Empirical Essays on the Effects of Countermeasures Against Cross-Border Tax Evasion and Avoidance

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Aaron Karl Hemmerich, M.Sc.

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Prof. Dr. Jost H. Heckemeyer

Prof. Dr. Kay Blaufus

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Zusammenfassung

Diese Dissertation beinhaltet drei Beiträge gemäß § 2 Promotionsordnung der Wirtschaftswissenschaftlichen Fakultät an der Gottfried Wilhelm Leibniz Universität Hannover. Die Beiträge analysieren die Wirksamkeit ausgewählter Gegenmaßnahmen zur Eindämmung der grenzüberschreitenden Steuerhinterziehung und -vermeidung. Die erste Studie analysiert die Auswirkungen des bilateralen Informationsaustausches auf Steuerhinterziehung im Rahmen grenzüberschreitender Portfolioinvestitionen (FPI). Die Ergebnisse zeigen, dass ausgehende Portfolioinvestitionen aus Steueroasen wesentlich stärker auf Informationsaustausch reagieren als Investitionen aus Nicht-Steueroasen, was als starker Beweis für eine Steuerhinterziehungskomponente in diesen durch Steueroasen gehaltenen Investitionen angesehen werden kann. Die zweite Studie untersucht ebenfalls die Auswirkungen erhöhter Transparenz auf Offshore-Finanzindustrie. Die Studie zeigt, dass eine Erhöhung der Transparenz durch U.S. Gesetzesinitiativen (Foreign Account Tax Compliance Act; FATCA) sich negativ auf die Präsenz multinationaler Banken in Steueroasen auswirkt. Der dritte Aufsatz verwendet einen durch die Österreichische Nationalbank (OeNB) zur Verfügung gestellten Paneldatensatz und untersucht die Wirksamkeit von Abzugsbeschränkungen zur Eindämmung von Steuervermeidung durch grenzüberschreitende Lizenzstrukturen. Die Ergebnisse zeigen ein Absinken von Lizenzzahlungen aus Österreich in betroffene Niedrigsteuerländer.

Summary

This dissertation consists of three separate essays according to section 2 Promotionsordnung (doctoral regulation) of the School of Economics and Management at the Gottfried Wilhelm Leibniz Universität Hannover. These essays analyze the effects of selected countermeasures in limiting cross-border tax evasion and avoidance. The first study analyzes the effect of bilateral information exchange on tax evasion in international portfolio investments (FPI). The results show that outbound portfolio investment from tax haven countries is significantly more responsive than outbound FPI from non-havens, which can be seen as strong evidence for a tax evasion component in tax haven investment in international securities markets. The second study also investigates the effect of increased transparency on the offshore banking industry. It finds an increase in transparency brought about by U.S. legislation (Foreign Account Tax Compliance Act; FATCA) to have a negative effect on the presence of multinational banks in tax havens. The third essay uses a unique panel dataset as provided by the Austrian National Bank (OeNB) and investigates the effectiveness of deduction disallowances in fighting tax avoidance via cross-border licensing. The results indicate a reduction in royalty payments by Austrian residents to entities resident in affected low tax countries.

Schlagwörter

Informationsaustausch, Steuerhinterziehung, Offshore-Investitionen, Offshore-Finanzindustrie, Steuervermeidung, Steuerplanung mit Immaterialgütern

Keywords

Information Exchange, Tax evasion, Offshore Investment, Offshore Banking, Tax Avoidance, Intellectual Property (IP) Tax Planning

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Chapter 1

Introduction

1.1 Motivation

Recent estimates suggest that about 10% of the global wealth is held in tax havens (Alstadsæter et al., 2018b). Furthermore, prior studies show that these low tax jurisdictions feature disproportionately high volumes of cross-border investment vis-à-vis other countries (Lane and Milesi-Ferretti, 2008; Hines, 2010). To some extent, this reflects their intermediary role in international finance (Lane and Milesi-Ferretti, 2011). However, anecdotal and first empirical evidence also suggests that investments involving a tax haven intermediary are at least partially linked to cross-border tax evasion by individuals, who are seeking ways to reinvest their offshore wealth (Gravelle, 2009; Hanlon et al., 2015).

Moreover, prior research reveals that low tax countries also attract large inflows of funds due to tax planning structures employed by multinational companies (Dharmapala, 2014; Heckemeyer and Overesch, 2017). This phenomenon has also received increased attention by authorities as specific tax planning schemes became public. Under such schemes, multinational companies allocate their intangible property in ways that allow them to transfer income from high tax to low tax countries, thereby generating substantial tax savings (Karkinsky and Riedel, 2012; Fuest et al., 2013). Data on U.S. corporations suggests that about 55% of their foreign profits are accounted for by tax haven entities (Zucman, 2014). Within the European Union such structures are also prevalent as prominent countermeasures, such as withholding taxes on outbound payments, are of limited effectiveness due to European law. Politicians and researchers have raised concerns that some European countries

structure their tax systems in ways that seemingly only help multinational corporations shift income across borders at the cost of other countries rather than fostering real activity (Reuters, 2013; Alstadsæter et al., 2018a). Recently, it was highlighted that Ireland for example attracts foreign royalty payments that amount to as much as about one quarter of its GDP (European Commission, 2018a).

It becomes clear that these issues translate into potentially large tax revenues losses for countries around the world. While it is difficult to quantify their exact magnitude, Zucman (2014) estimates that, for the U.S., shifting income to tax haven affiliates enables U.S. companies to reduce their tax burden by about 20%. On a global basis, figures provided by the OECD suggest that this number ranges between 4% to 10% translating into tax revenue losses of about $100 to $240 billion annually (OECD, 2015b). With regard to tax evasion by individuals, Zucman (2014) suggests that annual revenue losses amount to approximately $200 billion, the equivalent of about 1% of total revenues raised by governments worldwide. Curtailing international tax evasion and avoidance is thus high on the international policy agenda.

In the fight against cross-border tax evasion, a strong emphasis is put on increased transparency and information exchange between jurisdictions in order to enable tax authorities to better detect cross-border tax evasion. Aware of the role played by tax havens, the OECD/G20 strongly promoted enhanced international cooperation with regard to tax matters between these jurisdictions and other countries in the early 2000s. Starting with bilateral information exchange on request, the mechanism has since further evolved, as FATCA (Foreign Accounts Tax Compliance Act) was passed in the U.S. in March 2010, introducing automatic information exchange.[1] FATCA was also the first regulation to directly target banks

[1] Up to today, a broader set of countries have committed themselves to implement the Common Reporting Standard (CRS), which can be seen as the international equivalent to FATCA. CRS will thereby establish a large network of exchange of information on an automatic basis starting from 2017/2018 (OECD, 2016).

as it obliges foreign financial institutions to search their databases for U.S. clients and report any income obtained by these costumers. Failure to do so is penalized with a 30% withholding tax on all U.S.-sourced income transferred to the respective institution.

With regards to cross-border tax avoidance, the introduction of deduction disallowances for royalty payments to low-tax countries is among the most recent developments. Austria introduced such a regulation in 2014. Similar regulations exist in Germany and the U.S. from 2018 onwards. While these regulations can generally reduce the benefits of cross-border IP tax planning, no empirical evidence with regard to their effectiveness exists, so far.

1.2 Contribution and Main Findings

As described earlier, several countermeasures against cross-border tax evasion and avoidance have been put in place over the last years. However, there is little empirical evidence about the effectiveness of these mechanisms, so far. This dissertation helps fill this gap as it analyzes the effects of several countermeasures against cross-border tax evasion and avoidance. It contributes to the existing literature as it adds to the so far few studies investigating the effects of increased transparency in the fight against cross-border tax evasion. Furthermore, relying on a unique dataset, provided by the Austrian National Bank for the purpose of this dissertation, to the best of my knowledge, it is the first study to investigate the effectiveness of deduction disallowances on royalty payments to low tax countries in limiting cross-border IP tax planning.

This dissertation consists of three separate essays. The following table provides an overview of the articles, including the title, co-authors (if any), conferences and research seminars at which the papers were presented by the author of this dissertation, and the current status of publication.

Table 1.1: Overview of Essays

Title	***Co-authors***	***Conferences (C) & Research Seminars (S)***	***Status of publication***
Information Exchange and Tax Haven Investment in OECD Securities Markets	Jost H. Heckemeyer	IIPF Annual Congress 2017 *(C)* Doctoral Conference University of Oxford 2018 *(C)* ZEW MaTax 2018 *(C)* IMF Tax Research Seminar 2019 *(S)*	Revise and Resubmit: *National Tax Journal*
The Effect of Transparency on the Tax Haven Presence of Banks	Jost H. Heckemeyer	Research Seminar University of Hannover 2018 *(S)* VHB Meeting 2019 *(C)*	Working paper
The Effect of Royalty Restrictions on Cross-Border Licensing	-	MaKi Kiel University 2018 *(S)* Doctoral Consortium WU Vienna 2018 *(C)*	Under Review: *International Tax and Public Finance*

The first article *(Information Exchange and Tax Haven Investment in OECD Securities Markets)* presented in Chapter 2 addresses a recent countermeasure against cross-border tax evasion, i.e. bilateral Exchange of Information (EOI) Agreements. Building on a list of uncooperative jurisdictions (i.e. tax havens) the OECD/G20 successfully convinced these jurisdictions to establish a network of tax information exchange on request. To do so, countries entered into bilateral EOIs with several OECD member states. As a consequence, domestic tax authorities no longer have to rely exclusively on taxpayer self-reporting but can, upon first indication, file a request to the (suspected) tax haven country and ask for information regarding the potential involvement of a resident in cross-border tax evasion. Once a tax haven enters into tax information exchange agreements, its attractiveness for tax evaders is supposed to decline as the risk of detection increases. Exploiting data on bilateral investments in OECD securities markets compiled by the International Monetary Fund (IMF), this study shows that outbound portfolio investments (FPI) from tax haven countries are indeed significantly more responsive to information exchange than outbound FPI from non-

havens. As investments from tax havens decrease following the signing of a bilateral EOI, exchange of information appears as an effective tool in limiting cross-border tax evasion. We also find evidence that round-tripping of investment, as found for U.S. securities markets by prior literature (Hanlon et al., 2015), seems to be a global phenomenon. Furthermore, we are able to show that, besides the overall positive effect of increased transparency, tax havens' attempts to undermine the OECD transparency initiative seem to pay off as the apparently become more attractive pass-through destinations for tax evaders.

The second essay *(The Effect of Transparency on the Tax Haven Presence of Banks)* presented in chapter 3 analyzes the effects of increased transparency on the offshore banking sector. Early enforcement initiatives mainly focused on compliance by individuals. If initiatives against tax havens ought to be effective, they must, however, effectively undermine the "business model" of tax havens. If this were the case, banks located in tax havens should ultimately (at least partly) cease their operations. This study thus focuses on a transparency initiative that strongly increased the risk for banks offering services related to tax evasion, namely FATCA (Foreign Accounts Tax Compliance Act) introduced by the U.S. in March 2010. Relying on the Bank Ownership Database, a dataset made available by Claessens and van Horen (2015) through the Dutch National Bank, we investigate whether the introduction of FATCA led to a reduction in the offshore presence of multinational banks. The results show that this is indeed the case. Our findings, however, also suggest that domestic tax haven banks might be filling the gap. Regardless of this trend, foreign owned banks still seem to play an important role in the offshore banking sector.

The third article *(The Effect of Royalty Restrictions on Cross-Border Licensing)* presented in chapter 4 investigates the effectiveness of deduction disallowances on outbound royalty payments to low-tax countries as a countermeasure against cross-border profit shifting via intangible property tax planning. Under such IP tax planning, multinational companies

strategically allocate and subsequently license their intellectual property in ways that enable them to transfer income from high tax to low tax countries. Restricting the deductibility of outbound payments in the source (i.e. high tax) country constitutes an economically equivalent burden to levying a withholding tax on royalties and can thus eliminate the tax saving potential from such cross-border profit shifting. Using data on royalty payments by Austrian residents, I test the effectiveness of such restrictions in fighting tax avoidance via cross-border licensing. I find the introduction of royalty restrictions to lead to a significant decrease in Austrian royalty outflows to entities resident in affected low tax countries as compared to the control group. Deduction disallowances thus appear as an effective countermeasure against cross-border IP tax planning.

Chapter 2

Information Exchange and Tax Haven Investment in OECD Securities Markets*

Abstract

Curtailing tax evasion is high on the international policy agenda. Still, there is only little empirical evidence about the effects of offshore tax evasion in cross-border portfolio investment and its responsiveness to changes in enforcement. Exploiting rich IMF data on bilateral investments in OECD securities markets, we show that outbound portfolio investment (FPI) from tax haven countries is significantly more responsive to information exchange than outbound FPI from non-havens. This is strong evidence for a tax evasion component in tax haven investment in OECD securities markets. We also find evidence that round-tripping of investment is a global phenomenon. Furthermore, we are able to show that tax havens' attempts to undermine the OECD transparency initiative pay off. Tax havens that enter into information exchange with other tax havens rather than with non-haven partner countries become more attractive pass-through destinations for tax evaders.

* This chapter is a co-authored work with Prof. Dr. Jost H. Heckemeyer (Kiel University)

2.1 Introduction

Tax havens feature disproportionately high volumes of cross-border investment vis-à-vis other countries (Lane and Milesi-Ferretti, 2008; Hines, 2010; Lane and Milesi-Ferretti, 2011). This reflects the intermediary role that offshore centers generally play in international finance (Lane and Milesi-Ferretti, 2011). At the same time, it is also consistent with tax evasion strategies of individual investors involving the use of offshore tax havens: Under any form of international tax evasion, concealed offshore funds must ultimately lead to outbound (re)investments in the stock or bond markets of wealthy economies able to absorb them (Guttentag and Avi-Yonah, 2006; Gravelle, 2009). General evidence on the existence, forms and true size of the tax evasion component in foreign investment traveling through tax havens, however, is scarce.

In this paper, we assess, on a large international scale, the effect of offshore tax evasion in transnational portfolio investment. Specifically, we exploit the OECD initiative on information exchange and the associated changes in enforcement to identify the tax evasion component in tax haven outbound foreign portfolio investment (FPI) in 25 OECD securities markets. Focusing on FPI, we can analyze the response of portfolio wealth to information exchange and substantially contribute to the literature on tax evasion.

Our empirical analysis exploits more than 460 bilateral agreements on the exchange of information (EOI) signed between 2001 and 2014. Bilateral data on outbound foreign portfolio investment from 21 tax haven and 22 non-havens in 25 OECD securities markets is taken from the Coordinated Portfolio Investment Survey (CPIS) collected by the International Monetary Fund (IMF).[2] Exploiting rich variation over time and across countries in the (perceived) risk of getting caught with tax evasion, this study extends previous research in several important ways.

[2] See Appendix 2.1 for a list of all countries in our sample.

First, our results show that enhanced tax enforcement through new EOIs signed with OECD countries exerts a statistically significant and negative effect on OECD-bound FPI from tax havens whereas investment from non-haven countries behaves much differently. Quantitatively, if a tax haven increases the number of information exchange agreements by one, its outbound portfolio investment stock in the OECD securities market decreases, on average, by 6% relative to the non-haven control group. We consider this as a reflection and strong evidence of a significant tax evasion component in haven outbound FPI. In absolute terms, investments in the securities markets of the United Kingdom and the U.S. show a particularly strong reaction. Our findings suggest that, on average, each new tax information exchange agreement signed by a tax haven reduces FPI bound to the these two securities markets, respectively, by about US$ 2.3 billion (U.S.) and by about US$ 1.9 billion (U.K.). Our findings turn out robust to variation in the sample composition, estimation techniques and weighting schemes.

Second, we add to previous research on round-tripping tax evasion which involves resident individuals investing in their domestic home markets (and not abroad) through offshore tax havens and thereby disguising themselves as foreign investors. Hanlon et al. (2015) provide first evidence for round-tripping evasion by showing that tax haven portfolio investment in the U.S. securities market varies with changes in the risk of detection for U.S. (would-be) tax evaders brought about by bilateral tax information exchange. In this study, we are able to show that round-tripping evasion is a global phenomenon.

Third, we investigate whether tax havens manage to undermine the OECD transparency initiative by partnering with their peers rather than with non-haven countries. While the OECD has urged tax havens to sign at least 12 bilateral exchange agreements, it has remained silent on the choice of partner country. This has led to concerns that tax havens could undermine the OECD transparency initiative by entering into information exchange

agreements with each other rather than with non-haven countries (Bilicka and Fuest, 2014; Johannesen and Zucman, 2014). Interestingly, we are able to show that signing information exchange agreements with other tax havens indeed exerts a positive effect of about 2%-3% on a haven's outbound FPI, which is the inverse of the effect we observe for agreements signed with non-havens. Thus, tax havens' attempts to undermine the OECD transparency initiative indeed seem to pay off.

This study is related to a small but growing strand of empirical research on tax havens and cross-border tax evasion. While there is a general awareness of the issue, tax evasion has for long been under-researched and thus our general knowledge about the existence, forms and true size of the tax evasion component in foreign investment traveling through tax havens is still fairly limited.

Several studies observe the disproportionately high volumes of cross-border investment channeled through tax havens (Lane and Milesi-Ferretti, 2008; Hines, 2010; Lane and Milesi-Ferretti, 2011; Gumpert et al., 2016). Zucman (2013) and Alstadsæter et al. (2018b) estimate that about 8% - 10% of the global financial wealth of households is held in tax havens, three-quarters of which goes unrecorded. Johannesen and Zucman (2014) use confidential banking data provided by the Bank for International Settlements (BIS) and document that information exchange is indeed associated with a statistically significant decrease in tax haven bank deposits held by foreign residents. However, rather than repatriating all offshore money, tax evaders seem to relocate part of their funds to more secretive havens. In a related study, Johannesen (2014) finds that Swiss bank deposits owned by EU residents fell by about 30-40% upon Switzerland's participation in the EU Savings Directive, which established information exchange with regard to interest payments. At the same time, again, structures involving the use of sham corporations became significantly more important as these types of vehicles offer ways to circumvent the Directive (Johannesen, 2014). Recently, Langenmayr

(2017) investigates the effects of voluntary disclosure programs on individual tax evasion and finds that voluntary disclosure mechanisms increase tax evasion. Her theoretical findings however suggest that these programs nevertheless have a positive effect on tax revenue (net of administrative costs).

Tax evaders may hide their funds in entities located in offshore tax havens, but they will ultimately invest in larger capital markets. In other words, tax havens may serve as hiding-places of funds, but their economies do not absorb the disproportionately high capital inflows (Lane and Milesi-Ferretti, 2008; Hines, 2010; Lane and Milesi-Ferretti, 2011). Thus, outbound investment should include an evasion component if tax evasion is actually taking place. The only previous study that has acknowledged and exploited this notion is put forward by Hanlon et al. (2015).[3] Documenting that U.S.-bound portfolio investment from the partnering tax haven decreases with a newly signed bilateral tax information exchange agreement they provide evidence for a significant share of tax haven investment in U.S. securities actually being round-tripped.

Our study informs the debate on tax evasion through tax havens by assessing the tax evasion component in haven outbound portfolio investment in global securities markets. Accordingly, we can learn about where tax evaders ultimately seek to invest, whether they are responsive to legal countermeasures and what the size of the tax evasion problem in these international funds actually is. Precisely, our approach adds to previous analyses of the effects of tax evasion in cross-border investment in several important ways. First, we consider bilateral tax haven FPI in 25 OECD countries rather than in the U.S. securities market only. Second, our data covers a total number of 21 tax havens[4] and we take into account all bilateral information

[3] In a recent study DeSimone et al. (2018) provide updated evidence on the impact of tax transparency for offshore investment in U.S. securities markets. Menkhoff and Miethe (2017) and Casi et al. (2018) further investigate patterns of relocation for offshore bank deposits.

[4] We classify a country as a tax haven if it is either included in the list established by Hines and Rice(1994) or was listed as a tax haven in the OECD 2000 Progress report (OECD, 2000).

exchange agreements signed between these havens and OECD economies. Third, we examine how havens' bilateral outbound portfolio investments in the 25 OECD markets respectively vary, not only after the signing of a bilateral treaty with the respective partner country, but also with changes in their full count of information exchange agreements signed with OECD countries. Thus, the analysis takes into account that the funds hidden in tax haven entities and reinvested outbound in a certain OECD country are not necessarily round-tripped but may originate from any other country quite as well. Finally, we are able to assess whether tax havens are able to undermine the OECD transparency initiative by partnering with their peers.

The paper proceeds as follows. In the next section, we describe our data. Section 2.3 presents our empirical analysis, providing visual as well as regression based evidence about the effect of information exchange on tax haven investment in OECD securities markets. Furthermore, we assess whether efforts made by tax havens to undermine the OECD transparency initiative by engaging in information exchange among each other are effective. Section 2.4 concludes.

2.2 The OECD's Fight against Cross-border Tax Evasion: Context and Data

2.2.1 The Evolution of Bilateral Information Exchange

Secrecy is crucial for many services offered to individuals engaging in illegal tax haven activities. It is thus not surprising that transparency has been brought forward by the OECD as a core element in the fight against tax evasion.

In 2002 the OECD published a model agreement that serves to establish exchange of tax information between tax authorities on a bilateral basis (OECD, 2002). By entering into such a bilateral agreement on the exchange of information, the partner countries agree to participate in mutual assistance in tax matters. These EOIs can either be concluded as a separate agreement (TIEA) or included in a double tax treaty (DTT). As a consequence, the investor's country of residence no longer has to rely exclusively on taxpayer self-reporting but domestic tax authorities can, upon first indication, file a request to the (suspected) tax haven

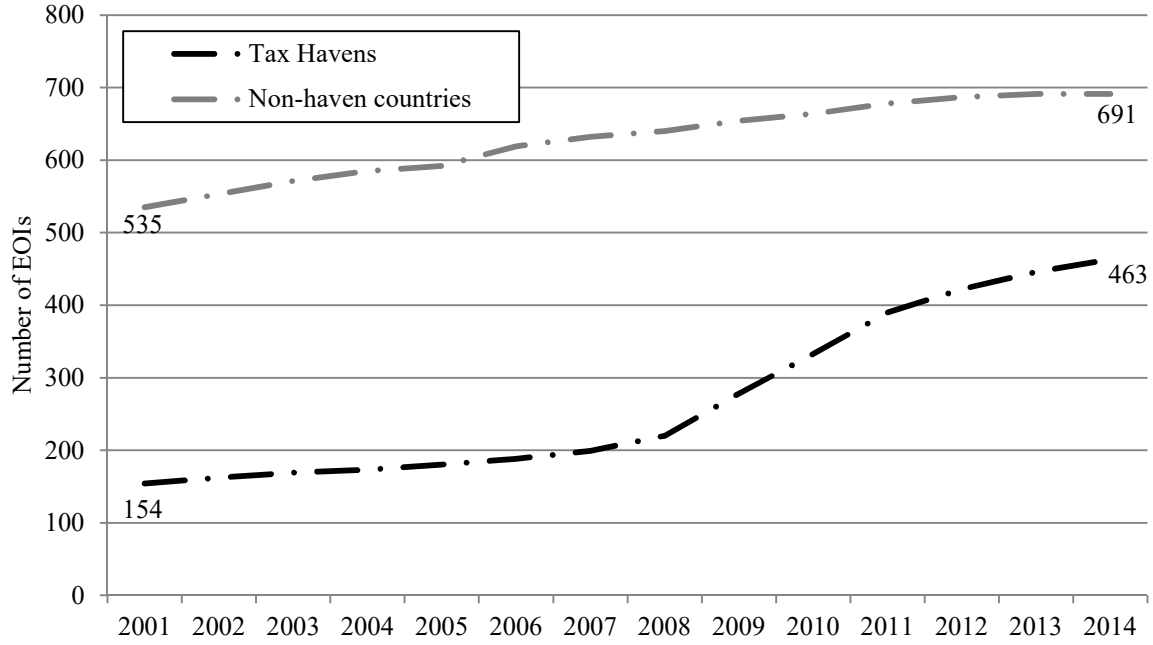
country and ask for information.[5] Thus, information exchange upon request increases the set of fact-finding instruments available to domestic tax authorities and might therefore increase the (perceived) risk of detection. Once a tax haven enters into tax information exchange agreements, its attractiveness for tax evaders is supposed to decline because transparency increases the risk of detection and, thus, the expected costs of evasion.

Figure 2.1 illustrates the evolution of information exchange throughout our sample period. For the first years in our sample, non-haven countries and tax havens faced a similar trend of slow but steady increase, with tax havens having concluded a comparably low number of agreements. Pressure on tax havens to agree on information exchange increased drastically after the 2009 G20 London summit (G20, 2009). Building on a list of 35 uncooperative tax havens, established by the OECD in its 2000 progress report (OECD, 2000), these havens were threatened with economic sanctions. A haven was deemed cooperative only after it had, inter alia, committed to establish information exchange with at least twelve partner countries (G20, 2009).

The increased pressure on tax havens clearly translates into a sharp rise in agreements signed by the tax havens in our sample, whereas the number of agreements between two non-haven OECD countries is increasing at a rather stable trend over time.

[5] Starting from 2017/2018, several tax havens have committed themselves to exchange tax information on an automatic basis (OECD, 2016).

Figure 2.1: Evolution of Information Exchange throughout our Sample Period



Note: Data obtained from OECD (Global Forum on Transparency and Exchange of Information for Tax Purposes). The black line displays the number of EOIs signed by the tax havens in our sample with OECD countries. The gray line indicates the number of agreements signed by the non-haven OECD countries in our sample with other OECD countries.

2.2.2 Foreign Portfolio Investment: Data Source and Quality

Our research is based on bilateral investment data collected by the International Monetary Fund (IMF). Precisely, we use stocks of outbound portfolio investment (Foreign Portfolio Investment, FPI) reported under the Coordinated Portfolio Investment Survey (CPIS).[6] Our data covers investments in 25 OECD target countries reported by a total of 43 investor countries (of which 21 are tax havens)[7] for the time period from 2001 to 2014 on an annual end-of-year basis. The final dataset is an unbalanced panel of about 1,000 country-pairs over 14 years and it includes up to 13,438 observations. Further details of the identification approach that we employ based on this data sample are provided in Section 2.3.1.

[6] FPI differs from Foreign Direct Investment (FDI) as it does not give the investor control or a significant degree of influence on the management of the investee. For equity securities this distinction is in general expressed by a 10% threshold. When this threshold is surpassed, a significant influence by the investor on the investee is suspected, leading to the investment being classified as FDI. For debt investment, intercompany lending under a direct investment relationship is classified as FDI (IMF, 2002, 2015).

[7] Appendix 2.1 shows the sample composition.

Portfolio investments usually require a financial infrastructure including a suitable legal, regulatory, and settlement framework, along with market-making dealers, and a sufficient volume of buyers and sellers. FPI differs from FDI mainly in that it leads to a "[…] largely anonymous relationship between the issuers and holders […]" (IMF, 2010). The anonymity and the high degree of trading liquidity for FPI in combination with the secrecy provided by tax havens make it difficult for local authorities to detect the involvement of a resident. This makes foreign portfolio investment highly attractive for tax evaders (Hanlon et al., 2015).[8]

Our dependent variable of interest is bilateral outbound investment in OECD countries reported by tax havens and non-haven countries. Thus, we refer to the "asset side" of CPIS which covers equity securities (mainly corporate stock that is not considered FDI and shares in mutual funds and investment trusts) and debt securities (such as corporate bonds and nonparticipating preferred stocks) issued by non-residents and owned by residents of the compiling economy. The CPIS offers many advantages for our research purpose, as it remains the primary database covering bilateral foreign portfolio holdings on a broad international scale (Lane and Milesi-Ferretti, 2008; Ananchotikul et al., 2015).[9] Our sample covers six of the seven most important tax havens and 19 of all 41 tax havens identified by Hines and Rice (1994).[10]

Since tax havens are in many cases not the true sources of investment (Lane and Milesi-Ferretti, 2008), haven outbound investment should, in principle, be attributed to the residence country of the beneficial owner. However, experience shows that the CPIS suffers from the

[8] According to Menkhoff and Miethe (2017), rather than being reinvested in securities markets, offshore funds might also be transferred to non-haven bank accounts in order to e.g. finance real estate investment or luxury consumption in the residence state of the owner. These flows turn out to be responsive to increased transparency, too.

[9] Participating countries are trying to assure high quality of data. Taking Bermuda as an example, official reports state that Bermuda's authorities are trying their best to ensure a high quality of data in order to "[…] ultimately enhance[.] the reputation of Bermuda and [to] re-emphasise […] [Bermuda's] commitment to a high standard of transparency" (Bermuda Monetary Authority (2015). Underreporting of assets by some countries cannot, however, be fully ruled out (Lane and Milesi-Ferretti 2008).

[10] Hines and Rice (1994) did not separately account for Guernsey and Jersey but rather included them as The Channel Islands. The CPIS offers separate data for both territories.

so-called “custodial bias”, leading to assets being reported as a claim by the tax haven in which the custodian bank resides, even though the beneficial owner resides in a different country. This bias is especially prevalent for the liabilities reported by the host countries (Bertraut et al., 2006; Zucman, 2013). However, due to common structures of tax evasion involving tax haven intermediaries as an additional layer of secrecy (Gravelle, 2009; OECD, 2009; Zucman, 2013) misattribution occurs on the asset side, as well. For example, the use of nominee accounts and sham corporations leads to the attribution of assets held by foreigners via tax havens to the respective haven country – rather than to the resident country of the beneficial owner. This misattribution from the perspective of the beneficial owner concept is present for data collected under the CPIS (IMF, 2002; Lane and Milesi-Ferretti, 2008). While this is considered undesirable for some types of macro-economic research, these types of “biases” in the data are highly welcome for our research purposes.

Table 2.1 shows the level of outbound FPI and relates it to the gross domestic product (GDP) for a selection of countries included in our sample. In line with our above explanations, the numbers clearly demonstrate tax havens’ disproportionately high volumes of outbound FPI vis-à-vis other countries that are reported in the CPIS data which we use for the purpose of this study. On average, haven countries show a FPI/GDP ratio of 406%, compared to 47% for non-haven OECD countries.

Table 2.1: Outward FPI Stocks – Haven vs. Non-Haven Countries; average 2001-2014

Country	*Outbound FPI in % of GDP (average 2001-2014)*	*Outbound FPI in in millions of U.S. dollars (average 2001-2014)*	*Thereof Equity FPI*
Tax Havens (selection)			
Bermuda	6753%	358,091	50,069
Luxembourg	4214%	1,944,861	750,482
Channel Islands	3395%	337,297	112,132
Cayman Islands	1344%	40,512	1,766
Isle of Man	840%	32,051	24,860
Ireland	625%	1,391,526	415,915
Barbados	344%	14,812	1,307
Netherlands Antilles	296%	10,244	5,871
Switzerland	144%	722,023	317,765
Singapore	140%	259,857	120,251
Average	*406%*	*272,922*	*95,424*
Non-havens (selection)			
Netherlands	154%	1,170,450	486,949
Belgium	134%	582,640	206,848
Norway	119%	483,671	241,016
United Kingdom	87%	2,147,310	831,880
Finland	83%	195,153	77,886
France	81%	2,000,486	486,460
Sweden	77%	349,760	232,060
Denmark	75%	224,229	101,032
Austria	72%	257,536	62,433
Germany	59%	1,938,627	643,349
Average	*47%*	*803,700*	*350,740*

Note: For both groups of countries, the ten countries with the highest FPI/GDP ratio (average 2001-2014) are displayed. Appendix 2.3 and Appendix 2.4 display FPI-to-GDP ratios for all the countries in our sample. Jersey and Guernsey are included as Channel Islands since we do not have separate GDP Data for these two countries. Data obtained from the IMF (CPIS), The World Bank, and the United Nations.

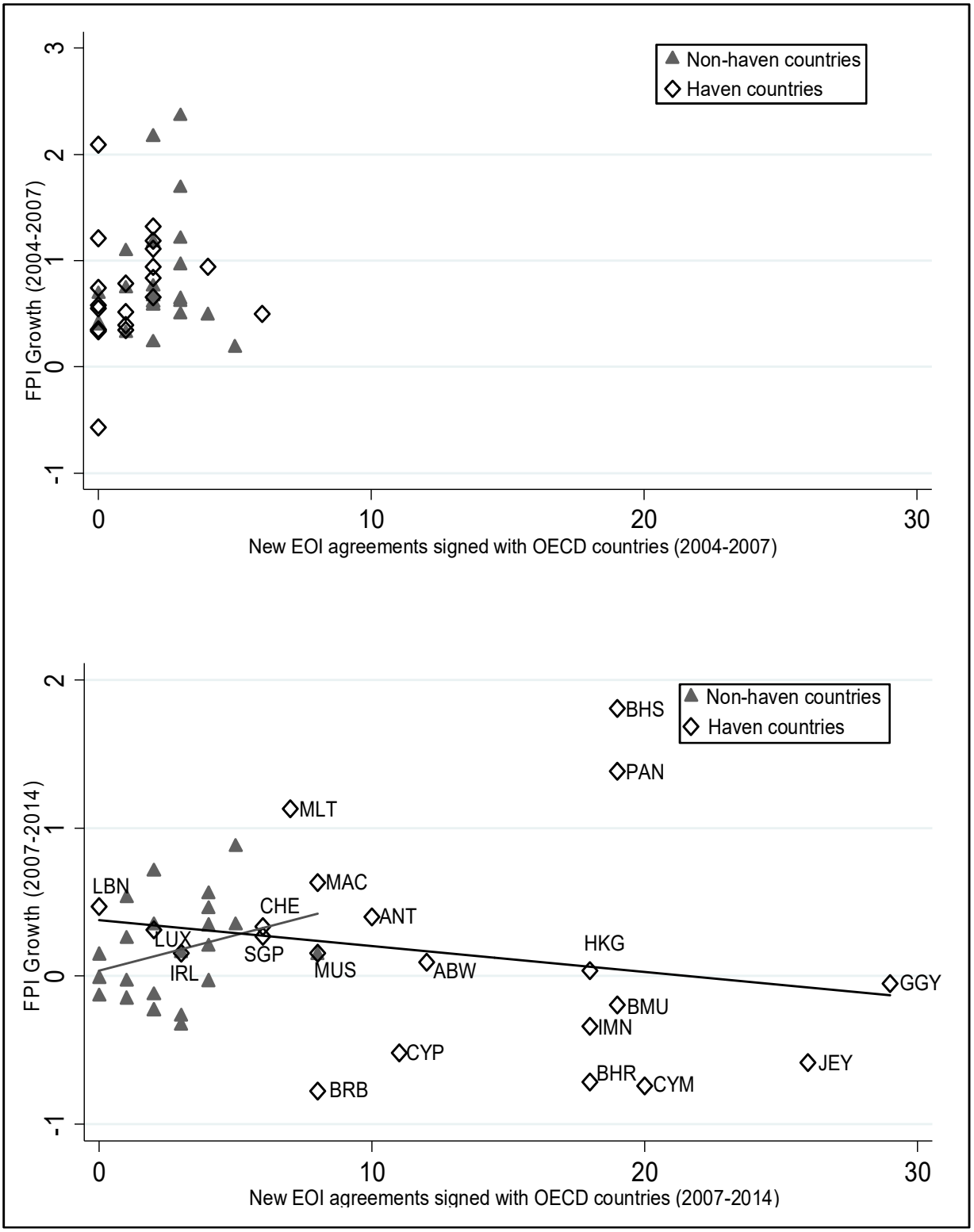
2.3 Empirical Analyses

2.3.1 Baseline Results

We are interested in whether changes in enforcement by means of bilateral tax information exchange have an effect on haven outbound investment in OECD securities markets. Our research design follows Hanlon et al. (2015) in that it compares the reaction of haven outbound FPI to new information exchange agreements with the response of outbound FPI from *non-haven* countries that engage in information exchange. Mirroring the decrease in attractiveness and use for tax evasion purposes, we expect havens' outbound FPI to respond negatively to their count of information exchange agreements. In contrast, outbound FPI from non-haven countries towards other OECD countries should not be negatively affected by enhanced information exchange, since it is much less likely to be linked to tax evasion activity. Those country-pairs thus serve as suitable control units.

Figure 2.2 plots the growth rate of outbound FPI against the number of new treaties signed with OECD partner countries for each investor country, respectively. Haven and non-haven countries followed a very similar trend during the time period until 2007, which basically represents the pre-treatment period (see the first graph in Figure 2.2). Things look quite different in later years, however, when the OECD initiative on information exchange started to take up pace. The second graph in Figure 2.2 shows, that, following 2007, overall haven outbound FPI correlates negatively with the respective count of information exchange agreements whereas outbound FPI from non-haven countries does not at all show such negative correlation with the countries' count of information exchange treaties.

Figure 2.2: FPI Growth and Information Exchange



Note: Data obtained from the IMF (CPIS) and OECD (Global Forum on Transparency and Exchange of Information for Tax Purposes). Country codes (according to ISO 3166-1 alpha-3) for the tax havens in our sample displayed in the second graph.

Following this first visual evidence, we estimate the corresponding estimation equation (1).

$$\ln(FPI_{ijt}) = \beta_0 + \beta_1 EOI_{it} + \beta_2 HAVEN_i^* EOI_{it} + X_{it} + \alpha_t + \alpha_{ij} + \alpha_{jt} + \varepsilon_{ijt} \qquad (1)$$

FPI_{ijt} denotes portfolio investment by country i in country j at the end of year t. EOI_{it} is a variable that counts the number of information exchange agreements signed by country i with OECD countries until the end of year t. $HAVEN_i$ is a binary variable, taking the value one if country i is a tax haven and zero otherwise. In order to separate the effect of information exchange for haven and non-haven investors we create an interaction term $HAVEN_i*EOI_{it}$. The coefficient on this interaction term is expected to be negative. We include vectors of time varying investor country characteristics (X_{it}). Specifically, in line with previous FPI research (Portes and Rey, 2005), we include GDP and GDP per capita (both in natural logs).[11] Country-pair fixed effects (α_{ij}) control for any stationary bilateral characteristics, such as distance and common language. Year fixed effects (α_t) control for aggregate shocks that commonly affect the level of outbound FPI for all country-pairs in our sample, like the financial crisis in 2007 and 2008. Furthermore, changes in equity prices and exchange rate fluctuations have potentially important effects on the evolution of portfolio holdings. To control for these and other factors (e.g. national withholding taxes), we include a full set of target country-specific time effects α_{jt}. The standard errors we compute are robust to clustering of observations at the level of investor countries.

Table 2.2 shows the estimation results. The estimated coefficient of $HAVEN_i*EOI_{it}$ in column (1) implies that a new information exchange agreement leads to a 6% decrease[12] in haven outbound FPI relative to the response of non-havens to increased enforcement. The FPI response of non-havens to a rising number of information exchange agreements turns out

[11] Appendix 2.2 provides summary statistics for these (and other main) variables.

[12] As the estimated specification is in semi-log form, the estimated effect of an additional EOI signed by a tax haven on its OECD-bound FPI as compared to non-haven investor countries is calculated as $e^{(\hat{\beta}_1)} - 1$.

small positive, but insignificant as shown by the estimated coefficient of EOI_{it}.[13] Again referring to column (1) of Table 2.2, the overall effect of an additional EOI translates, on average, into a 3.5% decrease in the tax haven's FPI stock in OECD capital markets.[14] Thus, our baseline findings indicate that outbound FPI from haven countries is significantly more responsive to enhanced enforcement through information exchange than outbound FPI from non-havens. These findings are consistent with Figure 2.2 and we interpret them as strong evidence for parts of haven outbound FPI being driven by tax evasion activity.

When interpreting the magnitude of these effects in terms of response elasticities, assumptions about the evasion related share in offshore wealth matter. Given that outbound FPI from tax havens towards OECD markets is not entirely driven by tax evasion, our estimates only provide a lower bound for the underlying response of tax evaders to changes in enforcement. Moreover, the relevance of tax evasion might vary between different tax havens. Luxembourg, for example, hosts a substantial fraction of the European fund industry, where one would expect tax evasion to play a less important role relative to other offshore activities. While it is difficult to get an overall estimate, prior research suggests, on average, an approximate share of about 50% to 75% of offshore wealth to be related to tax evasion (Zucman, 2013; Johannesen and Zucman, 2014; Alstadsæter et al., 2018b). Taking our baseline results at face value, this would, again on average, translate into an 8% to 12% decrease in evasion related tax haven FPI in response to a new treaty on tax information exchange.

[13] A small positive effect of information exchange on non-haven FPI might be due to more funds being directly invested within the OECD securities market instead of being channeled through tax havens. Another potential explanation is that double tax treaties, the general instrument establishing information exchange if two OECD partner countries are involved, reduce obstacles for cross-country investment (i.e. double taxation) and might thus foster bilateral investment(Blonigen and Davies, 2004; Blonigen et al., 2014; Haberly and Wójcik, 2014).

[14] Recall that the regression is in semi-log form, so the estimated effect of an additional EOI signed by a tax haven on its OECD-bound FPI is given by $e^{(\hat{ß}_1+\hat{ß}_2)}-1$, i.e. $(e^{(0.0280-0.634)}-1)$. The overall effect is statistically significant with a p-value of 0.015 (from a Z-test).

Table 2.2: Panel Regressions of Bilateral FPI

Variables	(1) Baseline	(2) Additional Tests: Equity FPI	(3) Additional Tests: Debt FPI	(4) Additional Tests: Excluding the U.S. and the U.K.	(5) Additional Tests: Excluding U.S./U.K. & Financial Crisis	(6) Additional Tests: Haven Year FE	(7) Additional Tests: Fixed Effects Poisson	(8) Additional Tests: Two-way clustering	(9) Additional Tests: Population-weighted count
EOI_{it}	0.0280	0.0372	0.0391	0.0380	0.0294	0.0504**	0.0247***	0.0280	0.00985
	(0.0237)	(0.0399)	(0.0238)	(0.0254)	(0.0253)	(0.0208)	(0.00812)	(0.0283)	(0.0152)
$HAVEN_i*EOI_{it}$	-0.0634**	-0.0674*	-0.0790***	-0.0721**	-0.0677**	-0.101***	-0.0341***	-0.0634*	-0.0396**
	(0.0264)	(0.0386)	(0.0282)	(0.0286)	(0.0282)	(0.0271)	(0.00693)	(0.0308)	(0.0166)
Constant	11.67	2.344	8.902	11.34	14.17	16.46			19.66
	(15.10)	(19.32)	(16.35)	(15.22)	(14.31)	(15.43)			(13.61)
Observations	13,016	11,921	12,417	11,254	9,594	13,016	13,398	13,011	13,016
R^2	0.327	0.351	0.282	0.318	0.331	0.331		0.327	0.321
Number of country-pairs	1,044	1,020	1,039	914	914	1,044	1,044	1,039	1,044
Controls	√	√	√	√	√	√	√	√	√
Country pair FE	√	√	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√	√	√
Target Country Year FE	√	√	√	√	√	√		√	√
Haven Year FE						√			

The dependent variable is the stock of portfolio investment by country *i* in country *j* at the end of year *t* in logs $ln(FPI_{ijt})$ except for column (7). The unit of observation is the country-pair (*i, j*) and the sample period goes from 2001 to 2014. For a given country *i* there are up to 25 destination countries *j*, and we consider foreign portfolio investment held by a total of 21 tax havens and 22 non-haven OECD countries. EOI_{it} is a variable that counts the total number of TIEAs and DTTs, allowing for the exchange of information upon request, signed by country *i* with OECD countries at the end of year *t*, weighted by partner country population for column (9). All specifications include control variables for the investor countries' annual GDP $(LOGGDP_t)$, as well as annual GDP per capita $(LOGGDPC_t)$, column (7) additionally includes these variables for each target country. Robust standard errors in parentheses; clustered at the investor country level for columns (1) to (6) and (9), clustered at the investor and target country level for column (8). *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

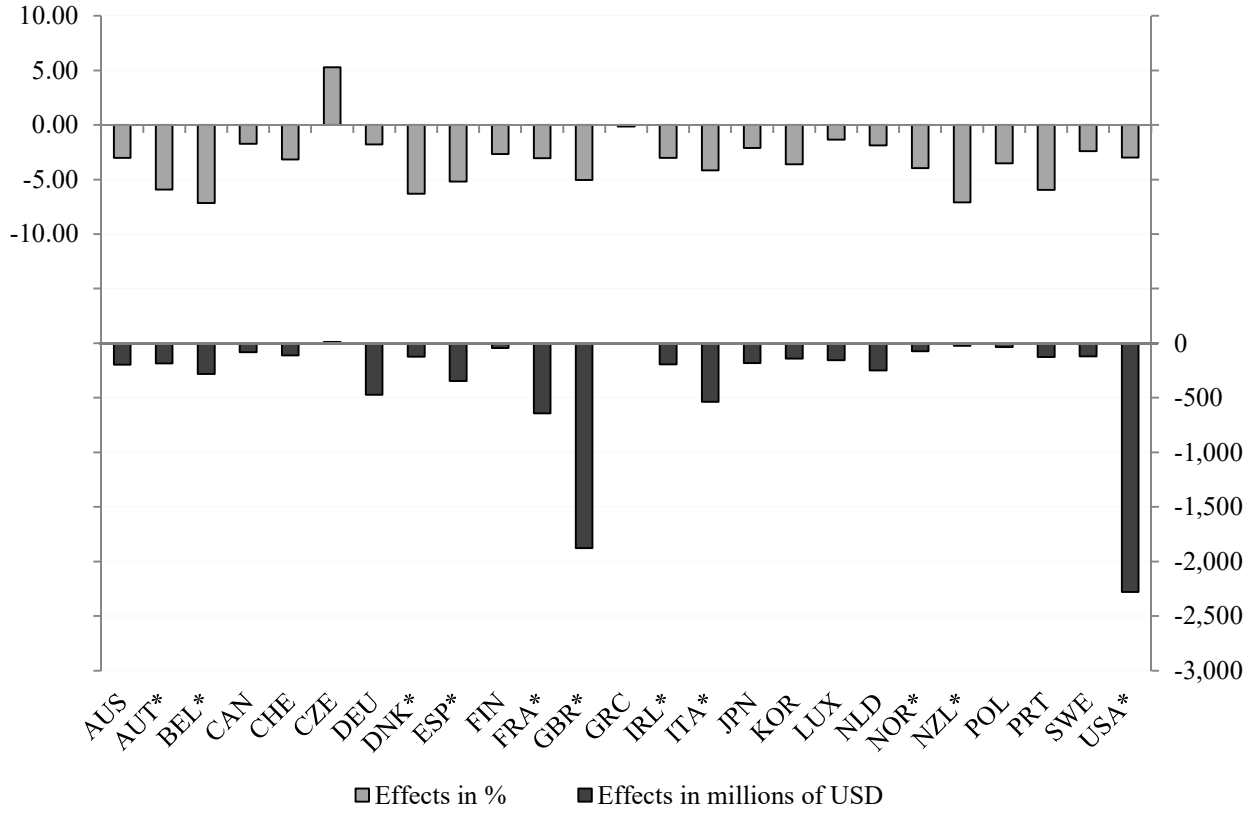
Interestingly, the structure of our data enables us to approximate the size of the effect for each target country individually. To this aim, we estimate the baseline specification for each target country separately and evaluate the effects of tax information exchange on haven outbound FPI into each specific target country.[15] The light gray bars in the upper part of Figure 2.3 show the overall effect (in %) of an additional information exchange agreement on haven investment in different OECD capital markets. The darker bars at the bottom of the graph approximate the absolute effect of an additional EOI on haven outbound FPI in millions of U.S. dollars.[16]

As shown by Figure 2.3, the magnitude of the relative effects of information exchange varies between target countries. For example, if tax havens increase transparency through information exchange, investment in the Belgium securities markets drops, on average, by -7.4%. By contrast, the relative drop is only -3% for the U.S. Quite intuitively, these varying relative effects are also driven by the magnitude of the underlying investment stock. The bottom of Figure 2.3 reveals the absolute effects of tax information exchange on haven portfolio investment in the different OECD securities markets. Looking at the most important securities markets, which are the U.K. and the U.S., an additional information exchange agreement that tax havens conclude with an OECD country tends to reduce haven outbound portfolio investment in these markets, respectively, by approximately US$ 1,878 million and US$ 2,280 million. This reflects the general importance of these two large markets for cross-border investment but, more importantly, it also reveals that they probably are large receivers of hidden funds responsive to increased transparency.

[15] Full results of country-specific regressions are available from the authors upon request.

[16] The absolute effects are approximated as follows: For each haven-OECD country pair, we first take the average total outbound stock in that specific target country over the sample period. Then, for each target country, we take the average haven outbound investment stock in the respective target country and multiply it by the average target-country specific effect of an additional EOI on tax haven investment ($\widehat{ß}_1 + \widehat{ß}_2$). Taking the U.K. as an example, the estimated EOI effect is -5.05% and the average tax haven U.K.-bound FPI stock is US$ 37,214 million. This results in an estimated decrease of US$ 1,878 million.

Figure 2.3: Country-Specific Effects



Note: An asterisk indicates statistical significance of the joint effect ($p<0.1$). See footnote 14 for an explanation of how we approximate the absolute effects in millions of U.S. dollars.

To assure the robustness of our baseline results, we run a series of additional tests. First, we estimate our baseline model separately for equity and debt FPI. As shown by the significant negative coefficients for $HAVEN_i*EOI_{it}$ in columns (2) and (3) of Table 2.2, an increase in the number of EOIs signed reduces a tax haven's outbound investments, both OECD equity and debt markets. Investment in debt securities turns out to be somewhat more sensitive to information exchange than equity investments.

As a next robustness test, we investigate the sensitivity of our results to the exclusion of selected observations. As shown by Figure 2.3, the U.S. and the U.K. are the target economies that, in absolute terms, are most affected by the rise of information exchange, receiving considerably less funds from tax havens that increase transparency. This might lead to potential concerns that these two countries alone are driving our findings. In order to check

for this, we exclude them from the sample in column (4) of Table 2.2. Excluding these two countries from our sample does not affect our results.

As our sample period covers the years 2001 to 2014, it includes the years of the 2007/2008 financial crisis. As economies got struck by the financial crisis, cross-border investment substantially decreased. At the same time, however, international awareness with regard to tax evasion and associated economic and fiscal damages rose drastically, with initiatives on tax transparency and tax information exchange taking up pace. Including year fixed effects, or even target country-specific year fixed effects as we so far do in all regressions, controls for such aggregate changes in the level of outbound FPI. Even if we additionally exclude the years of the financial crisis in column (5) of Table 2.2, our results turn out robust.

Public and political awareness with regard to cross-border tax evasion have strongly increased over the last two decades. Concerned for their tax revenues, many OECD economies have since taken several actions in order to fight tax havens. Country-pair and target country-specific time fixed effects included in all previous specifications should capture changes in regulatory enforcement beyond tax information exchange, such as increased OECD scrutiny (Hanlon et al., 2015). The ongoing fight against tax evasion might, however, affect haven outbound FPI differently than non-haven investment and, at the same time, correlate with countries' EOI policies. Such diverging unobserved time trends would not be captured by our fixed effects, so far. To account for this, we introduce haven-year fixed effects in specification (6) of Table 2.2. The coefficient on the interaction term $HAVEN_i$*EOI_{it} is negative and statistically highly significant. Our inferences are thus unchanged.

Since our dependent variable is expressed in (natural) logs, zero FPI values are omitted from the sample. A proven alternative to log-linear panel estimation, especially in the context of cross-border investment and international trade analyses, is a Poisson fixed effects model

(Santos Silva and Tenreyro, 2006, 2011)[17] Considering the negative and statistically significant coefficients on $HAVEN_i*EOI_{it}$ in column (7) of Table 2.2, our main baseline inferences turn out robust to this alternative estimation approach.[18]

Next, we modify the clustering of standard errors. As the main variable of interest, i.e. the count of information exchange agreements EOI_{it}, varies at the investor country level, we use standard errors that are robust to a clustering of observations within investor countries while at the same time controlling for country-specific time and country-pair fixed effects. To address potential concerns about clustering of observations within investor *and* target countries, we re-estimate equation (1) with standard errors that allow for clustering along two dimensions, i.e. the investor and the target country level. Column (8) of Table 2.2 shows the results. The coefficient on the interaction term $HAVEN_i*EOI_{it}$ remains negative and statistically significant. We are thus confident that our main inferences discussed in column (1) are robust, even if we take into account potential clustering of observations at the investor and target country level.

So far, our main variable of interest EOI_{it} is designed as a simple count of the number of agreements signed by each investor country. While the implied equal weighting of partner countries is transparent, the simple count variable does not account for the fact that signing an EOI with a the United States will affect more tax evaders and larger investment positions than entering into information exchange with a much smaller country like, e.g. Denmark. Therefore, we now use a population-weighted count, where we weight each information exchange agreement signed by investor country *i* with the respective partner country's

[17] Using a Poisson model allows zero-observations to be retained and eliminates a potential bias introduced by the log-transformation in the presence of heteroscedasticity (Santos Silva and Tenreyro, 2006). For applications, see, among others, (Santos Silva and Tenreyro, 2006; Head and Ries, 2008; Johannesen, 2014; Fally, 2015). Similar to the study put forward by Johannesen (2014), about 3% of our observations are zeros.

[18] The fact that coefficient values (-0.0341) estimated by the Poisson fixed effects model are somewhat smaller as compared to those estimated by OLS and reported in column (1), is in line with previous studies that have used both OLS and Poisson fixed effects models (Santos Silva and Tenreyro, 2006; Head and Ries, 2008; Johannesen, 2014).

population relative to the OECD average population. The weighted count thus would increase by exactly one if the partner country has the OECD-average population size. The results using the population-weighted count in column (9) of Table 2.2 show that the interaction term $HAVEN_i*EOI_{it}$ again loads statistically significant and negative. Signing a tax information exchange agreement with the OECD-average partner country reduces haven outbound FPI by about -4% relative to the response of non-havens to a similar treaty.

2.3.2 Round-Tripping

Using an overall count of the EOIs signed by each investor country as the explanatory variable of interest takes into account that the funds channeled through tax havens originate from a multitude of different countries. Consequently, a tax haven's outbound investments should be, and turn out to be, responsive to the haven's overall policy in terms of information exchange, as reflected by our variable EOI_{it}. Hanlon et al. (2015), however, show that in the U.S. context one specific form of investor-level tax evasion, described as "round-tripping" exists. Round-tripping implies that U.S. residents hide funds in tax havens and then reinvest those funds in the U.S. equity and debt markets, i.e. their home country of residence. Thereby, investment is seen as originating from tax haven residents, while in reality U.S. persons are carrying out the investment. A fraction of the FPI from tax havens towards other OECD countries potentially follows a similar pattern as it might simply be round-tripped and originate from the respective target economy itself. The round-tripped FPI component is supposed to be responsive especially to bilateral information exchange agreed directly between the investing tax haven country and the FPI target economy. This is due to the fact that the risk of evading taxes increases strongly for residents of the respective target economy, that disguise themselves as tax haven investors (Hanlon et al., 2015). In column (1) of Table 2.3 we introduce the variable *EOI Roundtrip*, which takes the value one if an agreement on tax information exchange exists specifically for the country-pair *ij* in year *t,* and zero

otherwise. The estimated coefficient for the interaction *HAVEN$_i$*EOI Roundtrip* is -0.567 (p-value < 0.01). Hence, upon introduction of an information exchange agreement with the FPI target country, the respective haven outbound investments in OECD securities markets decrease by 43% relative to the control group of non-havens.[19] This result is very much in line with the effect of information exchange on round-tripped investment identified by Hanlon et al. (2015) for the United States who, using the same identification strategy, reported effects between -29% and -45%. Thus, our findings are consistent with the notion that round-tripping of investment is a global rather than only a U.S. phenomenon.

The approach proposed by Hanlon et al. (2015) and applied in column (1) of Table 2.3, however, neglects that that the funds channeled through tax havens originate from a multitude of different countries. Part of the round-tripping effect identified in column (1) might thus be attributable to responses to information exchange signed with other partners than the FPI target country. Therefore, we combine our approach with the specification by Hanlon et al. (2015) by accounting for the overall level of transparency as expressed by EOI_{it},[20] and in addition include the variable *EOI Roundtrip* in our model. The results are displayed in column (2) of Table 2.3. Interestingly, the estimated coefficient for the interaction *HAVEN$_i$*EOI Roundtrip* is smaller, but still substantially negative and statistically significant. Quantitatively, we now estimate that upon introduction of an information exchange agreement with the FPI target country, haven outbound FPI in OECD securities markets decreases by 24% relative to non-havens. The corresponding influence on haven FPI from information exchange with non-target partners is -4%.

[19] The estimated effect is calculated as $e^{(-0.567)} - 1\%$.

[20] The variable EOI_{it} is now slightly modified and no longer takes into account bilateral agreements between the investor country *i* and target country *j* as these are captured separately by the dummy *EOI Roundtrip*.

Table 2.3: Round-Tripping

Variables	(1) Round-Tripping I	(2) Round-Tripping II
EOI_{it}		0.00835
		(0.0154)
$HAVEN_i$*EOI_{it}		-0.0340**
		(.0166)
EOI Roundtrip	0.168	0.104
	(0.106)	(0.101)
$HAVEN_i$*EOI Roundtrip	-0.567***	-0.273*
	(0.203)	(0.141)
Constant	23.13*	18.87
	(13.68)	(13.47)
Observations	13,016	13,016
R^2	0.316	0.322
Number of country-pairs	1,044	1,044
Controls	√	√
Country pair FE	√	√
Year FE	√	√
Target Country Year FE	√	√

The dependent variable is the stock of portfolio investment by country *i* in country *j* at the end of year *t* in logs $ln(FPI_{ijt})$. The unit of observation is the country-pair (*i, j*) and the sample period goes from 2001 to 2014. For a given country *i* there are up to 25 destination countries *j*, and we consider foreign portfolio investment held by a total of 21 tax havens and 22 non-haven OECD countries. EOI_{it} is a variable that counts the population-weighted number of TIEAs and DTTs, allowing for the exchange of information upon request, signed by country *i* with OECD countries at the end of year *t*. All specifications include control variables for the investor countries' annual GDP $(LOGGDP_t)$, as well as annual GDP per capita $(LOGGDPC_t)$. Robust standard errors clustered at the investor country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

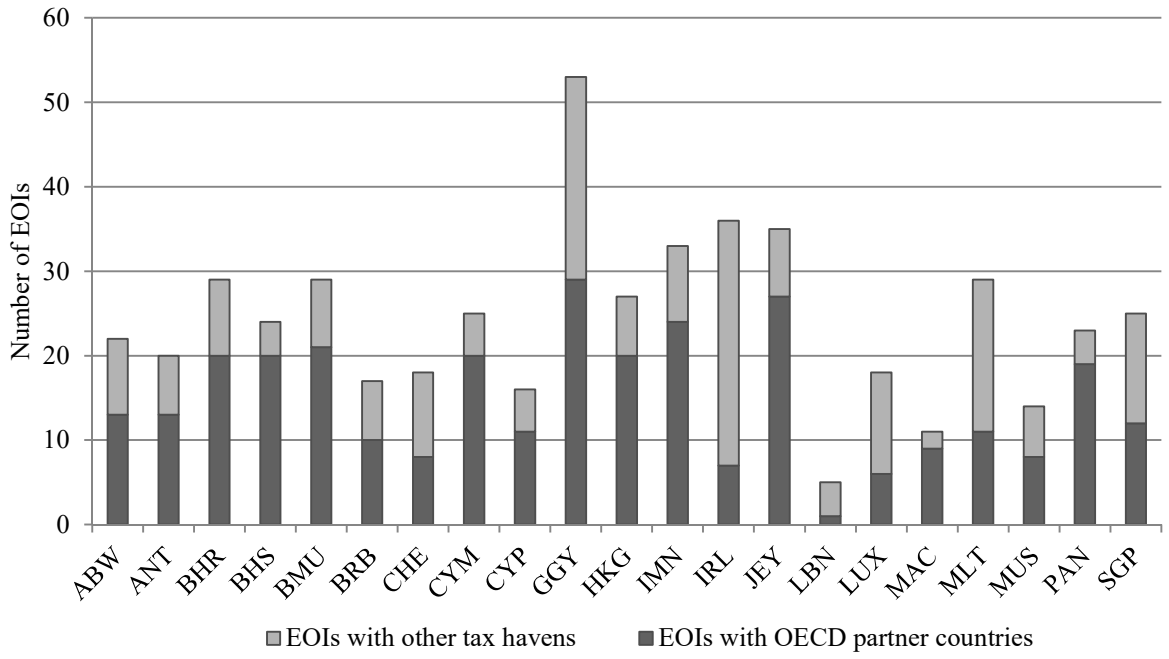
2.3.3 Partnering with Peers: Do Intra-Haven Agreements Undermine the Initiative?

Tax information exchange agreements are mutually agreed on a bilateral basis. This has led to concerns about potential efforts undertaken by single havens in order to undermine the OECD initiative. Investors, when deciding whether or not to use a specific tax haven to evade taxes, assess how likely this tax haven will provide a secrecy regime (Konrad and Stolper, 2016). Elsayyad and Konrad (2012) develop a competition theory framework in which they show that sequentially signing bilateral agreements is inferior to introducing a multilateral agreement, under which all tax havens are simultaneously forced to cooperate. If only a subset of tax havens agrees to effective information exchange, this ultimately renders the tax haven status for the remaining havens more profitable. As a consequence, these havens may turn even more reluctant and thus avoid to effectively increase their level of transparency (Elsayyad and Konrad, 2012).

According to OECD policy, a tax haven has to sign at least twelve bilateral agreements on information exchange to be removed from the OECD blacklist – regardless of whether the partner country is a non-haven or a tax haven itself. The incentives of tax havens to maintain their status (Elsayyad and Konrad, 2012) have led to concerns that tax havens could undermine the OECD transparency initiative by entering into information exchange agreements *with each other* rather than with non-haven countries (Bilicka and Fuest, 2014; Johannesen and Zucman, 2014). If tax havens systemically undermine the OECD initiative by entering into information exchange among each other, potential tax evaders might perceive this as willingness to remain secretive. This makes these havens more attractive, rather than less attractive, destinations for hidden capital, which in return should translate into higher, rather than lower, OECD-bound investment by these havens.

Figure 2.4 shows, for each tax haven in our sample, the total number of information exchange agreements signed throughout the sample period from 2001 to 2014. It also indicates the share of agreements these havens have signed, respectively, with other tax havens or, alternatively, with OECD partner countries. In our empirical analysis, so far, the focus has been on those latter agreements signed with OECD partners. However, on average, the 21 tax havens in our sample partner with other tax havens in 39% of their new agreements. In many cases, the share of *intra-haven* information exchange even exceeds this level; it reaches more than 50% for Ireland, Lebanon, Luxembourg, Malta, Singapore, and Switzerland.

Figure 2.4: Share of Intrahaven Information Exchange Agreements



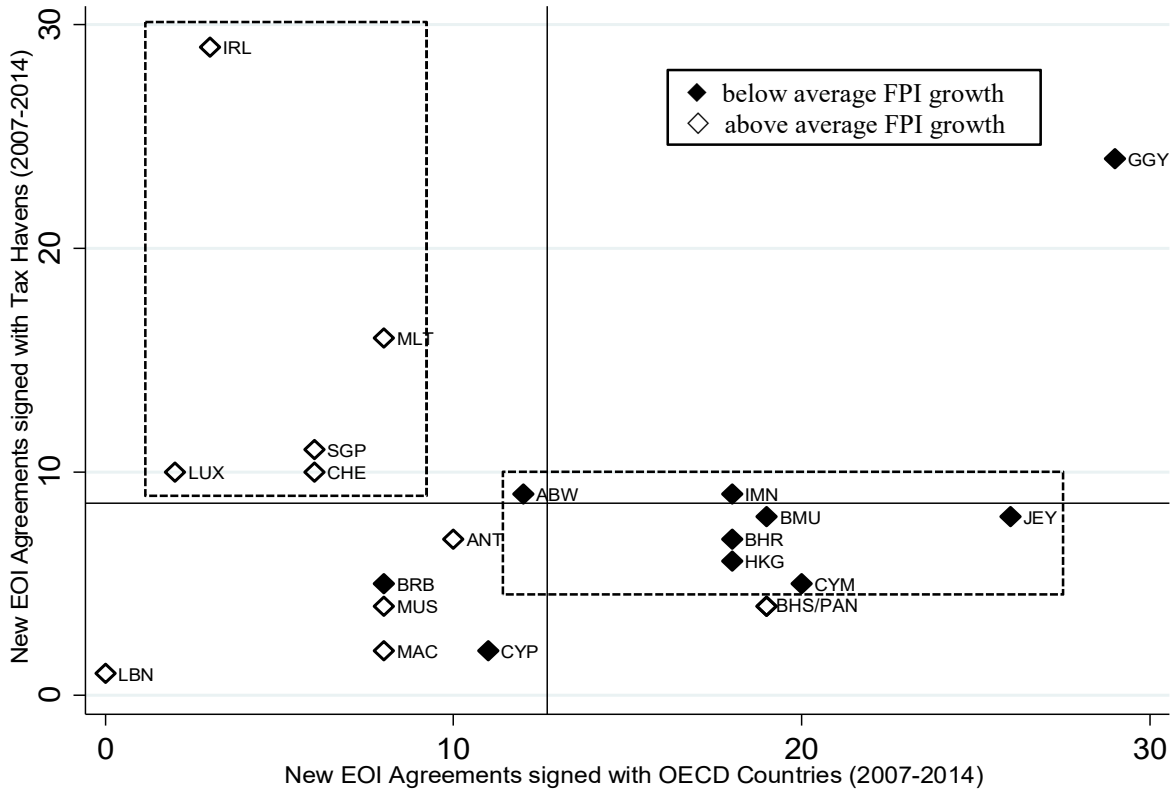
Note: Data obtained from OECD (Global Forum on Transparency and Exchange of Information for Tax Purposes). The darker bars display the number of EOIs signed by the tax havens in our sample with OECD countries from 2001 to 2014. The brighter gray bars indicate the number of agreements signed by the tax havens in our sample with other tax havens from 2001 to 2014.

In this section, we conduct further analyses in which we assess the influences of the choice of partner country on tax haven FPI in OECD markets. For a first graphical analysis, Figure 2.5 plots, for each tax haven respectively, the number of new information exchange agreements signed with another tax haven country against the number of new agreements signed with an

OECD partner country. The outline color (black/white) indicates, for each tax haven, whether its FPI growth rate is below (black) or above (white) the mean FPI growth rate of all 21 tax havens during the most intense period from 2007 to 2014. The black reference lines in Figure 2.5 indicate, respectively, the average number of new treaties that tax havens have signed with other tax havens (= 8.6, see horizontal line) and the average number of new treaties the tax havens have signed with OECD partner countries (= 12.6, see vertical line).

Considering the plot in Figure 2.5, we find that most tax havens that show up in the lower right part of the graph, i.e. that feature an above-average number of new EOIs with OECD partner countries and a relatively low number of new EOIs with other tax havens, display FPI growth rates which fall short of the average FPI growth rate among the 21 tax havens considered. By contrast, tax havens plotted in the upper left part of Figure 2.5, i.e. havens that entered into relatively many new EOIs with other havens while signing a below-average number of EOIs with OECD partners, tend to feature above-average FPI growth. Singapore, as an example for a tax haven with above-average FPI growth, entered into twice as many new agreements with other tax havens as compared to agreements with OECD partner countries between 2007 and 2014. The graphical evidence shown in Figure 2.5 is thus consistent with the notion that (at least some) tax havens effectively undermine the OECD transparency initiative by entering into information exchange with other financial centers rather than non-havens, increasing their attractiveness for would-be tax evaders relative to other potential intermediary countries.

Figure 2.5: Signing Behavior of Tax Havens and FPI Growth



Note: Data obtained from the IMF (CPIS) and OECD (Global Forum on Transparency and Exchange of Information for Tax Purposes). The vertical (horizontal) line indicates the mean number of new agreements signed by the tax havens in our sample with OECD countries (12.6) (other tax havens; 8.6) for the years 2007-2014. Country codes according to ISO 3166-1 alpha-3.

Building on this graphical evidence we amend our model. So far, previous specification included EOI_{it} as the count of information exchange agreements that investor country i has signed with OECD partner countries. The dummy $HAVEN_i$ marked whether country i itself was a tax haven or a non-haven country in order to test for different FPI responses of haven countries vs. non-havens to an increase in EOI. Now, we additionally count the information exchange agreements that investor country i has concluded with tax havens, introducing the variable *EOI with Haven*. Again, we also interact this new count variable with the dummy $HAVEN_i$. The estimation results in columns (1) to (3) of Table 2.4 show that tax havens show a strong and statistically highly significant negative reaction to an increase in the number of information exchange agreements signed with OECD countries relative to the non-haven control group. On the other hand, quite interestingly, relative to the control group, tax havens

which increase the number of information exchange agreements signed with other tax havens increase their outbound portfolio investment in OECD securities markets.

Table 2.4: The Effect of Intrahaven Agreements

VARIABLES	Intrahaven EOI		
	Total FPI	Equity FPI	Debt FPI
	(1)	(2)	(3)
EOI_{it}	0.0446	0.0576	0.0482*
	(0.0271)	(0.0480)	(0.0258)
$HAVEN_i$*EOI_{it}	-0.0862**	-0.0975*	-0.0906**
	(0.0345)	(0.0539)	(0.0346)
EOI_{it} *with Haven*	-0.0006	-0.0046	0.0035
	(0.0069)	(0.0123)	(0.0058)
$HAVEN_i$*EOI_{it} *with Haven*	0.0300**	0.0333***	0.0225*
	(0.0116)	(0.0080)	(0.0116)
Constant	11.4706	3.4316	8.7511
	(14.874)	(18.603)	(16.376)
Observations	13,016	11,921	12,417
R^2	0.332	0.356	0.286
Number of country-pairs	1,044	1,020	1,039
Controls	√	√	√
Country pair FE	√	√	√
Year FE	√	√	√
Target Country Year FE	√	√	√

The dependent variable is the stock of portfolio investment by country *i* in country *j* at the end of year *t* in logs $ln(FPI_{ijt})$. The unit of observation is the country-pair (*i, j*) and the sample period goes from 2001 to 2014. For a given country *i* there are up to 25 destination countries *j*, and we consider foreign portfolio investment held by a total of 21 tax havens and 22 non-haven OECD countries. EOI_{it} is a variable that counts the total number of TIEAs and DTTs, allowing for the exchange of information upon request, signed by country *i* with OECD countries at the end of year *t*. EOI_{it} *with Haven* counts the total number of agreements signed by country *i* with tax havens at the end of year *t*. All specifications include control variables for the investor countries' annual GDP $(LOGGDP_t)$, as well as annual GDP per capita $(LOGGDPC_t)$. Robust standard errors clustered at the investor country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

While an additional information exchange agreement between a tax haven and an OECD country reduces OECD-bound tax haven FPI, an additional intra-haven EOI, on the contrary, does exert positive effects on haven outbound FPI of about 2%-3%. Hence, efforts undertaken by tax havens to undermine the OECD initiative by partnering with other havens seem to pay off. Havens that commit themselves to pseudo-transparency by engaging in information

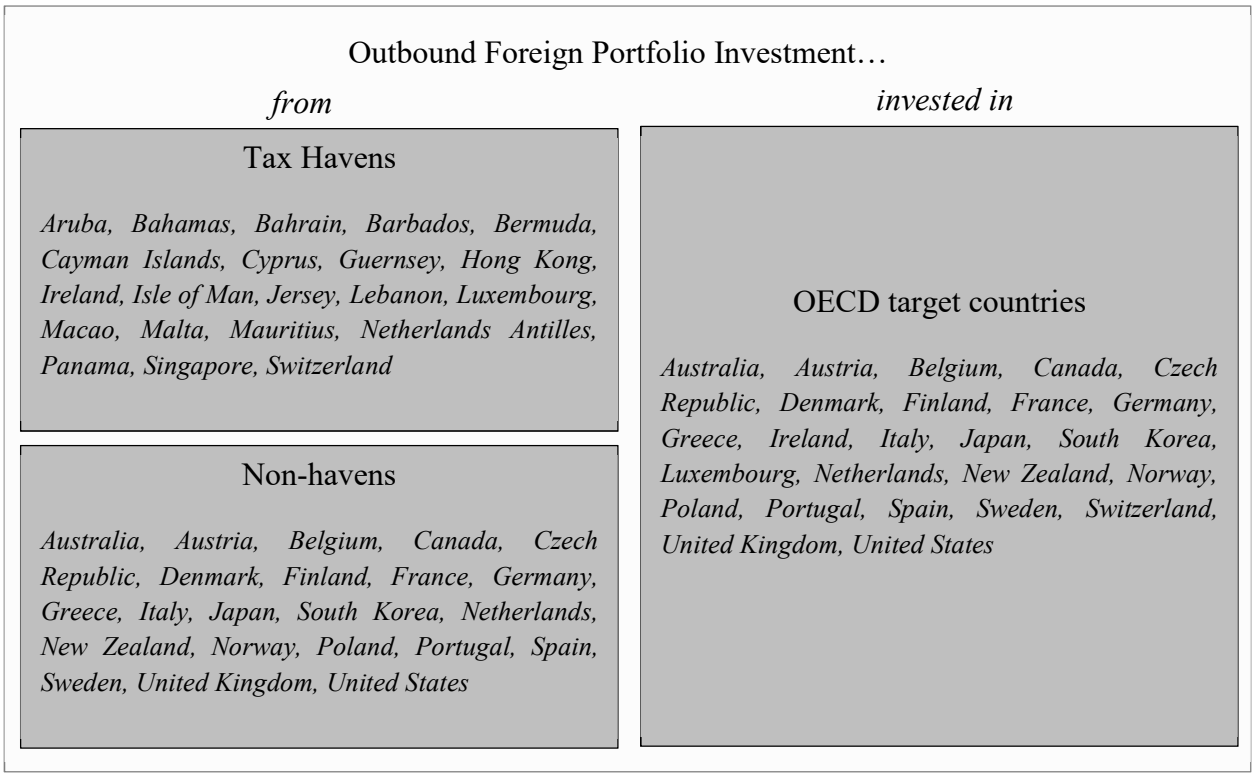
exchange with other tax havens seem to become more attractive pass-through destinations for tax evaders, with outbound FPI bound toward OECD securities markets on the rise.

2.4 Conclusion

This paper analyzes the effects of offshore tax evasion on international portfolio investment and its responsiveness to changes in enforcement. Based on a large data set of outbound FPI from 43 countries (of which 21 are tax havens) in 25 OECD countries for the years 2001 to 2014, our results show that enhanced tax enforcement through the signing of new information exchange agreements with OECD countries exerts a statistically significant and negative effect on OECD-bound FPI from tax havens. Quantitatively, if a tax haven increases the number of information exchange agreements by one, its outbound portfolio investment stock in OECD securities market decreases, on average, by 6% relative to non-haven investment. Our findings turn out robust to variation in the sample composition, estimation techniques and weighting schemes. We consider this as a reflection and strong evidence of a significant tax evasion component in haven outbound FPI. Furthermore, we are able to show that round-tripping tax evasion is a global phenomenon and, in addition, document that tax havens undermine the OECD transparency initiative by signing information exchange agreements with their peers. These results inform the debate on international tax evasion through tax havens which - despite being at the cutting edge of international tax policy - is still an under-researched topic.

2.5 Appendix

Appendix 2.1: Data Structure and Sample



Appendix 2.2: Descriptive Statistics

Variable		Mean	SD	Median	Min	Max
LogFPI	*Total*	20.8763	3.1992	21.2182	11.5129	26.9227
	Equity	19.6591	3.4451	20.1105	9.7975	26.4867
	Debt	20.4709	3.0938	20.7067	11.5129	26.3874
LogGDP	*Investor country*	25.4374	2.3441	26.0312	21.2024	30.4845
	Target country	27.1329	1.304	29.9239	23.7703	30.4845
LogGDP per Capita	*Investor country*	10.3080	0.6875	10.3954	8.2406	11.6666
	Target country	10.4796	0.5441	10.5636	8.5134	11.6666

Note: The number of observations for which we also have data for all controls variables is 13,016 for Total 11,921 for Equity, and 12,417 for Debt FPI, respectively. LogFPI is winsorized at 0.5% on both sides of the sample distribution.

Appendix 2.2 presents summary statistics of all dependent variables and our controls used in the analysis. There are differences with regard to the volumes of outbound FPI as well as the

values for GDP and GDP per capita, as the countries in our sample differ in size and economic development (ranging from small tax havens to the U.S.). The log of the total outbound FPI stock is close to standard normal with values being dispersed around the mean log of 21.2182 (US$ 1,640 million). The lowest (11.5129; equivalent to US$ 100,000) and the highest value (26.9227; equivalent to US$ 492,470 million) reflect the smallest and largest country-pair year observation, respectively.

Appendix 2.3: Outward FPI of Tax Havens; average 2001-2014[21]

Country	*Outward FPI in % of GDP (average 2001-2014)*	*Outward FPI in in millions of U.S. dollar (average 2001-2014)*	*thereof Equity FPI*
Bermuda	6753%	358,091	50,069
Luxembourg	4214%	1,944,861	750,482
Channel Islands	3395%	337,297	112,132
Cayman Islands	1344%	40,512	1,766
Isle of Man	840%	32,051	24,860
Ireland	625%	1,391,526	415,915
Barbados	344%	14,812	1,307
Netherlands Antilles	296%	10,244	5,871
Switzerland	144%	722,023	317,765
Singapore	140%	259,857	120,251
China, P.R.: Hong Kong	132%	283,318	96,684
Malta	103%	8,038	766
Bahamas, The	83%	6,281	875
Cyprus	81%	19,091	1,203
Bahrain, Kingdom of	68%	13,637	1,805
Mauritius	51%	4,414	3,282
China, P.R.: Macao	28%	5,486	1,729
Aruba	16%	393	256
Panama	14%	3,544	191
Lebanon	9%	2,983	1,288
Average	*406%*	*272,922*	*95,424*

[21] Jersey and Guernsey are included as Channel Islands since we do not have separate GDP Data for these two countries.

Appendix 2.4: Outward FPI of Non-haven OECD countries; average 2001-2014

Country	*Outward FPI in % of GDP (average 2001-2014)*	*Outward FPI in in millions of U.S. dollars (average 2001-2014)*	*thereof Equity FPI*
Netherlands	154%	1,170,450	486,949
Belgium	134%	582,640	206,848
Norway	119%	483,671	241,016
United Kingdom	87%	2,147,310	831,880
Finland	83%	195,153	77,886
France	81%	2,000,486	486,460
Sweden	77%	349,760	232,060
Denmark	75%	224,229	101,032
Austria	72%	257,536	62,433
Germany	59%	1,938,627	643,349
Portugal	56%	120,961	24,626
Italy	45%	873,216	409,487
Japan	40%	1,932,423	406,327
Canada	40%	560,689	442,413
Spain	33%	401,851	113,865
Australia	29%	281,609	174,608
United States	27%	3,976,815	2,700,513
Greece	27%	70,440	7,870
New Zealand	20%	24,919	18,518
Czech Republic	10%	17,117	7,042
Korea, Republic of	6%	63,079	37,109
Poland	2%	8,437	4,002
Average	*47%*	*803,700*	*350,740*

Appendix 2.5: Full regression results Table 2.2

Variables	(1) Baseline	(2) Additional Tests: Equity FPI	(3) Additional Tests: Debt FPI	(4) Additional Tests: Excluding the U.S. and the U.K.	(5) Additional Tests: Excluding U.S./U.K. & Financial Crisis	(6) Additional Tests: Haven Year FE	(7) Additional Tests: Fixed Effects Poisson	(8) Additional Tests: Two-way clustering	(9) Additional Tests: Population-weighted count
EOI_{it}	0.0280	0.0372	0.0391	0.0380	0.0294	0.0504**	0.0247***	0.0280	0.00985
	(0.0237)	(0.0399)	(0.0238)	(0.0254)	(0.0253)	(0.0208)	(0.00812)	(0.0283)	(0.0152)
$HAVEN_i$*EOI_{it}	-0.0634**	-0.0674*	-0.0790***	-0.0721**	-0.0677**	-0.101***	-0.0341***	-0.0634*	-0.0396**
	(0.0264)	(0.0386)	(0.0282)	(0.0286)	(0.0282)	(0.0271)	(0.00693)	(0.0308)	(0.0166)
LOGGDPit	-0.0377	0.354	0.224	-0.0454	-0.242	-0.318	1.843***	-0.0377	-0.545
	(1.012)	(1.302)	(1.078)	(1.041)	(0.976)	(1.019)	(0.395)	(1.010)	(0.921)
LOGGDPPCit	0.920	0.706	0.469	0.893	1.116	1.119	-1.253***	0.920	1.422
	(1.115)	(1.440)	(1.163)	(1.164)	(1.091)	(1.090)	(0.438)	(1.116)	(1.038)
LOGGDPjt							3.234***		
							(0.465)		
LOGGDPPCjt							-2.833***		
							(0.476)		
Constant	11.67	2.344	8.902	11.34	14.17	16.46			19.66
	(15.10)	(19.32)	(16.35)	(15.22)	(14.31)	(15.43)			(13.61)
Observations	13,016	11,921	12,417	11,254	9,594	13,016	13,398	13,011	13,016
R^2	0.327	0.351	0.282	0.318	0.331	0.331		0.327	0.321
Number of country-pairs	1,044	1,020	1,039	914	914	1,044	1,044	1,039	1,044
Country pair FE	√	√	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√	√	√
Target Country Year FE	√	√	√	√	√	√		√	√
Haven Year FE						√			

Appendix 2.6: Full regression results Table 2.3

Variables	(1) Round-Tripping I	(2) Round-Tripping II
EOI_{it}		0.00835
		(0.0154)
$HAVEN_i*EOI_{it}$		-0.0340**
		(.0166)
EOI Roundtrip	0.168	0.104
	(0.106)	(0.101)
$HAVEN_i$*EOI Roundtrip*	-0.567***	-0.273*
	(0.203)	(0.141)
LOGGDPit	-0.793	-0.492
	(0.932)	(0.912)
LOGGDPPCit	1.699	1.370
	(1.070)	(1.027)
Constant	23.13*	18.87
	(13.68)	(13.47)
Observations	13,016	13,016
R^2	0.316	0.322
Number of country-pairs	1,044	1,044
Country pair FE	√	√
Year FE	√	√
Target Country Year FE	√	√

Appendix 2.7: Full regression results Table 2.4

VARIABLES	Intrahaven EOI		
	Total FPI (1)	Equity FPI (2)	Debt FPI (3)
EOI_{it}	0.0446	0.0576	0.0482*
	(0.0271)	(0.0480)	(0.0258)
$HAVEN_i*EOI_{it}$	-0.0862**	-0.0975*	-0.0906**
	(0.0345)	(0.0539)	(0.0346)
EOI_{it} *with Haven*	-0.0006	-0.0046	0.0035
	(0.0069)	(0.0123)	(0.0058)
$HAVEN_i*EOI_{it}$ *with Haven*	0.0300**	0.0333***	0.0225*
	(0.0116)	(0.0080)	(0.0116)
LOGGDPit	-0.0670	0.224	0.195
	(1.001)	(1.258)	(1.081)
LOGGDPPCit	0.992	0.901	0.540
	(1.101)	(1.400)	(1.161)
Constant	11.4706	3.4316	8.7511
	(14.874)	(18.603)	(16.376)
Observations	13,016	11,921	12,417
R^2	0.332	0.356	0.286
Number of country-pairs	1,044	1,020	1,039
Country pair FE	√	√	√
Year FE	√	√	√
Target Country Year FE	√	√	√

Chapter 3

The Effect of Transparency on the Tax Haven Presence of Banks*

Abstract

Curtailing tax evasion is high on the international policy agenda. First empirical studies provide some insights into the secretive world of offshore banking. With countermeasures against cross-border tax evasion showing first results, the questions remains, how this affects the tax haven economies themselves. If initiatives against tax havens ought to be effective, they must effectively undermine the business model of tax havens. If this were the case, banks located in tax havens should ultimately (at least partly) cease their operations. Our research enables us to shed some light on these questions. Exploiting the Bank Ownership Database, a unique dataset containing an almost complete picture of bank ownership around the world over the period 1995 to 2013 created by Claessens and van Horen (2015), we are able to investigate real economic effects of countermeasures, namely the U.S. Foreign Accounts Tax Compliance Act (FATCA), against cross-border tax evasion via the use of tax havens on the respective haven economy. We find FATCA to have a negative effect on the presence of multinational banks in tax havens. Our results, however, also suggest that domestic tax haven banks might be filling the gap. Regardless of this trend, foreign owned banks still seem to play an important role in the overall offshore banking sector.

* This chapter is a co-authored work with Prof. Dr. Jost H. Heckemeyer (Kiel University)

3.1 Introduction

Tax havens have been shown to play a central role as intermediaries in international finance (Lane and Milesi-Ferretti, 2011). Furthermore, recent studies suggest, that services offered by offshore banks are frequently used to evade taxes (Zucman, 2013; Johannesen, 2014; Johannesen and Zucman, 2014; Zucman, 2014). Curtailing this international tax evasion is high on the policy agenda. Several countermeasures in order to improve transparency in tax havens and thus increase the risk of getting caught evading taxes have been implemented within the last two decades. This increase in transparency has been shown to be associated with a statistically significant decrease in tax haven bank deposits held by foreign residents (Johannesen, 2014; Johannesen and Zucman, 2014). Furthermore, recent studies show that this also translates into decreased volumes of outbound investments by tax havens (Hanlon et al., 2015; Heckemeyer and Hemmerich, 2018).

So far, little empirical evidence exists with regard to the effects of this fight against cross-border tax evasion on tax haven economies and the agents that are active in the local financial sector. In this study, we shed some light on this question by exploiting a unique dataset covering bank presence and ownership around the world. All in all, the data provides an almost complete picture of bank ownership around the world over the period 1995-2013 (Claessens and van Horen, 2015). As we can observe the year of foundation as well as the ongoing activity status of banks and have information on whether banks are domestically or foreign owned, we are able to analyze whether the major crackdown on tax havens really affected local banking activity in tax haven economies. The results show that the U.S. Foreign Accounts Tax Compliance Act (FATCA) indeed led to a reduction in the offshore presence of multinational banks. Our findings, however, also suggest that domestic tax haven banks might be filling the gap. Regardless of this trend, foreign owned banks still play an important role in the offshore banking sector. The paper proceeds as follows. In the next section, we briefly

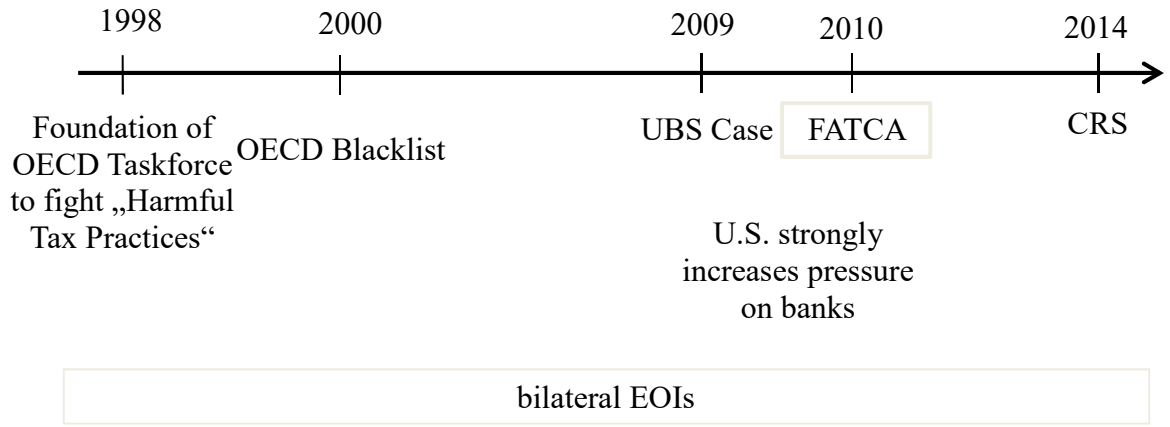
review the existing literature about offshore banking and cross-border tax evasion and stress our contribution. Section 3.3 describes the data and presents our empirical analysis. Section 3.4 concludes.

3.2 Offshore Banking and Cross-border Tax Evasion

3.2.1 The Evolution of Tax Transparency

As it is crucial that banks provide high levels of secrecy to individuals engaging in tax evasion, it is little surprising that an increase in transparency is one of the core elements in the internationally coordinated fight against tax evasion. The evolution of information exchange can be categorized among several dimensions. One possible distinction can be drawn with regard to the design of the mechanism. Information exchange can take place upon request, as it is usually agreed on under a Tax Information Exchange Agreement (TIEA). Alternatively, information can be exchanged automatically. Furthermore, the mechanism for information exchange can be distinguished according to the body behind it. Traditionally, the U.S. has played a prominent role in promoting countermeasures against international tax evasion More recently, however, internationally coordinated countermeasures by the OECD/G20 have taken up pace, as well. Figure 3.1 displays the evolution of tax transparency over time.

Figure 3.1: The Evolution of Tax Transparency



The first efforts date back to as early as the 1970's and 1980's when the United States entered into agreements allowing for the exchange of information with several tax havens. These agreements are concluded on a bilateral basis and establish mutual assistance in tax matters. Therefore, countries no longer have to rely on taxpayer self-reporting but domestic tax authorities can, upon first indication, file a request to the (suspected) tax haven country and ask for information. The first agreement between the U.S. and a tax haven was signed with Trinidad and Tobago in 1970. Further agreements with several other important tax havens (e.g. with Bermuda in 1988) followed.[22] A major weakness of these early agreements was their lack of effectiveness, however. While they included regulations that generally obliged the involved tax authorities to provide information upon request, such a request could be denied if the authorities themselves would have had to gather the information from banks (or other financial agents). The effectiveness of such provisions in the fight against cross-border tax evasion should thus be close to nil.

Aware of the so far limited success in fighting cross-border tax evasion, the OECD founded a special taskforce with the single aim of identifying harmful tax practices and developing potential countermeasures in 1998 (OECD, 1998). This taskforce helped establish a blacklist of non-cooperative tax havens (OECD, 2000) and identified several measure to reduce cross-border tax evasion. Furthermore, the group also helped draft the OECD's model agreement that serves to establish exchange of tax information between tax authorities on a bilateral basis (OECD, 2002). The U.S. signed its first agreement that allowed for effective exchange of information with the Cayman Islands in 2001. More countries followed and an extensive network of information exchange upon request began to evolve over the next 10-15 years.

Meanwhile, the U.S. was again the first jurisdiction to go one step further. Especially the UBS scandal starting in 2007 raised public awareness with regard to banks' assistance with cross-

[22] These provisions were in general included in double tax treaties. The first TIEA was signed between the U.S. and Barbados in 1984.

border tax evasion. A whistleblower leaked internal data revealing that the Swiss bank had offered services related to tax evasion to U.S. clients. The U.S. estimated that UBS alone managed undeclared assets worth about 20 Billion U.S. Dollars, translating into an estimated tax revenue loss of about 200 Million U.S. Dollars each year (United States District Court Southern District of Florida, 2008).

With the scandal emerging, U.S. authorities tightened their grip on foreign banks operating in tax havens. UBS agreed to a settlement including a fine of US$ 780 Million (U.S. Department of Justice, 2009). It took several years of negotiations and prosecution until U.S. authorities successfully obliged UBS to transfer client data on 4,450 accounts (The Guardian, 2015; The Wall Street Journal, 2015).[23] Nevertheless, in July 2008, UBS already announced that it "[…] will cease providing cross-border private banking services to US-domiciled clients through its non-US regulated units" (UBS, 2008).

Following this scandal, the U.S. government introduced FATCA in March 2010.[24] Under FATCA, non-U.S. banks are obliged to search their databases for existing accounts and to implement processes to identify new accounts held by U.S. clients. The scope is rather broad as foreign banks have to report on both, U.S.- and non-U.S.-sourced, payments to these accounts.[25] FATCA thus established a system of information exchange which strongly reduces the chances of undetected tax evasion. Non-compliant institutions are burdened with a penalty in the form of a 30% withholding tax on all U.S.-sourced payments managed by the respective institution. Furthermore, disclosed information could also trigger prosecution against the involved banks for their assistance in illegal tax evasion like it happened to UBS

[23] At the same time, however, of over 90 percent of the United States customers of UBS's cross-border business remained anonymous (The Guardian, 2015; The Wall Street Journal, 2015).

[24] Prior to FATCA, the Internal Revenue Service (IRS) had already launched its QI (Qualified Intermediary) Program in 2001. The program obliged foreign banks to collect (and remit) taxes on their clients' U.S.-sourced income. The program proofed insufficient, however (Byrnes and Munro, 2017).

[25] Institutions can either directly submit the collected data to the IRS or first transfer it to local authorities which will then (based on an Intergovernmental Agreement) submit the information to the U.S. authorities. Currently, over 110 countries have signed such an agreement with the U.S. (Casi et al., 2018).

following the data leak. The introduction of FATCA in 2010 thus signals a strong increase in scrutiny by U.S. authorities with regard to the involvement of banks in offshore activities.

The international community of states again followed and introduced its own standard for automatic exchange of information in late 2014, called the Common Reporting Standard (OECD, 2014). The standard adopts (and modifies) the U.S. regulation and thus enlarges the network of automatic information exchange. Starting from 2017/2018, over a hundred jurisdictions, including several tax havens, have committed themselves to exchange tax information on an automatic basis (OECD, 2016).[26]

As shown, information exchange clearly increases the set of fact-finding instruments available to domestic tax authorities and might therefore increase the (perceived) risk of detection. Early attempts mainly focused on individuals, while more recent developments address banks directly. Thus, the risk of assisting in tax evasion strongly increased due to U.S. legislation introduced in 2010. This exposure is especially high for large, internationally active banks. As prior literature suggests that offshore entities were used to assist in tax evasion and other illegal activities (United States Senate, 2008; Chernykh and Mityakov, 2017), this increase in transparency brought about by FATCA might translate into a withdrawal of international banks from tax haven jurisdictions in order to reduce their exposure with regard to enforcement.

3.2.2 Context and Literature

This study relates to a growing empirical literature on offshore banking and tax evasion. Several studies have shown that disproportionately high volumes of cross-border investments are channeled through tax havens (Lane and Milesi-Ferretti, 2008; Hines, 2010; Lane and Milesi-Ferretti, 2011; Gumpert et al., 2016). These high numbers reveal the overall

[26] The U.S. is not among the signatory countries, as FATCA is already in place. Critics claim that FATCA is not an apt substitute for the CRS as the U.S. ask for the provision of information but only rarely (to never) deliver information themselves (Casi et al., 2018).

importance of tax havens in international tax planning (Hines and Rice, 1994; Gumpert et al., 2016) and international finance (Lane and Milesi-Ferretti, 2011).

Recent empirical studies, however, also find a clear link between the use of tax haven banks and tax evasion (Zucman, 2013; Johannesen, 2014; Johannesen and Zucman, 2014; Zucman, 2014). Public, political, and academic attention with regard to the tax revenue loss associated with tax havens have strongly increased over the last two decades. Recent estimates indicate that about three-quarters of financial wealth of households that is held in tax havens goes unrecorded. In total, it is estimated that about 8% to 10% of the global wealth are held in tax havens (Zucman, 2013; Alstadsæter et al., 2018b).

Over the last two decades, several mechanisms to increase cross-border transparency were put in place. The larger body of literature focuses on the effects of these policy reforms on investor behavior and find such transparency initiatives to be partially effective. Johannesen and Zucman (2014) use confidential banking data provided by the Bank for International Settlements, to assess how tax information exchange agreements affected bank deposits held in tax havens. The authors find that information exchange is indeed associated with a statistically significant decrease in tax haven bank deposits held by foreign residents. However, rather than repatriating all offshore money, tax evaders seem to relocate part of their funds to more secretive havens. In a related study, using BIS data on Swiss bank deposits, Johannesen (2014) investigates the effect of the EU Savings Directive, dating back to 2003, as an attempt to fight cross-border tax evasion on interest payments by means of automatic information exchange. He documents that Swiss bank deposits owned by EU residents fell by about 30-40% upon Switzerland's participation in the EU Savings Directive. At the same time, structures involving the use of sham corporations became significantly more important as these types of vehicles offer ways to circumvent the EU Savings Directive (Johannesen, 2014). Hanlon et al. (2015) and Heckemeyer and Hemmerich (2018) assess the

tax evasion component in tax haven outbound reinvestments in OECD securities markets and find these investments to substantially decrease with a higher risk of detection brought about by bilateral tax information exchange.

Omartian (2017) investigates the effect of increased transparency on offshore sham companies. Anecdotal and prior empirical evidence (Johannesen, 2014) show that such companies have traditionally been put in place by individuals looking to conceal their involvement in offshore tax evasion. Using data on the incorporation activity by investors, as made available through the Mossack Fonseca leak in 2015, the author shows that an increase in transparency indeed leads to offshore entities being shut down. As mentioned before, the EU Savings Directive traditionally only applied to income by households. As this had proven insufficient (Johannesen, 2014), the EU drafted an amendment in 2013 to address this issue. The amendment was passed in December 2014 and from then on obliges financial institutions to (try to) look through sham corporations in order to identify the beneficial owner. If this beneficial owner falls within the scope of the Directive, the reporting requirements have to be met, even though the direct owner is a corporation and not a household. Employing Survival Analysis, Omartian (2017) finds that, following the 2013 draft, relative to the control group, the hazard rate for offshore entities incorporated by EU investors to be closed increases by 411%. Besides this analysis, the author also finds FATCA to reduce the offshore incorporation activity by US investors by approximately one third. Thus, as the risk of detection rises, investors seem less willing to keep their nexus to the respective tax haven.

Another, yet smaller, strand of literature directly investigates offshore activities of banks themselves. Langenmayr and Reiter (2017) use data on the foreign activities of German banks as provided by the German central bank (Bundesbank). The authors find banks to engage in substantial profit shifting to low tax countries themselves. In order to gain a tax advantage, banks strategically relocate their proprietary trading to low-tax jurisdictions. Thus, like for

non-financial businesses, international tax planning in order to maximize profits seems to play an important role for financial institutions. Merz et al. (2017) find similar results. The authors analyze the effect of taxation and regulation policy on the international activity of banks. To do so, the authors rely on data provided by the German central bank (Bundesbank), as well. Taking data about financial sector FDI by German firms for the years 2000 to 2012, the authors show that the probability for German firms to establish a new subsidiary (or branch) in a certain country is affected by the level of taxation and other regulatory aspects. The authors find that a higher level of taxation leads to less investments in the financial sector. Stricter regulatory requirements exert a negative effect on such investments, as well. Thus, tax havens were traditionally very attractive for financial sector activity, as they usually provided low taxation and a high institutional quality. The study, however, does not provide insights with regard to (increases in) transparency and its effect on banks' business activity in tax havens.

These studies shed some light on the secretive world of offshore banking, they do not, however, investigate banks' involvement in illegal offshore activities and their reaction to increased enforcement. The only study so far to directly investigate the involvement of banks in offshore tax evasion, that we are aware of, is put forward by Chernykh and Mityakov (2017). The authors use information on the international activity of Russian banks. They show that banks active in offshore locations engage in more international wire transfers, a finding interpreted as an indication of the banks' assistance in cross-border tax evasion. Interestingly, the authors also find that the Russian Central Bank responds to this as license revocation and criminal investigation against top-management becomes more likely for these banks.

While these studies help understand general motives for multinational banks to engage in tax havens, they do not allow us to assess to real economic effects of countermeasures against tax evasion on banks operating in tax havens. If initiatives against such tax evasion are effective,

they undermine the entire 'business model' of tax havens and should thus ultimately lead to a reduction of offshore banking activity. Our study thus contributes to the existing literature as we provide first evidence of real economic effects on tax havens, measured as the shutdown of tax haven banks for a large set of countries, induced by the fight against tax evasion.

3.3 Empirical Analysis

3.3.1 Data

Many of the activities carried out in tax havens require a solid financial infrastructure including a suitable legal, regulatory, and settlement framework, along with market-making dealers (IMF, 2002). Therefore, the majority of these activities, which have been shown to be partially linked to tax evasion, could not be carried without the assistance of banks. Banks acting as agents in tax havens should thus be affected by policy changes designed to tackle illegal offshore activities. Our study relies on the Bank Ownership Database, a unique dataset created by (Claessens and van Horen, 2015).[27] All in all, the database provides an almost complete picture of bank ownership around the world over the period 1995-2013 (Claessens and van Horen, 2015).[28] The starting point for the dataset is a list of all banks reporting to Bankscope in 2009. Starting there, Claessens and van Horen (2015) included all banks in the database that were active for at least 1 year between the years 1995 and 2009 (later updated to 2013). Therefore, the database includes both, banks still active in 2013 and banks that ceased their operations during the sample period. We have data for a total of 14 tax havens, among them important financial centers such as Hong Kong, Panama, Luxembourg, Singapore, and Switzerland.[29]

[27] Available at https://www.dnb.nl/en/onderzoek-2/databases/bank.jsp.

[28] According to the authors, the database covers at least 90% of the banking system in terms of assets for every country included in the database. It thus has very few limitations with regard to coverage. It only includes subsidiaries, but not branches. Furthermore, countries are not included if they host less than 5 active banks reporting to Bankscope. In addition, some smaller, typically regional banks are not included (Claessens and van Horen, 2015).

[29] See Appendix 3.1 for a full list of countries.

With regard to the bank level information contained in the database, a significant share of this information was manually collected by the creators of the database. To do so, they relied on a variety of sources, inter alia bank websites and annual reports, central bank websites, newspaper articles, and other sources. Doing so, enabled them to determine the year of entry and (if applicable) exit for the banks in the database.[30] As we are therefore able observe the year of foundation as well as the ongoing activity status of banks, we can analyze whether the major crackdown on tax havens really affected local banking activity in tax haven economies. Furthermore, the dataset contains information on whether banks are domestically or foreign owned, enabling us to investigate potential differences between domestic and foreign owned banks.

3.3.2 Aggregate Country-level Analysis

As mentioned earlier, offshore banks have been shown to facilitate tax evasion. With increased scrutiny by U.S. authorities, multinational banks might thus be inclined to reduce their offshore presence in order to reduce their exposure the U.S. enforcement.[31] In the first part of our analysis, we analyze the impact of increased transparency on the overall tax haven presence of multinational banks. To do so, we count the number of active foreign owned banks for each country in our sample.[32] FATCA changed the environment not only for individual tax evaders, but also for banks, as U.S. authorities now threaten non-compliant foreign banks with a 30% withholding tax on their U.S. business. The data shows a decrease in the importance of foreign owned banks as compared to the overall banking industry,

[30] For about 0.9% of banks in the entire database the authors could neither identify the year of establishment nor was there an indication of activity prior the 1995 (the information is thus missing in the data). In cases where the exact year of establishment could not be determined, but additional information indicated that the bank was already active prior to 1995, the year 1500 was set as the fictitious year of establishment (Claessens and van Horen, 2015). Due to these restrictions, we drop these observations for our analyses.

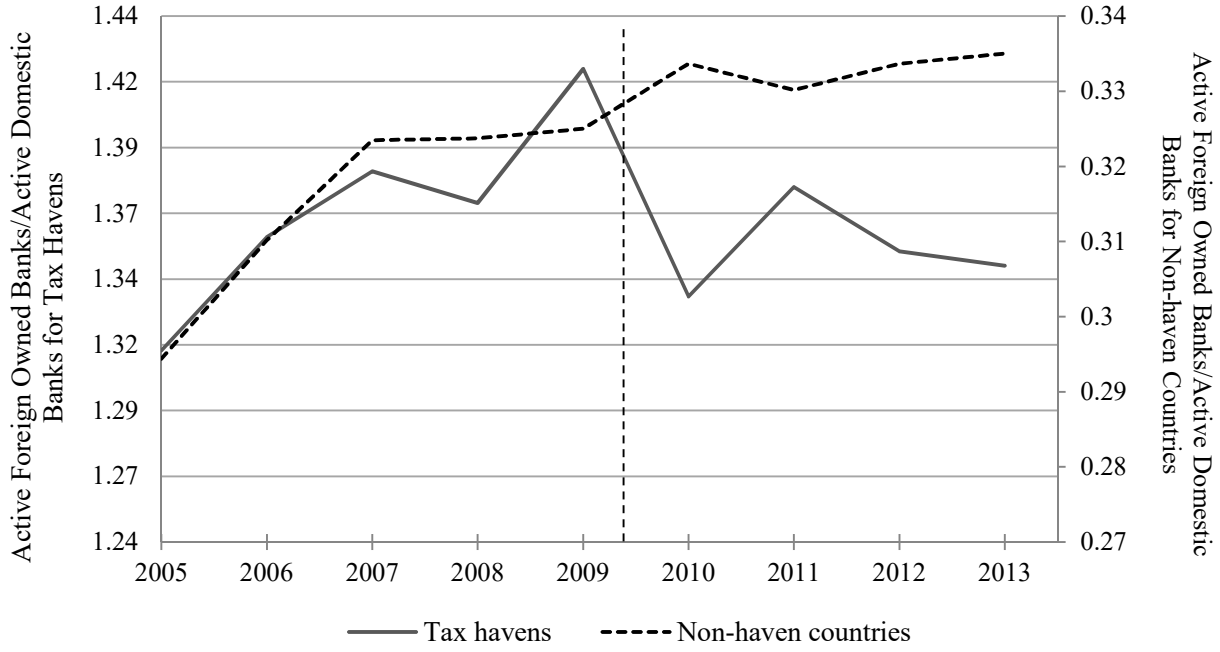
[31] The statement made by UBS executives could be interpreted as such an attempt (UBS, 2008).

[32] We consider all banks in the sample with a majority foreign shareholder resident in an OECD country for at least one year during the sample period as foreign owned. Our sample includes all OECD member states as of 2017 that are not classified as a tax haven, leaving us with 32 non-haven countries. Note that the ownership information is updated each year. It is thus not necessarily constant for each bank and the overall number of parent countries reaches 40.

measured as the ratio of foreign owned banks over domestic banks in a respective country, in tax havens following the increased pressure by U.S. authorities, as illustrated by Figure 3.2.

For tax havens, the ratio of foreign owned banks over domestic banks increased from 1.32 for the year 2005 to 1.42 in 2009 until, following the introduction of FATCA, it decreased again to about 1.35 in 2013. This indicates that, following the increase in pressure put forward by FATCA, the banking landscape in tax havens seems to be changing, with multinational banks losing importance. For non-haven countries, on the other hand, the importance of foreign owned banks seems to be increasing throughout the years as the ratio displayed in Figure 3.2 has steadily increased from about 0.31 in 2005 to 0.34 in 2013. Interestingly, Figure 3.2 reveals that regardless of the decrease following the U.S. initiative, foreign banks still seem to play a far more important role for tax haven countries as compared to non-haven countries. Taking 2013 as the last year in our sample period as an example, foreign owned banks still account for almost 57% of the overall number of banks resident in tax havens in our sample (the number of active banks lies at 230 and 171, for foreign owned and domestic banks, respectively, translating into a ratio of 1.35 as displayed in Figure 3.2). For non-haven countries this share lies at about 25% (332 foreign owned banks as opposed to 991 domestic banks, i.e. the ratio lies at 0.34). Considering the entire database, the share of foreign banks lies at about 34% (Claessens and van Horen, 2015).

Figure 3.2: Presence of foreign banks (2005-2013)



Note: Raw data obtained from Claessens and van Horen (2015), available at https://www.dnb.nl/en/onderzoek-2/databases/bank.jsp. Ratio of active foreign owned banks over active domestic banks on y-axes (left-hand side: tax havens; right-hand side: non-haven countries). The dotted vertical line indicates the introduction of FATCA (i.e. March 2010).

Next we test whether this decrease in importance of foreign banks as suggested by Figure 3.2 is driven by the withdrawal of foreign institutions. Therefore, we estimate the following model:

$$Banks_{it} = ß_0 + ß_1 * Tranparency_t + ß_2\, Haven_i * Tranparency_t + X_{it} + a_i + \varepsilon_{it}$$

The dependent variable ($Banks_{it}$) counts the number of active banks in country *i* at the end of year *t*. $Haven_i$ is a dummy variable taking the value one if country *i* is a tax haven and zero otherwise.[33] $Transparency_t$ takes the value zero for the years 1995 to 2009 and then changes to one from 2010 (when FATCA was introduced) onwards. Furthermore, we include a set of standard macroeconomic controls (X_{it}; GDP and inflation). The standard errors we compute are robust to clustering of observations at the level of subsidiary countries (i.e. banks' country of residence). The variable of interest is $Haven_i$*$Transparency_t$ as the interaction term allows

[33] As we include country fixed effects in all specifications, we do, however, not include $Haven_i$ as a separate variable.

us to separate the effect of increased transparency on banks resident in tax havens compared to their peers resident in non-haven economies. We test our hypothesis by employing poisson regressions. For specification (1) and (2) we count the number of foreign owned banks, while column (3) and (4) investigate the impact of FATCA on the number of domestic banks. As shown by column (1) and (2), FATCA negatively affected the number of active foreign owned banks located in tax havens as compared to those located in non-haven countries. The negative and statistically significant coefficient on $Haven_i*Transparency_t$ indicates that, relative to the control group, the overall number of foreign owned banks resident in tax havens decreased by about 13% following the introduction of FATCA. With regard to domestic banks, on the aggregate level, we do not find a statistically different reaction between banks resident in tax haven and those resident in non-haven countries, as the coefficients on $Haven_i*Transparency_t$ in column (3) and (4) of Table 3.1 are not statistically different from zero.

Table 3.1: Aggregate Country-level Analysis

Variables	Aggregate Country-level Analysis			
	No. of Active Foreign Owned Banks		No. of Active Domestic Banks	
	(1)	(2)	(3)	(4)
$Transparency_t$	-0.045		-0.064*	
	(0.031)		(0.035)	
$Haven_i*Transparency_t$	-0.139***	-0.136***	0.012	0.022
	(0.047)	(0.045)	(0.064)	(0.066)
GDP_{it}	0.201***	0.139	-0.136***	-0.185**
	(0.043)	(0.108)	(0.047)	(0.093)
$Inflation_{it}$	-0.004**	-0.003*	0.006***	0.006***
	(0.002)	(0.002)	(0.001)	(0.001)
N	852	852	871	871
# of countries	45	45	46	46
Country FE	√	√	√	√
Year FE		√		√

The dependent variable is a variable counting the number of foreign-owned banks resident in country *i* at the end of year *t* for column (1) and (2) and the number of domestic banks resident in country *i* at the end of year *t* for column (3) and (4). The sample period goes from 1995 to 2013. All specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %). Robust standard errors clustered at the subsidiary country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

3.3.3 Bank-level Analysis

As the Bank Ownership Database contains information for each single bank, we can further analyze consequences of FATCA on an individual banks' reaction. In the next part of our empirical analysis, we thus assess potential determinants of the decision whether to keep a bank active or not. For each year during our sample period we can observe the decision outcome, i.e. whether a bank keeps its business active - or not. We thus define a binary variable *Inactive* on the value zero as long as a bank remains active and turns to one for the year when it is closed and estimate the following model:

$$Inactive_{it} = ß_0 + ß_1 * Haven_i + ß_2 * Tranparency_t + ß_3\, Haven_i * Tranparency_t + ß_4 * X_{it} + \alpha_t + \alpha_z + \varepsilon_{it}$$

We analyze the effect of increased transparency on the survival of individual banks using Logit and Probit models as well as a Linear Probability Model (LPM). Specifications (1), (3), and (5) present a reduced model, while we augment the respective model by time and subsidiary country dummies, thus controlling for overall time trends (α_t) and country specific characteristics (α_z) for columns (2), (4), and (6). We again control for a set of variables (X_{it}), namely countries' GPD and level of inflation and the number of years each bank has remained active (i.e. its age). Statistical inference is based on standard errors that are robust to clustering of observations at the firm level. Again, the variable of interest is $Haven_i$*$Transparency_t$. As shown by Table 3.2, the coefficients on the interaction term load statistically significant positive for all specifications. Thus, we find that the probability to be shut down (*Inactive*=1) as a consequence of stricter transparency requirements substantially increases for foreign owned banks located in tax havens as compared to their peers resident in non-haven countries.

Table 3.2: Bank-level Analysis: Foreign Banks

Variables	Bank-level Analysis: Foreign Banks					
	Logit		Probit		LPM	
	(1)	(2)	(3)	(4)	(5)	(6)
$Haven_i$	-0.281		-0.115		-0.004	
	(0.244)		(0.097)		(0.004)	
$Transparency_t$	0.280		0.119		0.006	
	(0.268)		(0.108)		(0.005)	
$Haven_i$*$Transparency_t$	0.668*	0.660*	0.288*	0.299*	0.018*	0.019*
	(0.385)	(0.401)	(0.161)	(0.170)	(0.010)	(0.010)
Age_{zt}	0.001	0.001*	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
GDP_{it}	-0.162***	-1.309*	-0.067***	-0.562**	-0.003***	-0.013
	(0.059)	(0.684)	(0.024)	(0.279)	(0.001)	(0.011)
$Inflation_{it}$	-0.033	-0.040	-0.012	-0.016	-0.000**	-0.000**
	(0.024)	(0.029)	(0.008)	(0.011)	(0.000)	(0.000)
Constant	0.241	34.707*	-0.347	14.586*	0.086***	0.243
	(1.585)	(21.079)	(0.637)	(8.571)	(0.027)	(0.224)
N	7,959	6,181	7,959	6,181	7,959	7,959
R^2					0.003	0.021
Year Dummies		√		√		√
Subsidiary Country Dummies		√		√		√

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. All specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

Results displayed in column (1) imply that banks resident in tax havens traditionally faced a lower (by a factor of 0.76) probability of closure as compared to banks resident in non-haven countries. Interestingly, estimation results suggest that FATCA increased this ratio of probabilities to about 1.45 (or 1.92 times the initial ratio) implying that banks resident in tax havens now face the larger probability of being shut down.[34] Overall, regression results imply that the introduction of FATCA increased the probability to be shut down by about 1.5 (column 1) to 1.9 (column 6) percentage points for banks resident in tax havens as compared to the control group. This trend is also reflected in summary statistics: the overall mean survival probability for the entire sample of banks lies at approximately 70%, with banks

[34] See Appendix 3.2 for a table displaying the described effect sizes.

resident in non-haven countries showing a mean survival rate of 73% as opposed to 65% for banks resident in tax havens. This finding is in line with our prior expectation and indicates that multinational banks reduce their offshore presence as a consequence of the stricter enforcement brought about by FATCA.[35]

As the database contains extensive ownership information, we are able to compare the reaction of domestic banks and foreign banks. When investigating the effect of enforcement initiatives on domestic offshore banks, we actually find a positive response by domestic banks resident in tax havens as compared to domestic banks resident in non-haven countries, as shown by the significant negative coefficients on $Haven_i$*$Transparency_t$ across all specifications in Table 3.3. This indicates that, while we do not observe an overall increase in the aggregate number of active domestic banks, on an individual level, the introduction of FATCA indeed increased the probability of survival for offshore banks. This finding might suggest that domestic offshore banks are trying to fill the gap left by multinational banks.

[35] It would further be interesting to see whether bank subsidiaries show a different reaction dependent on the residence country of their parent. However, taking column (1) of Table 3.2 as an example, the number of banks used for the analysis, lies at 481 across 44 countries (of which 13 are tax havens). As the ownership information is updated each year it is not necessarily constant for each unit of observation and the overall number of parent countries reaches 44. Thus, when trying to differentiate between different parent countries, we face some challenges and are thus not able to provide country specific estimates.

Table 3.3: Bank-level Analysis: Domestic Banks

Variables	Bank-level Analysis: Domestic Banks					
	Logit		Probit		LPM	
	(1)	(2)	(3)	(4)	(5)	(6)
$Haven_i$	-0.015		0.006		-0.000	
	(0.183)		(0.072)		(0.003)	
$Transparency_t$	1.045***		0.425***		0.021***	
	(0.120)		(0.050)		(0.003)	
$Haven_i$*$Transparency_t$	-1.166***	-0.794**	-0.476***	-0.351**	-0.023***	-0.019***
	(0.380)	(0.395)	(0.152)	(0.158)	(0.007)	(0.007)
Age_{zt}	-0.000	0.001	-0.000	0.000*	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP_{it}	-0.190***	-2.102***	-0.072***	-0.685***	-0.003***	-0.022***
	(0.038)	(0.453)	(0.015)	(0.189)	(0.001)	(0.006)
$Inflation_{it}$	0.010***	-0.007	0.005***	-0.003	0.000***	-0.000**
	(0.002)	(0.004)	(0.001)	(0.002)	(0.000)	(0.000)
Constant	0.812	40.716***	-0.276	12.509***	0.099***	0.450***
	(1.031)	(9.605)	(0.409)	(3.998)	(0.019)	(0.132)
N	22,721	21,097	22,721	21,097	22,721	22,456
R^2					0.005	0.019
Year Dummies		√		√		√
Subsidiary Country Dummies		√		√		√

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. All specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

3.3.4 Robustness Tests

In the next section, we run several tests to assure to assure the robustness of our results.

First, rather than investigating the effect of transparency initiatives on foreign and domestic banks separately, for this part of the analysis, we use the full sample. Therefore, for Table 3.4, we include a full set of variables and their interactions. The coefficients of interest are $Haven_i$*$Transparency_t$ and $Haven_i$*$Transparency_t$*$Foreign_z$. The first interaction term captures the effect of FATCA on domestic offshore banks. The negative coefficients indicate that FATCA led to a reduction in the probability to be shut down for domestic offshore banks, a finding in line with prior results using the restricted sample.

$Haven_i$*$Transparency_t$*$Foreign_z$ captures the effect of FATCA on foreign owned banks resident in tax havens. The significant positive coefficients are again in line with prior results suggesting that FATCA negatively affected the chances of survival for foreign owned tax havens banks relative to the control group.

Table 3.4: Robustness Test I: Full Sample

Variables	Bank-level Analysis: Full Sample					
	Logit		Probit		LPM	
	(1)	(2)	(3)	(4)	(5)	(6)
$Haven_i$	-0.090		-0.030		-0.002	
	(0.161)		(0.063)		(0.003)	
$Transparency_t$	1.011***		0.412***		0.020***	
	(0.117)		(0.049)		(0.003)	
$Haven_i$*$Transparency_t$	-1.269***	-1.095***	-0.515***	-0.448***	-0.024***	-0.022***
	(0.344)	(0.345)	(0.135)	(0.136)	(0.005)	(0.005)
$Foreign_z$	0.004		0.002		-0.000	
	(0.142)		(0.056)		(0.002)	
$Haven_i$*$Foreign_z$	-0.081		-0.032		-0.001	
	(0.242)		(0.096)		(0.004)	
$Transparency_t$*$Foreign_z$	-0.566**	-0.717***	-0.233**	-0.303***	-0.013**	-0.017***
	(0.286)	(0.264)	(0.116)	(0.110)	(0.006)	(0.006)
$Haven_i$*$Transparency_t$*$Foreign_z$	1.777***	1.964***	0.738***	0.847***	0.041***	0.047***
	(0.514)	(0.476)	(0.209)	(0.199)	(0.012)	(0.011)
Constant	0.427	33.037***	-0.370	11.026***	0.093***	0.390***
	(0.828)	(7.471)	(0.328)	(3.060)	(0.015)	(0.106)
N	32,878	30,484	32,878	30,484	32,878	32,537
R^2					0.004	0.014
Controls	√	√	√	√	√	√
Subsidiary Country Dummies		√		√		√
Year Dummies		√		√		√

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. All specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

So far, we focused on effects linked to the introduction of FATCA. This part of the analysis focusses on further events that might potentially drive our results. In Table 3.5 we therefore test the effect of alternative events using our sample of foreign owned banks (i.e. as used for Table 3.1). First, we test the effect of another prominent transparency initiative, namely the

EU Savings Directive. The directive was introduced in 2003[36] and provides for two alternative ways of cooperation. The primary regime establishes automatic exchange of information with regard to interest income earned by EU households in another state covered by the directive. The respective source country automatically exchanges information with regard to this income the households' home countries' tax authorities. The second, transitory, regime granted countries the option to alternatively levy a withholding tax on the qualifying income and transfer 75% of the revenue from this tax to the home countries of the respective households. If the tax payer opted for this option (i.e. chose not to report her income), she stayed anonymous in exchange for reducing the achieved gain by the tax evasion structure. This regime was mainly employed by the tax havens covered by the directive (Johannesen, 2014).

As shown by column (1) and (2) of Table 3.5, we do not find the introduction of the EU Savings Directive to have a significant effect on the offshore presence of banks. This might be due to the Directive falling short in several important dimensions. First, its regional scope is limited. Second, as it only covers certain interest payments, investors can easily shift to instruments not covered by the directive (e.g. equity investments). Third, it traditionally only applied on an immediate ownership basis and could thus be circumvented by shifting ownership of assets to (offshore) sham corporations, until it was updated in 2014. This seems in line with findings by Johannesen (2014), who shows that EU-owned bank deposits in tax havens participating in the directive strongly decrease upon the implementation of the directive. At the same time, he, however, also finds the Savings Directive to lead to a 95% increase in Swiss deposits held through Panama (Johannesen, 2014).

As our sample period covers the years 1995 to 2013, this includes the years of the financial crisis. As economies got struck by the financial crisis, negative effects on banks were

[36] The directive became effective simultaneously in all EU countries and several tax havens in July 2005.

especially pronounced. Including year fixed effects in our regression, already controls for such aggregate shocks. To mitigate remaining concerns about the financial crisis potentially affecting tax haven banks differently than non-haven banks, we define a variable $FinCrisis_t$, taking the value zero for all years prior to 2007 and then changing to one thereafter. This allows us to rule out that our results are merely driven by a diverging trend between non-haven and offshore banks dating back to the financial crisis. The positive and significant coefficient on $FinCrisis_t$ in column (3) of Table 3.5 indeed suggests that the financial crisis reduced to overall probability for a bank to remain active. As shown by columns (3) and (4) of Table 3.5, the coefficients on $Haven_i$*$FinCrisis_t$, however, do not load statistically significant. Apparently the financial crisis did thus not systemically affect banks resident in tax havens differently as compared to banks resident in non-haven countries.

Table 3.5: Robustness Test II: Other Events

Variables	Other Potential Events			
	EU Savings Directive		Financial Crisis	
	(1)	(2)	(3)	(4)
$Haven_i$	-0.180		-0.123	
	(0.297)		(0.259)	
$EUSD_t$/$FinCrisis_t$	0.143		0.467**	
	(0.224)		(0.229)	
$Haven_i$*$EUSD_t$/$FinCrisis_t$	0.172	0.013	0.049	-0.060
	(0.336)	(0.373)	(0.339)	(0.367)
Constant	-0.086	34.012	0.287	34.412*
	(1.619)	(21.004)	(1.611)	(20.799)
Observations	7,959	6,181	7,959	6,181
Controls	√	√	√	√
Subsidiary Country Dummies		√		√
Year Dummies		√		√

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. All specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

As mentioned before, the database additionally includes information about the year of foundation and closure (if so). We are thus able to observe the life span for each bank. This allows us to employ Survival Analysis to investigate the impact of increased transparency on offshore banking activity.

A major advantage of these models is their ability to handle censored data. Neither delayed entry (i.e. if a bank is founded e.g. in 2008) nor the inexistence of an inactivation date (i.e. if a bank remains active until after 2013) pose a problem for time-to-event analysis (Holmes et al., 2010). We start our analysis with a specific, and very popular, form of a proportional hazards model, the so-called Cox model (Cox, 1972).[37] Other proportional hazards methods (such as the exponential or Weibull) require more assumptions as compared to the Cox model, but are frequently used in literature, as well (Holmes et al., 2010; Pappas et al., 2017).

Following the general design of such analyses, here the dependent variable is a dummy *Inactive*, taking the value zero as long as a bank remains active and then switches to one once the event (i.e. failure/closure) occurs. Banks that remain active beyond 2013 are thus censored, as *Inactive* remains at zero. As shown by Table 3.6, the coefficient $Haven_i$*$Transparency_t$ loads statistically significant positive. Thus, as the event (i.e. failure/closure) becomes more likely, an increase in transparency substantially decreases the chances of survival for banks resident in tax havens.

[37] Our design thus somewhat follows Omartian (2017), who, when investigating the effect of increased transparency on the activity through offshore sham corporations, also uses this method besides a Linear Probability Model.

Table 3.6: Robustness test IIIA: Survival Analysis: Foreign Banks

Variables	Survival Analysis: Foreign Banks			
	Cox Regression		Weibull Model	
	(1)	(2)	(3)	(4)
$Haven_i$	-0.073	-0.272	0.012	-0.259
	(0.195)	(0.224)	(0.196)	(0.225)
$Haven_i$*$Transparency_t$	1.003***	1.003***	0.568**	0.596**
	(0.359)	(0.356)	(0.283)	(0.283)
N	8,877	8,860	8,877	8,860
Controls		√		√
Exponentiated Coefficients				
$Haven_i$	0.930	0.762	1.012	0.772
$Haven_i$*$Transparency_t$	2.726	2.726	1.765	1.815

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. Full specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Unreported constant included for column (3) and (4); shape parameter *(p)* given as1.60 and 1.68 for column (3) and (4), respectively. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

Expressing the effects in exponentiated coefficients, helps understand the magnitude of the effect. Taking column (2) of Table 3.6 as an example, our results suggest that the hazard rate increases for banks resident in tax havens by about 270% after the introduction of FATCA relative to that of banks resident in non-haven countries. Focusing on the relative hazard prior to the reform (as expressed by $Haven_i$), shows that banks resident in tax havens used to have a somewhat higher chance of survival as compared to non-haven banks (as the exponentiated coefficients lie below one for the majority of specifications). Taken together, tax haven banks face an 2.1 (=0.762 x 2.726) times higher hazard rate than banks resident in non-haven countries, as indicated by the coefficients displayed in column (2) of Table 3.6.

Again, when investigating the reaction of domestic banks, we find a positive response by domestic banks resident in tax havens as compared to domestic banks resident in non-haven

countries, as shown by the significant negative coefficients on $Haven_i$*$Transparency_t$ across all specifications displayed in Table 3.7. These findings thus support prior analyses.

Table 3.7: Robustness test IIIB: Survival Analysis: Domestic Banks

Variables	Survival Analysis: Domestic Banks			
	Cox Regression		Weibull Model	
	(1)	(2)	(1)	(2)
$Haven_i$	0.267*	-0.157	0.194	-0.329*
	(0.137)	(0.176)	(0.137)	(0.179)
$Haven_i$*$Transparency_t$	-1.106***	-1.138***	-0.806**	-0.797**
	(0.363)	(0.361)	(0.338)	(0.338)
N	22,959	22,919	22,959	22,919
Controls		√		√
Exponentiated Coefficients				
$Haven_i$	1.306	0.855	1.214	0.720
$Haven_i$*$Transparency_t$	0.331	0.320	0.447	0.451

The dependent variable is a dummy variable *Inactive*, indicating whether a bank was active during year *t* or had ceased its operation during the year *t*. The sample period goes from 1995 to 2013. Full specifications include control variables for the countries' annual GDP (in natural logs) and annual inflation (GDP deflator; annual %) as well as banks' age in years. Unreported constant included for column (3) and (4); shape parameter *(p)* given as1.60 and 1.75 for column (3) and (4), respectively. Robust standard errors clustered at the firm level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

3.3.5 Additional Analysis: Evolution of Bank Deposits

Our results suggest that multinational banks are reducing their presence in tax havens in response to increased transparency. At the same time, domestic banks seem to be gaining importance. This leads to the question, whether the overall offshore banking sector is generally shrinking or whether the withdrawal by multinational banks is compensated by domestic institutions. Data on cross-border and local bank deposits as provided on a quarterly basis by the Bank for International Settlements (BIS) under its Locational Banking Statistics might help address this question. Available data for offshore centers, especially cross-border

data on a bilateral basis, is limited.[38] However, coverage with regard to aggregate country data is better, leaving us with a balanced panel on aggregate cross-border and local deposits by major offshore centers (including e.g. the Cayman Islands, Bermuda, and Hong Kong) from 2014 onwards on a quarterly basis.[39] Thus, the available data can be used to descriptively complement our prior results. If the substitution effect found in prior analyses is taking place, we should be able to see a shift in the relative importance of multinational banks for the offshore banking sector, even though the data at hand starts a few years after the introduction of FATCA. Therefore, for this part of the analysis, we compare the evolution of cross-border deposits reported by an aggregate of offshore centers to the volume of local deposits reported by the same jurisdictions.[40] If domestic tax haven banks are indeed becoming more important, this could result in a shift from cross-border positions to local positions, as transactions that traditionally involved a foreign entity are now carried out between purely local banks.[41] It should be kept in mind, however, that these figures can only provide a rough descriptive illustration.

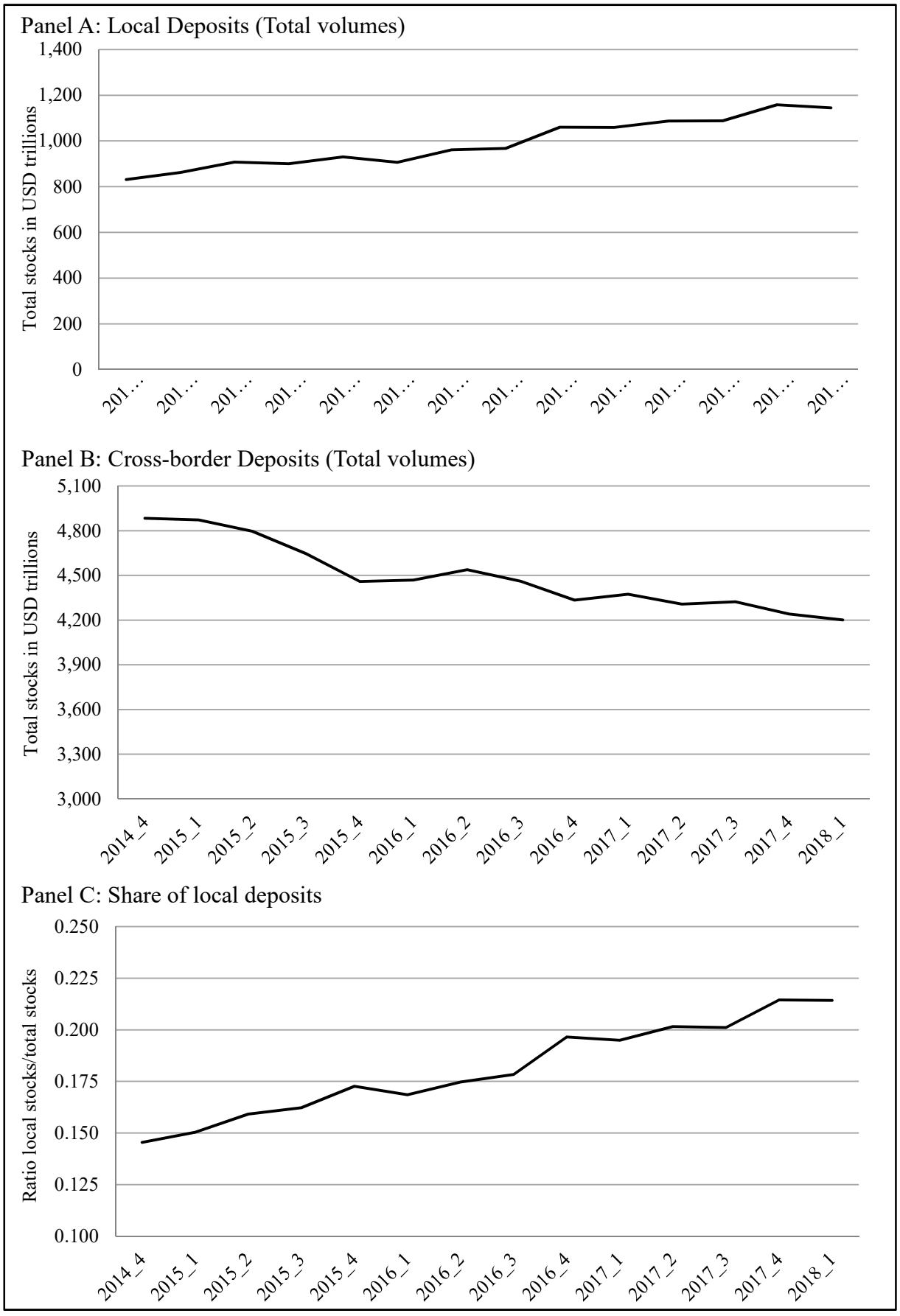
[38] Data on bilateral cross-border deposits is disclosed for five offshore centers only, starting in September 2016, while the majority of jurisdictions publish aggregate data only.

[39] In total we have data for: Bahamas, Bahrain, Bermuda, Cayman Islands, Curacao, Guernsey, Hong Kong, Isle of Man, Jersey, Macao, and Panama.

[40] Ideally, we would want to use separate data on domestic and foreign owned banks. However, such a distinction is not possible in the data at hand.

[41] Keep in mind that local deposits do not necessarily involve domestic banks, as the data cannot be separated between domestic and foreign owned banks. If e.g. two subsidiaries with a foreign parent reside in the same country and engage in a transaction, this would show up in the data as a local transaction. An increase in purely local transactions could, however, be interpreted as an indicator of in increasing importance of the local (i.e. domestic) banking sector.

Figure 3.3: Evolution of Bank Deposits



Note: Data obtained from BIS Locational Banking Statistics.

As shown by Panel A and B in Figure 3.3, cross-border deposits, which have been shown to be reactive to increases in transparency (Johannesen and Zucman, 2014; Menkhoff and Miethe, 2017), have decreased throughout the years, while local deposits are steadily increasing. More precisely, while cross-border deposits decreased by about 14%, local deposits increased by approximately 38% throughout the sample period, resulting in an overall decrease in offshore deposits of approximately 6.5%. As shown by Panel C in Figure 3.3, this is also reflected in the increasing share of local deposits in overall deposits for offshore centers. In the last quarter of 2014, this share ranged at approximately 14.5% and has since increased by almost 50% and amounted to 21.5% for the first quarter of 2018.[42] In line with prior results, these numbers also reveal that, while the cross-border business is still dominant for the overall offshore banking industry, domestic institutions and transactions between these seem to be gaining in importance.

3.4 Conclusion

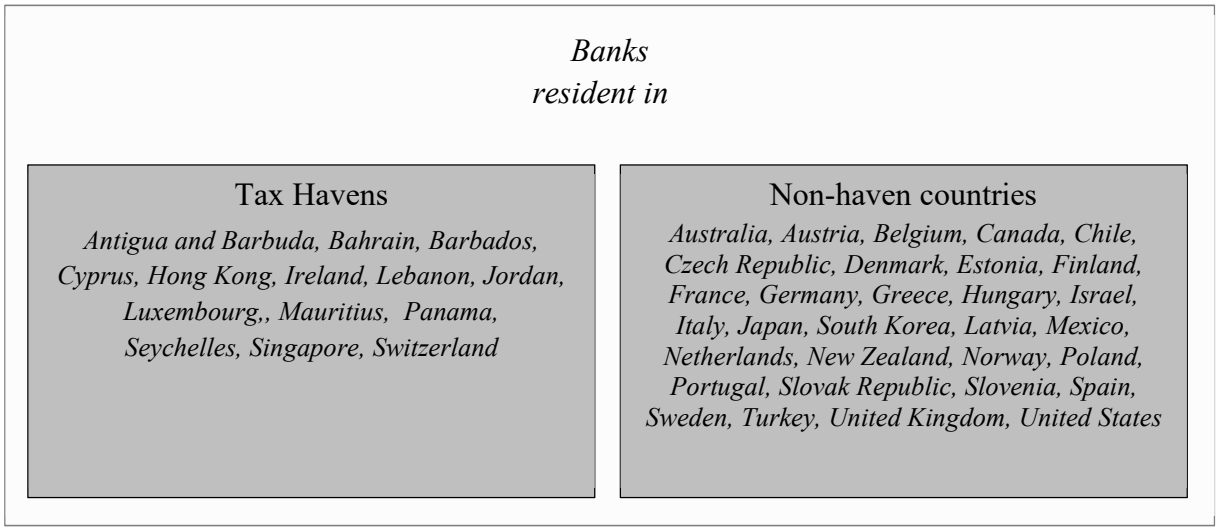
Curtailing tax evasion is high on the international policy agenda. First empirical studies provide some insights into the secretive world of offshore banking. With countermeasures against cross-border tax evasion showing first results, the questions remains, how this affects the tax haven economies themselves. If initiatives against tax havens ought to be effective, they must undermine the business model of tax havens. Exploiting the Bank Ownership Database, a unique dataset created by Claessens and van Horen (2015) that contains an almost complete picture of bank ownership around the world over the period 1995 to 2013, we are able to investigate real economic effects of internationally coordinated countermeasures against tax evasion and avoidance via the use of tax havens on the respective haven economy.

[42] For a minority of tax havens (Bahamas, Bahrain, and the Cayman Islands) data is available as far back as 1984. Another bulk of jurisdictions (i.e. Guernsey, Isle of Man, and Jersey, Bermuda) joined in the early 2000s. The data indicates that the share of local positions did only substantially increase in recent years. More precisely, the local share ranged at approximately 10% in 1984, 12.5% in 2010, and 17% in 2018. It should be kept in mind, however, that these numbers are based on an unbalanced panel.

We find an increase in transparency to have a negative effect on the presence of multinational banks in tax havens. Our results further suggest that chances of survival are increasing for domestic banks. This might be a reflection of the increase in importance by local and legal business in tax havens or merely a reflection of a shift by tax evaders to domestic offshore banks. Regardless of this trend, foreign owned banks still play an important role in the overall offshore banking industry.

3.5 Appendix

Appendix 3.1: Sample composition



Note: All countries listed as tax havens were either included on the Hines and Rice (1994) list or listed in the OECD's 2000 progress report (OECD, 2000). Jordan is only included when analyzing domestic banks as there are no active foreign owned banks during the sample period.

Appendix 3.2: Effect sizes for specification (1) of Table 3.2

FATCA	***Non-haven***		***Haven***	
	Pr(Inactive)	Std. Err.	Pr(Inactive)	Std. Err.
Pre	0.0180	0.002	0.0136	0.002
Post	0.0236	0.006	0.0343	0.008

Delta Pre-Post	0.0057	0.0207
Relative Change Tax Haven/Non-haven	0.0150	

Ratio of Pr(Inactive) Tax Haven/Non-haven	
Pre	0.76
Post	1.45
Relative Change (1.42/0.76)	1.92

Appendix 3.3: Full regression results Table 3.4

Variables	Bank-level Analysis: Full Sample					
	Logit		Probit		LPM	
	(1)	(2)	(3)	(4)	(5)	(6)
$Haven_i$	-0.090		-0.030		-0.002	
	(0.161)		(0.063)		(0.003)	
$Transparency_t$	1.011***		0.412***		0.020***	
	(0.117)		(0.049)		(0.003)	
$Haven_i$*$Transparency_t$	-1.269***	-1.095***	-0.515***	-0.448***	-0.024***	-0.022***
	(0.344)	(0.345)	(0.135)	(0.136)	(0.005)	(0.005)
$Foreign_z$	0.004		0.002		-0.000	
	(0.142)		(0.056)		(0.002)	
$Haven_i$*$Foreign_z$	-0.081		-0.032		-0.001	
	(0.242)		(0.096)		(0.004)	
$Transparency_t$*$Foreign_z$	-0.566**	-0.717***	-0.233**	-0.303***	-0.013**	-0.017***
	(0.286)	(0.264)	(0.116)	(0.110)	(0.006)	(0.006)
$Haven_i$*$Transparency_t$*$Foreign_z$	1.777***	1.964***	0.738***	0.847***	0.041***	0.047***
	(0.514)	(0.476)	(0.209)	(0.199)	(0.012)	(0.011)
Age_{zt}	0.000	0.001**	0.000	0.000***	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP_{it}	-0.176***	-1.754***	-0.069***	-0.621***	-0.003***	-0.020***
	(0.031)	(0.350)	(0.012)	(0.144)	(0.001)	(0.005)
$Inflation_{it}$	0.006**	-0.007*	0.003**	-0.003*	0.000*	-0.000***
	(0.002)	(0.004)	(0.001)	(0.002)	(0.000)	(0.000)
Constant	0.427	33.037***	-0.370	11.026***	0.093***	0.390***
	(0.828)	(7.471)	(0.328)	(3.060)	(0.015)	(0.106)
N	32,878	30,484	32,878	30,484	32,878	32,537
R^2					0.004	0.014
Subsidiary Country Dummies		√		√		√
Year Dummies		√		√		√

Appendix 3.4: Full regression results Table 3.5

Variables	Other Potential Events			
	EU Savings Directive		Financial Crisis	
	(1)	(2)	(3)	(4)
$Haven_i$	-0.180		-0.123	
	(0.297)		(0.259)	
$EUSD_t/FinCrisis_t$	0.143		0.467**	
	(0.224)		(0.229)	
$Haven_i*EUSD_t/FinCrisis_t$	0.172	0.013	0.049	-0.060
	(0.336)	(0.373)	(0.339)	(0.367)
Age_{zt}	0.001	0.001*	0.001	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_{it}	-0.151**	-1.281*	-0.169***	-1.294*
	(0.060)	(0.683)	(0.060)	(0.676)
$Inflation_{it}$	-0.033	-0.031	-0.029	-0.029
	(0.024)	(0.025)	(0.022)	(0.025)
Constant	-0.086	34.012	0.287	34.412*
	(1.619)	(21.004)	(1.611)	(20.799)
Observations	7,959	6,181	7,959	6,181
Subsidiary Country Dummies		√		√
Year Dummies		√		√

Appendix 3.5: Full regression results Table 3.6

Variables	Survival Analysis: Foreign Banks			
	Cox Regression		Weibull Model	
	(1)	(2)	(3)	(4)
$Haven_i$	-0.073	-0.272	0.012	-0.259
	(0.195)	(0.224)	(0.196)	(0.225)
$Haven_i*Transparency_t$	1.003***	1.003***	0.568**	0.596**
	(0.359)	(0.356)	(0.283)	(0.283)
Age_{zt}		-0.002		-0.004
		(0.003)		(0.003)
GDP_{it}		-0.095*		-0.134**
		(0.054)		(0.057)
$Inflation_{it}$		-0.008		-0.007
		(0.013)		(0.015)
Constant			-5.819***	-2.323
			(0.272)	(1.513)
N	8,877	8,860	8,877	8,860

Appendix 3.6: Full regression results Table 3.7

Variables	Survival Analysis: Domestic Banks			
	Cox Regression		Weibull Model	
	(1)	(2)	(3)	(4)
$Haven_i$	0.267*	-0.157	0.194	-0.329*
	(0.137)	(0.176)	(0.137)	(0.179)
$Haven_i$*$Transparency_t$	-1.106***	-1.138***	-0.806**	-0.797**
	(0.363)	(0.361)	(0.338)	(0.338)
Age_{zt}		-0.003***		-0.003***
		(0.001)		(0.001)
GDP_{it}		-0.140***		-0.165***
		(0.038)		(0.038)
$Inflation_{it}$		0.010***		0.013***
		(0.002)		(0.002)
Constant			-5.815***	-1.558
			(0.192)	(1.024)
N	22,959	22,919	22,959	22,919

Chapter 4

The Effect of Royalty Restrictions on Cross-Border Licensing

Abstract

Among the most recent developments in international taxation is the introduction of deduction disallowances for outbound royalty payments to low-tax countries as a countermeasure against cross-border profit shifting via intangible property tax planning. The most prominent examples are the Austrian royalty restriction (2014), the German royalty restriction (2018) and the so-called BEAT by the U.S. (2018). Employing a unique panel dataset as provided by the Austrian National Bank (OeNB) for the purpose of this study allows me to test the effectiveness of such restrictions in fighting tax avoidance via cross-border licensing. I find the introduction of royalty restrictions to lead to a significant decrease in Austrian royalty outflows to affected countries as compared to the control group. These findings may help policy makers when considering the introduction of royalty restrictions in their country.

4.1 Introduction

Political and public awareness with regard to cross-border profit shifting via intellectual property (IP) tax planning has steadily increased over the last decade. Several European countries are in the center of attention, as they offer a very attractive tax environment for companies engaging in such tax planning schemes.[43] Very recently, it has been highlighted that Ireland for example attracts foreign royalty payments that amount to as much as about one quarter of its GDP (European Commission, 2018a). Accordingly, Ireland and other countries have been criticized for offering a set of rules that seemingly only help multinational corporations shift income across borders at the cost of other countries rather than fostering real activity (Reuters, 2013; Alstadsæter et al., 2018a). Other countries have thus sought new mechanisms to fight such cross-border profit shifting. Among the most recent developments is the introduction of deduction disallowances for royalty payments to low-tax countries. Austria introduced such a regulation in 2014. Germany and the U.S.[44] also introduced more complex, but still similar, regulations that restrict the deductibility of outbound payments from 2018 onwards. Restricting the deductibility of outbound payments in the source country constitutes an economically similar burden to levying a withholding tax on royalties and can thus eliminate the benefits of cross-border profit shifting via licensing of intellectual property.

Employing a unique panel dataset as provided by the Austrian National Bank (OeNB) for the purpose of this study, allows me to test the effectiveness of such deduction disallowances in fighting tax avoidance via cross-border licensing for the first time in literature. The data shows increased volumes for royalty payments from Austrian residents to entities resident in low-tax European countries prior to the introduction of the royalty restriction. This changes

[43] Usually these countries operate an IP Box regime thereby granting preferential tax treatment for income derived from intellectual property See Evers et al. (2015) for a detailed discussion of these regimes.
[44] The U.S. regulation is known as the Base Erosion Anti-Abuse Tax (BEAT).

over time, however, as I find the Austrian mechanism to lead to a statistically significant decrease in royalty outflows to these countries.

The paper proceeds as follows. In the next section, I briefly review the existing literature on IP tax planning and describe the newly established countermeasure. Section 4.3.1 describes the data and presents the empirical analysis, providing visual as well as regression based evidence about the effect of deduction disallowances on outbound payments to low tax countries. Furthermore, I investigate potential effects of other countermeasures against cross-border profit shifting, such as the OECD's Nexus Approach. Section 4.3.2 confirms prior results using firm-level data on European multinational subsidiaries. Section 4.4 concludes.

4.2 Intellectual Property (IP) Tax Planning – Relevance and Countermeasures

4.2.1 IP Tax Planning – Context

When trying to reduce the overall tax burden, multinational companies can generally choose between shifting income earned in high tax countries via debt financing or via other, non-financial strategies (such as transfer pricing and licensing of intellectual property) to low taxed group entities. Heckemeyer and Overesch (2017) provide a broad review of the existing literature in this research field. Conducting a meta-study, the authors find taxes to have a highly significant effect on profits reported by multinationals. The study finds sound empirical evidence for cross-border corporate tax planning by the use of both, financing as well as non-financial strategies. The authors furthermore show that profit shifting via non-financial strategies is especially responsive to taxation.[45]

Focusing on the latter, the tax planning idea behind the scheme is simple. If companies assign their intangible assets to low taxed entities and license the right to use these to group

[45] Grubert (2003) finds that non-financial shifting strategies account for approximately half of the shifted income, while the other half is to be attributed to debt financing strategies. Taken together, these two strategies thus account for virtually all the observed tax motivated differences in the profitability of entities resident in high and low tax countries.

affiliates, they are able to transfer income earned by entities resident in high tax countries to low tax jurisdictions.[46] Such schemes have long been documented in literature. A study by Auerbach (2016) describes a case where such a scheme was implemented in Austria, as well. Under this scheme a European multinational company set up a company structure involving several holding companies resident in the Netherlands, Luxembourg, and Liechtenstein.[47] These subsidiaries then acted as IP Holding companies. The report further lists that each subsidiary within the multinational group payed a royalty of 3% of its sales to the Dutch IP Holding company. According to the report, the estimated amount of royalties paid by Austrian subsidiaries to the respective holding company amounted to 16.4 million Euros for the financial year 2014 (Auerbach, 2016).[48]

Besides such anecdotal evidence, several studies also find robust empirical evidence for the existence of such schemes on a large, economically significant scale. Following the idea of the described structures, two types of data can be used to estimate the effect of taxation on cross-border IP tax planning. The first, more broadly studied, data are firms' intangible assets. In order to be able to charge royalties for the use of intangible property, the low tax entities must own these assets. They should thus show increased volumes of intangible assets.

Dischinger and Riedel (2011) investigate the effects of taxes on the location of intangible assets within European multinational groups. Employing panel data for the years 1995 to 2005, the authors show that the level of intangible asset investment correlates with the tax burden faced by the respective subsidiary as compared to other group entities. In other words, the lower an entity's tax rate relative to other group affiliates the higher is its level of

[46] See Fuest et al. (2013) for a more general description of such licensing schemes.
[47] All these countries operate(d) an IP Box regime. For a detailed discussion on these regimes see Evers et al. (2015).
[48] This anecdotal evidence is in line with the results found by Herbst et al. (2017). The authors find empirical evidence for profit shifting for a sample of Austrian multinationals. Precisely, the authors' results show that the number of affiliates located in a specific country is positively correlated with the tax differential between Austria and the respective country. Furthermore, the authors show that a high number of affiliates in tax havens is correlated with a lower tax burden for the Austrian multinational.

intangible assets. The authors find that a decrease in the average tax difference by 1 percentage point leads to an increase in a subsidiary's stock of intangible assets by about 1.7%. In a subsequent study, Karkinsky and Riedel (2012) investigate the effect of taxes on patent applications (rather than the book value of intangible assets) by European multinational companies. The authors' results suggest that the corporate tax rate differential to other group entities exerts a negative effect on the number of patent applications filed by a multinational affiliate. Group entities located in (relatively) high tax countries thus file fewer patents than those group entities located in (relatively) low tax countries. The economic magnitude of the response is larger than the one found for capitalized intangible assets, as the authors find that a one percentage point increase in the tax rate translates into a 3.5-3.8% decrease in the number of patent applications in a given country. Employing data on patent and trademark applications, Dudar and Voget (2016) confirm this finding and show that trademark location by multinationals also reacts to changes in taxation. For Austria, the authors find the semi-elasticity for patent (trademark) location choice to lie at about -2.4% (-6.9%).[49]

The second data that can be used are payments for the use of intangible assets (i.e. cross-border royalty flows). As low tax jurisdictions attract large shares of intangible assets, which are subsequently used for shifting income out of high tax into these low tax countries, the amount of inflow of royalties should negatively correlate with a country's tax level. This idea is confirmed by previous empirical studies. For the U.S., early studies by Grubert (1998) and Grubert (2001) find taxes to have a significant effect on cross-border royalty payments. A finding confirmed more recently by Mutti and Grubert (2009). Grubert (2003) furthermore shows that subsidiaries located in high or low tax jurisdictions (thus facing a strong incentive

[49] This response is thus slightly stronger than the average response (-1,9% for patents and -6,2% for trademarks) found by the authors (Dudar and Voget, 2016). Heckemeyer et al. (2018) also find host country tax rates to matter for the location choice of U.S. trademarks. However, the authors also find a strong home country concentration of U.S. trademark ownership. See Heckemeyer et al. (2019) for a detailed analysis on this matter.

to shift income in or out) also undertake a significantly larger volume of intercompany transactions in general, enabling them to shift a greater share of their income.

In a recent study Dudar et al. (2015) confirm the importance of profit shifting via the use of intangibles. The authors rely on publicly available OECD data on bilateral royalty flows for the years 1990 to 2012. The authors find a strong negative impact of taxation on the volume of cross-border royalty flows. With regard to the economic magnitude, the authors' findings suggest that a one percentage point decrease in the net tax rate on bilateral royalty payments leads to a 1.0-7.9% increase in bilateral royalty flows between a given country-pair.

Overall, these studies thus show that multinational companies engage in cross-border IP tax planning in an economically significant scale.

4.2.2 Countermeasures against Cross-border IP Tax Planning

Over the last decades scrutiny on low tax countries has steadily increased,[50] with the OECD's Base erosion and profit shifting (BEPS) project constituting the broadest internationally coordinated initiative in this context. It consists of 15 Action Plans that address several key aspects of cross-border tax planning (OECD, 2015b). Within the European Union, selected aspects of these Action Plans were transformed into the Anti Tax Avoidance Directive (ATAD).[51] The Directive dates back to July 2016 and assures, from January 2019 onwards, a minimum standard of anti-avoidance rules for European Union Member States (European Union, 2016). The provisions do not specifically target intellectual property tax planning via the use of licensing schemes, however. The most prominent countermeasure to directly target such IP tax planning, the (modified) Nexus Approach, also stems from the OECD's BEPS project. Under this approach, countries shall only grant a preferential tax treatment for returns on intellectual property in cases where a substantial share of the underlying research and

[50] Also see section 4.3.1.4 for a more detailed discussion on this.
[51] Council Directive (EU) 2016/1164 of 12 July 2016.

development activity was conducted in the respective country. Traditionally, virtually all IP Box regimes did not comply with this condition. During the year 2016, most countries however committed themselves to amend existing provisions in order to fully comply with the Nexus Approach by no later than 2021 (OECD, 2018).[52]

Besides these internationally coordinated measures, other, unilateral, countermeasures also address cross-border tax planning. Due to European law, prominent unilateral countermeasures such as withholding taxes and CFC rules are of very limited effectiveness within the European Union, creating an attractive environment for multinational companies that engage in cross-border tax planning (Bräutigam et al., 2017).

Among the most recent developments with regard to unilateral countermeasures is the introduction of deduction disallowances on outbound payments in Austria (2014). Other countries like Germany and the U.S. have already followed and introduced similar mechanisms from 2018 onwards.[53] The idea of such deduction disallowances is rather simple as it constitutes an economically equivalent burden to levying a withholding tax on royalties.[54]

The Austrian Royalty Restriction[55] became effective for all royalty payments between affiliated firms within a corporate group from March 2014 onwards if those payments are taxed at less than 10% at the level of the receiving corporation. The mechanism accounts for

[52] So far, France is the only country that has not yet amended its regime in order to comply with the OECD's nexus approach (OECD, 2018).

[53] The German mechanism covers payments to certain preferential tax regimes from 2018 onwards (German Federal Parliament, 2017). The U.S. regulation is quite broad and covers other payments besides royalties for the use of intellectual property (e.g. certain management fees) (Department of the Treasury, 2018).

[54] Unlike withholding taxes, deduction disallowances do however not tax the creditor under her limited tax liability. There is an ongoing debate on whether such mechanisms are compatible with EU law. Concerning the legality of German Thin Capitalization Rules (which limit the deduction of certain interest payments at the level of the debtor), the European Court of Justice found such mechanisms to be compatible with secondary EU law (European Court of Justice, 2011). Whether this EU law compatibility also holds for the newly introduced mechanism in Austria is still subject of debate (see Peyerl (2014) for a discussion on this matter).

[55] The regulation (§ 12 I No. 10 KStG) also covers interest payments. Unlike royalty restrictions, thin capitalization rules already exist in a broad range of countries. Their aim is comparable to the one of the newly implemented royalty restriction, but these restrictions only tackle profit shifting via means on financing. Prior literature has found these rules to be effective in limiting such profit shifting (Buettner et al., 2012; Wamser, 2014).

withholding taxes and includes them in the 10% threshold (Peyerl, 2014). Payments to non-treaty countries are thus not affected by the royalty restriction as the Austrian withholding tax rate ranges at 20% for these countries. For other cases, a statutory (IP Box) tax rate below 10% in the residence country of the receiving entity triggers the Austrian royalty restriction.[56] Once the regulation is triggered, the deductibility of the respective payments is fully suspended for Austrian tax purposes. To clarify the scope of the regulation, explanatory notes to the actual law by the Austrian Government (Austrian Ministry of Finance, 2014b) provide two scenarios:

The first scenario describes an Austrian limited liability company (GmbH) that pays royalties to its sister company, resident in state X. The statutory tax rate in X is 30%, but 80% of the royalty payments are treated as a deductible business expense. The statutory IP tax rate thus lies at 6%.[57] As this falls below the 10% threshold, the royalty restriction is triggered and deduction of the expenses is fully denied for Austrian tax purposes. The second scenario again uses an Austrian limited liability company (GmbH) as an example. This time the company engages in intra-group transactions with its parent, resident in state Y. The statutory tax rate in Y is 35%, but 55% of the received payments are tax exempt, and thus overall payments are effectively taxed at a level of 15.75%. Accordingly, scenario 2 does not fall under the scope of the mechanism.

This clearly demonstrates the aim of the Austrian Royalty Restriction: It was designed in order to eliminate the possibilities of IP tax planning, especially within the European Union. The regulation is rather short and simple and thus covers a large portion of cross-border cases.

Table 4.1 displays the countries in my sample and lists their regular CIT rates and, if applicable, the year of implementation of an IP Box Regime and the corresponding statutory

[56] The threshold also accounts for low taxation due to e.g. an IP Box or individual agreements between the taxpayer and the tax authorities. It is thus not necessary that the residence country of the recipient is a low tax country in general.

[57] The Belgian IP Box , for example, is designed in such a way (Evers, 2014).

tax rate on income from intellectual property. Accordingly, with the mechanism becoming effective in 2014, firms resident in the following European countries in my sample are since potentially affected: Belgium, Bulgaria, Cyprus, Hungary, Ireland, Luxembourg, Malta, the Netherlands and the United Kingdom (marked as Treat; T), while firms resident in the rest of the countries in my sample should in general not be affected by the Austrian mechanism. They thus serve as the control group (marked as C) for Difference in Difference analyses conducted in chapter 3.

Table 4.1: Country Composition Sample

Country Code	Regular CIT Rate	IP Box Implementation	Statutory IP Box Rate	Group DiD
BEL	34	2008	6.8	T
BGR	10	-	-	T
CYP	12.5	2012	2.5	T
CZE	19	-	-	C
DEU	30.2	-	-	C
DNK	24.5	-	-	C
ESP	30	2008	12	C
EST	21	-	-	C
FIN	20	-	-	C
FRA	38	2000	16.8	C
GBR	21	2013	10	T
GRC	26	-	-	C
HRV	20	-	-	C
HUN	19	2003	9.5	T
IRL	12.5	1970/2016	0-6.25	T
ITA	31.3	2015	22	C
LUX	29.2	2008	5.8	T
LVA	15	-	-	C
MLT	35	2010	0	T
NLD	25	2007	5	T
POL	19	-	-	C
PRT	31.5	2014	15.8	C
ROU	16	-	-	C
SVK	22	-	-	C
SVN	17	-	-	C
SWE	22	-	-	C

Note: Regular (statutory combined) CIT Rates as of 2014 taken from Eurostat (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) and OECD Tax Database (https://stats.oecd.org/index.aspx?DataSetCode=TABLE_II1). Information on IP Box Regimes taken from Alstadsæter et al. (2018a) for Ireland and Portugal and from Evers et al. (2015) for all other countries. Information on IP Box Regimes are as of 2014 or the year of implementation if the regime was introduced after 2014. Bulgaria and the United Kingdom exactly meet the threshold of 10%. As it is reasonable to assume that a significant share of payments to these countries will also be affected, I include them in the treatment group.

Recent empirical studies (Dischinger and Riedel, 2011; Karkinsky and Riedel, 2012; Dudar and Voget, 2016; Heckemeyer and Overesch, 2017) show that the described cases of cross-border tax avoidance via licensing of intangibles take place in an economically significant scale. As a consequence, countries with low taxation attract large volumes of cross-border royalties (Dudar et al., 2015). Restricting the deductibility of outbound payments eliminates the tax saving potential of cross-border profit shifting via licensing agreements. As a deduction disallowance increases the tax burden on licensing payments to low tax countries, I would expect the introduction of such a mechanism to lead to a reduction in the volumes of outbound royalty flows to firms resident in affected low tax countries relative to firms resident in non-affected countries. I use the introduction of a royalty restriction in Austria as a natural experiment to test the effectiveness of such a policy instrument using Difference in Difference analyses.

4.3 Royalty Restrictions and Cross-border IP Tax Planning

4.3.1 The Impact of Royalty Restrictions on Cross-border Licensing

4.3.1.1 Data

Employing a unique panel dataset as provided by the Austrian National Bank (OeNB) for the purpose of this study, allows me to test the effectiveness of royalty restrictions in fighting tax avoidance via cross-border licensing. The data are part of the Austrian balance of trade in services, a subsection of the Austrian balance of payments.[58] The data is not publicly available. For the purpose of this study, the Austrian National Bank, however, provided me with a dataset covering payments to entities resident in 26 European countries on an aggregate basis over the period of eleven years (2007 to 2017). The dataset thus is a balanced panel with 286 observations. The OeNB provided my data for the item "Patents and Licenses" on a yearly basis. The item covers payments made for the use of various types of intellectual

[58] For details with regard to the data collection see Austrian National Bank (2012) and Statistik Austria (2018b).

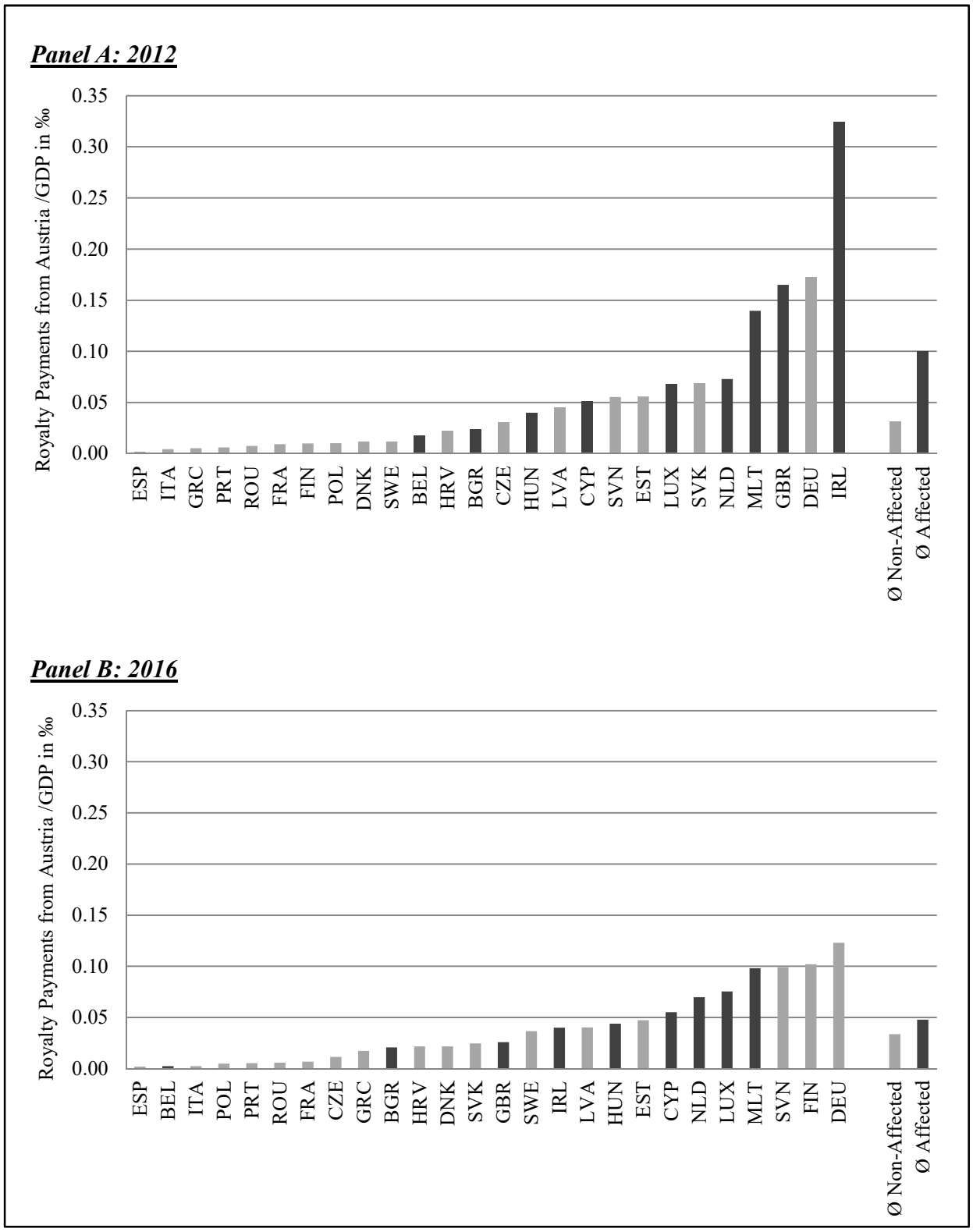
property rights, such as patents, industrial processes, copyrights, and utility models (Statistik Austria, 2018a). Thus, the unit of observation is the sum of royalty outbound payments (in Euros)[59] from Austrian firms to entities resident in the respective partner country.

The advantage of using cross-border royalty flows as provided by the OeNB is that the dataset offers a very comprehensive database of potentially affected payments. Ideally, firm-level data on intercompany royalty payments would be used as the dependent variable. However, micro-level data on internal trade is strictly confidential for many countries, including Austria, and thus not available for research.[60] While not disintegrated to the firm-level, aggregate country level data nevertheless includes all payments between related parties and has been found to be responsive to taxation (Dudar et al., 2015). If the restriction were to be effective, the bulk of bilateral outbound payments should thus decrease. Figure 4.1 provides an overview of cross-border royalty flows from Austria to other European countries two years prior to the introduction of the royalty restriction (i.e. values are from 2012) and, for each country, relates it to its GDP. If no cross-border profit shifting took place, I would expect the variation among different countries to be small.

[59] Due to confidentiality, values below 1 million Euros are not displayed in the data. See section 4.3.1.3 for specifications that addresses this issue.

[60] Note that the German Central Bank (Bundesbank) offers on-site access to anonymized micro-level data on international trade in services of German firms. Once available for the relevant time period, this data could be used to analyze the German mechanism.

Figure 4.1: Bilateral Royalty Flows



Note: Data obtained by the OeNB and the World Bank. Values in per thousand. Dark gray bars indicate affected countries.

As shown by Panel A in Figure 4.1 this is not the case. Several countries attract disproportionally high volumes of royalty payments from Austria. Out of the top five, four countries are affected by the Austrian royalty restriction. The only country ranked in the front, which is not affected by the royalty restriction, is Germany. The high volumes attracted by German firms are most likely a reflection of Germany's strong economic ties with Austria (in addition to their common border, Germany and Austria are the only two countries in my sample with German as their main language). All other countries out of the top five (Ireland, Malta, the Netherlands, and the United Kingdom) are known for offering a very attractive tax environment to multinational companies (Alstadsæter et al., 2018a). Ireland stands out as the top recipient, a finding in line with recently provided figures for a broader range of countries by the European Commission (European Commission, 2018a). Overall, low-tax countries attract disproportionately high volumes of royalty payments from Austria, with the average ratio being three times the one for non-affected countries (0.100 vs 0.031).

However, this finding changes over time. Comparing 2012 to 2016, the restricted deductibility of payments made to firms resident in affected countries indeed seems to translate into lower royalty payments from Austrian entities. As Panel B in Figure 4.1 shows, low tax countries do no longer clearly receive disproportionately high royalty payments from Austrian firms. Indeed, now Germany leads the ranking, being followed by another two countries that were also not affected by the Austrian mechanism. The highest ranking country being affected by the Austrian Royalty Restriction is Malta at the fourth place, also having experienced a substantial decrease of about 30%, however. Furthermore, the average ratio for affected countries fell to 0.048 while it slightly increased to 0.034 for non-affected countries.

Interestingly, while Austrian residents thus seemingly reduced the amount of royalty payments to entities resident in these countries, data by the European Commission reveals, that the overall level of royalty inflow from other countries remained high throughout the

years, as Ireland, the Netherlands, Luxembourg, Hungary, Malta and Belgium were still leading the ranking for the top recipients of royalty inflows from a bulk of countries as compared to country size for the years 2015 and 2016 (European Commission, 2018a).

Looking at mere numbers further supports my findings. While outbound payments to affected countries fell from about 464 million Euros in 2012 to only about 226 million Euros during my sample period, the amount of payments to non-affected countries remained virtually unchanged (2012: 537 million Euros; 2017: 525 million Euros).

This graphical analysis clearly indicates a decrease in royalty outflows to affected countries as compared to non-affected countries in the years following the introduction of the Austrian Royalty Restriction and thus lends itself to a Difference in Difference (DiD) study to further investigate the causal relationship of these findings.

4.3.1.2 Empirical Evidence

My empirical analysis consists of a Difference in Difference setup. The empirical strategy exploits that the Austrian Royalty Restriction changed the international tax environment for cross-border settings involving an entity resident in a low tax country leaving other cross-border licensing agreements unaffected. Intuitively, I use the post-2013 evolution of non-treated royalty flows to proxy for the counterfactual post-2013 evolution of affected flows in the absence of the royalty restriction to estimate its causal effect on cross-border royalty flows. Table 4.1 includes a list of all countries in my sample and assigns them to the treatment and control group. I thus estimate the following baseline equation:

$$\ln(Royalty_{jt}) = \beta_0 + \beta_1 Treat_j + \beta_2 Post_t + \beta_3 Treat_j * Post_t + X_{jt} + \varepsilon_{jt}$$

$Royalty_{jt}$ is the Euro value of royalty payments from Austrian companies to residents of other European countries (j) for the year t. $Treat_j$ is a binary variable taking the value one if the recipient country is affected by the Austrian policy change and zero otherwise. As prior

literature finds cross-border profit shifting to take place on a substantial scale, I expect the coefficient on $Treat_j$ to load statistically significant positive. $Post_t$ is a binary variable that takes the value zero for the years before the introduction of the Austrian Royalty Restriction (2007-2013) and then changes to one for the following years (2014 onwards). To identify the effect of the royalty restriction on payments made to entities resident in affected countries, I introduce the interaction term $Treat_j$*$Post_t$. The coefficient on the interaction term should, by expectation, be negative, as the mechanism should reduce the amount of payments made to firms resident in affected countries only. X_{jt} is a vector of time varying controls including a set of standard macroeconomic controls (GDP and GDP per capita).[61] First, I estimate a model without fixed effects. This simple form of a Difference in Difference estimator has methodological drawbacks that might lead to overestimation of significance levels in the presence of serial correlation (Bertrand et al., 2004). At the same time, it is a well-established method when investigating the effect of a specific policy change (Bertrand et al., 2004) and is still frequently used in the economic literature (Bergner and Heckemeyer, 2017). Furthermore, it allows for $Treat_j$ and $Post_t$ to be included as separate variables. In the next step, I augment the model by time and country fixed effects.[62] Time fixed effects (α_t) capture the effect of all time variant determinants of cross-border royalty flows and thus control for common shocks that affect all countries in my sample (e.g. the financial crisis). As Austria is the only partner country in my sample, time fixed effects also control for the economic environment in Austria (e.g. GDP). Country fixed effects (α_j) capture the effect of all time invariant determinants of cross-border royalty flows from Austria to the recipient country such as bilateral distance and common language and also control for recipient country characteristics (such as a country's legal system and other institutional characteristics). They

[61] Appendix 4.1 provides descriptive statistics for the all variables.
[62] Note that $Treat_j$ ($Post_t$) is thus no longer included as a separate variable since it would drop out of the model due to collinearity with the country (time) fixed effects.

thus strengthen my interpretation of the royalty restriction as the driving force behind the response. Statistical inference is based on standard errors that are robust to clustering of observations at the level of recipient country. In addition to the linear regressions, I also test my hypothesis by using a Poisson model, as it is common in international trade analyses (Santos Silva and Tenreyro, 2006, 2011; Dudar et al., 2015).[63] Table 4.2 displays the results from my baseline analyses. Column (1) and (2) present results for the baseline model without fixed effects, while column (3) and (4) present the results from estimating the augmented specification. Coefficients presented in column (1) and (3) were produced by linear OLS, column (2) and (4) display the results for Poisson regressions.

Table 4.2: Baseline Results

Variables	Baseline model		Full model	
	(1)	(2)	(3)	(4)
$Treat_j$	1.188***	1.101**		
	(0.412)	(0.519)		
$Post_t$	0.148	-0.237		
	(0.152)	(0.269)		
$Treat_j*Post_t$	-0.648**	-0.861***	-0.603*	-0.487*
	(0.251)	(0.288)	(0.294)	(0.276)
GPD_{jt}	0.645***	1.436***	1.326	-11.34*
	(0.160)	(0.253)	(2.194)	(5.994)
$GPDpc_{jt}$	0.655***	1.837*	-1.427	12.30**
	(0.206)	(1.008)	(2.083)	(5.865)
Constant	0.615	-21.30	13.43	32.68
	(2.224)	(13.08)	(8.005)	(20.16)
N	286	286	286	286
R^2	0.596		0.108	
Country FE			√	√
Year FE			√	√

The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t*; in logs $ln(Royalty_{jt})$ for columns (1) and (3). The sample period goes from 2007 to 2017. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

[63] Therefore, I do not log-transform the dependent variable but rather use the Euro value of outbound royalty payments for this specification.

The results in column (1) and (2) of Table 4.2 confirm prior descriptive findings, that low-tax countries attract larger volumes of royalty payments from Austria, as the coefficients on $Treat_j$ load statistically significant positive. Moreover, the coefficient of interest ($Treat_j$*$Post_t$) is negative and statistically significant for both specifications. This indicates that, royalty flows to affected countries decreased as compared to the control group following the policy change.

This finding is robust to the inclusion of fixed effects in the model. As shown by the negative and significant coefficients on the interaction term $Treat_j$*$Post_t$, I find the introduction of the royalty restriction to lead to a statistically significant decrease in royalty outflows to affected countries as compared to the control group. The coefficient on the interaction term $Treat_j$*$Post_t$ takes the value -0.603 for column (3) and -0.487 for column (4) and thus indicates that the introduction of the royalty restriction led to a decrease of about 39–45%[64] in the amount of annual royalty flows from Austria residents to recipients resident in affected countries as compared to unaffected countries. Therefore, my regression results confirm the observed patterns in royalty payments from Austria to affected countries and indicate a strong response by taxpayers. The additional tax burden of 25% reduced the net-of-tax rate from cross-border profit shifting from 1 to 0.75. As my results suggest that the reduction in Austrian outbound royalty payments caused by the royalty restriction lies at about 39–45%, this implies an elasticity of Austrian outbound royalty payments with respect to the net-of-tax rate in the range of -1.5 to -1.8.[65]

[64] Recall that, for columns (1) and (3) the linear regression is in semi-log form. Estimated effects are thus calculated as: $e^{(ß)} - 1$. As the coefficients in columns (2) and (4) were produced by using a Poisson estimator, the expected effects are calculated the same way.

[65] The economic magnitude thus lies within the range found by Dudar et al. (2015), but is somewhat lower as compared to the authors' preferred specification (-6%). My estimate draws on the standard assumption (Fuest et al., 2013; Fuest et al., 2014; Johannesen, 2014) that the bulk of payments is affected. If this assumption is relaxed and it is assumed that e.g. only half of the outbound payments are affected, the size of estimated elasticity would increase to around -3 to -3.6.

A simple back-of-the-envelope calculation helps illustrate potential tax revenue gains associated with this effect. The total of outbound payments to affected countries in my sample ranges at approximately 464 million Euros for the year 2012[66] which could potentially translate into a positive tax revenue effect of about 115 million Euros.[67] In an ex ante assessment the Austrian government estimated potential positive tax revenue effects of about 100 million Euros per year (Austrian Ministry of Finance, 2014a). It is not clear which data was used to obtain these estimates, as the Austrian Ministry of Finance points to a lack of data and estimates the tax revenue effects based on experience/rule of thumb. The estimated figure, however, match quite well with my estimates.

4.3.1.3 Robustness Tests

First robustness tests address the data structure and chosen empirical methodology.

As, due to confidentiality, values below 1 million Euros are not displayed in the data, so far, I have treated these observations as having the value of 1 Million. These observations could, however, be true zeros or lie at any given value between zero and 1 million. As a robustness test, I treat these values as zero observations and re-estimate specification (3) of Table 4.2. Given the log-linear specification, these observations are now omitted, leaving me with a total of 235 observations. My results turn out robust to this alternative specification as the coefficient on $Treat_j$*$Post_t$ takes the value of -0.599 and is statistically significant, shown by column (1) of Table 4.3. Due to the loss of observations, using a Poisson fixed effects model

[66] I take 2012 as the reference year as it lies two years prior to the introduction of the royalty restriction and was taken as the reference point for the estimated increase in tax revenue of 100 million Euro for the year 2015 (Austrian Ministry of Finance, 2014a).

[67] These estimates potentially provide a lower bound as I only include European countries in my sample, while royalty outflows to non-European low tax countries could also be affected. As a withholding tax of at least 10% suspends the royalty restriction, I am confident that my sample, consisting of 26 European countries, covers a large fraction of the affected payments, however. On the other hand, the estimate follows (Fuest et al., 2014) and draws on the assumption that the bulk of outbound payments is affected by the policy change and might therefore provide an upper bound, If e.g. only 50% of the payments were affected, this would generate additional tax revenue of approximately 60 million Euros. Overall, these numbers should be interpreted with care, as I cannot rule out that profits were shifted to other countries rather than being taxed in Austria.

rather than linear OLS is the preferred way to address this issue, however.[68] Doing so allows me to include the zero observations in the regression. I thus also re-estimate specification (4) of Table 4.2 treating all values below 1 million Euros as zeros. As shown by column (2) of Table 4.3, this does not change the results with regard to size and significance. Furthermore, I use a Tobit model, as proposed by e.g. Lane and Milesi-Ferretti (2008), to address the issue of censored data. Thus, the dependent variable is specified as being censored at 1 million Euros. I find a strong and statistically significant negative response to the introduction of the royalty restriction for affected royalty payments, as displayed by column (3) of Table 4.3. Overall, the results obtained by these alternative specifications are thus all in line with my baseline findings with regard to size and significance.

Table 4.3: Robustness test I: Addressing Zero Values

Variables	Addressing zero Values		
	OLS (1)	Poisson (2)	Tobit (3)
$Treat_j*Post_t$	-0.599* (0.344)	-0.483* (0.282)	-0.872** (0.415)
GPD_{jt}	0.568 (2.677)	-12.12* (6.405)	1.373 (3.882)
$GPDpc_{jt}$	-0.850 (2.530)	13.05** (6.203)	-1.490 (3.446)
Constant	17.02 (11.44)		
N	235	286	286
R^2	0.113		
Country FE	√	√	√
Year FE	√	√	√

The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t*; in logs $ln(Royalty_{jt})$ for columns (1) and (3). The sample period goes from 2007 to 2017. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

[68] See (Santos Silva and Tenreyro, 2006, 2011). For an application using data on royalty flows also see Dudar et al. (2015).

As a next robustness test, I conduct several placebo regressions. I follow Bertrand et al. (2004) and randomly pick half the countries in my sample as "treated" and then test for random events. As the placebo treatment and control group both include payments to firms resident in affected countries and firms resident in non-affected countries,[69] I should not be able to identify a statistically significant difference between these two groups. In Table 4.4, I re-estimate the full model and test all the years 2009 to 2015 (thus leaving at least two years before/after the "placebo reform"). My expectation holds as all of the coefficients on the interaction term $Treat_j*Post_t$ are insignificant.

Table 4.4: Robustness test II: Placebo Regressions

Variables	Placebo Regressions						
	2009	2010	2011	2012	2013	2014	2015
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Treat_j*Post_t$	0.248	0.202	0.115	0.0945	0.0354	-0.0389	-0.0858
	(0.176)	(0.175)	(0.187)	(0.221)	(0.275)	(0.267)	(0.291)
GPD_{jt}	-0.632	-0.570	-0.579	-0.570	-0.630	-0.739	-0.794
	(1.763)	(1.740)	(1.780)	(1.815)	(1.907)	(1.915)	(1.883)
$GPDpc_{jt}$	0.231	0.191	0.203	0.200	0.241	0.321	0.369
	(1.722)	(1.711)	(1.731)	(1.740)	(1.788)	(1.812)	(1.798)
Constant	20.46***	20.12***	20.11***	20.03**	20.34**	20.86**	21.04**
	(6.893)	(6.840)	(7.206)	(7.667)	(8.220)	(7.979)	(7.601)
N	286	286	286	286	286	286	286
R^2	0.062	0.061	0.057	0.056	0.055	0.055	0.056
Country FE	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√
Treatment Group	*BGR*; CYP*; CZE; EST; FRA; GRC; HRV; IRL*; ITA; POL; SVK; SVN; SWE*						
Control Group	*BEL*; DEU; DNK; ESP; FIN;GBR*; HUN*; LUX*; LVA; MLT*; NLD*; PRT; ROU*						

The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t* in logs ($ln(Royalty_{jt})$). The sample period goes from 2007 to 2017. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

[69] Country composition of the placebo treatment and control group displayed at the bottom of Table 4.4. An asterisk indicates countries that were truly affected.

As shown by Figure 4.1, Ireland and the U.K. had traditionally received large volumes of royalty payments as compared to their economic size and experienced a sharp decline in this ratio following the introduction of the Austrian Royalty Restriction. This might raise potential concerns that these two countries alone are driving my results. Therefore, I exclude them from the sample for Table 4.5 and re-estimate my baseline model. As shown by the negative and significant coefficients on $Treat_j*Post_t$, excluding these two countries from my sample does not affect my overall results.

Table 4.5: Robustness test III: Exclusion of Certain Observations

Variables	Exclusion of Certain Countries		
	Ireland	U.K.	Ireland & U.K.
	(1)	(2)	(3)
$Treat_j$	1.088**	0.830**	0.661**
	(0.430)	(0.299)	(0.267)
$Post_t$	0.152	0.152	0.159
	(0.152)	(0.154)	(0.153)
$Treat_j*Post_t$	-0.599**	-0.546**	-0.477*
	(0.266)	(0.247)	(0.259)
GPD_{jt}	0.646***	0.535***	0.527***
	(0.162)	(0.165)	(0.167)
$GPDpc_{jt}$	0.613***	0.726***	0.672***
	(0.194)	(0.189)	(0.173)
Constant	1.017	1.268	1.900
	(2.283)	(2.311)	(2.369)
N	275	275	264
R^2	0.585	0.532	0.517

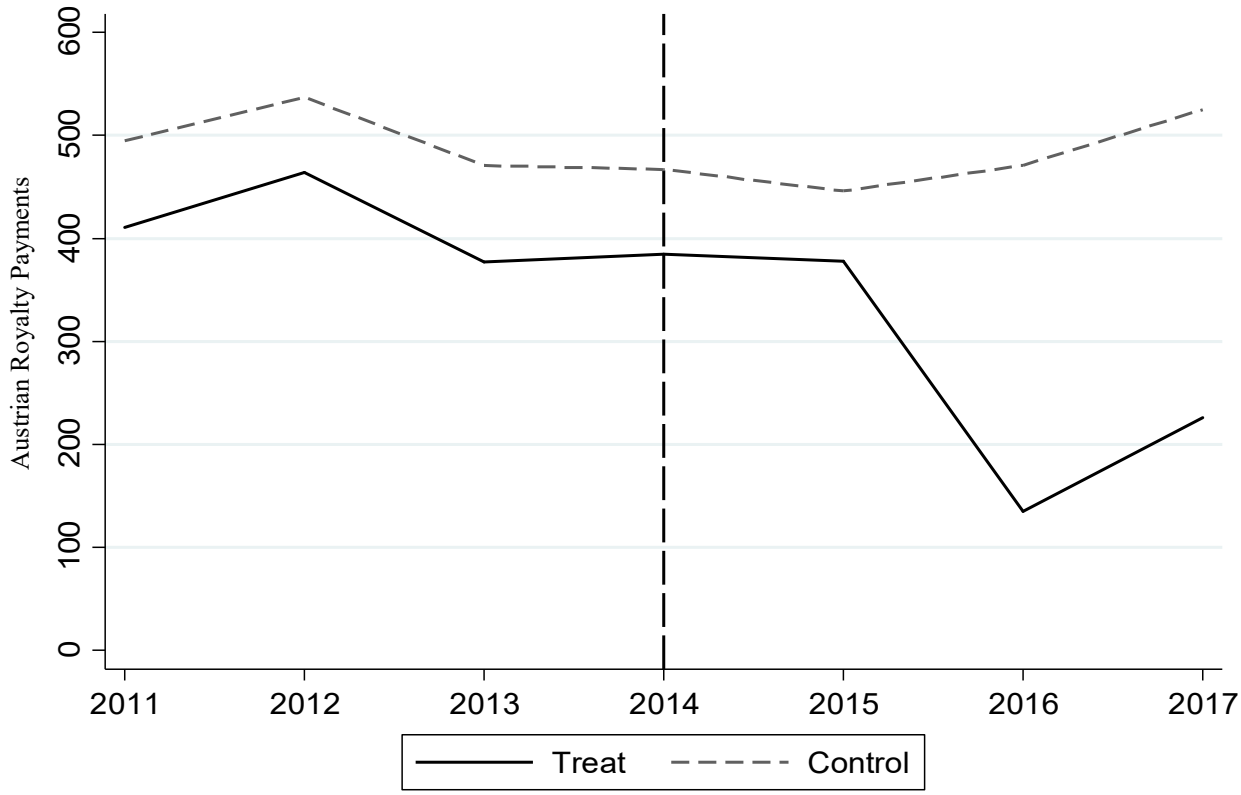
The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t* in logs ($ln(Royalty_{jt})$). The sample period goes from 2007 to 2017. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

So far, I assumed an immediate reaction by taxpayers to the introduction of the Austrian policy reform. Adjusting the underlying contractual structure might, however, take some time, which might potentially lead to a time lag in the taxpayers' response. Regardless of the contractual structure, especially for the year 2014, it is not clear whether a strong response can be identified in the data, as the royalty restriction only affected payments made from March 2014 onwards. Payments made during the months before, were still fully deductible, even if they were directed to entities resident in low-tax countries.[70] Figure 4.2 shows the sum of outbound royalties from Austria to affected countries before and after the reform and compares it to the amount of outbound payments to non-affected countries. As shown by Figure 4.2, the two groups followed a very similar trend during the years prior to the introduction of the royalty restriction. This supports the common trend assumption underlying prior analyses. This pattern changes following the introduction of the royalty restriction in 2014, as royalties to affected countries strongly decreased for the years 2015 to 2017 while payments to non-affected countries remained rather stable. The graph indicates that there seems to be a lag in the response of about one year.

This is in line with findings by prior literature. An analysis by Schwab and Todtenhaupt (2018) suggests that timing is of relevance when investigating the effect of taxation on intellectual property tax planning. More precisely, investigating the impact of tax cuts on cross-border profit shifting via IP tax planning, Schwab and Todtenhaupt (2018) find patent income reported by multinational corporations to show the strongest reaction in the second year after the policy change.

[70] Anticipatory effects seem unlikely, as the legislative process only took a few weeks with the bill being first presented in the Austrian Parliament on 29th of January 2014 (Austrian Parliament, 2018).

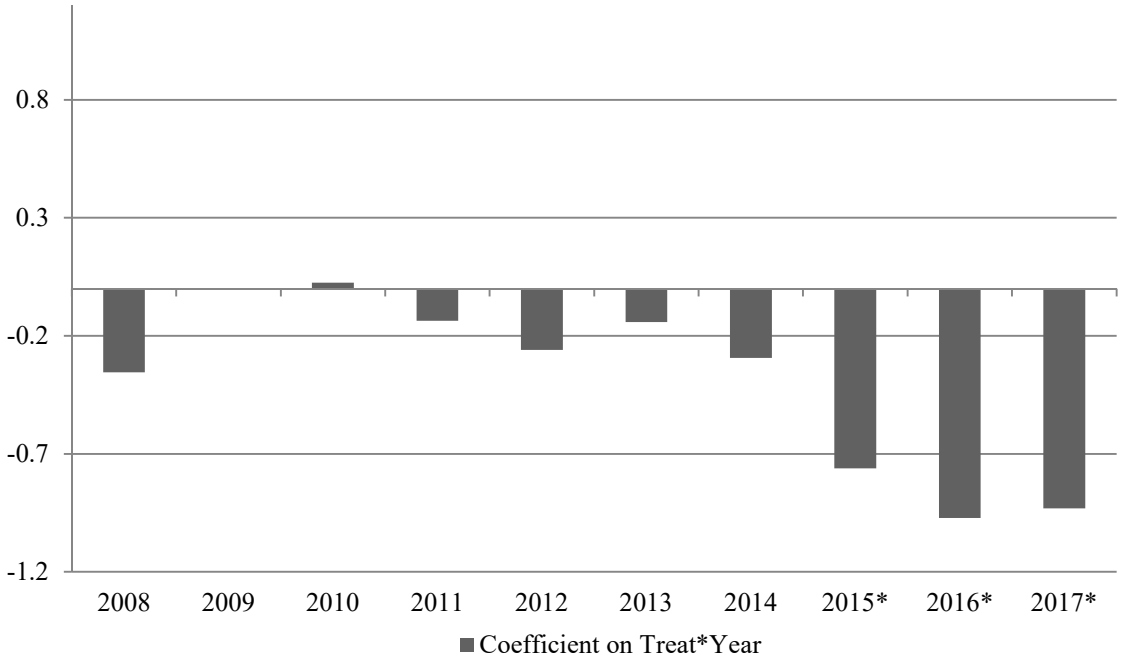
Figure 4.2: Trends in outbound royalties: Affected vs. and Non-affected Countries



Note: Values in millions of Euros. The dashed vertical line indicates the introduction of the Austrian Royalty Restriction (i.e. 2014).

To further investigate this aspect, I interact the full set of year dummies with the treatment variable and re-run my regression model. Figure 4.3 graphs the coefficients for each interaction term ($Treat_j$*$Year_t$). The coefficients are volatile, partially small, and not statistically significant from zero during the early years in my sample, indicating the treatment and control group did not systemically differ. Like Figure 4.2, this also strongly supports the common trend assumption underlying my analyses. Starting in 2014, affected countries experienced a larger decrease in royalty inflows from Austria relative to non-affected countries as compared to prior years. This effect is statistically significant for the years 2015 to 2017 (p-value <0.05 for 2015 and 2016, and p-value<0.1 for 2017). I thus find the Austrian royalty restriction to have a strong impact on cross-border licensing over several years.

Figure 4.3: Timing Patterns



Note: An asterisk indicates statistical significance (p-value<0.1). Coefficients were produced by interacting the full set of year dummies with the treatment variable and re-running the full regression OLS model (including country controls as well as time and country fixed effects). Regression results can be found in Appendix 4.2.

While the chosen empirical strategy with country fixed effects already accounts for time invariant characteristics for a given country's tax system, changes in the tax system in the recipient countries would not be captured, so far. To do so, I further augment the model by a set of tax variables that express the attractiveness of a country's tax system (Schanz et al., 2017) in Table 4.7. More precisely, I account for a country's generosity with regard to depreciations and R&D tax incentives. Furthermore I include variables that account for a country's suitability as a holding location and its rules on anti-avoidance and group taxation. I also account for the level of taxation faced by corporations. Table 4.6 provides short descriptions of the variables and the states the expected sign on the coefficients.

Table 4.6: Tax Attractiveness – Variable Description

Variable	*Description*	*Expected sign (coefficient)*
$Depreciations_{jt}$	Depreciations on commercial property, normalized (0-1)	positive
$R\&D\ Tax\ Incentives_{jt}$	R&D tax credits/deductions in relation to R&D costs, categorical (0,0.5,1)	positive
$Anti\text{-}Avoidance\ Rules_{jt}$	Existence of no (1), general (0.5) or general and specific (0) anti-avoidance rules	positive
$Group\ Taxation\ Regime_{jt}$	Existence of no (0), national (0.5) or cross-border (1) group relief	positive
$Holding\ Tax\ Climate_{jt}$	Existence of special holding regime, binary (0,1)	positive
$CIT\ Rate_{jt}$	$\frac{\text{maximum CIT rate}_t - \text{CIT Rate}_{jt}}{\text{maximum CIT rate}_t}$	positive
$Tax\ Attractiveness\ Index_{jt}$	Weighted aggregate measure of described features	positive

Note: Variables taken from Schanz et al. (2017).

Results are somewhat mixed across specification (1) and (2) of Table 4.7. The results indicate a significant effect on the volume of royalty payments for depreciation rules and a country's holding tax climate, only. The generosity of R&D tax incentives seems to have no significant influence on the volume of royalties. Referring to Figure 4.1, some countries experienced an increase in the relative inflow of royalty payments even though the tax saving potential of shifting income to these countries was rather limited (e.g. Sweden, Denmark, Finland and Slovenia). At the same time, these countries lowered their CIT rates during my sample period. Including the overall CIT level in the model could thus provide further insights. As the coefficient on $CIT\ Rate_{jt}$[71] does not load statistically significant, however, this does not appear as the driving force behind the development. With regard to the other variables, I find mixed, partially insignificant, effects.

Besides accounting for these characteristics separately, in an alternative specification in column (3) and (4) of Table 4.7, I use an aggregate measure ($Tax\ Attractiveness\ Index_{jt}$) as

[71] Note that $CIT\ Rate_{ijt}$ as taken from Schanz et al. (2017) is a normalized measure ranging between zero and one. A higher value indicates a more attractive (i.e., lower) statutory tax rate. The positive (insignificant) effects are thus intuitive. Including statutory CIT rates as an alternate measure does not affect my results as I obtain insignificant negative results. Size and significance remain virtually unchanged for the other variables.

provided by Schanz et al. (2017), which combines these characteristics into an overall measure. I do not find a statistically significant effect for this combined measure.

Table 4.7: Robustness test IV: Overall Tax Environment

Variables	Changes in the Overall Tax Environment			
	Tax System Characteristics		Tax Attractiveness Index	
	(1)	(2)	(3)	(4)
$Treat_j$*$Post_t$	-0.565**	-0.413***	-0.602*	-0.480**
	(0.245)	(0.127)	(0.294)	(0.211)
$Depreciations_{jt}$	1.679***	1.356***		
	(0.413)	(0.388)		
R&D Tax Incentives$_{jt}$	-0.211	-0.229		
	(0.230)	(0.194)		
Anti-Avoidance Rules$_{jt}$	-0.571	-2.057***		
	(0.468)	(0.577)		
Group Taxation Regime$_{jt}$	0.833	1.764***		
	(0.702)	(0.269)		
Holding Tax Climate$_{jt}$	0.524***	0.834***		
	(0.143)	(0.280)		
CIT Rate$_{jt}$	1.605	0.501		
	(1.403)	(1.174)		
Tax Attractiveness Index$_{jt}$			0.0093	-3.000
			(1.176)	(1.889)
GPD_{jt}	0.945	2.905	1.331	-12.20**
	(1.741)	(4.444)	(2.363)	(5.769)
$GPDpc_{jt}$	-0.925	-2.118	-1.432	13.93**
	(1.734)	(4.518)	(2.312)	(6.027)
Constant	11.37	-0.354	13.43	27.66
	(6.747)	(15.83)	(8.044)	(17.42)
N	286	286	286	286
R^2	0.191		0.108	
Country FE	√	√	√	√
Year FE	√	√	√	√

The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t*; in logs *ln(Royalty*$_{jt}$*)* for columns (1) and (3). Coefficients presented in column (1) and (3) were produced by linear OLS, column (2) and (4) display the results for the Poisson regressions. The sample period goes from 2007 to 2017. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. *Tax Attractiveness Index*$_{jt}$ is a measure provided by Schanz et al. (2017) that aggregates the separate tax variables employed in columns (1) and (2) into a combined measure. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

Most importantly, my results with regard to the effect of the Austrian Royalty Restriction on cross-border licensing to low-tax countries remain unchanged, as the coefficients on $Treat_j$*$Post_t$ load statistically significant negative for all specifications displayed in Table 4.7. Moreover, effect sizes lie within the same range as found in prior analyses. I am thus confident that the implied effect is not driven by changes in the overall tax environment.

4.3.1.4 Other Countermeasures against IP Tax Planning

Scrutiny on low tax countries has increased over the last decade. Other countermeasures besides the Austrian Royalty Restriction might thus also affect the amount of royalty payments to low tax countries. Prior analyses already account for important features with regard to a country's tax attractiveness. This might, however, not fully capture other countermeasures against cross-border profits shifting.

As discussed earlier, some countermeasures are of very limited effectiveness within the European Union. However, some countermeasures that address cross-border tax planning exist as of today. The Anti Tax Avoidance Directive (ATAD) includes a set of such countermeasures. ATAD transforms selected aspects of the OECD's BEPS project into European law (European Commission, 2018b). It thus creates a minimum level of protection against corporate tax avoidance throughout the European Union. The ATAD mainly addresses five areas: CFC rules in order to assure that profits are taxed within the European Union. Switchover rules aimed to prevent double non-taxation of income. Exit taxation to prevent companies from avoiding taxes when re-locating assets. Interest limitations in order to tackle artificial debt arrangements, and General anti-abuse rule, which shall apply when the other rules don't apply (European Commission, 2018b).

These countermeasures might thus reduce the potential for cross-border profit shifting within the EU as they set a minimum standard of anti-avoidance rules that all countries must apply. They do, however, not specifically target intellectual property tax planning via the use of

licensing schemes. Moreover, ATAD dates back to 2016, but countries were granted a two and a half year period to transform the Directive into national law. Therefore, the process should be completed from January 2019 onwards (European Union, 2016). As this lies outside my sample period, ATAD should not affect my results.

Another prominent countermeasure in the context of my analysis, the (modified) Nexus Approach, that is - at least partly - in place already is also based in the OECD's BEPS project. Following the OECD's 2015 report on BEPS, which considered virtually all IP Box regimes harmful (OECD, 2015a), European countries amended their tax systems throughout the year 2016 in order to comply with the (modified) Nexus Approach (OECD, 2018).[72] Under this approach, countries shall only grant a preferential tax treatment for returns on intellectual property in cases where a substantial share of the underlying research and development activity was conducted in the respective country.[73] However, a generous phasing out period until 2021 was granted. During this transition period, former regimes can remain active, with new entrants being able to only opt for the new regime. Unless cross-border flows are mainly driven by the relation between new entrances and exits, a (strong) response (if at all) to the modified nexus approach should most probably take place after 2021. Accordingly, the long transition period has already led to concerns because it offers a large potential for cross-border profit shifting in the meantime, as stated by the German government (German Federal Parliament, 2017). Nevertheless, I cannot fully rule out that these amendments potentially reduce the (perceived) attractiveness of existing tax regimes for the use of profit shifting during the last years of my sample period.

[72] So far, France is the only country that has not yet amended its regime in order to comply with the OECD's nexus approach (OECD, 2018).

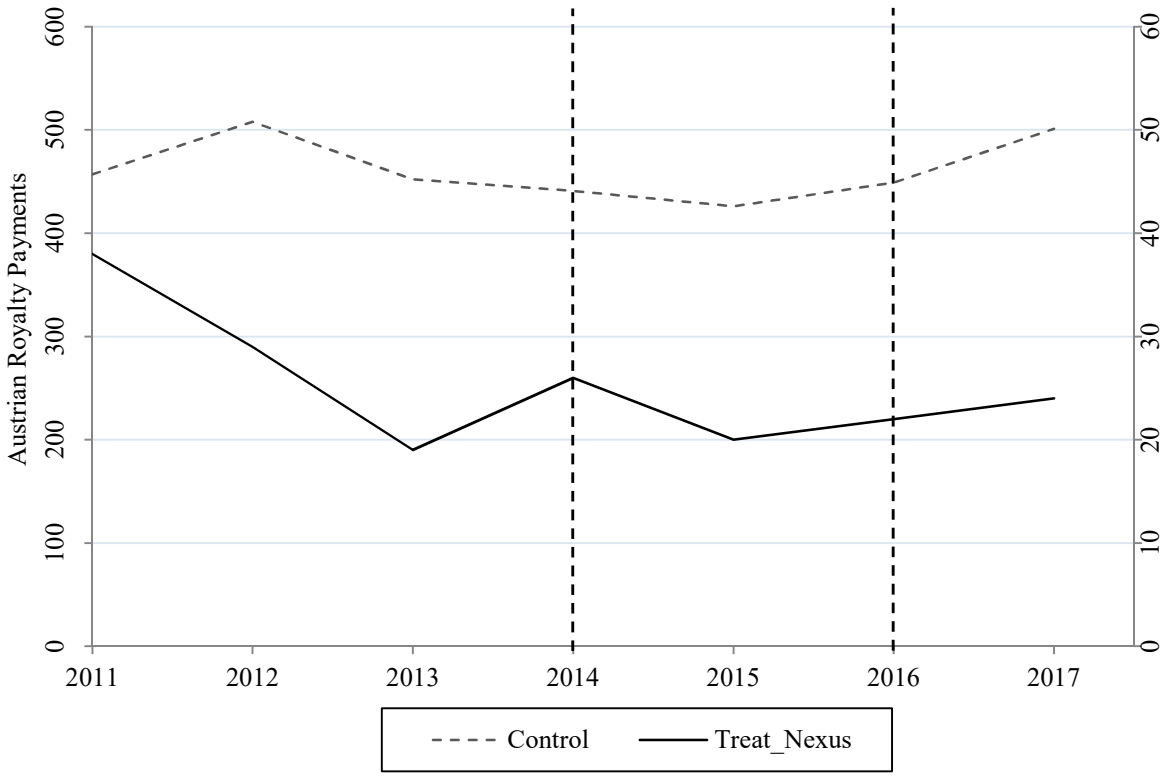
[73] Within the European Union, this condition might be of limited effectiveness, however, as it has to comply with European law. Thus, the underlying R&D activity does not necessarily have to take place in the IP Box country, but can also be undertaken in another EU member state (Merrill, 2016; Faulhaber, 2017). It thereby establishes a coherent tax system from an *EU* perspective, not for single countries on a stand-alone basis. See Sanz-Gómez (2015) for a detailed discussion on this matter.

So far, as shown by Table 4.1, besides non-IP Box countries the control group also includes IP Box countries that were not affected by the introduction of the Austrian Royalty Restriction in 2014.[74] These countries are, however, potentially affected by more general countermeasures, such as the nexus approach. If more general countermeasures against IP Boxes were already effective, payments to IP Box countries should decrease, irrespective of whether they are affected by the Austrian Royalty Restriction or not. Still, throughout prior specifications (e.g. Table 4.2) I find a negative response of treated flows relative to the control group. As my findings so far indicate that royalty flows to countries that were affected by the royalty restriction decreased more strongly once the mechanism became effective, this already somewhat alleviates concerns with regard to other countermeasures being the true source for the decrease in Austrian royalty flows to affected countries.

This is also in line with the findings by the EU Commission that Ireland, the Netherlands, Luxembourg, Hungary, Malta and Belgium were leading the ranking for the top recipients of royalty inflows as compared to country size for the years 2015 and 2016 (European Commission, 2018a). If effects of more general countermeasures against IP Box regimes had already materialized, figures should have been lower for these years, as payments from other countries (e.g. Germany) should also decrease.

[74] These are France, Italy, Portugal, and Spain.

Figure 4.4: Trends in Royalty Payments: Non-affected Countries Operating an IP Box Regime vs. Non-affected Countries Without an IP Box Regime



Note: Values in millions of Euros. The dashed vertical line indicates the introduction of the Austrian Royalty Restriction (i.e. 2014) and the Nexus Approach (i.e. 2016).

In line with this, as shown by Figure 4.4 royalty flows from Austria to IP Box countries that were not affected by the Austrian Royalty Restriction, but nevertheless experienced the increase in the overall pressure on preferential tax regimes (marked as Treat_Nexus), remain rather stable over the years. Especially to the end of my sample period, the most intense time with regard to countermeasures against IP Boxes (i.e. 2016 onwards), non-affected IP Box countries did not experience any drop in royalty inflows from Austria. In fact, they even showed a slight increase. If countermeasures like the nexus approach had already materialized, payments to these countries should decrease following 2016. As this is not the case, this already indicates that the observed decrease in royalty flows to low-tax European countries is indeed caused by the royalty restriction.

To further test this finding, I run a series of regressions with alternating treatment and control groups. First, I re-estimate my baseline model with a modified Treatment indicator as

described with Figure 4.4. Therefore, for this part of the analysis, I compare the reaction of royalty payments from Austrian residents to entities resident in countries that are not affected by the Austrian Royalty Restriction, but operate an IP Box regime to those payments made to residents of other non-affected European countries that do not operate such a regime. As the "treated" countries were in reality not affected by the Austrian royalty restriction, I would not expect to observe any statistically significant different reaction in the flows to these countries as compared to other non-affected countries following the policy change. The results displayed in column (1) and (2) of Table 4.8 confirm this conjecture.

An additional robustness test follows a similar logic, but addresses the issue differently. Rather than modifying my Treatment variable, for this part, I restrict the control group to IP Box countries that were not affected by the Austrian Royalty Restriction. I thus compare the reaction of royalty flows to countries affected by the royalty restriction to the introduction in 2014 to those to non-affected IP Box countries. This allows me to separate the effect of the Austrian Royalty Restriction from other countermeasures against IP Boxes, such as the nexus approach. The coefficient on the interaction term $Treat_j*Post_t$ should, by expectation, be negative, as, following the introduction of the royalty restriction, royalty flows to affected countries should decrease as compared to royalty payments to IP Box countries with a tax rate above 10% (i.e. the control group). As shown by column (3) and (4) of Table 4.8, this expectation holds, as I find royalty flows to affected countries to substantially decrease relative to non-affected IP Box countries. Overall, this leaves me confident that $Post_t$ does not simply capture an overall tightening on IP Box regimes but effectively isolates the effect of the Austrian Royalty Restriction.

Table 4.8: Robustness test IV: Other Countermeasures against IP Box Regimes

Variables	Other Countermeasures against IP Box Regimes			
	Non-Affected IP Boxes as Treat		Non-Affected IP Boxes as Control	
	(1)	(2)	(3)	(4)
$Treat_j$	-1.495*	-2.899***	2.535***	3.467***
	(0.710)	(0.205)	(0.584)	(0.274)
$Post_t$	0.196	-0.210	-0.0974	-0.140
	(0.220)	(0.128)	(0.0963)	(0.192)
$Treat_j$*$Post_t$	-0.299	0.0373	-0.418*	-0.714**
	(0.231)	(0.231)	(0.226)	(0.309)
GPD_{jt}	0.747**	1.414***	0.825***	1.302***
	(0.263)	(0.179)	(0.148)	(0.197)
$GPDpc_{jt}$	0.770	0.783*	0.541***	0.285
	(0.457)	(0.446)	(0.168)	(0.366)
Constant	-1.401	-9.413***	-1.666	-5.615**
	(4.115)	(3.529)	(2.317)	(2.850)
N	187	187	143	143
R^2	0.628		0.748	
Treatment Group	*ESP; FRA; ITA; PRT*		*BEL; BGR; CYP; GBR; HUN; IRL; LUX; MLT; NLD*	
Control Group	*CZE; DEU; DNK; EST; FIN; GRC; HRV; LVA; POL; ROU; SVK; SVN; SWE*		*ESP; FRA; ITA; PRT*	

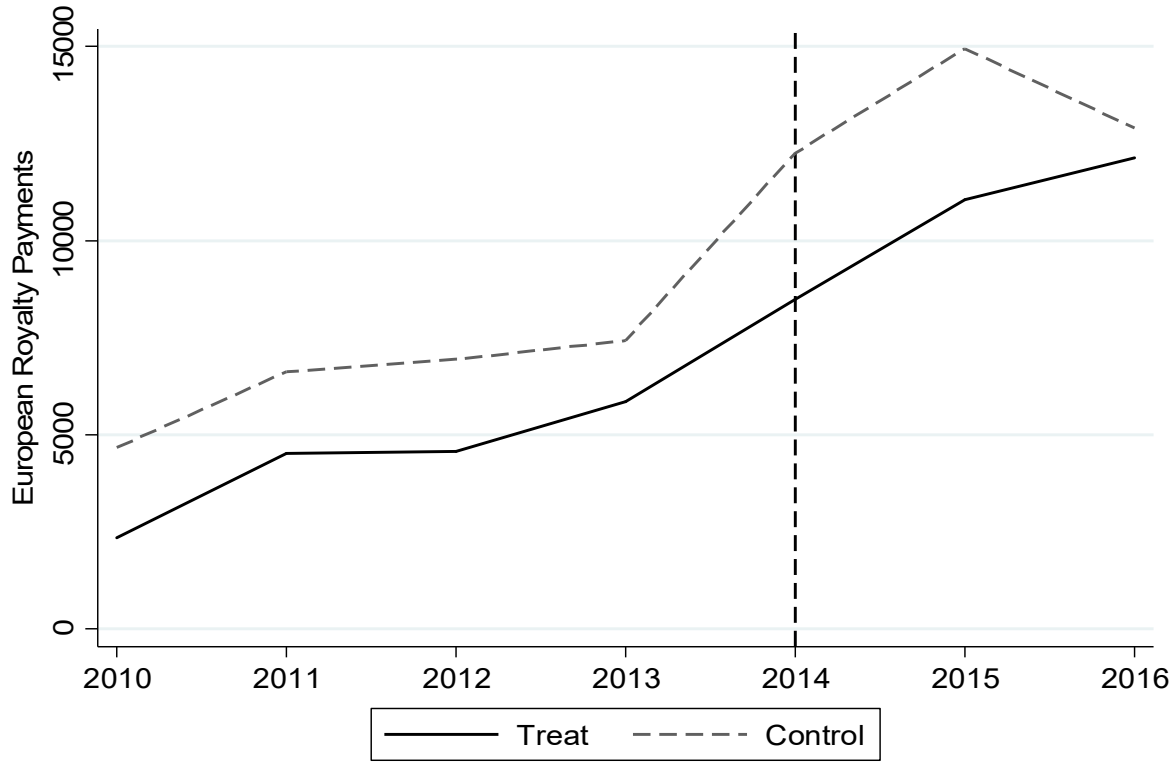
The dependent variable is the Euro value of outbound royalty payments from Austria to country *j* during the year *t*; in logs $ln(Royalty_{jt})$. The sample period goes from 2007 to 2017. For columns (1) and (2) these non-affected IP Box countries constitute the treatment group, while other non-affected-non IP Box countries serve as control units. For columns (3) and (4) the treatment remains unchanged to the baseline regressions, whereas the control group consists of non-affected IP Box countries only. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

To further substantiate this finding, I rely on publicly available data on bilateral royalty flows between European countries.[75] Note that while this data is, in principle, comparable to the data I am using, coverage is limited with regard to time and reporting countries. Nevertheless, there is data for some of the countries affected by the Austrian Royalty Restriction, namely, Belgium, Hungary, Ireland, Luxembourg, the Netherlands, and the U.K. over the years 2010 to 2016. Comparing bilateral royalty flows to these countries to payments to other non-

[75] Available at https://stats.oecd.org/Index.aspx?DataSetCode=TISP_EBOPS2010.

affected European countries reveals that unlike payments from Austrian residents the volumes even increase over time.[76] As shown by Figure 4.5, overall, affected and non-affected countries received almost the same amount of inbound payments during the early years. Following 2014 there is rather steady increase in the overall volume of royalty flows, with flows to the low-tax countries increasing more strongly than those to non-affected countries. Unlike royalties paid by Austrian residents, royalty flows to low-tax countries from other European countries did thus not decline following 2014. Again, this finding is in line with figures presented by the EU Commission as low-tax European countries still rank at the top with regard to royalty inflows for the years 2015 and 2016 (European Commission, 2018a).[77]

Figure 4.5: Bilateral Royalty Flows between other European Countries



Note: Values in millions of Euros. The dashed vertical line indicates the introduction of the Austrian Royalty Restriction (i.e. 2014).

[76] Included partner countries are European countries. See Appendix 4.3 for a full country list.

[77] Note that, while there seems to be a stronger positive trend for the aggregate volumes of royalty flows to low-tax countries, I do not find a statistically significant difference between affected and non-affected countries following 2014. Regression results are displayed in Appendix 4.4.

I can therefore not confirm that the overall tightening on IP Box regimes and other harmful tax practices has already translated into reduced volumes of royalty payments to such low-tax countries. Thus, I am confident that the sharp decrease in royalty flows from Austria to these countries is indeed a result of the introduction of the Austrian Royalty Restriction. Therefore, the primary goal of royalty restrictions, to keep taxpayers from shifting income to low tax countries, seems to be achieved. Royalty restrictions thus appear as an effective tool in limiting profit shifting via cross-border licensing.

4.3.2 The Impact of Royalty Restrictions on the Allocation of Intangible Assets within Multinational Firms

So far, the dependent variable has been bilateral royalty payments. While this presents the potentially more direct measure of cross-border profit shifting via licensing of intellectual property, as mentioned before, other potential data could be used.

To assure the robustness of my results, I follow Dischinger and Riedel (2011) and use the location of intangible assets within European multinational groups to investigate the effects of the Austrian Royalty Restriction on cross-border IP tax planning. To this purpose, I rely on firm-level data for subsidiaries located in affected low-tax European countries for the years 2007 to 2016 as compiled by Bureau van Dijk in its AMADEUS database. The database contains detailed accounting and ownership information for European firms. The sample consists of subsidiaries resident in the nine countries marked as *Treat* in Table 4.1[78] with a parent in a European Member State (including Austria). I thus use data on subsidiaries located in countries that are potentially affected by the Austrian Royalty Restriction with a global ultimate owner resident in Austria (marked as $Treat_{ij}$) and compare their reaction to subsidiaries with their parent company in other European Member States.[79]

[78] Namely these are: Belgium, Bulgaria, Cyprus, Hungary, Ireland, Luxembourg, Malta, the Netherlands and the United Kingdom.

[79] See Appendix 4.5 for the country composition and a detailed description of the sample selection process.

If the Austrian mechanism were to be effective, one would expect a negative impact on subsidiaries in affected low-tax countries with an Austrian parent. I therefore run fixed effects regressions to test for the effectiveness of the Austrian regulation on firm behavior in European low tax countries. The results are displayed in Table 4.9. The coefficient of interest is $Treat_{ij}$*$Post_t$ and I expect the coefficient to load statistically significant negative. The dependent variable for column (1) and (2) is the capitalized amount of intangible assets held by each subsidiary at the year *t*. Taking capitalized intangible assets as the dependent variable might potentially underestimate the effect of taxation on intellectual property location, as local accounting rules might lead to a share of intangible assets not being capitalized. Moreover, as discussed earlier, coverage with regard to this variable tends to be low. Nevertheless, prior literature finds a positive correlation between the value of capitalized intangible assets within European multinational firms and low taxation in the respective country (Dischinger and Riedel, 2011). As the Austrian Royalty Restriction effectively eliminates the tax saving potential, I expect it to cause a reduction in the level of intangible assets held by affected subsidiaries as compared to their non-affected peers. As large fraction for the dependent variable (*Intangible* $Assets_{zt}$) lies at zero,[80] I use a Poisson fixed effects model.

[80] For specification (1), for example, about 29% of the observations show a zero value for intangible assets.

Table 4.9: Robustness test V: Firm-Level Analysis

Variables	Intangible Assets	
	(1)	(2)
$Treat_{ij}$*$Post_t$	-0.756***	-0.361***
	(0.285)	(0.139)
CIT_{it}		0.145
		(0.134)
$Sales_{zt}$		0.424***
		(0.0924)
R&D Expenditure$_{it}$		0.0749
		(0.435)
$Population_{it}$	0.838	-1.699
	(1.964)	(1.886)
CPI_{it}		0.207*
		(0.120)
$GPDpc_{it}$	1.024*	2.011**
	(0.553)	(0.792)
GPDpc Growth$_{it}$		0.00688
		(0.0162)
Unemployment rate$_{it}$		0.0369
		(0.0303)
$EBIT_{zt}$	0.0847**	
	(0.0382)	
Observations	55,002	42,179
R^2		
Number of id	8,599	5,816
Subsidiary FE	√	√
Year FE	√	√

The dependent variable is the Euro value of intangible assets for each subsidiary z at the end of year *t*. The sample period goes from 2007 to 2016. Missing values for country controls were set constant at the most recent available value. Robust standard errors clustered at subsidiary level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

Column (1) of Table 4.9 presents a reduced specification, while column (2) includes the full set of control variables used by Dischinger and Riedel (2011, p. 704).[81] As shown by column (1) and (2) of Table 4.9, the coefficient of interest on $Treat_{ij}$*$Post_t$ loads statistically highly significant negative. Thus, I find that companies with an Austrian owner show a substantial negative response to the introduction of the Austrian Royalty Restriction compared to unaffected subsidiaries with a non-Austrian European ultimate owner. The magnitude of the

[81] Appendix 4.6 provides descriptive statistics for all variables used in this section.

response is economically significant as a one percentage point increase in the tax rate translates into a 1.2% to 2.1% decrease in a subsidiary's stock of intangible asset according to the coefficients on $Treat_{ij}$*$Post_t$ in column (1) and (2), respectively.[82] This figure compares quite well to earlier findings by Dischinger and Riedel (2011) who find a one percentage point increase in their tax rate variable to cause a 1.7% decrease in intangible assets.

4.4 Conclusion

Employing a unique panel dataset as provided by the Austrian National Bank (OeNB) for this study, I test the effectiveness of royalty restrictions in fighting tax avoidance via cross-border licensing. The data shows increased volumes of royalty payments from Austria to low-tax countries prior to the reform. These payments substantially decrease after the introduction of the Austrian Royalty Restriction. Payments to affected countries are approximately cut by half, while payments to non-affected countries remain virtually unchanged. Employing a Difference in Difference estimate, I find this effect to be statistically significant. The introduction of the royalty restriction has led to a significant decrease in royalty outflows to affected countries as compared to the control group. The results turn our robust to a variety of robustness tests. Overall, royalty restrictions appear as an effective tool in limiting cross-border tax planning via the licensing of IP. This finding is also confirmed by a second analysis employing firm-level data on European multinational subsidiaries. This study is the first to provide such evidence and can thus help policy makers when considering the introduction of royalty restrictions in their country. Whether my findings also hold for Germany and the U.S. could be addressed by future research.

[82] Again, the introduction of the royalty restriction effectively raised the tax burden on affected royalty payments by 25 percentage points and thus reduced the net-of-tax rate on shifted profits from 1 to 0.75. The implied decrease of about 30-53% for affected subsidiaries' intangible assets thus translates into an elasticity of about -1.2 to -2.1. Note that, as the dependent variable (*Intangible Assets*) for this specification only captures capitalized intangible assets, my estimate probably provides a lower bound for the real response. For further discussion on this matter also see Dischinger and Riedel (2011).

4.5 Appendix

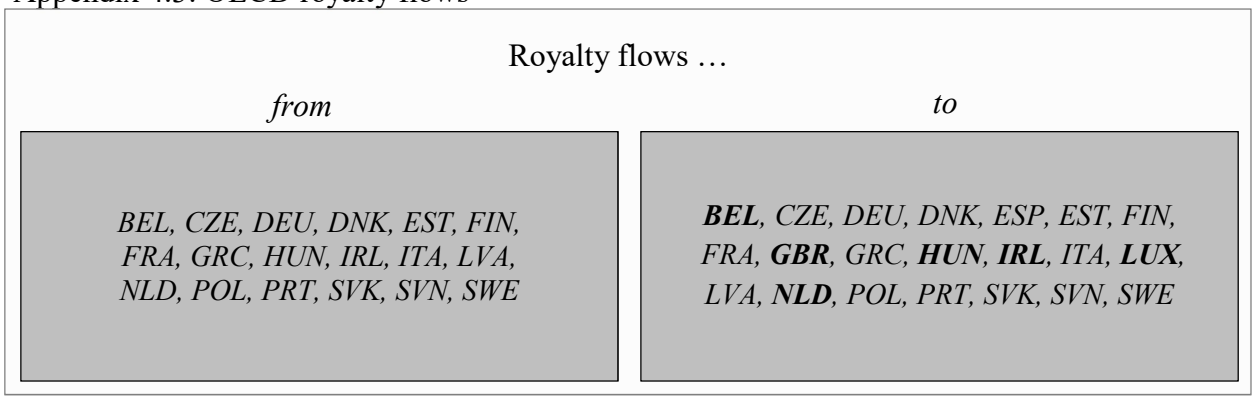
Appendix 4.1: Descriptive Statistics Macro-Data

DiD Group	Variable	Mean	SD	Min	Max
Control (187 Observations)	*Royalty (in EUR mln)*	26.20	85.30	1.00	477.00
	LnGDP	12.26	1.49	9.56	15.00
	LnGDP per Capita	9.86	0.55	8.72	10.82
	Depreciations	0.62	0.17	0.26	1.00
	R&D Tax Incentives	0.37	0.33	0.00	1.00
	Anti-Avoidance Rules	0.28	0.27	0.00	1.00
	Group Taxation Regime	0.36	0.35	0.00	1.00
	Holding Tax Climate	0.10	0.30	0.00	1.00
	CIT Rate (Schanz)	0.41	0.15	0.03	0.63
	Tax Attractiveness Index	0.45	0.07	0.30	0.63
	Unemployment rate	9.98	4.94	2.90	27.50
Treat (99 Observations)	*Royalty(in EUR mln)*	46.80	113.00	1.00	569.00
	LnGDP	11.63	1.71	8.66	14.77
	LnGDP per Capita	10.13	0.78	8.34	11.42
	Depreciations	0.48	0.25	0.00	0.80
	R&D Tax Incentives	0.42	0.36	0.00	1.00
	Anti-Avoidance Rules	0.24	0.25	0.00	0.50
	Group Taxation Regime	0.33	0.24	0.00	0.50
	Holding Tax Climate	0.08	0.27	0.00	1.00
	CIT Rate (Schanz)	0.45	0.23	0.11	0.77
	Tax Attractiveness Index	0.33	0.08	0.18	0.48
	Unemployment rate	7.76	3.07	3.70	16.10

Appendix 4.2: Coefficients displayed in Figure 4.3

Variables	Timing Patterns	
	Base Effect ($Year_t$)	Interaction Term ($Treat_j$*$Year_t$)
2008	0.361*	-0.355
	(0.182)	(0.284)
2009	0.0477	0.0009
	(0.0861)	(0.225)
2010	-0.173	0.0255
	(0.152)	(0.343)
2011	0.0041	-0.136
	(0.146)	(0.356)
2012	0.180	-0.260
	(0.164)	(0.329)
2013	0.285	-0.142
	(0.170)	(0.479)
2014	0.343*	-0.294
	(0.193)	(0.406)
2015	0.390**	-0.761**
	(0.163)	(0.357)
2016	0.338*	-0.972**
	(0.196)	(0.425)
2017	0.481*	-0.931*
	(0.250)	(0.476)
GPD_{jt}	1.702	
	(2.351)	
$GPDpc_{jt}$	-1.771	
	(2.228)	
Constant	12.34	
	(8.403)	
N	286	
R^2	0.135	
Country FE	√	
Year FE	√	

Appendix 4.3: OECD royalty flows



Note: Bold letters indicate (potentially) affected countries.

Appendix 4.4 Robustness Test IV: European Royalty Flows: Affected vs. Non-Affected Countries

Variables	European Royalty Flows: Affected vs. Non-Affected Countries			
	Baseline model		Full model	
	(1)	(2)	(3)	(4)
$Treat_i$	0.511**	0.320		
	(0.200)	(0.201)		
$Post_t$	0.128*	0.0914		
	(0.0727)	(0.101)		
$Treat_i$*$Post_t$	-0.0161	0.108	-0.0710	0.0265
	(0.132)	(0.179)	(0.118)	(0.138)
GPD_{it}	0.724***	0.728***	5.004*	1.050
	(0.0679)	(0.0715)	(3.025)	(4.103)
$GPDpc_{it}$	0.169	0.382*	-3.764	-1.284
	(0.178)	(0.209)	(3.156)	(4.189)
GPD_{jt}	0.806***	0.542***	10.01***	1.941
	(0.0626)	(0.0745)	(3.547)	(7.305)
$GPDpc_{jt}$	1.405***	1.986***	-9.397**	-0.717
	(0.196)	(0.320)	(3.907)	(7.229)
Constant	-19.55***	-23.35***	-42.99***	
	(2.700)	(4.484)	(12.81)	
N	1,465	1,877	1,465	1,877
R^2	0.588		0.108	
Country-pair FE			√	√
Year FE			√	√

The dependent variable is the Euro value of outbound royalty payments from country *i* to country *j* during the year *t*; in logs $ln(Royalty_{ijt})$ for columns (1) and (3). The sample period goes from 2010 to 2016. All specifications include control variables for the countries' annual GDP and annual GDP per capita (both in natural logs). Missing values for the control variables were set constant at the most recent available value. Robust standard errors clustered at the recipient country level in parentheses. *** indicates statistical significance at the 1% threshold, ** at the 5% threshold, and * at the 10% threshold.

Appendix 4.5: Sample Description Firm-level Analysis

Country Composition Firm-level Data

Subsidiary Location	Parent Location
BEL, BGR, CYP, GBR*, HUN, IRL*, LUX, MLT, NLD*	*AUT, BEL, BGR, CYP, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, HRV, HUN, IRL, ITA, LUX, LTU, LVA, MLT, NLD, POL, PRT, ROU, SVK, SVN, SWE*

*due to data restrictions only included for specification (1) of Table 4.9.

Sample Selection Process

The analysis uses data on companies resident in Belgium, Bulgaria, Cyprus, Hungary, Ireland, Luxembourg, Malta, the Netherlands, and the United Kingdom (5,486,753 in total in Bureau van Dijk's Amadeus database). I then restrict the selection to subsidiaries, which show a value for intangible assets at least once during the years 2013 to 2016. This leaves me with 940,747 entities in the extracted raw data. Following this, I reduce the sample to subsidiaries with a global ultimate owner resident in a European Member State, thereby again strongly reducing the sample to 67,573 entities.[83] I follow prior literature (Dischinger and Riedel, 2011), in that I only include large enough multinational groups in order for them to engage in strategic allocation of intangible assets. Thus, I restrict the analyses to firms with at least three companies in their corporate group, which leaves me with 42,140 firms. Omitting observations with values below zero for assets (intangible, fixed, overall) slightly reduces this number again, resulting in the final sample of 42,115 firms (equaling a maximum of 421,150 firm-year observations). Due to low coverage with regard to certain key variables, the number

[83] It should be noted, that the Austrian regulation affects payments between related entities in a corporate group. Thus, a subsidiary-parent relationship between the Austrian entity and the foreign company is not required. Payments between two subsidiaries with a common parent, for example, also fall under the regulation. However, it seems reasonable to assume that, in order for the Austrian regulation to have an economically significant effect, the entities resident in affected countries should show a strong link to Austria. I thus focus on subsidiaries only.

of observations used in the analyses lies significantly below the maximum number, however, and ranges at about 42,000 to 55,000, depending on the specification. With regard to column (1) in Table 4.9 for example, only a total of 116,759 observations show values for all variables for at least one year during the sample period. Of the remaining firms, about 3,900 firms only report a value for one year during the sample period, however, with another 10,898 firms in the sample not showing any variation over the sample period for a given variable (mainly due to intangible assets remaining at zero throughout all the years). Taken together, this leads to an additional 61,757 observations being dropped from the analysis, resulting in 55,002 observations to column (1) of Table 4.9.

Appendix 4.6: Descriptive Statistics Firm-Level Analysis

Variable	**Mean**	**SD**	**Min**	**Max**
Intangible assets (in EUR thousands)	5,387	163,825	0	28,500,000
LnGDP per Capita	10.37	0.51	8.34	11.42
GDP per Capita Growth	0.83	3.15	-6.46	24.76
LnPop	16.68	1.38	12.91	18.00
LnR&D	0.46	0.33	-0.95	0.90
Corruption Perception Index	7.60	1.15	3.33	9.00
CIT Rate (Eurostat)	24.94	6.53	10.00	35.00
Unemployment rate	7.02	2.23	3.70	16.10
LnAssets	6.98	3.30	0.00	18.89
LnSales	8.55	2.49	0.00	19.25
LnEBIT	6.42	2.25	0.00	16.24

Chapter 5

Concluding Remarks

This dissertation sheds lights on the effects of selected countermeasures in limiting cross-border tax evasion and avoidance. It contributes to the existing literature as it adds to the so far few studies investigating the effects of increased transparency on cross-border investment and banking activity. Furthermore, relying on a unique dataset, to the best of my knowledge, it is the first study to investigate the effectiveness of deduction disallowances on royalty payments to low tax countries in limiting cross-border IP tax planning.

The second chapter analyzes the effects of offshore tax evasion on international portfolio investment and its responsiveness to changes in enforcement. Based on a large data set of outbound FPI from 43 countries (of which 21 are tax havens) in 25 OECD countries for the years 2001 to 2014, the results show that enhanced tax enforcement through the signing of new information exchange agreements with OECD countries exerts a statistically significant and negative effect on OECD-bound FPI from tax havens. Furthermore, the study finds round-tripping tax evasion is to be a global phenomenon and, in addition, documents that tax havens undermine the OECD transparency initiative by signing information exchange agreements with their peers.

The third chapter also investigates the effect of increased transparency on the offshore banking sector. Exploiting the Bank Ownership Database, a unique dataset containing an almost complete picture of bank ownership around the world over the period 1995 to 2013 created by Claessens and van Horen (2015), the study finds an increase in transparency through U.S. enforcement initiatives to have a negative effect on the presence of multinational

banks in tax havens. The results, however, also suggest that domestic tax haven banks might be filling the gap. Regardless of this trend, foreign owned banks still seem to play an important role in the overall offshore banking industry.

Employing a panel dataset as provided by the Austrian National Bank (OeNB) for the purpose of this study, the fourth chapter investigates the effectiveness of royalty restrictions in fighting tax avoidance via cross-border IP tax planning. The results indicate a reduction in royalty payments by Austrian residents to entities resident in affected countries of about 50% relative to the control group once the mechanism was introduced. Such deduction disallowances thus appear as an effective tool in limiting cross-border tax planning via the licensing of IP. These findings are also confirmed by a second analysis employing firm-level balance sheet data on European multinational subsidiaries. This study is the first to provide such evidence.

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