e., to remove the obstacles which cause harmful effects on the exchange of goods and services and movements of capital, technology and persons (OECD 2019). In looking to remove the hurdles that exist with double taxation, bilateral tax treaties usually (a) decrease the withholding tax rates on dividend payment, and (b) eliminate or mitigate international double taxation through a foreign tax relief system (Marques and Pinho 2014).

From the perspective of eliminating double taxation, it can be argued that this function can be achieved unilaterally or bilaterally (Daurer 2014: 695; Whalley 2001). Most countries have implemented rules in their national tax codes that prevent the double taxation of international investment income by deducting or crediting foreign taxes against taxes due in the residence country, or by exempting such income from taxation in the country of residence altogether (Rixen and Schwarz 2009: 445). Alternatively, countries can enter into a bilateral (or even multilateral) agreement where these rules are laid down. The bilateral approach advocates implementation of tax treaties formulated by signatory countries that are aimed at alleviating double taxation on the investments of the residents of the one signatory state in the other signatory state. One substantial differential does distinguish the unilateral solution from the treaty mechanism. Although treaties and unilateral solutions achieve approximately the same reduction, they allocate tax revenues between the contracting states differently. Tax treaties tend to allocate tax revenues more generously to residence countries than the unilateral

[2] The OECD defines 'double taxation' as 'the imposition of comparable taxes in two (or more) States on the same taxpayer in respect of the same subject matter or identical periods' (OECD 1977: 18). The classic case of double taxation arises when a resident of one country produces income in another country and is subject to tax on that income by both the country of residence as well as the country in which her income is earned (the source country).

alternative does (Dagan 2000: 942). Then, the question arises: *why do countries negotiate double tax treaties at all, if they can relieve double taxation unilaterally?* The small body of theoretical and empirical literature on this issue has given four possible answers to this question (Rixen and Schwarz 2009: 445–447). Musgrave (1969) and Hamada (1966) suggest that tax treaties are seen as cooperative instruments to move from deductions to the more efficient solution of credit and exemption.[3] The second reason, as Janeba (1995) suggests, relates to the role of tax treaties in harmonising the withholding tax rate on international capital income. A third function of tax treaties is that of a cooperative mechanism for the reciprocal lowering of source taxation (Chisik and Davies 2004a; 2004b). Since countries are residence and source countries at the same time, they have a reciprocal interest in limiting each other's source withholding taxes. Importantly, however – and this is the fourth aspect – the choice of a harmonised treaty withholding rate has important distributional implications: by limiting the extent of source taxation, tax treaties involve a revenue transfer from the net capital importer to the net capital exporter (Rixen 2008; Rixen and Schwarz 2009: 446).[4]

The fourth aspect suggests that double tax treaties may bring costs as well. First, tax treaties have an immediate revenue cost. They allocate taxing rights on business income, income from moveable property and income from immovable property. Today's global treaty network shows a tendency towards residence taxation.[5] This system implies that, if following their national law, source states can levy taxes without any limitations, the tax treaty shifts the taxing rights to the residence state because in many instances tax treaties limit the source state's taxing rights (Daurer 2014: 696).[6] The large majority of DTTs are drafted along the lines of either the OECD or the UN MTCs.[7] Both these model conventions (albeit the UN Convention to a lesser degree) tend to shift taxing powers from the source state to the residence state of a company (Braun and Zagler 2018).

Nevertheless, the revenue cost of source tax limitations imposed by tax treaties will largely depend on the capital flows between the countries. The revenue disparity is probably insignificant between two developed countries. In this case, each signatory state serves simultaneously as a host country for foreign investment and as a residence country for its own residents. The taxes it loses from lowering its taxes on foreign investments (in its capacity as source country) will be offset by the taxes it collects from its own residents (in its capacity as resident country). Hence, for countries where the economic flows are approximately equal, any loss of source taxation revenue on inbound investment is likely to be offset by revenue gains resulting from not having to provide, in respect of outbound investment, foreign tax credits or exemption of foreign income or capital.

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3 However, this is subject to criticism in Feldstein (1994).

4 A detailed analysis on the reasons why a country would enter into a tax treaty with another country can be found in Pickering (2013) as well.

5 See Daurer 2014 for a discussion on the concepts used to support the primacy of residence or of source state, i.e., the *efficiency concept, the equity concept, the benefit principle*.

6 Source taxation is limited through the limiting of taxing rights to business income of the permanent establishment (PE), and the reducing of source-based taxation on passive income.

7 Most tax treaties today are based on the OECD Model Double Taxation Convention on Income and Capital and its commentaries and provide for different allocation rules with respect to the taxation of active business income, i.e., business profits, and to the taxation of passive income, i.e., royalties, dividends, and interest payments. With respect to passive income, according to the OECD Model the residence country has the right to tax passive income. While royalties are only taxable in the residence state, the source state is granted a limited right to tax dividends and interest payments.

2 Developing countries and tax treaties: breaking the symmetry

In tax treaties with developed countries, the developing country will typically play the role of a host country, while the developed country will predominantly be the residence country. When investment flows are asymmetric, with one treaty partner experiencing more inward than outward investment vis-à-vis the other partner, there is a distributional conflict between net capital importers and exporters: in the case of an asymmetric position, the lowering of withholding tax rates limiting the extent of source taxation involves a revenue transfer from the net capital importer to the net capital exporter (Dagan 2000; Rixen and Schwarz 2009; Braun and Zagler 2014). It is the imbalance that makes the issue of DTTs between developed and developing countries particularly important. Not only are the developing countries in need of foreign private capital, but by entering into DTTs to attract FDI, they make taxation concessions on inward investment that can impose a significant cost on themselves in terms of lost tax revenue. Restrictive source-based taxing rights cause developing countries economic losses (Eyitayo-Oyesode 2020).[8] The revenue transfer from the net capital importer to the net capital exporter due to the tax treaty signed between the parties has a negative impact on governments which, as a consequence, leads to underfunding of public resources which are critical for social and economic development (Mutava 2019: 8).[9] For instance, Soondram, Samy and Jugurnath (2021) examine how the presence of double tax treaties has impacted the effect of tax revenue on human development in sub-Saharan Africa, suggesting that the net effect from the complementarity between tax revenue and double tax treaties in influencing human development is for the most part negative.[10]

Despite the immediate impact on revenue in the source country, tax treaties have other costs. For instance, they may affect or limit the operation of certain domestic tax laws; may bring a risk for treaty shopping; can create unintended double-non-taxation where a treaty provision precludes taxation in one country of income or capital that is not taxed in the other country; may require certain changes to, or clarifications of, domestic law, to ensure that the treaty can be properly applied and administered; finally, negotiation, interpretation and administration of tax treaties require highly-skilled staff (Pickering 2013). Given the disadvantages the current tax treaty network has for developing countries, then the question arises: why do countries sign tax treaties, and in particular OECD model-based tax treaties?

The literature has debated the extent to which the sacrifice of taxing rights by a lower income country in signing a tax treaty is justified by its impact on the tax treatment of inward investment. Hearson (2021) delivers a two-fold discussion of arguments related to the extent to which ‘the sacrifice of taxing rights by a lower income country in signing a tax treaty is justified by its impact on the tax treatment of inward investment’ (p.13). On one side, the literature argues that, given the entire rationale of tax treaties between developed and developing countries is ‘aid in reverse – from poor to rich countries’, and that net capital exporters already relieve double taxation unilaterally, then for ‘capital-importing lower income countries, the best strategy should be to sit tight’ (p.14). On the other hand, while fostering outbound investment and thus encouraging the international expansion of domestic

8 In particular, Eyitayo-Oyesode (2020) analyses Nigeria.

9 Mutava (2019) considers the lack of a well-crafted and properly implemented treaty policy in developing countries (in sub-Saharan countries in particular) as a relevant factor, which creates ambiguity on matters such as who should be involved in negotiating and concluding tax treaties, which countries are viable treaty partners, and the minimum tax treaty terms that a country should contend for. The author suggests that this provides room for political and elite capture of the negotiation process and leads to the conclusion of treaties without adequate consideration of their technical implications, which could therefore be detrimental to the country (p.3).

10 However, note that the incapacity of the governments of low income countries to raise more tax revenues is attributed to a variety of factors, which go beyond the signature of tax treaties. See Moore (2013).

companies may arguably be more relevant for capital-exporting countries, for capital importers, encouraging inbound investment may be more in focus, with policy makers wishing to attract foreign direct investment, entailing the transfer of skills and technologies, and thus fostering economic growth (Braun and Zagler 2014).[11] As Lang and Owens (2014) suggest, the expectation of increased capital inflows after the signature of DTTs is the most prominent reason why developing countries enter into an asymmetric DTT. Immediate loss of revenue due to investment flows asymmetry may be ameliorated if entry into the tax treaty results in additional foreign investment that contributes to the growth of the recipient country's economy and/or leads to increased employment in that country.

On the one hand, it is the provisions included in a tax treaty which can reduce the tax burden of a taxpayer, e.g., the permanent establishment (PE) principle and the lower withholding tax rates; on the other hand, the mere existence of a tax treaty with a country can create a better business environment through the legal certainty it can provide. A tax treaty is perceived by the business community as a signal that the country is open for investment and willing to play along with internationally accepted standards of taxation. In order to attract more FDI, a country might also follow the policy of forgoing source-taxing rights in their treaties in order to be more attractive for investors. The assumption is that more FDI will create a broader tax base in the country, which will eventually outweigh the negative effects of the tax treaty (Daurer 2014).

Other reasons for entering into treaty negotiations commonly include to attract inbound transfers of technology or skills, or to respond to political or other pressure from other countries (Pickering 2013: 5). Furthermore, a political-economy perspective can explain why poor countries sign 'treaties that hurt them' (McGauran 2013). After the UN Model Convention failed to become a global standard, developing countries were faced with existing internationally accepted tax treaty standards reflecting OECD country interests. However, the OECD tax treaty network provides a number of advantages for its members (including non-OECD members), such as minimisation of communication and enforcement costs or reputation advantages.

While being in a weaker bargaining position than OECD members, poor countries are dependent on capital import. They follow the OECD model for fear of driving FDI away to competing jurisdictions. Indeed, tax competition between developing countries is why the so-called asymmetric treaty network has grown since the 1980s (McGauran 2013: 25–26). In addition, the function of DTTs as a signalling device indicating that the signatory states play by the internationally accepted tax standards may be more relevant for developing countries (Braun and Zagler 2014: 245). A treaty mitigates uncertainty for the foreign investor as to how overseas profits will be taxed as earned and repatriated (Neumayer 2007) and acts as a signal of commitment to a favourable foreign investment environment (Christians 2005). Finally, tax treaties form the legal basis for administrative assistance among tax authorities of different countries and for the exchange of information. If all of these attributes increase FDI, the developing countries will enjoy the traditional benefits attributed to it,[12] as well as an increased tax base and therefore tax revenue, i.e., business profits and withholding taxes.[13]

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11 For a detailed analysis of reasons why developing countries enter into a treaty see also Dagan 2000: 990.

12 E.g., economic growth, knowledge and technology, capital accumulation, job opportunities, increasing integration into the international economy, formalisation of the host economy by extending value chains, etc.

13 It is however relevant to mention that the question of whether FDI contributes to economic development and government revenues depends on (1) the amount of capital that leaves the country in the form of profit repatriation, royalties, and interest payments on intra-company loans; (2) the balance between FDI imports (such as machinery and intermediate products) and FDI exports; (3) the balance between payments made by multinational enterprises (MNEs) and the subsidies provided by the government to attract them, as well as the extent of transfer mispricing (McGauran 2013: 20).

3 Review of previous literature

A dramatic increase of FDI during the 1990s led to a boom in economic research studying the forces that affect it. A part of this literature looks at the relation of government policies and FDI. Although until recently empirical evidence on the effectiveness of double tax treaties in inducing higher FDI was ambiguous,[14] Petkova *et al.* (2020) end this ambiguity. Their study suggests that there is always a positive effect of double tax treaties on FDI, as long as the treaty is relevant, i.e., it offers to investors a financial advantage by reducing the direct tax distance both over domestic law and the entire existing treaty network. Before highlighting more in detail the results of that study, which has inspired our work, we provide a literature review of empirical studies investigating the effect of DTTs on FDI. We divide the literature into two sections: section 3.1 reviews studies which look at the impact of DTTs on FDI while considering as the host (source) both developed and developing countries, and section 3.2 reviews studies that focus their empirical investigation on asymmetric double taxation treaties and consider as the host (source) only developing countries.

3.1. The impact of double tax treaties on FDI

Blonigen and Davies (2000) were the first to explore the effects of tax treaties on foreign direct investment, using data over the period 1966–1992 on U.S. inbound and outbound FDI, concluding that tax treaties have a strong positive impact on FDI.[15] Davies (2003)[16] examines the impact of treaty renegotiations over the period 1966–2000 on both inbound and outbound U.S. FDI, suggesting that treaties have either zero or even a negative effect on FDI.[17] Similar to Davies (2003), Blonigen and Davies (2004), focusing on U.S. inward and outward investment stocks, find that DTTs have no positive effect on inward or outward FDI. Using inbound and outbound FDI stock and flow data for OECD countries between 1982–1992, Blonigen and Davies (2005) suggest that when the sample is not split between old and new treaties, there is a positive and significant effect of tax treaties on FDI; however, once they distinguish between old and new treaties, the old treaty estimate results are positive and significant, whereas the new treaty estimate is negative and significant. Egger *et al.* (2006) estimate the effect of tax treaties on bilateral outward FDI from OECD source countries over the period 1985–2000 and find a negative average treatment effect of DTTs on FDI using different matching estimators and focusing on a difference-in-differences approach. Di Giovanni (2005), using a large panel data set of cross-border Merger and Acquisition (M&A) deals between 1990 and 1999, examines the impact of various macroeconomic and financial variables on cross-border M&A activities as a component of FDI. The author suggests that a DTT is accompanied by increased cross-border acquisition activities. Coupé *et al.* (2009), using fixed and random effects, as well as an instrumental variable (IV) strategy to estimate a gravity model, do not find any evidence of the impact of DTTs on FDI flows for a sample of OECD source countries to transitioning economies between 1990 and 2001.

Instead, Barthel *et al.* (2010) show that DTTs are indeed positively associated with foreign investment in the host country. Their results hold for different specifications of the econometric model. Lejour (2014) investigates the impact of bilateral and multilateral tax treaties on FDI based on an extensive database of all OECD countries from 1985 onwards.

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14 See sections 3.1. and 3.2.

15 The authors introduce two approaches to capture the effects of the treaties. A first approach uses a simple dummy variable that indicates whether there is a treaty or not for a specific country-pair. In the second approach, the authors use a treaty age variable equal to the number of years that a treaty has been in effect. In both cases, the authors find positive and significant effects. Both approaches have been subject to criticism, see for e.g., Coupé *et al.* (2009).

16 One limitation of the study is sample selection, i.e., all treaty negotiations took place with developed countries, and only U.S. FDI is examined (Barthel, Busse and Neumayer 2010: 369).

17 The author explains the findings: first, investment originating in mature subsidiaries may be independent of the withholding tax reductions that treaties achieve; and second, due to the reduction of tax evasion, i.e., since some FDI may occur to facilitate transfer pricing, treaty provisions that hinder tax avoidance may reduce FDI.

The author concludes that new tax treaties increase bilateral FDI by 21 per cent if the tax treaties are instrumented with geographic variables, although this effect tempers out after ten years. In addition, the author finds that treaty shopping exists, but does not attempt to quantify how much it contributes to the increase in FDI stocks.

Whereas studies using aggregate country and country-pair-level data tend to find negative or statistically insignificant results, there is a tendency for studies based on micro-data to find some positive effects of DTTs (Petkova *et al.* 2020: 3).

Davies *et al.* (2009) and Egger and Merlo (2011) analyse the extent at which bilateral tax treaties affect foreign investment decisions at the extensive margin (i.e., location decisions) and intensive margin (i.e., level of investment). Both studies find that the existence of a tax treaty with the parent country, in particular with Sweden and Germany, increases the probability of a multinational having a subsidiary in a given treaty partner country. Blonigen *et al.* (2014), using U.S. firm-level data for the period 1987–2007 from the Bureau of Economic Analysis (BEA), find a positive effect of DTTs on foreign direct investment, which is larger for firms that use differentiated inputs. Marques and Pinho (2014) analyse the extent to which tax treaties influence the number of new foreign subsidiaries incorporated by European multinationals between 2000 and 2009. They provide evidence that tax treaties induced a positive and significant impact on the number of foreign subsidiaries incorporated in the last decade.

In contrast to Marques and Pinho (2014), Petkova *et al.* (2020) – building on previous literature, which focuses on the relationship between tax treaties and FDI by initiating the use of network analysis in the international tax field (i.e., Mintz and Weichenrieder 2010; Dreßler 2012; Weyzig 2013) – consider the possibility of treaty shopping and measure the impact of tax treaties relative to domestic law. The authors present an alternative and more accurate methodology than is usual for the literature that adopts a network approach to investigate the tax treaties network (p.578). They treat the international tax system as a network and subsequently account for treaty shopping potential when estimating the effects of DTTs on FDI. They calculate the shortest tax distance between any two countries that allows the corporate income to be channelled through intermediate jurisdictions. Differentiating between relevant and neutral DTTs – i.e., tax treaties that offer investors a financial advantage – and irrelevant DTTs, the authors find that only relevant and neutral tax treaties increase bilateral FDI, whereas irrelevant DTTs do not.

Mintz and Weichenrieder (2010) focus on whether and how tax treaties may influence the internal ownership structure of multinational enterprises. Their paper relates the chains of corporate structure for German multinationals across various countries for the year 2001 to the underlying fiscal motives, suggesting that withholding taxes are important in determining which countries are used as a platform for investments, i.e., higher bilateral withholding taxes to and from Germany substantially increase the probability that outward and inward FDI is diverted via a third country. Dreßler (2012) and Weyzig (2013) reach similar conclusions. Dreßler (2012) shows that the level of withholding taxes between two group members is relevant in determining the probability of an indirect participation. Weyzig (2013), using micro-data from Dutch special purpose entities to analyse the geographical patterns and the structural determinants of FDI diversion, finds that tax treaties are a key determinant of FDI routed through the Netherlands, with the reduction of dividend withholding tax rates as the driving mechanism.

Lewellen and Robinson (2013), Dyreng, Lindsey, Markle and Shackelford (2015) and Hong (2018) add more to the literature with a particular focus on the impact of the ownership structures of multinational enterprises. Lewellen and Robinson (2013) find that tax considerations, such as minimisation of withholding taxes imposed abroad, are important factors in organising foreign ownership chains of American multinational enterprises. Dyreng

et al. (2015) examine foreign ownership chains of American multinational enterprises and suggest that the withholding tax rate on dividends from source to home countries is positively related to the use of a foreign equity holding company in an ownership chain. Finally, Hong (2018) examines the relationship between multinational ownership chains and tax treaty networks by building data on ownership chains of multinational enterprises. The author suggests that the existence of a tax-minimising direct route from one country to another is negatively related to the use of a foreign intermediate subsidiary and the cross-border length of an ownership chain. Second, the difference between the foreign tax rates of the direct route and a tax-minimising route is positively related to the use of a foreign intermediate subsidiary and the cross-border length.

3.2. Asymmetric DTTs and FDI to developing countries

The sample of most existing studies on the impact of DTTs on FDI flows includes both developed and developing countries as potential host countries. The grouping of both types of countries in an empirical analysis, – i.e., the simultaneous presence of both OECD and developing countries in the sample – can be problematic because the investment location decisions in developed and developing countries are likely to be determined by very different factors (Blonigen and Wang 2004; Neumayer 2007). Exceptions are Neumayer (2007), Baker (2014) and Braun and Fuentes (2016).

Neumayer (2007) investigates whether DTTs with the U.S. attract more FDI to developing countries. The author suggests that developing countries that sign a DTT with the United States benefit from a higher FDI stock and share of FDI stock originating from U.S. investors. However, once the sample of developing countries is split into low income and middle income countries, the positive effect is only found for the latter group. Baker (2014) looks at tax treaties between developed countries and least developed countries. Using a dataset between 1991 and 2006, the author shows that DTTs do not have any effect on FDI, explaining this with a further qualitative analysis of the domestic tax legislation of developed countries. Since countries can and do unilaterally provide for the relief of double taxation, this removes the key economic benefit attributed to DTTs, which is expected to influence MNEs to invest in a treaty partner country, and therefore explains why DTTs do not have a positive impact on FDI (Baker 2014: 343). Finally, using a panel data set that covers 104 potential host countries over the period 1990–2001, Braun and Fuentes (2016) analyse the Austrian DTT network with developing countries, looking at the effects of DTTs on Austrian outward foreign direct investment (OFDI). Their analysis suggests that middle income countries signing a DTT with Austria may expect an increased number of foreign direct investment projects from Austrian companies.[18]

4 Research questions

The empirical analysis of this study investigates three main questions, as disclosed and explained in the following:

(i) Does the relief method in the residence country (OECD member state) matter for the foreign direct investments in the source country (developing)?

There are roughly five different relief methods available to avoid double taxation: exemption, indirect credit, direct credit, deduction, and no relief, with exemption and credit being the

[18] First, the authors examine whether the existence of a DTT makes it more likely that an Austrian firm invests in a given host country, i.e., extensive margin. Second, they conduct an analysis on whether having a DTT with Austria leads to an increase in the number of Austrian FDI projects in a developing country, i.e., intensive margin.

dominant relief methods (Petkova *et al.* 2020). Countries can typically adopt a specific relief method in their domestic law, but a double tax treaty can alter the applied relief method for a specific partner country. As multinationals care about their combined tax liability in both the source and the residence country, the source country's aim to attract more FDI will thus be frustrated, especially when the residence country imposes worldwide taxation (Azémar and Dharmapala 2019). Developing economies are typically capital-importing economies, and the relief method adopted in the country of residence of their investors matters for their net earnings, and thus for their foreign direct investment. We expect the outward FDI stocks from the OECD member state to the developing economy to react to the change in the OECD member country's relief method once a treaty between the two countries is signed.

Changes in the residence (home) country's tax relief should reflect an additional gain that the investor gets when the treaty switches the relief method, i.e., when the relief method applied under the treaty differs from the unilateral (domestic) relief method. DTTs contain a provision on the method of double tax avoidance, specifying that, where exclusive tax jurisdiction over certain income is allocated to the country of source, the initial responsibility for preventing double taxation is on residence countries by granting their residents *exemption* or a *foreign tax credit*. Whereas the credit method imposes the foreign corporate income tax rate, the exemption method permits developing economies to implement a tax policy on their own (Paolini, Pistone, Pulina and Zagler 2016). The exemption method entails a residence country altogether excluding foreign income from its tax base, with the source country being given the exclusive right to tax. Exemption in the residence state can therefore lower the overall tax burden of the investor if tax concessions are granted by the source country. On the other hand, the credit method entails the resident remaining liable in the country of residence on its global income. However, a credit for tax paid in the source country is given by the residence state against its domestic tax, as if the foreign (source) tax were paid to the country of residence itself.[19]

While the exemption method puts investors in a more favourable condition in terms of tax burden as compared to the foreign tax credit,[20] both methods are more advantageous than a simple deduction – i.e., a system under which foreign income is taxed in the parent country and foreign tax deductions on taxable income in the parent company are allowed – or than the refusal to grant a tax relief in the country of residence, i.e., some countries using a worldwide taxation regime do not provide any foreign tax relief and tax payments on subsidiaries will not be applied against the parent company's liability.[21] Therefore, we expect the change in the OECD member state (residence; home) tax relief method, following the signature of a double tax treaty with a developing country, to incentivise foreign direct investments to the developing country (source; host).

(ii) Do the tax sparing provisions affect foreign direct investment in developing countries?

Given that tax incentives are used by developing countries in the hope of attracting foreign direct investment, double taxation prevention methods by residence countries are also some of the most contentious negotiation points for developing countries. In order for tax incentive measures not to be cancelled out by the domestic tax policies of the other signatory state, developing countries can negotiate *tax sparing* credits in bilateral tax treaties.[22] Tax sparing is the practice by which capital-exporting countries amend their taxation of foreign source

19 Hence, the credit method leads to a stable tax rate, as any lowering of tax rates in the source state is calculated against the resident state's tax rate.

20 When the residence country applies the exemption method, given that the taxing power remains with the developing country, this method would leave room in the host country's tax policy for being more effective in increasing FDI from the residence (developed) to the source (developing) country.

21 For a comparative example of the calculation of the effective tax rate on income earned under each double taxation relief system, see Marques and Pinho 2014: 533–536.

22 The Commentary on Article 23 of the UN Model Convention recognised that for some developing countries the inclusion of tax sparing provisions (or relief of double taxation by the exemption method) 'is a basic and fundamental aim in the negotiation of the tax treaties' (Paragraph 4 of the Commentary on Article 23 of the UN Model Convention).

income to allow firms to retain the advantages of tax reductions provided by host countries. Specifically, tax sparing often takes the form of allowing firms to claim foreign tax credits against home-country tax liabilities for taxes that would have been paid to foreign governments, in the absence of special abatements, on income from investments in certain developing countries (Hines 2001). Tax sparing credit is therefore an extension of the regular tax credit.[23] Its crucial element is that the tax credit permitted by the residence country to its MNEs 'shall be deemed to include' tax 'spared' by the source country as well as taxes actually paid to the source country (Hines 2001).[24]

While full exemption systems recognise a nation's exclusive right to source taxation, tax sparing, on the other hand, is an exception to resident taxation. The home country agrees to relinquish its right to the extent that the source country decides to reduce its normal tax burden to accomplish important societal goals (Barker 2007; McGauran 2013). In treaties with countries that use the credit method or that make exemption of foreign income conditional on a certain level of taxation in the source country, the inclusion of tax sparing provisions under a tax treaty can ensure that the benefit of tax incentives of the source country is maintained. Accordingly, tax sparing entails losses for the residence country and gains for the source country (and residence country multinationals), since it involves revenue losses for the residence country, while the source country benefits from greater efficacy of any tax reduction and tax incentives that it chooses to grant in attracting FDI.[25]

Legal analysis predominantly suggests that the tax sparing provisions are regarded as tools of economic development that foster the flow of FDI to developing countries since they can ensure that the benefit of the source country's tax incentives is maintained (e.g., Dagan 2000; Pickering 2013 etc.). However, tax sparing clauses started to be questioned in the OECD in the 1990s following a critical OECD report, which suggested to both OECD member and non-member countries that they should reconsider tax sparing provisions since they offer wide opportunities for tax planning and tax avoidance, while providing a set of suggestions ('best practices') on the design of tax sparing provision to minimise abuse (OECD 1998). Following the report, more recent literature reveals further concerns related to tax sparing clauses. For instance, although tax sparing clauses may attract foreign investment, it is often transitory and crowds out domestic investment. In addition, they are usually framed as a concession by developed economies in a context of competition for inward investment by developing countries. Finally, as more and more countries have exempted foreign source dividends from tax altogether, tax sparing provisions in the treaties have become redundant (Hearson 2015: 12–13; Thuronyi 2010). To this redundance is also added the fact that tax sparing provisions often refer to specific acts of law which were in place when the treaty was signed, but are no longer relevant, which would suggest that a tax sparing clause agreed 20 years ago might not have the same effect nowadays.

Although empirical literature on the effects of tax sparing agreements on investments is quite limited, there exist a few studies suggesting that tax sparing is an important determinant of FDI.[26] Hines (2001)[27] analyses cross-sectional data for 1990 on the location of FDI by Japanese and U.S. MNEs in 67 source countries, suggesting that tax sparing is effective in

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23 Of course, if the home country of the enterprise exempts the income (either unilaterally or under domestic double tax relief provisions or under tax treaties that provide for relief by the exemption method), tax sparing provisions are not required in order to preserve the benefit of the source country's tax incentives, since the country of residence will not tax that income.

24 Tax sparing represents a departure from Article 23 of both the OECD and the UN models, which lay down that a foreign tax credit should be 'equal to the [capital or income] tax paid in that other State'.

25 Although it may seem puzzling that residence countries agree to tax sparing provisions, one way to resolve this puzzle is to view these provisions as part of the foreign aid policy of developed countries (OECD 1998).

26 These cast some doubt on the OECD's (1998: 5) claim that: 'Investment decisions taken by international investors resident in credit (worldwide) countries are rarely dependent on or even influenced by the existence or absence of tax sparing provisions in treaties.'

27 Substantially, this study evaluates the concern that tax sparing credits are ineffective in encouraging greater investment in developing countries (mostly advanced in OECD 1998).

stimulating FDI, i.e., Japanese FDI is substantially higher, relative to U.S. FDI, in source countries with which Japan has a tax sparing agreement. Azémar, Desbordes and Mucchielli (2007) estimate the impact of tax sparing provisions on Japanese outbound FDI between 1989 and 2000 in 29 source countries. Their results suggest that each additional year subsequent to the signature of a tax sparing provision increases Japanese FDI activity by 2.3 to 11 per cent. Finally, Azémar and Dharmapala (2019) analyse the impact of tax sparing provisions using panel data on bilateral FDI stocks from 23 OECD countries in 113 developing and transition economies over the period 2002–2012. The authors find that tax sparing agreements are associated with up to 97 per cent higher FDI, suggesting that tax sparing is an important determinant of FDI in developing countries for MNEs from both worldwide and nearby source countries.

We replicate prior literature investigation looking at the impact of tax sparing agreements on FDI by analysing it in a panel data of asymmetric double tax treaties between 37 OECD members states and 71 developing economies. In addition, the novelty of our study consists of the estimation of tax sparing provisions' effect on FDI, while considering network effects. We distinguish between a direct route and an indirect route through conduit countries for investments from OECD countries to developing countries. We expect the positive impact of tax sparing provisions on FDI in developing countries to be greater when investors choose the direct route to invest from residence (OECD members) to source (developing countries), since it offers the shortest tax distance. Finally, we explore another effect of tax sparing provisions, i.e., their effect on the source country's tax policy, as explained in research question (iii).

(iii) Does the residence country's tax relief method restrain the host country's domestic tax policy?

Finally, we investigate whether the double taxation relief method in the country of residence restrains the source country's domestic tax policy, in particular its corporate income tax rate. We start from the premise that under a foreign tax credit mechanism, the level of the corporate income tax rate in the host economy is frustrated, given that the credit method sets a bottom threshold for the CIT in capital-importing countries, beyond which any tax rate in the capital-importing country would result in a tax revenue shift to the capital-exporting country. Therefore, with the purpose of minimising the tax wedge, the host (developing) country cannot set a corporate income tax rate which is lower than the one in the residence (developed) country. This highlights the role of the credit method in the capital-exporting countries in setting a lower bound for tax competition, as well as on restricting the capital-importing countries' tax policy to attract investments. On the contrary, under the exemption mechanism, developing countries have the exclusive right to tax. Consequently, either they might be engaged in tax competition setting low levels of corporate income tax rates, or they might have a high CIT, subject thereafter to tax holidays and tax incentives to attract FDI, which in any case would not be cancelled by a residence country's relief methods.

Furthermore, the empirical analysis extends to the tax sparing provisions, investigating whether they affect the host country's CIT, as well as whether they alter the impact of the residence country's double tax relief method on the source country's CIT. While the inclusion of tax sparing provisions is irrelevant if the residence country exempts foreign-sourced profits, it is expected to be crucial when the residence country provides a foreign tax credit which, according to tax sparing rules, should be given for the taxes that would have been paid in the absence of tax incentives. Thus, the empirical analysis will provide evidence on an interaction effect between the tax relief method in the residence country and the tax sparing provisions included in the treaty.

5 Data

This study uses a dataset of double taxation treaties between 37 OECD member states, considered as developed (capital-exporting) countries, and 71 developing (capital-importing) countries. We follow prior literature, which uses OECD members as proxy for developed countries and non-OECD members as proxy for developing. We consider as developing countries those classified as low income, lower-middle income and upper-middle income economies in the World Bank classification[28] at the initial period of the analysis, i.e., 2005. The time dimension considered for the investigation of the research questions is between 2005 and 2016. Accordingly, our dataset is a dyadic panel data set that consists of country-pairs with a developing country on the one hand and an OECD member state on the other hand, which have an effective tax treaty either for some or for all the years between 2005 and 2016.

Data for the existence of a double tax treaty between each of the OECD member states and developing countries is taken from the most comprehensive available dataset of bilateral tax treaties, i.e., IBFD Tax Research platform, as well as from the tax treaties database from Petkova *et al.* (2020).[29] Information taken includes the treaty's year of signature, year of effectiveness, termination of the treaty, re-signature, as well as years of amendments by protocols. Overall, we consult 946 tax treaties that became effective before 2016, to hand-collect the relevant withholding tax rates and method of double tax relief from the respective DTTs and applicable protocols. We use the IBFD Global Corporate Tax Handbooks (2005–2016) to collect information on the domestic tax system and in particular on taxation of foreign income, including the methods of double taxation, as well as domestic corporate and withholding tax rates from the respective yearbook. For data not available in the IBFD handbooks, we rely on EY Corporate Tax Guides (2005–2016), PwC Worldwide Tax Summaries (2005–2016), Deloitte, and most importantly, various national websites.

Given the above dynamics, the treaty network might be subject to changes, i.e., new treaties becoming effective; treaties being terminated at a later point in time; the conditions of the treaties being changed through protocols in the following years; the conditions of the treaties being altered through amendments in domestic law (Petkova *et al.* 2020: 582). We take all of these changes into consideration when manually collecting data on international tax networks.

Another relevant variable of the empirical investigation is the inclusion of the tax sparing provisions in each of the treaties of the country-pairs. We code tax sparing agreements by searching the text of each bilateral tax treaty between any of the OECD members and any of the developing countries for language specifying a tax sparing provision. Following Azémar and Dharmapala (2019), we searched in particular for the 'shall be deemed to include' language, and for language that is similar in function, e.g., 'tax paid shall include an amount equal to the amount of any tax forgone which, under the law of Fiji and in accordance with this agreement, would have been payable as tax on income but for an exemption from, or a reduction of, tax on that income resulting from the operation of …'; or 'for the purpose of the deduction referred to in sub-paragraph (b), Chinese tax shall be deemed to have been paid at the rates provided in paragraphs 2 of Articles 10, 11 and 12', etc.

Data on bilateral inward FDI stocks (in millions of dollars) between 2005 and 2016 is obtained under special request from UNCTAD's database. We invert it to measure the investment from the home to the host country. Note that our analysis is unidirectional,

[28] Consulted with the United Nations classification as well.

[29] We further consult and check the data collected with the ICTD Tax Treaties Explorer database, which adds to the IBFD Tax Research Platform in terms of coding, standardisation in a spreadsheet and minor corrections.

therefore in our data set we only have information on investments from the OECD member country (home, residence) to the developing country (host, source). Since the available data reports only the immediate home to host country FDI stocks, we estimate the impact of the relief method and of tax sparing provisions on these immediate home to host country FDI stocks. The dataset is identified at the country-pair-year level – i.e., each observation represents the FDI stock held by investors from residence country *o* in source country *d* in year *t*. In principle, the same country could appear as both a residence and a source country, and FDI from residence country *o* in source country *d* in year t would represent a separate observation from FDI from residence country *o* in source country *d* in year *t*. However, this does not occur in our data, because residence countries are restricted to be developed (OECD member states) and source countries to be developing.

Following prior literature on the impact of tax treaties on FDI, as control variable, we include the bilateral investment treaties (BITs) signed between the OECD member states and developing countries. Information on BITs is taken from the Investment Policy Hub of UNCTAD, as well as from the International Centre for Settlement of Investment Disputes (ICSID) World Bank Group database.

5.1. Variables' construction

The main empirical analysis focuses first on the investigation of whether the double tax relief method in the OECD member state, which is in the role of residence country, has an impact on investments from the OECD member country to the developing country.

We rely on the theoretical background of Petkova *et al.* (2020) to calculate the tax distance between the two countries, where authors define the tax distance as 'the cost of channelling corporate income from one to another in terms of taxes to be paid' (p. 579). In line with that study, in our analysis the tax cost of a multinational enterprise (MNE) consists of corporate income taxes and non-resident withholding taxes on the income of the subsidiary. Depending on the relief method applied in the resident (home) country *o* on income from source (host) country *d*,[30] the combined effective tax rate t_{do} (relief method) for the multinational company can be defined as:

a) t_{do} (no relief) $= 1 - (1 - t_d)(1 - w_d) + t_o - t_d t_o$

b) t_{do} (deduction) $= 1 - (1 - t_d)(1 - w_d)(1 - t_o)$

c) t_{do} (direct credit) $= \max \{1 - (1 - t_d)(1 - w_d), 1 - (1 - t_d)(1 - t_o)\}$

d) t_{do} (indirect credit) $= \max \{1 - (1 - t_d)(1 - w_d), t_o\}$

e) t_{do} (exemption) $= 1 - (1 - t_d)(1 - w_o)$

(Petkova *et al.* 2020: 579)

We make use of the above formulas to calculate two types of tax burdens included in the main analysis, i.e., the actual tax burden (*Atb*) and the hypothetical tax burden (*Htb*).
The actual tax burden (*Atb*) is the combined effective tax rate (tax cost) for the multinational enterprise which consists of corporate income taxes to be paid in the country of residence of the parent (home), corporate income taxes to be paid in the country of source (host), and withholding taxes on the income of the subsidiary to be paid in the source country (host), calculated according to the tax relief method in the resident (home) country applied under the effective treaty between the OECD member country and the developing country: i.e., taking into consideration the change in the residence (home) tax relief method due to the treaty.

[30] We define the resident or home country with *o*, instead of R as normally denominated, since the home country in our analysis is always an OECD member country. Similarly, we use *d* for host country, meaning that the host country is always a developing country in our sample.

The hypothetical tax burden (*Htb*) is the combined effective tax rate (tax cost) for the multinational enterprise, which consists of corporate income taxes to be paid in the country of residence of the parent (home), corporate income taxes to be paid in the country of source (host), and withholding taxes on the income of the subsidiary to be paid in the source country (host), as if the double tax treaty between the OECD member country and the developing country had not unilaterally changed the tax relief method in the OECD country: i.e., as if the home (residence) country had continued to apply the unilateral relief method despite the effective treaty with the host (source) country. Thus, in calculating the tax burden, t_{do}, we consider the corporate income taxes to be paid in the country of residence of the parent (home), corporate income taxes to be paid in the country of source (host), and withholding taxes on the income of the subsidiary to be paid in the source country (host) as negotiated under the treaty, while the relief method at home equals the one that would have been applied in the absence of the treaty.

In this way, the difference between the *Htb* and *Atb* is only due to the relief method in the resident (home) country. Differently from the calculation of *Atb*, in the calculation of the *Htb*, each of the taxes is equal to the rates under the double tax treaty, while the tax relief method is equal to the relief method under the domestic law, and thus to the relief method as if there were not an effective double tax treaty between the country-pair, even when actually there is an effective double tax treaty which has changed the unilateral residence's tax relief. It is relevant to underline that *Htb* differs from *Atb* only for country-pairs for which the tax treaty relief method differs from the unilateral (domestic) tax relief method.

While the analysis of treaty shopping and the identification of conduit countries is not the main purpose of this study, we do understand that both the residence country's tax relief method and the inclusion of the tax sparing provisions in the treaty between the OECD member state and the developing country matter for investments from the former to the latter, if investors choose the direct route to invest in the developing country, instead of an indirect route through conduit countries. Therefore, the analysis extends to a distinction between treaties, which make the direct investment from home to host more convenient in terms of tax distance than investing through an indirect route.

We add a dummy variable, which equals one if the direct route exhibits a shorter tax distance than an indirect route, namely the variable Direct_cheap. In order to encode this dummy variable, we make use of two variables as constructed and taken from Petkova *et al*. (2020), i.e., DirectTaxDistance and distance_minimum.[31] While the DirectTaxDistance is the tax distance, i.e., the effective tax rate on overseas profits, taking into account a possible tax treaty between the two countries, the distance_minimum is the minimum indirect cost between any two countries, i.e., the lowest tax distance, considering intermediate countries (up to a maximum of two conduit countries). Accordingly, if the DirectTaxDistance equals the distance_minimum, investing directly from home to host is the cheapest route in terms of tax distance. Otherwise, if the DirectTaxDistance is bigger than the distance_minimum, then there is a cheaper route, which goes through one or two conduit countries and it is the minimum distance, i.e., the cheapest route through the network. Comparing the DirectTaxDistance with the distance_minimum, if they are equal, investors do not use a conduit, while if the distance_minimum is lower than the DirectTaxDistance, apparently, they use a conduit, which makes it cheaper. Our dummy variable Direct_cheap equals one in the first case (DirectTaxDistance=distance_minimum) and zero otherwise (DirectTaxDistance>distance_minimum).

[31] Note that, even by using the same methodology as in Petkova *et al.* (2020), it was impossible for us to calculate these variables on our own, as the coding procedure requires a more extended dataset with respect to ours. For details on the methodology used to calculate the DirectTaxDistance and distance_minimum see Petkova *et al.* (2020).

As can be observed in Table 1, the sample includes 753 asymmetric tax treaties in 2005, i.e., in the initial year of the observation period, and 939 asymmetric tax treaties in 2016, i.e., in the last year of the observation period. In 2005, the OECD member countries relieve double taxation on cross-border dividends through a foreign tax credit (direct and indirect) in 78.74 per cent of the effective tax treaties, and through the exemption method in 21.24 per cent of them. In 2019, the OECD member countries relieve double taxation through a foreign tax credit (direct and indirect) in 79.65 per cent of the effective tax treaties, and through the exemption method in 20.34 per cent of them.

Table 1 Tax treaty network

		2005	2016
Number of country-pairs with an effective tax treaty		753	939
Relief method under the tax treaty			
	Direct credit	62.54%	59.42%
	Indirect credit	16.20%	20.23%
	Exemption	21.24%	20.34%
Shortest distance*	Direct	52.72%	44.51%

Note: Sample is restricted to country-pair-year observations for which the tax treaty dummy equals one.
Percentages rounded to two decimal points.
*Percentage of country-pair-year observations for which the direct tax distance equals the minimum distance.

After constructing the dummy variable containing qualitative information on whether the direct route is the cheapest route to invest from the OECD member country to the developing country, we count that in 2005 (2019), in 52.72 per cent (44.51 per cent) of the cases (country-pair-year obs.), the direct route exhibits a shorter tax distance than the indirect route, i.e., investing through conduit countries.

The two graphs in Figure 1 show the percentage of treaties for which the home country's double tax relief method, once the treaty becomes effective, remains equal to the home country's unilateral double tax relief method (see bar *'Equal'*), and the percentage of treaties for which the home country's double tax relief method, once the treaty becomes effective, differs from the home country's unilateral double tax relief method (see bar *'Different'*). This is represented respectively for 2005 and 2016. In 2005 (2019), in 64.70 per cent[32] (73.0 per cent)[33] of the effective tax treaties in place between OECD member states and developing economies, the bilateral tax relief method at home differs from the unilateral tax relief method, which would otherwise apply (i.e., in the absence of the treaty).

[32] 487 out of 753 effective tax treaties.
[33] 686 out of 939 effective tax treaties.

Figure 1 Comparison between bilateral and unilateral tax relief method at home (OECD member country)

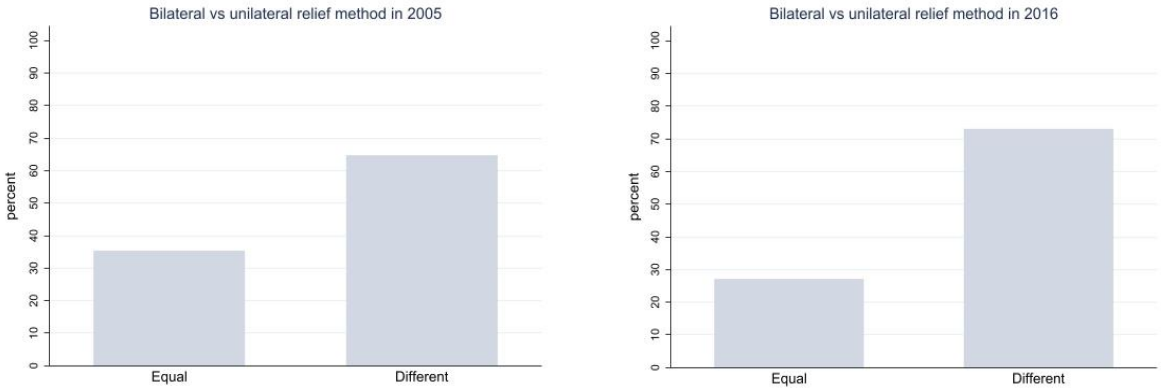

Table 2 provides summary statistics for variables used in the empirical analysis for the estimation sample.

Table 2 Summary statistics estimation sample

Variable	Obs.	Mean	Std. dev	Min	Max
FDI stocks *(in million U.S. dollars)*	7,339	2268.47	9105.96	-626.18	212568.8
Hypothetical tax burden *(Htb)*	10,218	.31085	.09669	0	.577706
Actual tax burden *(Atb)*	10,218	.30154	.09349	0	.556
Direct cheapest	10,218	.53846	.49854	0	1
Direct tax distance	10,218	.07339	.06625	0	.41
Distance minimum	10,218	.03366	.04819	0	.41
Tax sparing	10,218	.32354	.46785	0	1
Exemption	10,218	.20336	.40252	0	1
BIT	10,218	.70512	.45600	0	1
Home CIT	10,218	.26307	.06136	.05	.46875
Host WHT	9,710	.13178	.04619	0	.3

6 Determinants of FDI in developing countries

6.1. Empirical methodology

We investigate first whether the residence country's double tax relief method has an impact on the foreign direct investments from OECD member countries to low and middle income countries, which have an effective tax treaty for the elimination of the double taxation in force. Second, we extend the analysis to the tax sparing provisions, and investigate whether the inclusion of tax sparing provisions in asymmetric tax treaties has an impact on the

investments from the developed treaty partner country to the developing treaty partner country. In analysing both of the questions, we take into account the possibility for treaty shopping that might give multinational companies benefits, such as lower or no withholding taxes. Following Petkova *et al.* (2020), we evaluate whether the direct tax distance investing from the OECD country (home) to the developing country (host) is lower than the indirect tax distance, i.e., investing from home to host through conduit countries, and allow for a differential effect of the residence country's relief method and of tax sparing provisions on FDI.

We exploit our panel data to investigate each of the questions estimating an empirical model, which looks like the following:

$$\begin{aligned} FDI_{o\text{-}d,t} = \exp[&\beta_1 Htb_{o\text{-}d,t} + \beta_1 Atb_{o\text{-}d,t} + \beta_2 Direct\_cheap_{o\text{-}d,t} + \delta_1 Direct\_cheap_{o\text{-}d,t}{*}Htb_{o\text{-}d,t} \\ &+ \delta_2 Direct\_cheap_{o\text{-}d,t}{*}Atb_{o\text{-}d,t} + \beta_3 X_{o\text{-}d,t} + \eta_{d,t} + \theta_{o,t} + \gamma_{od}] + \varepsilon_{d,t} \qquad (1) \end{aligned}$$

where *o* indicates an OECD member country (home, residence), *d* stands for for developing country (host, source), and *t* stands for year.

The sample is restricted to country-pair-year observations with an effective tax treaty in force in a certain year over the period 2005–2016. Our bilateral FDI stocks contain a substantial number of zero values, indicating the absence of any FDI data from the residence to the source country in that year.[34] A conventional method for estimating the determinants of FDI is to use an OLS specification with the log of FDI as the dependent variable. However, when there are large numbers of zero observations, a fundamental problem with the log function is that observations for which the FDI value is equal to zero are dropped from the sample.[35] Ideally, the high frequency of zeros with bilateral FDI stocks requires a model that accommodates zeros and which allows for consistent estimators in the presence of a large number of zeros. With this type of data, Santos Silva and Tenreyro (2006) suggest the use of a PPML estimator.[36] Therefore, we employ a gravity model to infer a home country's double tax relief method effects on bilateral FDI stocks, and adopt a PPML estimator, resorting to the PPML estimator as proposed by Santos Silva and Tenreyro (2006) to account for zero FDI stocks and, more importantly, heteroscedasticity in FDI data (Azémar and Dharmapala 2019).[37] Following Petkova *et al.* (2020), given the large number of fixed effects, we use the *ppml-panel_sg* STATA command from Larch, Wanner, Yotov and Zylkin (2019) to estimate equation (1).

The first two variables of interest are $Htb_{o\text{-}d,t}$ and $Atb_{o\text{-}d,t}$, which stand respectively for *hypothetical tax burden* and *actual tax burden* on investments from the OECD member country (home, residence) to the developing country (host, source); we include the dummy variable, namely $Direct\_cheap_{o\text{-}d,t}$, to indicate whether the direct route of investing from country *o (OECD member country, home)* to country *d (developing country, host)* exhibits a shorter tax distance than a possible/eventual indirect route through conduit countries. Thus, it equals one if investing directly from the OECD member country to the developing country exhibits a shorter tax distance than investing through an indirect route, i.e., using conduit countries, and zero otherwise. In order to investigate for the effect of the *hypothetical* and *actual tax burden* within investments going from home to host through an indirect route, the

[34] Indeed, bilateral FDI stocks are 0 for 1,218 country-pair-year observations, from a total number of 10,218 country-pair-year observations in the estimation sample.

[35] These observations can be retained in the sample by adding an appropriate constant to these values. However, this introduces some degree of arbitrariness in the interpretation of magnitudes, depending on the choice of units (Azémar and Dharmapala 2019: 95).

[36] While Poisson models are most familiar in the context of count data, this estimator remains consistent with a continuous dependent variable such as in our case (Winkelmann 2008; Wooldridge 2010).

[37] In particular, Santos Silva and Tenreyro (2006) argue that the standard log-linear OLS approach results in inconsistent estimates.

Direct_cheap$_{o\text{-}d,t}$ enters interacted with both *Htb*$_{o\text{-}d,t}$ and *Atb*$_{o\text{-}d,t}$; *X*$_{o\text{-}d,t}$ is a vector of control variables, which in our case is only a dummy variable controlling for a BIT within the two countries (OECD member country and developing country) in year *t*; finally, $\eta_{d,t}$ denotes time-varying host country fixed effects, $\theta_{o,t}$ denotes time-varying home-country fixed effects, and γ_{od} denotes country-pair fixed effects; $\varepsilon_{d,t}$ is the Poisson error term. Time-varying host country and home-country fixed effects absorb any between country variation over time, while country-pair fixed effects control for physical distance between the host and the home country (see Wooldridge 2010; Baier and Bergstrand 2007). Thus, we restrict the analysis to the within-country-pair variation over time. The *ppml-panel_sg* STATA command by default clusters standard errors at country-pair level.

Since our dependent variable *FDI*$_{o\text{-}d,t}$ is in level form, the coefficient can be interpreted analogous to a log-linear estimation, where a unit increase in the regressor will lead to a $100(e^{\beta}-1)$ percentage increase in the dependent variable. Because the PPML estimator does not allow for negative values of FDI stocks, we replace the negative FDI stocks with zero in our main analysis.[38]

We extend the analysis and re-estimate equation (1) adding a dummy variable, namely *Tax sparing*$_{o\text{-}d,t}$, which contains qualitative information on whether the tax treaty between the OECD member state and the developing country in year *t* includes tax sparing agreements, which enforce the home country to allow firms to claim foreign tax credits against home-country tax liabilities for taxes that *would have been paid* to foreign governments, in the absence of special abatements, on income from investments in the developing treaty partner country. We investigate the impact of tax sparing provisions on investment from OECD member states to the developing countries, while controlling for the relief method effect, as well as allowing for a differential effect between treaties which make the direct route cheaper than an indirect route through conduit countries, i.e., introducing an interaction term between tax sparing dummy, *Tax sparing*$_{o\text{-}d,t}$ and *Direct_cheap*$_{o\text{-}d,t}$.

6.2. Results

Results of the estimation of equation (1) are represented in Table 3. All the specifications (columns 1–4) include home-year, host-year and country-pair fixed effects. Standard errors are clustered at country-pair level.

First, in column 1, we introduce only the two types of tax burden, i.e., the actual tax burden *(Atb)*, which is the tax burden that the investor investing in the developing country actually bears due to the tax treaty in place within the country-pair; and the hypothetical tax burden *(Htb)*, which is the tax burden that the investor investing in the developing country would bear, if the OECD member state (residence; home) had continued to apply the unilateral tax relief method, hence, if the treaty between the OECD member state and the developing country had not changed the residence country's unilateral (domestic) tax relief method. Both of the tax burdens enter the regression in decimals.

[38] On one hand, the negative values of FDI are economically meaningful, i.e., representing disinvestments in the host economy; on the other hand, negative FDI stocks may generally be a consequence of accounting method as well (Gouel, Guimbard and Debucquet 2012; Petkova *et al.* 2020: 597). We conduct a robustness check by replacing the negative FDI stocks with missing values as well.

Table 3 Estimating the impact of OECD member countries' tax relief method on FDI to developing countries

Dependent variable: FDI stocks in mill $ (2005–2016)				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	-3.079***	-3.050***	1.571	1.500
	(0.942)	(0.945)	(1.763)	(1.728)
Actual tax burden *(Atb)*	0.541	0.685	-4.130**	-4.004**
	(1.114)	(1.096)	(1.964)	(1.923)
Direct_cheap *(dummy)*		0.0363	-0.0858	-0.0539
		(0.0625)	(0.382)	(0.378)
Htb * Direct_cheap			-6.186***	-6.113***
			(2.258)	(2.227)
Atb * Direct_cheap			6.591***	6.398***
			(2.520)	(2.475)
BIT				-0.367**
				(0.157)
Observations	6,484	6,484	6,484	6,484
R-squared	0.991	0.991	0.991	0.992
Home-Year FE	Yes	Yes	Yes	Yes
Host-Year FE	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

Note: Sample is restricted to country-pair-year observations for which the treaty dummy equals one.

We obtain a strongly statistically significant negative effect of the hypothetical tax burden on FDI stocks in developing countries, where increasing by ten percentage points the hypothetical tax burden decreases FDI stocks by almost 9.5 per cent.[39] Accordingly, while the tax treaty is expected to improve the investor's tax burden, either through lower withholding tax rates at source, or through a more advantageous tax relief method,[40] then a treaty, which although it lowers the withholding tax rates does not improve the relief method, can actually deteriorate investments to developing countries.

On the other hand, the coefficient on the actual tax burden is positive. The actual tax burden represents the additional gain that the investor gets when the residence country (home) imposes a different relief method from the unilateral (domestic) one, hence when the treaty between the partners improves the tax relief method.[41] Therefore, the positive coefficient represents the additional gain that the investor gets when the treaty switches the relief method, thus when the relief method applied under the treaty differs from the unilateral

39 Calculated as: 100 [$e^{(-3.079)}$ - 1]

40 For instance, from no relief or deduction under domestic tax law, to foreign tax credit (either direct or indirect), or to exemption.

41 We remind here that *Htb* differs from *Atb* only for country-pairs for which the tax treaty relief method differs from the unilateral (domestic) tax relief method.

(domestic) relief method. Although the effect is only insignificantly positive, the sign of the coefficient is due to the switching to a more favourable relief method (i.e., from credit method to exemption, or from no relief to credit). Although part of it may be due to cases where the opposite happens (e.g., switching from exemption to credit method), these cases do not matter, since the more favourable domestic relief method prevails (e.g., exemption). Accordingly, the positive sign would suggest that switching to a more favourable relief method under the treaty gives a boost to the FDI.

In column 2, we distinguish between tax treaties that make the direct route the cheapest route in terms of tax distance to invest in the developing country, as compared to an eventual indirect route through conduit countries, introducing *Direct_cheap*, which equals one if the direct route exhibits the shortest tax distance, and zero otherwise. While the coefficient on the dummy variable is positive, we cannot say that the level of FDI stocks in developing countries is statistically significantly higher when the direct route exhibits the shortest tax distance as compared to when an indirect route is cheaper.

Particularly relevant for our analysis are the estimation results in columns 3 and 4, where each of the tax burdens enters interacted with the *Direct_cheap(dummy) – Htb*Direct_cheap* and *Atb*Direct_cheap* – allowing us to look at the impact of respectively *Htb* and of *Atb* on our dependent variable, when investors choose the direct route to invest from the OECD member state to developing country. The coefficients on both interaction terms result statistically strongly significant, suggesting that the impact of the hypothetical tax burden and of the actual tax burden on FDI stocks to developing countries differs between investments through the direct and indirect route.

Results suggest that for country-pair-years for which the direct route is the cheapest and FDI investments go directly from the OECD member country to the developing country, an increase in the hypothetical tax burden by ten percentage points decreases FDI stocks by almost 9.9 per cent,[42] the effect being statistically significant at the 1 per cent significance level. Accordingly, once the investors are investing through the direct route, increases in the tax burden that they would bear due to a tax treaty, which however does not change the residence country's tax relief method, discourage FDI. On the other hand, we find a very large positive effect of the actual tax burden on FDI stocks in the cheapest direct route, i.e., an increase by ten percentage points in the actual tax burden increases FDI stocks by more than 10 per cent,[43] which reflects the advantage gained when the relief method switches following the treaty's year of effectiveness.

Note that the coefficients on the single terms *Htb* and *Atb*, respectively 1.571 and -4.130, capture now the impact of each of the tax burdens on FDI stocks in country-pair-year observations for which the indirect route exhibits the shortest tax distance (hence for which *Direct_cheap(dummy)* equals zero). While the hypothetical tax burden has no effect on FDI stocks within the indirect route, the actual tax burden has a negative effect on them, which is statistically significant at the 5 per cent significance level. Thus, if the direct route does not exhibit the shortest tax distance, and investments go from home to host through conduit countries, increases in the actual tax burden significantly reduce FDI, which might be explainable by countries not using the indirect route, i.e., sometimes the advantage gained is so small that firms simply do not build conduit structures and choose the direct route nevertheless.

In column 4, we control for the bilateral investment treaty within the country-pair, which has a negative effect on FDI stocks of almost 30.7 per cent.[44] While the negative effect of the hypothetical tax burden on FDI stocks in the direct route being the cheapest remains strongly

[42] Calculated as: [1.571 + (-6.186)] = -4.615; 100 [e $^{(-4.615)}$ - 1]
[43] Calculated as: [(-4.130) + 6.591] = 2.461; 100[$e^{2.461}$ – 1]
[44] Calculated as: 100 [$e^{(-0.367)}$-1]

statistically significant, the positive effect of the actual tax burden becomes marginally significant.

Table 4 is a continuation of Table 3, representing results of the additional analysis on the impact of tax sparing agreements included in the tax treaty between the OECD member states and developing countries on FDI stocks in the developing country. We introduce the *Tax_sparing (dummy)* in specification 5. The main findings remain as in Table 3, i.e., the hypothetical tax burden exhibits a strongly statistically significant negative effect on FDI stocks through the direct route,[45] while the actual tax burden exhibits a positive effect on FDI stocks through the direct route,[46] which is only marginally statistically significant.

The coefficient on the *Tax_sparing(dummy)* suggests a negative effect of the tax sparing agreements on the FDI stocks to developing economies of almost 17.88 per cent,[47] and is statistically significant at the 5 per cent significance level. In specification 6, we look for the effect of tax sparing agreements on investments going through the direct route, it being the cheapest in terms of tax distance over the treaty network.

However, we fail to find an interaction effect between the *Direct_cheap (dummy)* and the *Tax_sparing(dummy)*; in specification 7, we control for the BIT as well. While we did actually expect a positive effect of the inclusion of tax sparing provisions in asymmetric tax treaties on FDI to developing economies, our results show the opposite. Our expectation was based on the intuition that giving a credit for taxes that 'shall have been paid' would attract more FDI to the developing countries, which would be free to use various tax incentives without bearing the risk of the tax incentives being cancelled by the residence country's tax relief method. Nevertheless, the negative effect of the tax sparing agreements on investments to developing economies might actually be attributed to reverse causality. While a large number of developing countries have signed one or more tax sparing provisions with OECD countries, most tax sparing agreements entered into force before the initial year of our observations period. Furthermore, while tax sparing provisions signed in the same year when the tax treaty was signed would have been another source of longitudinal variation for our analysis, note that we restrict the analysis to country-pair-year observations for which the treaty dummy variable equals one. We identify only 14 instances[48] in which tax sparing agreements were terminated over the period 2005–2016 and no instances in which new tax sparing agreements were signed.

Accordingly, we believe that the negative coefficient on the effect of the tax sparing agreements on FDI stocks to developing economies estimates actually a between effect (between country-pairs) rather than the within effect (within country-pairs). This would suggest that OECD member states tend to offer tax sparing provisions mostly to less-developed economies, which already receive very low, if any foreign direct investment, nevertheless. Therefore, the costs arising by providing tax sparing agreements to these economies are close to being irrelevant, since these countries do not however receive FDI.

45 Calculated as: [1.553 + (-6.170)] = -4.617; $100[e^{(-4.617)} - 1]$

46 Calculated as: [(-3.981) + 6.351] = 2.37; $100(e^{2.37} - 1)$

47 Calculated as: $100[e^{(-0.197)} - 1]$

48 Identified in the following tax treaties: Germany-China, Germany-Mauritius, Finland-China, United Kingdom-China, United Kingdom-Croatia, Italy-Bangladesh, South Korea-India, Netherlands-China, Norway-India, Norway-Zambia, Poland-India.

Table 4 Estimating the impact of tax sparing agreements on FDI to developing countries

Dependent variable: FDI stocks in mill $ (2005–2016)				
Regressors	**(3)**[49]	**(5)**	**(6)**	**(7)**
Hypothetical tax burden *(Htb)*	1.571	1.553	1.556	1.487
	(1.763)	(1.758)	(1.748)	(1.710)
Actual tax burden *(Atb)*	-4.130**	-3.981**	-3.889**	-3.737*
	(1.964)	(1.972)	(1.972)	(1.927)
Direct_cheap *(dummy)*	-0.0858	-0.0245	-0.000685	0.0367
	(0.382)	(0.385)	(0.383)	(0.378)
Htb * Direct_cheap	-6.186***	-6.170***	-6.136***	-6.056***
	(2.258)	(2.256)	(2.246)	(2.213)
Atb * Direct_cheap	6.591***	6.351**	6.166**	5.927**
	(2.520)	(2.532)	(2.529)	(2.480)
Tax sparing *(dummy)*		-0.197**	-0.195**	-0.189**
		(0.0959)	(0.0952)	(0.0942)
Tax sparing * Direct_cheap			0.0582	0.0765
			(0.0833)	(0.0849)
BIT				-0.369**
				(0.161)
Observations	6,484	6,484	6,484	6,484
R-squared	0.991	0.991	0.991	0.992
Home-Year FE	Yes	Yes	Yes	Yes
Host-Year FE	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

[49] Column 3 from Table 3.

7 Does the residence's relief method restrain the source's domestic tax policy?

7.1. Empirical methodology

We extend our empirical analysis to the investigation of the third research question, i.e., the role of the residence (home) country's tax relief method in the source (host) country's domestic tax policy, in particular on the source country's corporate income tax rate. We use the same dyadic panel dataset of asymmetric tax treaties in order to analyse whether the double tax relief method on repatriated profits applied in the OECD member country (in the role of home (residence) country) affects the corporate income tax under domestic law in the developing country (in the role of host (source) country), when the two countries have an effective double tax treaty in force. In addition, we explore the impact of the inclusion of tax sparing agreements on the host country's CIT, as well as whether they alter the impact of the relief method on the host country's domestic tax policy. As in the first part of the analysis, since we investigate the impact of the residence country's relief method on the host country's tax policy, while the two countries have an effective tax treaty in force, the sample is restricted to country-pair-year observations for which the dummy containing qualitative information on the effective tax treaty in year *t* equals one.

Using this sample of 10,218 observations, we estimate an empirical model, which looks like the following:

$$CIT_{d,t} = \alpha + \beta_1 Exemption_{o,t} + \beta_2 Tax\_sparing_{o\text{-}d,t} + \delta_1 Exemption_{o\text{-}d,t} * Tax\_sparing_{o\text{-}d,t} +$$

$$+ \beta_4 X_{o,d,t} + \gamma_{o\text{-}d} + \theta_t + \epsilon_{o\text{-}d,t} \qquad (2)$$

where *o* stands for the OECD member country (residence, home), *d* stands for the developing country (source, host), and *t* stands for the year. The dependent variable is the corporate income tax rate in the host country *d* in year *t*, which we keep in percentages.

Our first main variable of interest is a dummy variable containing qualitative information on the relief method on dividends applied in the home country *o* in year *t*. Under the tax treaty rules, the residence country can either exempt dividends sourced in the host country, or can provide a foreign tax credit for taxes paid abroad. Therefore, we introduce the dummy variable $Exemption_{o,t}$, which takes the value one if the OECD member country relieves double taxation on dividends repatriated from the developing country through the exemption method, and zero if it provides a foreign tax credit (either direct or indirect credit).[50]

$Tax\ sparing_{o\text{-}d,t}$, is the second main variable of interest, which contains qualitative information on whether the tax treaty between the OECD member country and the developing country includes tax sparing agreements, which enforce the home country to allow firms to claim foreign tax credits against home-country tax liabilities for taxes that *would have been paid* to foreign governments, in the absence of special abatements, on income from investments in the developing treaty partner country. This dummy is then interacted with the relief method dummy, *Exemption*Tax_sparing*, in order to investigate an eventual interaction effect between the relief method and the inclusion of tax sparing agreements in the treaty between the country-pair, on the host country's corporate income tax rate.

[50] As a robustness check, we look at the different impact of the indirect and direct credit method on host country's CIT as well.

$X_{o,d,t}$ is a vector including three control variables, namely the home country's statutory corporate income tax rate in year *t* (Home CIT), the withholding tax (WHT) rate in the host country (Host WHT), and a dummy variable on whether a bilateral investment treaty is in force within the country-pair (BIT). The statutory corporate income tax rate in the residence country (OECD member) may have an impact on developing country tax policy, especially when the former relieves double taxation through the credit method, setting in this way a sort of bottom threshold for the overall tax that might be credited against the residence CIT. On the other hand, as for the host country withholding tax rate's impact on the host country's corporate income tax rate, while it may reflect general preferences towards taxation, it might also have a substitutive effect. The developing country may want to tax business profits moderately and in turn realise more revenue from the repatriations of foreign-owned firms through withholding taxes (Rixen and Schwarz 2009: 454). Finally, we expect that the signature of a BIT between the country-pair will incentivise a lower CIT rate in the host country, as a consequence of the missing negative impact on tax revenue due to an increase in foreign direct investment following the BIT signature.

Because our independent variables exhibit variability mainly across country-pairs, an incorporation of country-specific fixed effects – in addition to entailing a significant loss in degrees of freedom – would result in imprecise points estimates (Chisik and Davies 2004a: 1131–1132; Rixen and Schwarz 2009: 455). While the Hausman test does suggest a fixed effects model over a random effects model, we introduce country-pair fixed effects to control for the physical distance between the host country and the home country, and time-fixed effects to control for unobserved time effects. Standard errors are clustered at country-pair. Table 5 reports the results of the estimation of equation (2).

7.2. Results

We start here from the interpretation of columns 3 and 4 of Table 5, where all the main variables of interest (column 3) and control variables (column 4) are included. All the specifications include country-pair and year fixed effects, while the standard errors are clustered at country-pair level.

Results suggest a positive impact of the exemption method in the residence country on the corporate income tax rate in the source country. Host countries (developing economies) set corporate income tax rates which are between 0.011 and 0.012 percentage points higher when the residence country relieves double taxation through the exemption method, as compared to when it uses foreign tax credit as a tax relief method. The effect is statistically significant at the 5 per cent significance level. The exemption method entails a residence country altogether excluding foreign income from its tax base, with the source country being given the exclusive right to tax. Since exemption in the residence state can therefore lower the overall tax burden of the investor if tax concessions are granted by the source country, developing countries should have then an incentive to engage in tax competition. The opposite would happen with the residence country applying the credit method on repatriated profits. In the latter case, if the residence country's corporate income tax rate is high, the source country reducing its corporate income tax rate does not give any benefit to the investors, since any lowering of tax rates in the source country is calculated against the residence state's tax rate, leading to one tax rate for the investor. Accordingly, we expected higher corporate income tax rates at source under the residence country's credit method, as compared to the residence country's exemption method. A reasonable explanation for the results obtained might be that OECD member states offer the exemption method to developing countries, which impose high corporate income tax rates, while they offer nothing

but a foreign tax credit to repatriated profits sourced in developing countries with low corporate income tax rates.[51]

In line with our expectation, we obtain a positive and statistically significant positive effect of tax sparing provisions on the corporate income tax rate in the host country. Developing countries set corporate income tax rates between 0.013 and 0.15 percentage points higher when they have a double tax treaty with an OECD member state which includes tax sparing agreements, i.e., when the residence country offers a credit for taxes that 'shall have been paid', as compared to when it does not.

This is in line with the intuition that tax sparing agreements might incentivise developing countries to set high corporate income tax rates, making the CIT thereafter subject to tax holidays and tax incentives, without bearing the risk of tax incentives being cancelled by the residence country tax relief method, since the OECD member state would be forced to provide a credit for the rate that would have been paid at the source.

In addition, the lack of statistical significance in column 4 – where the full set of main and control variables is included – on the interaction term *Exemption*Tax sparing*, is in line with the expectation that tax sparing provisions matter for the source country's tax policy, as long as the residence country offers a foreign tax credit for the taxes paid at source, while they become irrelevant when the residence country already exempts foreign repatriated profits.[52]

While we do not obtain any significant effect of the home country's corporate income tax rate (Home CIT) and of the host country's withholding tax rate (Host WHT) on the host country's corporate income tax rate, a BIT between the OECD member state and the developing country lowers the corporate income tax rate in the developing country, and the effect is statistically significant at the 5 per cent significance level.

51 This interpretation would be in line with results that we obtain in the robustness check in Table A5, where we use as baseline group the *Exemption method*, and distinguish between *direct credit* and *indirect credit* at home. We find that corporate income tax rates in the developing countries are almost 0.018 percentage points lower when these countries are in tax treaties with OECD member states that relieve double taxation through the direct credit method, as compared to when they apply the exemption method on repatriated profits. Accordingly, it might suggest that to developing economies with low corporate income tax rates, OECD member states do not offer a more favourable tax relief method than the foreign tax credit.

52 In line with this explanation, in the robustness check reported in Table A6, we do actually find an interaction effect between the direct credit method at home and the inclusion of tax sparing provisions in the treaty between the OECD member state and the developing country, with the coefficient being statistically significant at the 5 per cent significance level.

Table 5 Estimating the impact of relief method and tax sparing on corporate income tax in host (developing) countries

Dependent variable: Corporate income tax in host country (2005–2016)				
Model: OLS–FE				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Exemption *(dummy)*	0.00666*	0.00668*	0.0113**	0.0115**
	(0.00344)	(0.00343)	(0.00495)	(0.00516)
Tax sparing *(dummy)*		0.00494	0.0142*	0.0147**
		(0.00474)	(0.00731)	(0.00743)
Exemption * Tax sparing			-0.0110*	-0.00982
			(0.00615)	(0.00635)
Home CIT				0.0167
				(0.0187)
Host WHT				-0.0572
				(0.0448)
BIT				-0.00742**
				(0.00323)
Observations	10,218	10,218	10,218	9,710
R-squared (within)	0.254	0.254	0.256	0.261
Number of pair_id	946	946	946	904
Country-pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

8 Robustness

The results obtained are robust to several robustness checks, as reported in the appendix. While the coefficients can be easily observed from Table A1 (a) to Table A6, linear combinations of the coefficients and their significance level are available upon request.

While all of the OECD member states are considered as developed countries in the baseline regressions in Tables A1 (a), A1 (b) and A5, following Azémar and Dharmapala (2019), we use a subset of 23 OECD member states, excluding those OECD member states that are themselves developing or transition economies, and restricting the analysis to tax treaties between developed and developing countries, instead of between OECD members and developing economies. The results remain robust. Tables A1 (a) and A1 (b) are replications of respectively Table 3 and Table 4 to this restricted sample (estimation of equation 1), while Table A5 is a replication of Table 5 (estimation of equation 2).

In this study, following previous literature, we used OECD member states as a proxy for developed countries and low and middle income countries as a proxy for developing economies. Accordingly, while investigating the impact of the tax relief method and of tax sparing provisions on FDI stocks, we considered developed economies as net capital exporters and developing economies as net capital importers. Although we conducted a

robustness check restricting the sample to 23 OECD member countries, by excluding those countries which are both OECD member states and developing economies, it is relevant to classify the developing countries as host and all the OECD members as home (residence) countries for all the years of the observation period, based on a comparison of bilateral FDI data. Following Chisik and Davies (2004a), we compared the relative FDI activity of the two countries of each country-pair for each year that bilateral FDI stock data was available in order to make sure that the OECD member state had higher activity in all of the years between 2005 and 2016. We conduct a robustness test estimating the impact of the tax relief method and of the tax sparing provision on the FDI stocks to developing economies, while excluding China from the estimation sample: although classified as a developing country, its outward FDI stocks to OECD member countries are larger than the inward FDI stocks from OECD countries for the majority of country-pair-year observations. In addition, we exclude all the country-pairs for which in at least one year during the observation period the inward FDI stocks reported in the developing country from the OECD member country were lower than the inward FDI stocks reported in the OECD member state from the developing country. The results of this robustness check can be observed in Table A1 (c). Our results are not affected by this restriction of the estimation sample.

In our baseline estimations, we follow the standard practice in the empirical literature on the effects of DTTs and use FDI stocks as the dependent variable (Blonigen and Davies 2004; Egger *et al.* 2006; Azémar and Dharmapala 2019; Petkova *et al.* 2020). Petkova *et al.* (2020: 602) suggest using FDI flows in cases where there could have been a lot of inertia in FDI and changes in the treaty network might only affect new FDI; following this, we include one-year lagged FDI as an independent variable in Tables A2 (a) and A2 (b), which results statistically insignificant. The rest of the results remain robust.

Braun and Weichenrieder (2015) suggest that firms invest in tax havens for non-tax reasons, such as secrecy, beyond lower tax rates. While our set of time-varying host and home country fixed effects should capture any unobservable reasons to invest in tax haven jurisdictions, following Petkova *et al.* (2020), in order to confirm that our results are not biased by the presence of tax havens, we conduct a separate analysis and exclude all of them. We consider as tax havens countries defined as such in Dyreng and Lindsey (2009) and Dyreng *et al.* (2009), thus excluding from the sample Aruba, Botswana, Lebanon, Mauritius, Panama, Seychelles, and Uruguay. As can be observed in Tables A2 (a) and A2 (b), our results are robust to the presence of tax havens.

As mentioned previously in the study, we identify only 14 instances in which tax sparing agreements were terminated over the period 2005–2016, and no instances in which new tax sparing agreements were signed. These instances are mostly identified between India and OECD countries, as well as between China and OECD countries. To make sure that our findings on the impact of tax sparing clauses on investments to developing countries are not driven by larger economies with more treaties, we estimate the impact of tax sparing agreements on investment flows in developing countries excluding China, and then excluding India. The results of this robustness test are reported in Table A3.

Because the PPML estimator does not allow for negative values of FDI stocks, we replace these observations with zero. However, we conduct a robustness check, reported in Table A4, considering them as missing values, since while negative FDI flows are economically meaningful and represent disinvestments in the host economy, negative FDI stocks are generally the consequence of accounting methods (Petkova *et al.* 2020). Different to the main results, the actual tax burden effect on FDI stocks remains positive, although insignificant.

Finally, we estimate equation (2) using as baseline group country-pair-year observations in which the OECD member state (residence, home) exempts foreign-sources dividends, and

thus distinguishing in the regression between the *indirect credit* and *direct credit* methods. The results of this robustness check are reported in Table A6. Under the indirect credit method, the parent company receives a tax credit which may be used against its tax liability, equal to the corporate income and withholding tax rates paid abroad. In the case of direct credit, the parent company only gains a credit in the non-resident withholding tax rate paid. Results suggest a strong statistically significant negative effect of the direct credit method on the corporate income tax in the developing countries, as well as a significant interaction effect between the credit method in the country of residence and the inclusion of tax sparing agreements in the treaty between the OECD member state and the developing country. The inclusion of tax sparing agreements vanishes the negative effect of the direct credit on the host CIT, which might suggest that following an agreement on tax sparing, developing countries increase their corporate income tax rates, offering thereafter tax incentives and tax holidays, without bearing the risk of these incentives being cancelled by the home country's tax policy.

9 Conclusions

This study has investigated the impact of the double tax relief method and of tax sparing agreements on foreign direct investments in developing countries. It focuses on tax treaties between countries with asymmetric investment flows, i.e., between 37 OECD member states, in the role of residence countries, and low and middle income countries, in the role of source countries, over the period 2005–2016, thus taking care of concerns arising because of grouping both developed and developing countries as potential host countries. Unlike any prior analysis on the effects of tax treaties on FDI, our work builds on Petkova *et al.* (2020) in considering treaty network effects when investigating the role of treaty heterogeneity content on FDI. Furthermore, this study extends to developing countries' tax policy and analyses whether the residence country's tax relief method and the inclusion of tax sparing provisions in the treaty between residence and source have an impact on the source country's domestic tax policy, in particular on its corporate income tax rate.

We conduct an empirical analysis using UNCTAD bilateral FDI stocks data between 2005 and 2016 and make use of the PPML estimator. Our results suggest that the double tax relief method applied in the OECD member state is a determinant for the foreign direct investments in developing countries. Having a tax treaty between the OECD member state and the developing country, which improves the investor's conditions in terms of tax burden, by changing the unilateral (domestic) tax relief method that the OECD member state would otherwise apply, results in an additional gain for the investor, and increases foreign direct investment in the developing treaty partner country. The positive effect prevails when investigated within investments made through the direct route from the OECD member state to the developing country, rather than through an eventual indirect route through conduit countries. In addition, we capture a between negative effect of the tax sparing agreements included in the asymmetric tax treaty on FDI stocks in developing economies, which suggests that OECD member states offer tax sparing provisions mostly to less-developed economies, which receive very low, if any foreign direct investment, nevertheless.

Finally, we use an OLS-fixed effects model to investigate the impact of OECD countries' relief method and of treaty tax sparing provisions on developing countries' CIT. We find that developing countries set higher corporate income tax rates when the OECD member state treaty partner relieves double taxation through the exemption method, as compared to when it offers a foreign tax credit, which suggests either that developing countries do not engage in tax competition, or that OECD member states offer the exemption method to those countries which impose high corporate income tax rates, while they offer nothing but a foreign tax

credit to repatriated profits sourced in developing countries with low corporate income tax rates. Finally, we find a positive effect of the inclusion of tax sparing agreements on the corporate income tax rate in developing countries.

There are two lessons to be learned for policymakers from this study. First, developed countries are willing to concede tax sparing, but currently seem to offer it only to very poor countries with very limited FDI inflows. Developing countries may want to stretch the margin and try to be included into that category and negotiate tax sparing. Second, the study clearly shows that countries that offer more generous relief methods will benefit from FDI inflows, pointing to tax competition and a potential race to the bottom. So far, we have not seen much tax competition going on, but this may change, unless countries coordinate their treaty policies, at least on a regional level.

Appendix: Robustness checks

Table A1 (a) Estimating the impact of OECD member countries' tax relief method on FDI to developing countries: sample restricted to 23 OECD member states

Dependent variable: FDI stocks (2005–2016)				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	-2.936***	-2.893***	-0.360	-0.384
	(1.031)	(1.038)	(1.261)	(1.218)
Actual tax burden *(Atb)*	0.522	0.764	-2.183	-2.058
	(1.194)	(1.167)	(1.614)	(1.569)
Direct_cheap *(dummy)*		0.0569	-0.141	-0.0925
		(0.0651)	(0.419)	(0.416)
Htb * Direct_cheap			-3.380**	-3.353**
			(1.618)	(1.596)
Atb * Direct_cheap			4.014*	3.821*
			(2.074)	(2.040)
BIT				-0.372**
				(0.156)
Observations	4,915	4,915	4,915	4,915
R-squared	0.991	0.991	0.991	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

Table A1 (b) Estimating the impact of tax sparing agreements on FDI to developing countries: sample restricted to 23 OECD member states

Dependent variable: FDI stocks (2005–2016)				
Regressors	**(3)**	**(5)**	**(6)**	**(7)**
Hypothetical tax burden *(Htb)*	-0.360	-0.393	-0.366	-0.390
	(1.261)	(1.251)	(1.240)	(1.197)
Actual tax burden *(Atb)*	-2.183	-1.977	-1.845	-1.728
	(1.614)	(1.627)	(1.619)	(1.576)
Direct_cheap *(dummy)*	-0.141	-0.0716	-0.0352	0.0112
	(0.419)	(0.424)	(0.421)	(0.416)
Htb * Direct_cheap	-3.380**	-3.340**	-3.315**	-3.286**
	(1.618)	(1.611)	(1.599)	(1.580)
Atb * Direct_cheap	4.014*	3.731*	3.487*	3.271
	(2.074)	(2.091)	(2.080)	(2.046)
Tax sparing *(dummy)*		-0.174*	-0.171*	-0.166*
		(0.0985)	(0.0973)	(0.0964)
Tax sparing * Direct cheap			0.0864	0.106
			(0.0856)	(0.0874)
BIT				-0.377**
				(0.161)
Observations	4,915	4,915	4,915	4,915
R-squared	0.991	0.991	0.991	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A1 (c) Estimating the impact of the tax relief method and tax sparing agreements on FDI to developing countries: sample restricted to country-pair observations for which OECD member state is a net capital exporter from 2005 to 2016

Dependent variable: FDI stocks (2005–2016)				
	Relief method effect		**Tax sparing effect**	
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	2.177	2.087	2.183	2.090
	(1.829)	(1.785)	(1.824)	(1.777)
Actual tax burden *(Atb)*	-3.477*	-3.320*	-3.432*	-3.265
	(2.056)	(1.995)	(2.057)	(1.990)
Direct_cheap *(dummy)*	0.211	0.235	0.222	0.248
	(0.419)	(0.407)	(0.420)	(0.405)
Htb * Direct_cheap	-6.798***	-6.696***	-6.798***	-6.687***
	(2.343)	(2.303)	(2.338)	(2.296)
Atb * Direct_cheap	6.001**	5.785**	5.952**	5.708**
	(2.673)	(2.594)	(2.676)	(2.589)
Tax sparing *(dummy)*			0.133	0.161
			(0.242)	(0.241)
Tax sparing * Direct cheap			0.0210	0.0408
			(0.0769)	(0.0771)
BIT		-0.401**		-0.402**
		(0.161)		(0.163)
Observations	6,111	6,111	6,111	6,111
R-squared	0.989	0.990	0.990	0.990
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A2 (a) Estimating the impact of OECD member countries' tax relief method on FDI to developing countries: adding one-period lagged FDI and excluding tax havens

Dependent variable: FDI stocks (2005–2016)

	Lagged FDI	Excluding tax havens		
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	1.259	1.630	1.556	1.412
	(1.749)	(1.750)	(1.723)	(1.761)
Actual tax burden *(Atb)*	-3.687*	-4.178**	-4.131**	-3.581*
	(1.940)	(1.952)	(1.921)	(1.937)
Direct_cheap *(dummy)*	-0.0993	-0.105	-0.0843	-0.100
	(0.382)	(0.382)	(0.379)	(0.379)
Htb * Direct_cheap	-5.738**	-5.740**	-5.610**	-5.400**
	(2.302)	(2.485)	(2.462)	(2.551)
Atb * Direct_cheap	6.137**	6.205**	5.987**	5.803**
	(2.548)	(2.736)	(2.698)	(2.781)
BIT	-0.404***		-0.357**	-0.392***
	(0.137)		(0.156)	(0.139)
LagFDI	5.35e-07			6.23e-07
	(6.48e-07)			(5.98e-07)
Observations	6,106	6,319	6,319	5,979
R-squared	0.992	0.991	0.992	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A2 (b) Estimating the impact of tax sparing agreements on FDI to developing countries: adding one-period lagged FDI and excluding tax havens

Dependent variable: FDI stocks (2005–2016)

	Lagged FDI	Excluding tax havens		
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	1.238	1.616	1.548	1.387
	(1.730)	(1.736)	(1.705)	(1.743)
Actual tax burden *(Atb)*	-3.417*	-3.952**	-3.868**	-3.319*
	(1.944)	(1.962)	(1.926)	(1.945)
Direct_cheap *(dummy)*	-0.00688	-0.0238	0.00621	-0.0111
	(0.382)	(0.384)	(0.379)	(0.379)
Htb * Direct_cheap	-5.672**	-5.699**	-5.561**	-5.331**
	(2.288)	(2.477)	(2.452)	(2.543)
Atb * Direct_cheap	5.642**	5.812**	5.532**	5.324*
	(2.554)	(2.750)	(2.710)	(2.796)
Tax sparing *(dummy)*	-0.192*	-0.194**	-0.190**	-0.186*
	(0.101)	(0.0968)	(0.0960)	(0.101)
Tax sparing * Direct cheap	0.0815	0.0500	0.0693	0.0754
	(0.0837)	(0.0848)	(0.0868)	(0.0851)
BIT	-0.409***		-0.360**	-0.397***
	(0.141)		(0.161)	(0.143)
LagFDI	6.15e-07			6.82e-07
	(6.50e-07)			(5.96e-07)
Observations	6,106	6,319	6,319	5,979
R-squared	0.992	0.992	0.992	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A3 Estimating the impact of tax sparing agreements on FDI to developing countries: excluding China; excluding India

Dependent variable: FDI stocks (2005–2016)				
	Excluding China		Excluding India	
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	2.274	2.185	1.325	1.255
	(1.847)	(1.802)	(1.750)	(1.707)
Actual tax burden *(Atb)*	-3.526*	-3.364*	-3.648*	-3.488*
	(2.074)	(2.011)	(1.969)	(1.921)
Direct_cheap *(dummy)*	0.207	0.233	0.00380	0.0448
	(0.418)	(0.404)	(0.383)	(0.378)
Htb * Direct_cheap	-6.653***	-6.550***	-5.828**	-5.747***
	(2.353)	(2.314)	(2.265)	(2.228)
Atb * Direct_cheap	5.917**	5.687**	5.840**	5.584**
	(2.685)	(2.606)	(2.542)	(2.489)
Tax sparing *(dummy)*	0.127	0.154	-0.200**	-0.194**
	(0.240)	(0.238)	(0.0995)	(0.0984)
Tax sparing * Direct cheap	0.00603	0.0243	0.0587	0.0788
	(0.0764)	(0.0772)	(0.0833)	(0.0852)
BIT		-0.384**		-0.408**
		(0.156)		(0.159)
Observations	6,245	6,245	6,339	6,339
R-squared	0.989	0.990	0.991	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A4 Estimating the impact of OECD member countries' tax relief method and of tax sparing provisions on FDI to developing countries: negative FDI turned into missing value

Dependent variable: FDI stocks (2005–2016)				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Hypothetical tax burden *(Htb)*	1.658	1.594	1.651	1.581
	(1.787)	(1.752)	(1.772)	(1.734)
Actual tax burden *(Atb)*	-4.148**	-4.003**	-3.891*	-3.737*
	(1.983)	(1.941)	(1.990)	(1.945)
Direct_cheap *(dummy)*	-0.0656	-0.0288	0.0239	0.0617
	(0.381)	(0.378)	(0.383)	(0.378)
Htb * Direct_cheap	-5.795**	-5.718**	-5.747**	-5.659**
	(2.323)	(2.294)	(2.312)	(2.281)
Atb * Direct_cheap	6.128**	5.918**	5.694**	5.444**
	(2.587)	(2.542)	(2.596)	(2.548)
Tax sparing *(dummy)*			-0.196**	-0.190**
			(0.0951)	(0.0942)
Tax sparing * Direct cheap			0.0570	0.0759
			(0.0825)	(0.0841)
BIT		-0.375**		-0.378**
		(0.158)		(0.162)
Observations	6,399	6,399	6,399	6,399
R-squared	0.991	0.992	0.991	0.992
Home–Year FE	Yes	Yes	Yes	Yes
Host–Year FE	Yes	Yes	Yes	Yes
Country–pair FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A5 Estimating the impact of relief method and tax sparing on CIT at host (developing) countries: sample restricted to 23 OECD member countries

Dependent variable: Corporate income tax at host country (2005–2016)				
Model: OLS–FE				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Exemption *(dummy)*	0.00375	0.00379	0.00624	0.00668
	(0.00356)	(0.00355)	(0.00560)	(0.00586)
Tax sparing *(dummy)*		0.00714	0.0119	0.0122
		(0.00545)	(0.00850)	(0.00874)
Exemption * Tax sparing			-0.00506	-0.00371
			(0.00679)	(0.00701)
Home CIT				0.0208
				(0.0234)
Host WHT				-0.0532
				(0.0465)
BIT				-0.00905**
				(0.00374)
Observations	7,492	7,492	7,492	7,083
R-squared (within)	0.254	0.254	0.255	0.264
Number of pair_id	683	683	683	650
Country-pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

Table A6 Estimating the impact of relief method and tax sparing on CIT at host (developing) countries: distinguishing between direct and indirect credit method

Dependent variable: Corporate income tax at host country (2005–2016)				
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Direct credit	-0.0176**	-0.0176**	-0.0214***	-0.0222***
	(0.00706)	(0.00706)	(0.00781)	(0.00757)
Indirect credit	-0.00424	-0.00426	-0.00676	-0.00644
	(0.00318)	(0.00318)	(0.00473)	(0.00498)
Tax sparing		0.00476	0.00209	0.00391
		(0.00467)	(0.00540)	(0.00526)
Direct credit * Tax sparing			0.0231**	0.0234**
			(0.0107)	(0.0114)
Indirect credit * Tax sparing			0.00633	0.00465
			(0.00609)	(0.00634)
Home CIT				0.0166
				(0.0187)
Host WHT				-0.0745
				(0.0493)
BIT				-0.00741**
				(0.00321)
Observations	10,218	10,218	10,218	9,710
R-squared (within)	0.256	0.256	0.257	0.263
Number of pair_id	946	946	946	904
Country-pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Clustering at country-pair level	Yes	Yes	Yes	Yes
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

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