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Vorwort

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Köln, im Januar 2017   *Pia Olligs*

Content

Chapter 1

Motivation and Research Question

Chapter 1

1.1. Motivation

Recently, several journalists' investigations have directed the general public's attention to the overall tax burden of several, large global players by providing anecdotal evidence for the tax planning strategies of these firms. Amongst others, one of the mostly known and discussed examples is Google Inc. with its so-called "Double Irish" and "Dutch Sandwich" structures. These tax planning structures enabled Google to shift most of its foreign income to Bermuda with paying hardly any taxes on the way. Thereby, the firm reduced its Effective Tax Rate (ETR) on foreign income to 2.4 percent in 2010.[1] The discussion about large multinational entities (MNEs) avoiding taxes has already been in full progress when the International Consortium of Investigative Journalists posted a database containing confidential documents about secret advanced tax rulings between Luxembourg's tax authorities and several firms and thereby stimulated the debate further in 2014.[2] Till this day, the last event attracting immense attention has been the publication of the Panama Papers in 2016 uncovering information about shell corporations being established in Panama amongst other reasons to save taxes.[3]

Most of this anecdotal evidence highlights low ETR measures that have been reached by using the gaps and frictions which arise when two sovereign countries' tax rules interact. As a result the main business' location and the country levying taxes on most of the respective profits differ in these cases. Although being legal, these tax avoidance strategies are inconsistent with the intention and purpose of tax law (Kadet, 2016). To hinder these activities, the

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[1] Cf. http://www.washingtonpost.com/wp-dyn/content/article/2010/10/30/AR2010103000034.html.
[2] Cf. https://www.icij.org/project/luxembourg-leaks/explore-documents-luxembourg-leaks-database.
[3] Cf. http://www.sueddeutsche.de/wirtschaft/panama-papers-der-groesste-kanal-nach-panama-1.296 9630.

Organisation for Economic Cooperation and Development (OECD) launched its project on Base Erosion and Profit Shifting (BEPS) in 2013. The main purpose of the BEPS project has been the alignment of tax systems so that the location of real economic activity does coincide with tax payments (OECD, 2013). Meanwhile the OECD has published the final reports for all of its 15 action items and the implementation into national tax laws is in process (OECD, 2015). However, the potential success of the BEPS project which focuses mostly on transfer pricing and enhanced transparency is still under dispute for various reasons.[4]

First, the economic magnitude of BEPS is still understood only roughly as it is difficult to separate tax savings resulting from BEPS structures and those resulting from tax-favored real activities (Hanlon and Heitzman, 2010). By now, it is common knowledge that at least some firms engage intensively in BEPS. However, at the same time not all firms engage in tax avoidance with the same intensity. Weisbach (2002) has raised the until now not completely solved question why this so-called undersheltering puzzle exists. Further puzzling evidence like the robust growth in corporate tax revenues of major economies brings the call for further empirical research about the magnitude of BEPS as well as the channels used for BEPS up. Only more understanding of these will enable to understand how BEPS can be hindered or whether this is necessary at all (Dharmapala, 2014).

While prior empirical literature finds compelling evidence that business structures involving an intense ownership of highly valuable intangible property facilitate tax avoidance (Grubert and Slemrod, 1998; Dischinger and Riedel, 2011; Markle and Shackelford, 2012a, 2012b), very little is known about the actual

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[4] Cf. for example http://www.economist.com/news/business/21672207-plan-curb-multinationals-tax -avoidance-opportunity-missed-new-rules-same-old.

location of certain types of intangible property. Recently, some studies have shown that patent ownership within MNEs is rather located at affiliates in low-tax countries (Karkinsky and Riedel, 2012; Griffith, Miller and O'Connell, 2014; Boehm et al., 2015). Beyond this knowledge about patents, it is not known which other types of intangible property are used for profit shifting.

Second, an ongoing public discussion has triggered a claim for a publicly disclosed country-by-country reporting of key economic indicators by MNEs (e.g., Tax Justice Network, 2014) while the OECD decided to enhance tax transparency rather towards the tax authorities instead of the general public (OECD, 2015). Tax authorities mostly have very limited resources and are now overwhelmed by information due to the OECD's country-by-country reporting. Therefore, it is questioned whether this will establish enough pressure to make MNEs managements believe their tax structures carry too much risk (Kadet, 2016). The supporter of a public country-by-country reporting for all MNEs expect a limitation of international tax avoidance, because a publicly disclosed country-by-country reporting might increase public pressure from customers or the general public. Lately, Amazon and Facebook changed the recording of their sales due to the high public pressure resulting from the public discussion of their very low ETRs. These changes will result in higher tax payments in Europe.[5] Even though these examples show that public pressure can have an influence on tax behavior of MNEs, empirical evidence on the effect of public disclosure of tax planning details on the scope of tax avoidance is still scare.

The recent debate primarily focuses on corporate taxes. However, as a big party of the debate − the public − consists of potential investors, the discussion

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[5] Cf. http://www.bbc.com/news/business-35724308; http://fortune.com/2015/05/26/amazon-is-going-to-pay-more-tax-in-europe.

should, consequently, also take the investor's personal tax burden into account. Prior empirical literature identifies the decisive influence individual top executives have on a firm's corporate tax planning (Dyreng, Hanlon and Maydew, 2010; Graham et al., 2014) and that differences in taxation of dividends and capital gains is reflected in the payout policy of firms (Brav et al., 2005; Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013). However, so far it is not known whether highly engaged in corporate tax planning comes along with a particularly high sensitivity to personal capital income taxes at a firm's level.

This thesis aims to contribute to these presented research gaps in three essays. The first essay "*Public Disclosure of Foreign Subsidiaries and International Tax Avoidance*" is co-authored by Michael Overesch, Chair of Business Taxation at the University of Cologne and Tanja Herbert, former doctoral research assistant at the Chair of Business Taxation at the University of Cologne. We analyze the influence of public disclosure of group structures in Exhibit 21 on tax avoidance of U.S. MNEs. The paper was presented at the Doctoral Research Seminar in Berlin 2015, the 2nd Doctoral Research Seminar in Vienna 2015, the 38th European Accounting Association Annual Congress 2015 in Glasgow, the Tagung der Kommission Betriebswirtschaftliche Steuerlehre der VHB 2015 and the Accounting Section of the German Economic Association 2015 (VfS).

The second essay "*Corporate Tax Planning and the Payout Ratio of Firms – Is the Dividend Tax Penalty Linked to ETRs?*" investigates whether those firms being sensitive about their corporate tax burden are also sensitive about their shareholders' tax payments. This paper was presented at the joint Doctoral

Research Seminar with FU Berlin in Cologne 2016. It is based on a working paper with Alexander Tassius, doctoral research assistant at the Chair of Business Taxation at the University of Cologne.

The final essay "*Corporate Taxes and the Location of U.S. Trademarks*" is co-authored by Michael Overesch, Chair of Business Taxation at the University of Cologne and Jost Heckemeyer, Professor of Accounting and Taxation at the University of Hannover. We analyze where the ownership of U.S. trademarks is located and whether tax considerations play a decisive role in the decision where to locate the ownership. The project was presented at the ZEW Public Finance Conference 2016, the 39th European Accounting Association Annual Congress 2016 in Maastricht, the Tagung der Kommission Betriebswirtschaftliche Steuerlehre der VHB 2016, the Forschungskolloquium 2016 at the Otto-von-Guericke-University Magdeburg and at the 6th Conference on Current Research in Taxation 2016 in Bonn.

1.2. Public Disclosure of Foreign Subsidiaries and International Tax Avoidance

1.2.1. Research Question and Design

The essay "Public Disclosure of Foreign Subsidiaries and International Tax Avoidance" analyzes the relationship between public disclosure of group structures in Exhibit 21 and international tax avoidance of U.S. MNEs. Several U.S. firms have removed a substantial number of subsidiaries from their Exhibit 21 since 2010 (Lindsey and Wilson, 2015). We considered Exhibit 21 as a simplified version of a publicly available country-by-country reporting. Interestingly, according to public company registries most of the subsidiaries still

exist after they have been removed from Exhibit 21 (Gramlich and Whiteaker-Poe, 2013).

A reason for the noticeable change in Exhibit 21 disclosure might be the growing interest in international tax avoidance and upcoming public pressure (Donohoe, McGill and Outslay, 2012). As executives are partially responsible for a firm's tax avoidance level (Dyreng, Hanlon and Maydew, 2010), we expect executives of those firms that become less transparent regarding the reporting of international firm structures in Exhibit 21 to deliberately make the decision to become more tax aggressive.

Prior literature finds that less accounting transparency concerning different types of country-by-country reporting leads to more aggressive tax behavior (Hope, Ma and Thomas, 2013; Dyreng, Hoopes and Wilde, 2016). Hence, we expect that a noticeable reduction of disclosed foreign subsidiaries was followed by changes in the tax avoidance behavior compared to firms that did not change disclosure. The public discussion about aggressive tax avoidance of MNEs has focused primarily on strategies affecting foreign tax payments. We therefore focus our analysis on foreign tax avoidance measured by *Foreign ETR*.

As we cannot observe one and the same firm in both scenarios – with and without the decision to reduce public disclosure – we apply one to five nearest neighbors propensity score matching (PSM) with *Foreign ETR* as outcome variable. Using the matched sample, we apply a difference-in-differences approach to measure the effect of the decision to become intransparent by comparing the change in foreign tax aggressiveness measured by *Foreign ETR* of the group that changed disclosure to the trend of the control group in the absence of this decision. By combining PSM with difference-in-differences estimation our

analysis is robust to the selection of observables and time-invariant unobserved effects (Heckman, Ichimura and Todd, 1998).

Besides considering *Foreign ETR Current* and *GAAP ETR* as additional measures for tax avoidance, we assure that our results are neither driven by our matching algorithm nor by our identification of the firms deciding to become intransparent. Therefore, we also apply a one to one nearest neighbor matching. Moreover, we alter our definition for firms significantly changing their disclosure by considering U.S. subsidiaries and M&A activities measured by change in total assets.

Our empirical analysis is based on a dataset of U.S. listed MNEs. From 2010 until 2014 more than 350 firms reduced the number of foreign subsidiaries disclosed in Exhibit 21 by more than 50 percent. The information of Exhibit 21 derives from Dyreng's database and the consolidated financial statement information is extracted from Compustat North America.

1.2.2. Results and Contribution to the Literature

The results of our difference-in-differences estimation after the PSM indicate that firms reducing transparency develop significantly different regarding their tax avoidance than firms that do not change behavior. We identify an additional decline in *Foreign ETR* and *Foreign ETR Current* by about 3 percentage points and in *GAAP ETR* by about 2 percentage points. These results are supported by our robustness checks. Accordingly, our results confirm a relationship between disclosure of international firm structures and the scope of international tax avoidance.

Since 2015 European credit institutions have to publish profit and tax payments as well as other information on a country-by-country basis. Very

recently, the European Commission adopted a proposal of a country-by-country reporting for all MNEs in Europe (European Commission, 2016). This study provides new insights to the related debate about the benefits of more transparency and more disclosure of international tax structures of MNEs. It contributes to a small strand of literature which analyzes the relationship between public disclosure and the intensity of international tax planning (Hope, Ma and Thomas, 2013; Dyreng, Hoopes and Wilde, 2016) and attends the ongoing discussion whether firms avoid less taxes if they perceive costs associated with public pressure (Gallemore, Maydew and Thornock, 2014; Jacob, Rohlfing-Bastian and Sander, 2014).

1.3. Corporate Tax Planning and the Payout Ratio of Firms – Is the Dividend Penalty Linked to ETRs?

1.3.1. Research Question and Design

The second essay "Corporate Tax Planning and the Payout Ratio of Firms: Is the Dividend Penalty Linked to ETRs?" investigates whether firms being highly engaged in corporate tax planning care also about their investor's tax burden. An investor can either receive a dividend payment of a firm while just holding the stock in his portfolio around the ex-day or sell the stock one day before the ex-day cum dividend and rebuy it the next day when the stock trades ex dividend. In both scenarios, the investor receives the dividend amount in cash and finally owns the corresponding stock. Yet the tax rate for each scenario might differ as in the first case the dividend tax rate and in the second case the capital gains tax rate applies. Hence, we analyze whether firms being highly engaged in corporate tax planning do react more sensitive to an exogenous variation of the relationship between

personal dividend and capital gains tax rates than firms which are less engaged in corporate tax planning.

Prior literature identifies that the difference in taxation of dividends and capital gains is reflected in the payout policy of firms (Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013). Moreover, a firm's management on the one hand influences the amount of the firm's corporate tax planning (cf. Graham et al., 2014) and on the other hand also decides about the amount of cash which is distributed to its shareholders via dividend payments and where according to Brav et al. (2005) personal shareholder taxes do play a role. Hence, if a firm's management cares relatively more about its corporate taxes, we suggest that it is also more engaged in reducing their shareholders' tax bills.

The challenge of this research question is to identify the intensity of a firm's tax planning activities, i.e. our dummy variable *TAXPL*. Prior literature implemented Effective Tax Rates (ETRs) as most popular measure for firms' tax planning behavior (cf. Hanlon and Heitzman, 2010). Accordingly, most of our definitions for *TAXPL* are based on the *GAAP ETR* and *GAAP ETR Current*. Besides accounting for the volatility of ETRs, we consider differences in tax planning due to industry affiliation and firm size. Moreover, we apply a pre-regression approach that accounts for all firm characteristics that have an influence on ETRs, but are not associated with aggressive tax planning. Previous studies have confirmed that the mobility of income increases for firms with high intangible asset ownership or high expenses for R&D (Harris, 1993; Grubert, 2003; De Simone, Mills and Stomberg, 2014). In a second step, we consider these firm characteristics to define *TAXPL*.

Our empirical analysis is based on a dataset of 13,106 distinct firms being located in 18 different countries (G7 merged with the EU15 member states) over ten years with several tax rate variations. Consolidated financial statement information derives from Compustat North America and Compustat Global. Personal tax rate information is hand collected from the European Tax Handbook, KPMG Individual Income Tax Rate Survey, PricewaterhouseCoopers Worldwide Individual Tax Summaries and Ernst and Young Worldwide Personal Tax Guide.

1.3.2. Results and Contribution to the Literature

The results of our difference-in-differences estimations confirm that a firm's dividend yield decreases when dividends become more heavily taxed compared to capital gains. However, applying a variety of definitions for tax planning affinity, we are not able to identify that these firms' dividend yields react stronger to changes in the relationship of dividend to capital gains taxation.

The study contributes to the existing literature by providing additional evidence and confirming prior literature that firms consider existing personal tax rates for dividends and capital gains when they choose the amount of dividends paid to the shareholders (Brav et al., 2005; Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013). Moreover, it provides additional tests whether this reaction is related to firm's corporate tax planning affinity. While prior literature's results indicate that a firm's management influences both, corporate tax planning and the level of dividend payments (Brav et al., 2005; Graham et al., 2014), so far no study has analyzed whether these are the same.

1.4. Corporate Taxes and the Location of U.S. Trademarks

1.4.1. Research Question and Design

The final essay "Corporate Taxes and the Location of U.S. Trademarks" investigates whether tax incentives play a role in the legal assignment of trademarks registered for the U.S. market by large U.S. based multinational enterprises (S&P 500). Furthermore, these results are compared to the assignment of U.S. trademarks registered by European firms (STOXX 600 Europe). As important intangible assets in modern business, trademarks often represent fundamental drivers of firm value. They serve to convey corporate identity by enabling companies to distinguish their products from the competition. Investors acknowledge the value of trademarks (Sandner and Block, 2011) and expect positive cash flow effects from new registered trademarks (Krasnikov, Mishra and Orozco, 2009).

MNEs may seek tax advantages in holding trademark assets offshore. Trademarks, just as other intangibles, exhibit characteristics of a public good (Markusen, 1995) and thus can be used as a non-rival input separate from other affiliates in the group. Appropriate royalty rates should be at arm's length. Given that the valuation of intangibles is difficult, MNEs may be able to distort intra-group royalty prices in order to shift additional income to the trademark-owner.

Our empirical analysis is tripartite: We first analyze the determinants of the corporate decision to locate legal ownership of U.S. trademarks offshore (offshore decision). In a second step, we investigate the tax and non-tax country characteristics that attract legal ownership of U.S. trademarks, conditional on offshoring ownership (foreign location decision) for S&P 500 firms. Finally, we compare the foreign location decision results of U.S. firms to those of European

firms. In our first step, we apply a logit model including independent variables that reflect the incentive to shift income and allocate assets offshore. Our second and third step consists of a mixed logit model accounting for varios country characteristics that might influence the choice where to locate a trademark.

The empirical analysis is based on U.S. trademark registrations of large U.S. (S&P 500) and large European (STOXX Europe 600) MNEs between 2003 and 2012. The trademark information derives from the U.S. Patent and Trademark Office's register whereas firm strucutre information derives from Exhibit 21 for U.S. firms and from Amadeus for European firms. Financial data is obtained from COMPUSTAT. Statutory corporate tax rates, information on CFC legislation in the U.S. and European countries as well as special tax treatment of trademark income (trademark boxes) are collected from the International Bureau of Fiscal Documentation (IBFD) and tax surveys provided by EY, KPMG and PwC. Macroeconomic data is obtained from the World Bank and CEPII GEODIST. U.S. Marginal Tax Rates derive from Graham's database.

1.4.2. Results and Contribution to the Literature

The results show that there is a strong home bias in U.S. trademark ownership of U.S. MNEs listed in the S&P 500. Similarly, European MNEs listed in the STOXX Europe 600 show a strong home and U.S. bias.

Interestingly, we do not identify tax considerations as an important factor in the U.S. firms' offshore decision. However, we find a strong concentration of trademarks' ownership location in Delaware which is acknowledged to be a domestic U.S. tax haven (Dyreng, Lindsey and Thornock, 2013; Lindsey and Wilson, 2015). Accordingly, we assume that tax considerations indeed play a role when a firm chooses an U.S. affiliate for trademark ownership.

Getting to the foreign location decision of U.S. firms, the tax elasticity of trademark location choice is indeed significant and negative. Moreover, we find that withholding taxes imposed on royalty payments between the U.S. and a potential trademark location significantly lower the respective country's probability to actually host a U.S. trademark. Simulating a one percentage point decrease in the statutory tax rate of some selected countries, we identify that especially tax havens benefit from this cut in statutory tax rate. Comparing these results to the location choice of European MNEs, we find that U.S. firms react slightly more sensitive to a one percentage point cut in statutory tax rate of tax haven countries.

Prior literature shows that tax-motivated income-shifting may involve the tax-efficient geographical allocation of intangible assets within the group (Grubert and Slemrod, 1998; Dischinger and Riedel, 2011; Markle and Shackelford, 2012a, 2012b). With respect to the types of intangibles at the heart of international tax saving strategies, previous work mostly concentrates on the role of patents (Karkinsky and Riedel, 2012; Griffith, Miller and O'Connell, 2014; Boehm et al., 2015). Dudar and Voget (2016) analyze the tax response of patent and trademark assignments for a pooled sample of European and U.S. firms. Still, very little is known about the relevance of U.S. trademarks for international tax planning of large MNEs, considering the particularities of the U.S. context. This paper fills this research gap and analyzes the extent to which international tax incentives drive the geographical ownership allocation of trademarks filed at the USPTO within large U.S. MNEs and European MNEs.

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Chapter 2

Public Disclosure of Foreign Subsidiaries and International Tax Avoidance

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Abstract:

Our study analyzes the relationship between public disclosure of group structures in Exhibit 21 and international tax avoidance of U.S. multinational firms. Several U.S. multinational enterprises have removed a substantial number of subsidiaries from their Exhibit 21 since 2010. Our analysis suggests that firms that decided to substantially reduce the number of foreign subsidiaries disclosed in their Exhibit 21 avoid significantly more taxes compared to firms that did not change disclosure.

Chapter 2

Tables

2.1. Introduction

The establishment of more transparency is one of the key aspects of the recent debate about taxation of multinational enterprises (MNEs). Disclosure about key economic figures and tax payments on a country-by-country basis should hinder international tax avoidance of MNEs. We analyze the relationship between public disclosure of group structures of U.S. MNEs in Exhibit 21 and tax avoidance using a noticeable change in the disclosure of foreign subsidiaries.

The ongoing public discussion about specific MNEs avoiding taxes has triggered a claim for a country-by-country reporting of key economic indicators by MNEs (e.g., OECD, 2013; Tax Justice Network, 2014). Since 2015 European credit institutions have to publish profit and tax payments as well as other information on a country-by-country basis. Very recently, the European Commission adopted a proposal for a country-by-country reporting for all MNEs in Europe (European Commission, 2016).

One expectation for the implementation of a publicly available country-by-country reporting is a limitation of international tax avoidance, because it might increase public pressure from customers or the general public. Currently, Amazon serves as a prominent example where public pressure due to accounting transparency leads to less tax avoidance. Under the pressure of E.U. authorities that investigate Amazon's tax arrangements via subsidiary locations especially in Luxembourg, the company has changed its financial accounting of revenues from sales in Europe, a step that could lead to higher tax payments.[6]

However, as MNEs are currently not obliged to disclose an entire country-by-country reporting, empirical evidence on the effect of public disclosure of tax

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[6] http://fortune.com/2015/05/26/amazon-is-going-to-pay-more-tax-in-europe.

planning details on the scope of tax avoidance is still scarce. Hope, Ma and Thomas (2013) analyze the adoption of the Statement of Financial Accounting Standards No. 131 in 1998 that allows firms to abstain from disclosure of geographic earnings. They find that opting to discontinue geographic earnings disclosure was associated with significantly lower ETRs. However, they also find that the effects vanished in 2004 when U.S. firms were required to include Schedule M-3 – a type of country-by-country reporting – in their tax returns. Hence, the firms also reacted to a change in tax disclosure that is not publicly available. Accordingly, the firms might rather have responded to better information of tax auditors than to changing reputational costs.

We therefore refer to a recent change in public disclosure of international firm structures by U.S. MNEs starting in 2010. U.S. listed firms are obliged to disclose a simplified country-by-country reporting that consists of a list of their significant subsidiaries and their country of incorporation in Exhibit 21 of Form 10-k to the U.S. Securities and Exchange Commission (SEC). Since 2010 several companies removed a substantial number of foreign subsidiaries from their Exhibit 21. For example, Oracle disclosed more than 400 significant subsidiaries for the fiscal year 2010, whereas in 2011 this number declined to six significant subsidiaries, of which only three are based in foreign countries.[7] As Oracle's 10-k filings mention an extensive expansion and acquisition program and do not reveal any explanation for this extensive reduction, there is no obvious reason for this phenomenon despite the option in the SEC regulation to omit non-significant subsidiaries. For two firms of the firms that substantially changed their disclosure in Exhibit 21, Google and Oracle, Gramlich and Whiteaker-Poe (2013) detect that

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[7]The Incredible Vanishing Subsidiary – From Google to FedEx, Wall Street Journal, 5/22/2013; http://www.wsj.com/articles/SB10001424127887323463704578497290099032374.

at least 65 percent of the disappearing subsidiaries still existed in 2012 after they substantially reduced their number of subsidiaries reported in Exhibit 21.

A reason for the noticeable change in Exhibit 21 disclosure might be the growing interest in international tax avoidance and upcoming public pressure (Donohoe, McGill and Outslay, 2012). Oracle, for example, reported an effective tax rate (ETR) on foreign income of 18.9 percent in 2010, the year before the number of foreign subsidiaries disclosed in its Exhibit 21 fell from 454 to 3. In 2011, Oracle reported an ETR on foreign income of only 12.45 percent, a reduction by 6 percentage points.

We use this phenomenon of intransparency regarding foreign subsidiaries reported in Exhibit 21 to test whether the noticeable reduction of disclosed information was followed by changes in the tax avoidance behavior. Our empirical design using a change in the disclosure of firm structures relates to a recent study by Dyreng, Hoopes and Wilde (2016). Using a sample of MNEs in the United Kingdom, they analyze how tax avoidance was affected by a force to disclose all foreign subsidiaries. They find increasing ETRs for U.K. firms after they had to reveal a complete list of their foreign subsidiaries.

Our focus however is on U.S. MNEs that reduce the number of foreign subsidiaries disclosed in Exhibit 21. From 2010 until 2014 more than 250 U.S. listed firms reduced the number of foreign subsidiaries by more than 50 percent. An explorative analysis reveals that the vanishing foreign subsidiaries are not concentrated in certain host countries. In particular, foreign subsidiaries from tax haven countries and other countries have been removed from Exhibit 21 in a similar manner.

In our empirical analysis, we use propensity-score matching (PSM) to carefully compare the tax avoidance behavior of MNEs that substantially reduced their disclosure of foreign subsidiaries with similar MNEs that do not. In particular, we consider a variety of well-known determinants of tax avoidance when computing the propensity scores. Using difference-in-differences estimations, our matched sample analysis shows that MNEs changing their disclosure develop significantly different regarding their tax avoidance compared to MNEs that did not. Our results suggest an additional decline in *Foreign ETR* and *Foreign ETR Current* by about 3 percentage points and in the *GAAP ETR* by about 2 percentage points, if a firm has noticeably reduced the disclosure of foreign subsidiaries. The effect of a change in public disclosure on international tax avoidance is robust across several specifications and different measures of international tax avoidance. As most of the firms referred to M&A activities as the main reason for their changes in disclosure, we also control for M&A activities in additional analysis.

We contribute to the recent debate about the benefits of more transparency and more disclosure of international tax structures of MNEs. While the OECD decided to enhance tax transparency rather towards the tax authorities instead of the general public (OECD, 2015), supporters claim for a publicly disclosed country-by-country reporting (e.g., Tax Justice Network, 2014) or even for public disclosure of tax returns (Lenter, Shackelford and Slemrod, 2003). Our results suggest that firms that decided to become intransparent regarding their international firm structures disclosed in Exhibit 21 develop significantly different regarding their tax avoidance behavior compared to firms that did not change disclosure. Accordingly, our results confirm a relationship between disclosure of

international firm structures and the scope of international tax avoidance and hence support the arguments in favor of a publicly available country-by-country reporting as recently proposed by the European Commission (2016).

The remainder of the paper is organized as follows. In Section 2.2, we discuss the impact of public disclosure on international tax avoidance. Section 2.3 describes our propensity score matching. Empirical results are presented in Section 2.4. Section 2.5 concludes.

2.2.   Public Disclosure and International Tax Avoidance

MNEs benefit from additional tax planning opportunities as profits can be shifted to subsidiaries subject to low tax rates. Previous studies have found that reported profits of foreign subsidiaries are inversely related to the local tax level, suggesting intra-firm shifting of taxable profits (Hines and Rice, 1994; Huizinga and Laeven, 2008; Klassen and LaPlante, 2012a, 2012b; Blouin, Robinson and Seidman, 2015). MNEs exploit international tax rate differentials by means of transfer pricing for intra-firm sales (Clausing, 2003) and allocation of valuable patents to low-tax subsidiaries to facilitate profit shifting by charging intra-firm royalties (Karkinsky and Riedel, 2012; Griffith, Miller and O'Connell, 2014). Moreover, MNEs establish subsidiaries in tax haven countries (Desai, Foley and Hines, 2006)[8] and benefit from different definitions of residence. In particular, structures including subsidiaries in Ireland benefit from the different definitions of residence under U.S. and Irish tax law (Ting, 2014). Therefore, studies by Dyreng and Lindsey (2009) and Markle and Shackelford (2012a, 2012b) consider tax

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[8] Subpart F of the IRC should prevent U.S. based firms from using subsidiaries in tax havens. However, U.S. firms can opt to disregard entities in their U.S. tax returns ('check the box') to avoid the consequences of Subpart F.

haven operations and proxies for profit-shifting channels as determinants of ETR measures.

Even though it is well known that MNEs engage in all types of tax avoidance (for an overview Hanlon and Heitzman, 2010), empirical evidence also shows that some firms use aggressive tax planning strategies while others do not (Weisbach, 2002; Dyreng, Hanlon and Maydew, 2008). An engagement in tax avoiding strategies is not only associated with paying less taxes, but also with costs and risks. Different costs and tax risks can explain differences in tax avoidance between firms. Tax avoidance is limited by direct costs of tax planning and tax advisors as well as by substitution effects due to limited management capacity (Jacob, Rohlfing-Bastian and Sandner, 2014). Prior literature also shows that lower ETRs result in significantly higher tax uncertainty (Dyreng, Hanlon and Maydew, 2014). Moreover, engagement in tax avoiding strategies or tax shelter schemes results in the risk of being detected or suffering bad reputation for the firm and its top management. These reputational costs cause the link between public disclosure and tax avoidance.

Reputational costs crucially depend on the information available for the assessment of a firm's tax strategy by shareholders, customers or the general public. While information requests of fiscal authorities might be satisfied by reporting requirements that are exclusively submitted to tax authorities, a rating of the scope of tax avoidance by customers or the general public requires publicly available information. If transparency about the international firm structure or tax planning strategies is reduced, customers can no longer observe the details of the tax strategy used. Non-tax literature finds evidence that poor transparency is often associated with costs for firms. For example, Leuz and Verrecchia (2000) show

that the cost of capital decreases when the level of disclosure increases. Biddle and Hilary (2006) show that an increase in accounting quality involves an increase in investment efficiency. If however a firm uses aggressive tax planning strategies and fears reputational effects, the firm should benefit from *less* transparency due to the decreasing risk of being detected or suffering bad reputation. Therefore, managers should be less tax aggressive, if they perceive significant reputational costs associated with public disclosure regulations revealing their tax avoidance strategies. While prior literature finds only ambiguous evidence for the magnitude of reputational costs (Hanlon and Slemrod, 2009; Gallemore, Maydew and Thornock, 2014), a recent survey among tax executives of U.S. firms confirms manager concerns of reputational costs are associated with corporate tax planning (Graham et al., 2014).

The recent debate about tax transparency of MNEs refers to the aforementioned mechanism to limit international tax avoidance. In April 2016, the European Commission has adopted a proposal of a country-by-country reporting of profits and tax payments as well as additional key economic information. However, the benefit of additional information to assess international tax avoidance is arguable. In particular, MNEs are already obliged to disclose information about their tax position in their financial accounts. This information allows computing ETR measures and evaluating tax avoidance of each MNE.

For example, tax strategies have an impact on the firm structure of U.S. MNEs (Lewellen and Robinson, 2013) and tax shelter is positively related to the use of tax haven subsidiaries (Lisowsky, 2010). Therefore, information about subsidiaries located in tax haven countries is often perceived as evidence for an

aggressive tax avoidance strategy. If this information is publicly available, firms might engage less in tax haven subsidiaries due to public pressure they anticipate.

Previous literature suggests that disclosure of additional information about the international firm structure influences the scope of international tax avoidance. Hope, Ma and Thomas (2013) find significantly lower ETR measures for firms that abstain from disclosure of geographic earnings in their financial reports after the adoption of the Statement of Financial Accounting Standards No. 131 in 1998. However, they also find that the effects vanished in 2004 when U.S. firms were required to include Schedule M-3 – a type of country-by-country reporting – in their tax returns. Since Schedule M-3 is not publicly available, this latter finding suggests that firms responded rather to a changing detection risk in tax audits than to changing reputational costs.

Recently, Dyreng, Hoopes and Wilde (2016) analyze public pressure on MNEs in the United Kingdom to carefully report a complete list of all foreign subsidiaries. While several U.K. firms had used to disclose only part of their foreign subsidiaries in former years, upcoming public pressure forced U.K. firms to reveal a complete list of their foreign subsidiaries. The study reveals increasing ETRs for U.K. firms after they had to reveal their list of foreign subsidiaries.

We also consider changes in the disclosure of information about foreign subsidiaries, but unlike Dyreng, Hoopes and Wilde (2016) we focus on U.S. MNEs. We consider the list of foreign subsidiaries provided in Exhibit 21. Exhibit 21 is part of Form 10-k, which U.S. listed firms are obliged to submit to the SEC for each fiscal year. According to the disclosure rule 601 of SEC Regulation S-K (§229.601), they must provide a list of all significant subsidiaries and their

countries of incorporation. Accordingly, the disclosed information allows a rough understanding of a firm's international group structure.

Interestingly, it can be observed that starting in 2010 several MNEs have removed a substantial number of foreign subsidiaries from their Exhibit 21 (Lindsey and Wilson, 2015). There is no obvious reason for the decrease in subsidiaries despite an option in the disclosure rule to omit certain subsidiaries and the respective firm's decision to opt for a lower level of transparency concerning their international activities.[9] A reason for the noticeable change in Exhibit 21 disclosure might be the growing interest in international tax avoidance and upcoming public pressure (Donohoe, McGill and Outslay, 2012). Since international tax avoidance is often associated with certain international firm structures, the information from Exhibit 21 has been used to investigate the impact of tax haven activities on tax avoidance (e.g., United States Government Accountability Office, 2008; Dyreng and Lindsey, 2009; Lindsey and Wilson, 2015). Less disclosure of international firm structures can avoid such assessments and negative media coverage. As a consequence, those firms, that decided to substantially reduce the information provided by their Exhibit 21, are subject to less restriction and might have started to use more enhanced international structures to avoid additional taxes. As executives are partially responsible for a firm's tax avoidance level (Dyreng, Hanlon and Maydew, 2010), we expect executives of firms which become intransparent to deliberately make the decision to become more tax aggressive.

The public discussion about intense tax avoidance of MNEs has focused primarily on strategies affecting foreign tax payments. For example, the

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[9] While the SEC's definition gives the option to omit certain subsidiaries and the disclosure might be difficult to enforce by the SEC, the potential penalty for failure to file information is only $100 per day (15 U.S.C. §78ff), or $36,500 per year.

coffeehouse chain Starbucks paid only £8.6 million in U.K. corporate taxes on sales of £3 billion from 1998 to 2012. Nevertheless, Starbucks' top-level management stressed that the company's tax rate was 32 percent on U.S. profits. We therefore focus our analysis on foreign tax avoidance. In particular, we investigate whether a reduction of foreign subsidiaries disclosed in Exhibit 21 of Form 10-k is associated with additional international tax avoidance measured by *Foreign ETR*.

2.3. Empirical Design

2.3.1. Intransparency regarding Subsidiaries Reported

Exhibit 21 of Form 10-k consists of a list of a firm's worldwide subsidiaries and their countries of incorporation. Item 601 of SEC Regulation S-K (§229.601) requires, however, only the disclosure of *significant* subsidiaries. A subsidiary is deemed to be insignificant if three materiality conditions are fulfilled.[10] Moreover, under certain conditions wholly-owned subsidiaries carrying on the same line of business may be omitted as well.[11] Even though the disclosure rule was not changed during our research period, a substantial number of subsidiaries vanished from some Exhibit 21 disclosures in this space of time. Therefore, we assume that this reduction in transparency derives from an option in Item 601 of SEC Regulation S-K (§229.601) which allows to omit non-significant subsidiaries and

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[10] According to SEC Regulation (17 CFR 210.1-02(w)), a subsidiary can be deemed not to be a significant subsidiary if all of the following three conditions are met: (1) the parent company's and its other subsidiaries' investments in the subsidiary do not exceed ten percent of the parent company's total assets; (2) the parent company's and its other subsidiaries' proportionate share of the assets of the subsidiary do not exceed ten percent of the consolidated firm's total assets; and (3) the parent company's and its other subsidiaries' proportionate share of the subsidiary's pre-tax income from continuing operations does not exceed ten percent of the consolidated income from continuing operations.

[11] According to SEC Regulation (17 CFR 229.601-(b)(21)(ii)), names of subsidiaries being consolidated wholly-owned multiple subsidiaries and carrying on the same line of business (such as chain stores and small loan companies) may be omitted if the name of the immediate parent, the line of business and the number of omitted subsidiaries divided by subsidiaries operating in the U.S. and subsidiaries operating in foreign countries is provided.

wholly-owned subsidiaries carrying on the same line of business. Prior literature considers Exhibit 21 as a reliable source for the geographic location of MNEs' subsidiaries until 2009 (Donohoe, McGill and Outslay, 2012; Lindsey and Wilson, 2015). Accordingly, we consider Exhibit 21 disclosures of various U.S. MNEs in a time period between 2009 and 2014 and compare these on a year by year basis to identify firms that have substantially reduced their list of foreign subsidiaries disclosed in Exhibit 21 suddenly.[12]

We assume a noticeable decline in significant subsidiaries, if the number of foreign subsidiaries reported in Exhibit 21 declines by more than 50 percent compared to the previous fiscal year. We however consider a firm only as substantially changing its disclosure, if at least 10 significant foreign subsidiaries vanished from its Exhibit 21. Moreover, we reclassify a firm as not substantially changing its disclosure, if the firm does not fulfil our definition in the subsequent year anymore. Thus, we guarantee that the change in Exhibit 21 is not only a temporary phenomenon. In the following, we refer to this phenomenon as change disclosure. Thus, change year refers to the year in which this definition is fulfilled and pre-change year to the year before. All other firms that do not noticeable change their disclosure are considered as control firms.

In our main definition we do not consider the U.S. subsidiaries disclosed in Exhibit 21, as we analyze the influence of public disclosure on international tax avoidance. However, in additional analysis we also check the robustness of our results for the consideration of U.S. subsidiaries.

To further investigate disclosure behavior, we contacted the investor relations departments of some of those firms that substantially changed the

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[12] The analyzed period ends in 2014 as this is the last year that is included in Dyreng's database.

number of significant foreign subsidiaries reported. We asked them via letters and email about the reasons for their decreasing number of foreign subsidiaries disclosed in Exhibit 21. Only very few firms responded to our request. We interpret this fact as an indication of their rather reluctant behavior concerning the supply of publicly available company information. For those firms that responded to our request, tax planning was not of particular importance. The firms refer to M&A activities as the main reason for their changes in disclosure. If we attempt to verify this explanation, we are unable to retrace all of the vanishing foreign subsidiaries as being related to the respective restructuring process. Because restructuring partly might be a reason in some cases, we however account for changes in Exhibit 21 due to M&A activities. We assume that a firm's total assets should noticeable decline, if and when it sells parts of its business. Accordingly, we treat firms as not substantially changing their disclosure, if the firm's total assets also decline by more than 50 percent in additional analysis.

Imposing our main definition on our research sample identifies 276 firms that noticeably reduced their public disclosure of foreign subsidiaries; among them Avis Budget Group Inc., Best Buy Co. Inc., Boeing Co., Coca-Cola Co., Emerson Electric Co., Merck & Co., Nike Inc., Oracle Corp., PepsiCo Inc. and Starbucks Corp. To further describe the characteristics of the 276 firms, table 1 shows the industries as well as the years in which these firms fulfil our main definition. The years in which most of the firms change their disclosure are 2012 and 2013. In these two years more than 65 percent of all cases took place. Referring to Fama-French industry classification, table 1 shows that the substantial changes in Exhibit 21 reporting is distributed across all industries.

Table 1: Characteristics of Firm's that Substantially Change Disclosure

Industry	Frequency	Change Year	Number of Firms
Food	12	2010	12
Mining & Minerals	1	2011	64
Oil & Petroleum Products	9	2012	98
Textiles, Apparel & Footwear	11	2013	84
Consumer Durables	5	2014	18
Chemicals	13		
Drugs, Soap, Perfumes, Tobacco	11		
Construction & Construction Materials	6		
Steel Works	3		
Fabricated Products	5		
Machinery & Business Equipment	70		
Automobiles	7		
Transportation	10		
Utilities	1		
Retail Stores	8		
Banks, Insurance Companies & Other Financials	11		
Other	93		
Total	276	Total	276

Notes: Table 1 gives an overview on the firms that substantially change disclosure of foreign subsidiaries listed in Exhibit 21 as it summarizes the industry and the year in which the firms changes its disclosure. The industry classification is based on Fama and French.

Those 276 firms that have changed their disclosure of foreign subsidiaries listed in Exhibit 21 reported on average subsidiaries in 27.9 distinct countries in the last year before the disclosure change. In the year of disclosure change, this number declines to 15.3 countries. This means that on average 12.6 countries vanish from each firm's Exhibit 21. We used the Exhibit 21 disclosures to identify the top 20 countries in which most firms with a changing Exhibit 21 disclosure

reported at least one subsidiary in the last year before they change their disclosure to less transparency and in the year of the change in disclosure. Table 2 provides the respective lists of countries disclosed in Exhibit 21. Information about subsidiaries located in tax haven countries is often perceived as evidence for an aggressive tax avoidance strategy (Dyreng and Lindsey, 2009; Balakrishnan, Blouin and Guay, 2012; Donohoe, McGill and Outslay, 2012). However, tax haven countries and other countries vanish in a similar manner, i.e. the firms that change disclosure rather decide to reduce transparency overall and not only for particular countries.

Table 2: Vanishing Countries

Country	Pre-Change Year	Country	Change Year
Great Britain	270	Canada	218
Canada	257	Australia	154
Germany	237	India	152
China	234	Mexico	147
Netherlands	232	Japan	144
France	226	France	138
Hong-Kong*	208	Hong-Kong*	125
Mexico	207	China	117
Australia	205	Singapore*	116
Japan	203	Rep. of Korea	112
Singapore*	197	Netherlands	105
India	190	Ireland*	99
Italy	190	Luxemburg*	82
Brazil	185	Thailand	82
Spain	177	Malaysia	75
Rep. of Korea	169	Argentina	73
Switzerland*	164	Belgium	72
Ireland*	151	Germany	71
Sweden	142	Chile	69
Belgium	140	Switzerland*	68

Notes: Table 2 presents the top 20 countries in which the firms that substantially changed disclosure of foreign subsidiaries in Exhibit 21 reported at least one subsidiary in their Exhibit 21. Pre-Change Year (Change Year) refers to the number of firms that reported at least one subsidiary in the respective country according to their Exhibit 21 in the year prior to the decision to noticeably change disclosure (the change year). Countries marked with a * are tax havens following Dyreng and Lindsey's (2009) definition.

2.3.2. Sample Selection

We use two distinct sources: financial statement information from Compustat North America and subsidiary information disclosed in Exhibit 21 of Form 10-k. Our starting point for data sampling is the Exhibit 21 dataset provided

by Scott Dyreng.[13] We use these data for the fiscal years 2009 through 2014. According to our definition a firm has to eliminate more than 10 subsidiaries to be considered as firm that has substantially changed disclosure in Exhibit 21. Consequently, we do not consider observations of firms reporting 10 or less foreign subsidiaries in our control group.

In a next step, we add the financial statement data from Compustat for the fiscal years 2009 till 2014. The two datasets are combined by CIK number. As we analyze the tax planning behavior of U.S. MNEs, we limit our sample to firms disclosing their financial statements in U.S. dollars and having their headquarters located in the U.S. Moreover, we require the firms to report subsidiaries in at least one foreign country.

Financial statement information is used to compute the tax avoidance measures and most of the variables used for the determination of our propensity scores. Our analysis focuses on *Foreign ETR* as a tax measure. Hence, we require non-missing values for foreign pre-tax income (*pifo*) and foreign income taxes (*txfo* and *txdfo*). As it is difficult to analyze our results concerning the tax planning activities of unprofitable companies in the respective period, we restrict the sample to firms having a positive pre-tax income (*pi*) and a positive pre-tax foreign income (*pifo*).

We derive a final sample consisting of 878 companies of which 276 decide to reduce their transparency concerning the reporting of foreign subsidiaries in Exhibit 21 between 2010 and 2014. For the treatment period (2010-2014), our final sample consists of 2,477 firm-year observations. 1,635 of these belong to control firms. The remaining 842 firm-year observations pertain to those firms

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[13] We thank Scott D. Dyreng for offering his Exhibit 21 dataset for download on https://spreadsheets.google.com/viewform?formkey=dElURjI1eUJvWDhHSmMwMmFPVmdv Vnc6MQ. Further description of the dataset can be found in Dyreng and Lindsey (2009).

that substantially reduce the number of subsidiaries reported in Exhibit 21. 469 of these firm-year observations refer to years prior to the change year whereas 373 refer to the post-change period.

2.3.3 Explorative Analysis

We expect that firms reduce transparency in order to engage in further tax avoidance. ETRs are well-accepted measures for tax avoidance of MNEs (cf. for example Plesko 2003; Dyreng, Hanlon and Maydew, 2008), as a lower ETR suggests that a firm is more effectively avoiding income taxes compared to firms with higher ETR measures. Since we are mainly interested in international tax avoidance, we focus our analysis on a firm's *Foreign ETR* as Tax Measure. However, to show the robustness of our results we also consider *Foreign ETR Current* and *GAAP ETR*.[14]

To get a first insight into the corporate tax planning of firms before and after they substantially reduced the number of foreign subsidiaries reported in their Exhibit 21, we provide an explorative analysis of our data. Table 3 compares the ETR measures und provides simple *t*-test results.

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[14] To limit the influence of outliers, we delete ETRs < 0 and ETRs > 1. Variables are described in the appendix.

Table 3: T-tests before Matching

| | pre-change period | | | post-change period | | |
	Treated	Control	Diff	Treated	Control	Diff
Foreign ETR	0.252	0.247	0.004	0.233	0.247	-0.014**
			(0.008)			(0.008)
Foreign ETR Current	0.273	0.267	0.006	0.252	0.267	-0.014*
			(0.008)			(0.009)
GAAP ETR	0.283	0.290	-0.007	0.277	0.290	-0.013**
			(0.006)			(0.007)

Notes: Table 3 presents results of several t-tests that are applied to test whether ETR measures of firms that change disclosure in Exhibit 21 (change firms) are lower compared to control firms' ETRs. The left column ("pre-change period") compares mean *Foreign ETR, Foreign ETR Current* and *GAAP ETR* of our change firms prior to the change to the respective mean measure of our control firms whereas in the right column ("post-change period") years from the change year onwards are considered for the change firms. For the control firms the ETR measures are considered for our full sample period (2010-2014) in both columns. For *Foreign ETR*, results are based on 1,635 observations for our control firms, 469 pre-change and 373 post-change observations for our change firms. The *Foreign ETR Current* row includes 1,614, 463 and 368 observations whereas the *GAAP ETR* column includes 1,529, 433 and 346 observations. The Variables are defined in the appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

In the left column we consider the respective ETR measure for those firms that reduce disclosure in Exhibit 21 prior to the change year whereas we consider the years from the change year onwards for these firms in the right column. We compare both – the average ETR measure of pre-change period and the average ETR measure of post-change period – with the respective ETR measure of firms that have not changed their disclosure attitude. For our main variable of interest, *Foreign ETR*, the results are based on 1,635 control group, 469 pre-treatment and 373 post-treatment firm-year observations. The left column of table 3 shows that those firms that change disclosure do not differ significantly from our control firms concerning foreign tax avoidance measured by *Foreign ETR* prior to the decision to become less transparent regarding the international firm structure reported in Exhibit 21. In contrast, these firms face a significantly lower foreign tax burden compared to our control firms afterwards. They have, significant at the

5 percent level, a 1.4 percentage point lower *Foreign ETR* in the periods after they decided to reduce transparency.

These results hold, if we consider our additional measures of tax avoidance. For both, *Foreign ETR Current* and *GAAP ETR*, table 3 depicts those firms that shorten the list of foreign subsidiaries do not differ significantly from our control firms prior to the decision to become intransparent while they do differ afterwards. In the post-change period, our changing firms have on average a 1.4 percentage point lower *Foreign ETR Current* and a 1.3 percentage point lower *GAAP ETR* compared to our control firms.

Taking the results for all ETR measures presented in table 3 together, those firms that reduced transparency about their firm structure cannot be distinguished from other firms by their tax planning attitude prior to the decision to noticeably change their disclosure in Exhibit 21. Together with reducing transparency concerning their international firm structure, these firms extend their tax planning activities and hence have significantly lower ETR measures than other firms.

2.3.4. Propensity Score Matching

Even though the results presented in table 3 already indicate that the 276 identified firms become more tax aggressive in the aftermath of the decision to become less transparent regarding their international firm structure, these results have some limitations. First, it is not possible to compare the trend in the tax avoidance measures of these firms in the post-change period to similar control firms in the same period as we cannot observe pre- and post-change periods for our control firms. Second, the change in corporate tax planning behavior of these firms compared to control firms might be attributed to other confounding determinants. Third, MNEs might have reduced the number of subsidiaries

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disclosed in their Exhibit 21, because they were already tax aggressive with regard to their foreign activities.

The optimal setting to solve these problems would be to observe and compare the development of tax planning behavior for the same firm in two scenarios. In the first scenario, the firm decides to substantially reduce the number of foreign subsidiaries reported in Exhibit 21 and in the second scenario the same firm does not use this option. As this is not possible, the best alternative is to identify firms of our control group that are as similar as possible regarding their tax avoidance opportunities and attitude prior to the change for each firm that decides to shorten the list of foreign subsidiaries reported in Exhibit 21. In this case, we can assume that the change in our ETR measures would be the same for both groups in the absence of the decision to become intransparent. Therefore, we use propensity score matching (PSM) to corroborate these problems. We identify partners for each firm that noticeably changes its Exhibit 21 reporting that are similar regarding the determinants of international tax planning in the year prior to this decision.

One concern with an analysis of tax avoidance behavior is the potential endogeneity of a firm's status. Admittedly, the MNE's existing tax avoidance strategy might as well influence the decision to reduce the information provided in Exhibit 21. PSM is a feasible technique to address the potential bias caused by selection on observables (Titus, 2007; Caliendo and Kopeinig, 2008).[15] It solves the potential endogeneity problem by selecting a control group (firms without a

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[15] The self-selection bias has been discussed extensively in prior research (e.g. Tucker, 2010). Many studies implement an instrumental variable or apply the two-step Heckman procedure using Inverse Mill's Ratio (Dwenger and Steiner, 2012; Badertscher, Katz, and Rego, 2013). Basically, both methods require an instrument, which explains the potentially endogenous variable, but has no effect on the dependent variable. In most cases it is difficult to have a consistent estimator, i.e. a variable that neither correlates with the outcome nor with any unobservables (Heckman, 1997; Blundell and Dias, 2000; Heckman and Li, 2004). Therefore, the need for a consistent instrument is a major limitation for this approach.

change in disclosure) that is as similar to the treatment group (firms that reduce information in Exhibit 21) as possible prior to the disclosure change. As control and treatment firms do not differ significantly concerning their tax planning attributes prior to the treatment, we can isolate the development of foreign tax aggressiveness post-treatment. The only difference between the groups lies in the decision to substantially reduce the number of subsidiaries reported in Exhibit 21 disclosure or not. Since the assumption is to have two equally tax aggressive groups, the results show the effect of a public disclosure change on tax avoidance.

According to Rosenbaum and Rubin (1983), identifying control and treatment firms requires a two-step approach: In a first step, a probit model including a vector of all relevant pre-treatment observables X_i is used to compute the probability to be in the treatment group (propensity score). In a second step, these propensity scores are used to identify one or more control firms for each treated firm that are sufficient similar with respect to the pre-treatment observables X_i.

Concerning the first step, it is important to choose the relevant pre-treatment, in our case pre-changing Exhibit 21, observables driving the self-selection bias. Only variables that influence both, treatment decision – the decision to reduce transparency in Exhibit 21 – and outcome variable – the *Foreign ETR* – should be included (Caliendo and Kopeinig, 2008; Augurzky and Schmidt, 2001).

Therefore, we consider a variety of well-known determinants of the ETR that have been used in prior research. Prior literature developed tax avoidance determinants in terms of more general firm characteristics and particular variables

that reflect certain international tax planning strategies. We include both set of variables to determine our propensity score.

The variables used are the following: We consider *SIZE* as a control for the impact of general tax planning determinants (Zimmermann, 1983; Wang, 1991; Plesko, 2003; Rego, 2003; Chen et al., 2010). *PROFITABILITY* is included to capture that more profitable firms have more opportunities and incentives to reduce tax expenses by engaging in tax avoidance (Gupta and Newberry, 1997; Plesko, 2003; Rego, 2003; Chen et al., 2010). As a high level of property, plant and equipment causes a tax reduction due to the deductibility of high depreciations (Gupta and Newberry, 1997) and might also indicate less mobility of taxable income regarding international tax planning strategies, we consider the variable capital intensity (*CAPINT*). Firms with a high level of debt can use the deductibility of interest expenses to reduce their tax burden (Plesko, 2003; Hanlon and Heitzman, 2010; Chen et al., 2010; Markle and Shackelford, 2012b). The variable *LEV* captures this. As the utilization of prior operating tax loss carryforwards should reduce current period tax payments (Mackie, 1999; Cooper and Knittel, 2010), we include the dummy variable *NOL* that captures decreases in tax loss carry forwards.[16] Previous studies have confirmed that the mobility of income increases, if a firm has many intangible assets or high expenses for R&D or advertising (Harris, 1993; Grubert, 2003). Hence, we include the variable *R&D*. Intense usage of tax haven countries for the location of affiliates is associated with more intense tax avoidance (Dyreng and Lindsey, 2009; Balakrishnan, Blouin and Guay, 2012; Lindsey and Wilson, 2015). Following the tax haven countries'

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[16] Note that we have replaced missing values for tlcf in Compustat with the value zero, expecting that these firms do not have any tax loss carryforwards in the respective period.

definition of Dyreng and Lindsey (2009), we include *HAVEN* to capture the effect of tax haven subsidiaries. All variables are defined in the appendix.

Using these observable characteristics, we compute the propensity score in accordance with Heckman, Ichimura and Todd (1998). Matching in the year before disclosure was changed, we require all firms to have a non-missing *Foreign ETR* in the year of the disclosure change and the year before as these values are required for our difference-in-differences approach. [17]

In the second step, the propensity scores are used to match the treatment firms with the control firms using a one to five nearest neighbor algorithm (with replacement). It is required to define the limit of deviation between the propensity score of treated and matched control firms, i.e. the maximum caliper. Prior literature identifies that higher calipers of 0.02 or 0.03 perform superior. Moreover, 20 percent of the standard deviation of the propensity score is seen as the optimal caliper (Austin, 2011; Lunt, 2014). In our case, these rules lead to the optimal caliper of 0.02[18]. Tax avoidance opportunities differ across industries due to the different business models (Balakrishnan, Blouin and Guay, 2012). Therefore, we ensure that only observations from the same year and industry are matched. We consider the Fama and French classification of 17 different industry groups. [19] In comparison to one to one nearest neighbor matching, one to five nearest neighbors matching is more reliable as it reduces the variability of the nearest neighbor estimator (Blundell and Dias, 2008). However, to ensure that the

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[17] We require companies to have non-missing values for all components of the dependent and independent variables in the matching year. However, visual inspection of several Form 10-k filings reveals that many of the missing values, especially for R&D expenses, in Compustat should be coded as zero. Therefore, we set missing values of the variable *R&D* to zero. Additionally, we exclude observations with implausible values as *LEV* > 1 and *CAPINT* > 1 from our sample.

[18] The average probability to participate in the group that substantially changes disclosure in Exhibit 21 for all firms is 0.32. The standard deviation is 0.12.

[19] Updated industry-classification can be downloaded from http://mba.tuck.dartmouth.edu/pages /faculty/ken.french/Data_Library/changes_ind.html.

matching results are not driven by the algorithm, we also apply one to one nearest neighbor matching (with replacement).

Propensity score matching selects the control group by observable variables only. Hence, our results might be negatively influenced by omitted variables. We therefore combine propensity score matching with a difference-in-differences approach that accounts for time-invariant unobservables (Heckman et al., 1998; Caliendo and Kopeining, 2008). The propensity score matching creates two groups that are primarily similar in their tax planning attitude and do only differ in their decision to become less transparent regarding the reporting of international firm structures in Exhibit 21 and their post-development. In other words, in the absence of the decision to change disclosure both groups should not differ in the change year either. Using these two groups, we estimate the effect of this decision on our ETR measures by using difference-in-differences.

2.4.   Empirical Results

2.4.1.   Main Findings

In accordance with prior literature, we consider Exhibit 21 as a reliable source for the geographic location of MNEs' subsidiaries until 2009. Hence, in our sample the treatment, i.e. the decision to noticeably change disclosure in Exhibit 21, can take place between 2010 and 2014. As we match in the fiscal year before the firms change their disclosure (pre-change year), we consider fiscal years between 2009 and 2013 in our probit regression and predict the propensity scores for these years. In a second step, we match each treatment firm to maximum five neighbors.

Table 4 depicts the results of our probit regression which indicates which firm characteristics determine the decision to change disclosure. The dependent variable is a dummy variable which is defined as one for those firms that substantially reduce their disclosure of foreign subsidiaries in Exhibit 21 according to our definition and zero otherwise.

Table 4: Probit Regression Results

	(1)
SIZE	0.230***
	(0.020)
PROFITABILITY	-0.805*
	(0.420)
CAPINT	-0.304**
	(0.122)
LEV	-0.016
	(0.184)
NOL	0.016
	(0.099)
R&D	1.657**
	(0.687)
HAVEN	-0.264
	(0.173)
Constant	-2.071***
	(0.170)
N	2,253

Notes: Table 4 presents the probit regression results used for the prediction of our propensity score. The Variables are defined in the appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

The results show that *SIZE*, *PROFITABLITY*, *CAPINT* and *R&D* have a significant influence on the decision. In line with our expectations, we find large

firms with low capital intensity tend rather to reduce transparency than other firms. High values for *R&D* indicate more possibilities for international tax avoidance. Hence, it is very interesting that these firms tend to have a significant higher probability to be in the treatment group.

Following our probit regression, we compute our propensity score and use it to match our treatment firms to a maximum of five neighbors from our control group. Table 5 compares the means of all variables considered for the matching between treatment and control group before and after the matching. Moreover, it shows the standardized bias for all observable variables.

Table 5: One to Five Nearest Neighbors Matching Quality

		Mean		Bias	t-test	
		Treated	Control	(in %)	t	p>t
SIZE	Unmatched	8.3614	7.7666	41.4	5.25	0.000
	Matched	7.9533	7.9999	-3.2	-0.31	0.758
PROFITABILITY	Unmatched	0.0962	0.1072	-16.2	-1.96	0.050
	Matched	0.0979	0.1042	-9.1	-0.77	0.441
CAPINT	Unmatched	0.3520	0.3918	-16.4	-2.02	0.044
	Matched	0.3543	0.3612	-2.8	-0.23	0.818
LEV	Unmatched	0.2206	0.2033	10.0	1.23	0.220
	Matched	0.2068	0.2156	-5.1	-0.41	0.681
NOL	Unmatched	0.0884	0.0901	-0.6	-0.07	0.942
	Matched	0.0923	0.1060	-4.8	-0.37	0.713
R&D	Unmatched	0.0344	0.0293	11.8	1.51	0.131
	Matched	0.0367	0.0348	4.3	0.32	0.747
HAVENS	Unmatched	0.1932	0.1890	3.4	0.41	0.684
	Matched	0.1860	0.1910	-4.0	-0.35	0.724

Notes: Table 5 presents the relevant matching characteristics before and after the matching. The results are formed on one to five nearest neighbors matching in the pre-treatment period requiring a propensity score of less than 0.02. Variables are defined in the appendix.

A standardized bias of up to about 5 percent after the matching is considered as reasonable. Higher biases are considered as too high and indicate a lack of balancing (Caliendo and Kopeinig, 2008). Overall, we reached a good matching quality as we successfully reduced the mean bias to below five percent, i.e. 4.8 percent. However, table 5 shows that in the case *PROFITABILITY* and *LEV* the bias is above 5 percent. This is not considered as a problem as the t-statistics indicate that the differences are still insignificant after the matching. Moreover, the bias is reduced in both cases.

The difference-in-differences results for the matched sample are presented in table 6. The results are based on a one to five nearest neighbors (1:5 NN) matching algorithm with *Foreign ETR* as outcome variable. Our propensity score matching matched 130 firms that decided to substantially reduce the number of foreign subsidiaries reported in Exhibit 21 with 329 control firms. Hence, our results for *Foreign ETR* presented in table 6 include 260 treated and 658 control observations. The column "pre-change year" compares the mean values of our treatment groups' ETR measures to the control group in the year prior to the decision to reduce transparency in Exhibit 21, i.e. the matching year whereas the column "change year" compares the two groups in the year the treatment firm decides to shorten its list of foreign subsidiaries. The last column shows the difference-in-differences estimator. Robust standard errors are clustered by firms.

Table 6: Difference-in-Differences Results after 1:5 Nearest Neighbors Matching

1:5 NN	pre-change year			change year			Diff-in-Diff
	Treated	Control	Diff	Treated	Control	Diff	
Foreign ETR	0.252	0.230	0.022	0.230	0.240	-0.009	-0.031**
			(0.017)			(0.016)	(0.013)
Foreign ETR Current	0.276	0.252	0.024	0.244	0.257	-0.013	-0.037**
			(0.019)			(0.016)	(0.017)
GAAP ETR	0.279	0.273	0.006	0.271	0.287	-0.016	-0.022*
			(0.012)			(0.013)	(0.013)

Notes: Table 6 presents difference-in-differences results after one to five nearest neighbors matching with *Foreign ETR Current* as outcome variable by showing the mean outcome of *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR* for treatment and control group before and after the decision to substantially reduce disclosure as well as its difference. "Pre-change year" refers to the year before the decision and "change year" to the year in which the firm actually reduces its reporting. Results are based on 260 observations in the treated group and 658 in the control group for *Foreign ETR*, 254 and 651 for *Foreign ETR Current* and 239 and 616 for *GAAP ETR* respectively. Robust standard errors clustered by firm are shown in parentheses. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

Table 6 shows that the propensity score matching aligned treatment and control group regarding their tax planning behavior prior to the decision to reduce transparency. Hence, we do not find a significant difference between the two groups before the change in disclosure takes place. Moreover, the mean values of all our ETR measures decreased from the pre-change to the change years for our treatment group while the respective control groups' measures do not decrease. The last column presents the difference-in-differences results. The difference-in-differences approach relies on the assumption that in the absence of the decision to substantially change disclosure, the change in *Foreign ETR* would be the same for both groups. The estimator is negative and statistically significant for *Foreign ETR*. Hence, the results presented in table 6 indicate a reduction in *Foreign ETR* of about 3.1 percentage points caused by the decision to noticeably change disclosure in Exhibit 21.

Table 6 depicts similar results, if we apply *Foreign ETR Current* and *GAAP ETR* on our matched sample. Based on 254 treated and 651 control observations, we find a reduction of 3.7 percentage points in *Foreign ETR Current* ascribable to the decision to change disclosure. Regarding the *GAAP ETR*, we identify a reduction of 2.2 percentage points based on 239 treated and 616 control observations.

2.4.2. Robustness Checks – Propensity Score Matching

To assure the quality of our propensity score matching, we perform several robustness checks. First, we assure that our results are not driven by the matching algorithm. Hence, we apply a one to one nearest neighbor algorithm (with replacement) with *Foreign ETR* as outcome variable. Applying this matching procedure, we reach an acceptable matching quality (mean bias of 5.1 percent). The results based 260 treated and 228 control observations are shown in table 7.

Table 7: Difference-in-Differences Results after 1:1 Nearest Neighbor Matching

1:1 NN	pre-change year			change year			Diff-in-Diff
	Treated	Control	Diff	Treated	Control	Diff	
Foreign ETR	0.252	0.227	0.025	0.230	0.244	-0.014	-0.038**
			(0.018)			(0.018)	(0.017)
Foreign ETR Current	0.276	0.244	0.032	0.244	0.262	-0.019	-0.051**
			(0.020)			(0.019)	(0.021)
GAAP ETR	0.279	0.264	0.015	0.271	0.289	-0.018	-0.034**
			(0.016)			(0.015)	(0.016)

Notes: Table 7 presents diff-in-diff results after one to one nearest neighbor matching with *Foreign ETR Current* as outcome variable by showing the mean of *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR* for treatment and control group before and after the decision to change disclosure as well as its difference. "Pre-change year" refers to the year before the decision and "change year" to the year in which the firm reduces its reporting. Results are based on 260 observations in the treated group and 228 in the control group for *Foreign ETR*, 254 and 226 for *Foreign ETR Current* and 239 and 213 for *GAAP ETR* respectively. Robust standard errors clustered by firm are shown in parentheses. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

The results presented in table 7 are similar to those of the one to five nearest neighbors matching. Once again, we find a negative and statistically significant difference-in-differences estimator for all tax avoidance measures while the two groups do not differ significantly in the pre-change year. For *Foreign ETR* we identify a at the 5 percent level significant reduction of 3.8 percentage points resulting from the decision to reduce transparency. This result is very similar to the 3.1 percentage points we identified in the difference-in-differences estimations of table 6. Similar, we do find a negative and statistically significant effect for the difference-in-differences estimators of *Foreign ETR Current* and *GAAP ETR*. Hence, we assume that our results are not driven by the matching algorithm.

To assure that the effect identified in section 2.4.1 is not just a temporary effect arising in the treatment period, we consider the pre-change year and the previous year as "pre-change period" and the change year and the year afterwards as "post-change period". Table 8 presents the results.

Table 8: Enlarging Pre- and Post-Change Period: Difference-in-Differences Results after 1:5 Nearest Neighbors Matching

1:5 NN	pre-change period			post-change period			Diff-in-Diff
	Treated	Control	Diff	Treated	Control	Diff	
Foreign ETR	0.250	0.231	0.019	0.232	0.238	-0.006	-0.024*
			(0.015)			(0.015)	(0.013)
Foreign ETR Current	0.270	0.249	0.021	0.248	0.256	-0.009	-0.029**
			(0.016)			(0.015)	(0.015)
GAAP ETR	0.285	0.274	0.010	0.279	0.287	-0.008	-0.018*
			(0.011)			(0.011)	(0.011)

Notes: Table 8 presents difference-in-differences results after one to five nearest neighbors matching with *Foreign ETR Current* as outcome variable by showing the mean outcome of *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR* for treatment and control group before and after the decision to substantially reduce disclosure as well as its difference. "Pre-change period" refers to the period including two years prior to the change year and "post-change period" refers to the year in which the firm actually reduces its reporting and the year afterwards. Results are based on 439 observations in the treated group and 1,130 in the control group for *Foreign ETR*, 437 and 1,128 for *Foreign ETR Current* and 412 and 1,085 for *GAAP ETR* respectively. Robust standard errors clustered by firm are shown in parentheses. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

As expected, we identify a negative and statistically significant estimator for all of our ETR measures in table 8. Accordingly, we can assure that the trend in additional tax avoidance due to the decision to noticeably change disclosure of foreign subsidiaries exists.

Choosing the treatment year has a great impact on our results. To assure that our results do not identify a general trend, we perform a placebo test by shifting the treatment year considered, i.e. the year in which our changing firms decide to reduce the level of disclosure in Exhibit 21, for our difference-in-differences estimation by one year in each direction.[20] We expect to find no significant effect. Table 9 shows the respective results.

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[20] Note that our sample size changes slightly as some firm-year observations are missing now.

Table 9: Varying Change Disclosure Year: Difference-in-Differences Results after 1:5 Nearest Neighbors Matching

1:5 NN	Baseline			Follow Up			Diff-in-Diff
	Treated	Control	Diff	Treated	Control	Diff	
Shifting one year back							
Foreign ETR	0.247	0.233	0.014	0.252	0.230	0.022	0.008
			(0.018)			(0.017)	(0.015)
Foreign ETR Current	0.263	0.247	0.017	0.276	0.252	0.024	0.008
			(0.019)			(0.019)	(0.018)
GAAP ETR	0.291	0.276	0.015	0.279	0.273	0.006	-0.009
			(0.015)			(0.012)	(0.015)
Shifting one year forward							
Foreign ETR	0.230	0.240	-0.009	0.235	0.235	0.000	0.010
			(0.016)			(0.020)	(0.018)
Foreign ETR Current	0.244	0.257	-0.013	0.254	0.256	-0.001	0.012
			(0.016)			(0.020)	(0.018)
GAAP ETR	0.271	0.287	-0.016	0.291	0.286	0.005	0.022
			(0.013)			(0.016)	(0.016)

Notes: Table 9 presents difference-in-differences results after one to five nearest neighbors matching with *Foreign ETR Current* as outcome variable by showing the mean outcome of *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR* for treatment and control group before and after the decision to substantially reduce disclosure as well as its difference. In the upper part "Shifting one year back" the change year is shifted one year back. Results are based on 231 observations in the treated group and 595 in the control group for *Foreign ETR*, 232 and 596 for *Foreign ETR Current* and 220 and 583 for *GAAP ETR* respectively. In the other half of the table "Shifting one year forward" the change year is shifted one year forward. Results in this part are based on 208 observations in the treated group and 535 in the control group for *Foreign ETR*, 205 and 532 for *Foreign ETR Current* and 192 and 502 for *GAAP ETR* respectively. Robust standard errors clustered by firm are shown in parentheses. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

In line with our expectation, Table 9 depicts no significant results for any specification. Thus, the results support our assumption that the different development in our tax avoidance measures is driven by the decision to substantially reduce transparency regarding the disclosure of firm structures.

2.4.3. Robustness Checks – Alternative Measures for Treatment

In further robustness checks, we focus on two different modifications of our treatment group identification in order to show the robustness of our main results. Once again, we apply our favored matching algorithm, i.e. the one to five nearest neighbors with *Foreign ETR* as outcome variable. Table 10 depicts the respective difference-in-differences results.

Table 10: Alternative Measures for Change in Disclosure: Difference-in-Differences Results after 1:5 Nearest Neighbors Matching

1:5 NN	pre-change year			change year			Diff-in-Diff
	Treated	Control	Diff	Treated	Control	Diff	
Including total assets reclassification							
Foreign ETR	0.252	0.232	0.020	0.230	0.240	-0.010	-0.030**
			(0.017)			(0.016)	(0.013)
Foreign ETR Current	0.276	0.252	0.025	0.244	0.257	-0.013	-0.038**
			(0.018)			(0.016)	(0.017)
GAAP ETR	0.273	0.279	0.007	0.271	0.287	-0.016	-0.023*
			(0.012)			(0.013)	(0.013)
Considering U.S. Subsidiaries							
Foreign ETR	0.248	0.228	0.020	0.237	0.242	-0.005	-0.025*
			(0.017)			(0.016)	(0.014)
Foreign ETR Current	0.274	0.250	0.024	0.248	0.263	-0.015	-0.039**
			(0.018)			(0.017)	(0.018)
GAAP ETR	0.279	0.275	0.003	0.269	0.287	-0.018	-0.022
			(0.012)			(0.012)	(0.013)

Notes: Table 10 presents difference-in-differences results after one to five nearest neighbors matching with *Foreign ETR Current* as outcome variable by showing the mean outcome of *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR* for treatment and control group before and after the decision to substantially reduce disclosure as well as its difference. "Pre-change year" refers to the year before the decision and "change year" to the year in which the firm actually reduces its reporting. In the upper part "Including total assets reclassification" treatment firms are reclassified as control firm if their total assets simultaneously decline by more than 50 percent. Results are based on 260 observations in the treated group and 664 in the control group for *Foreign ETR*, 254 and 657 for *Foreign ETR Current* and 239 and 623 for *GAAP ETR* respectively. In the other part "Considering U.S. subsidiaries" treatment firms are not considered as treatment firms if firms do not also reduce their list of subsidiaries including U.S. subsidiaries by more than 50 percent. Results are based on 270 observations in the treated group and 654 in the control group for *Foreign ETR*, 264 and 648 for *Foreign ETR Current* and 248 and 615 for *GAAP ETR* respectively. Robust standard errors clustered by firm are shown in parentheses. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively

Restructuring might be partly a reason for the reduction in the list of foreign subsidiaries disclosed in some cases. Therefore, we account for changes in Exhibit 21 due to M&A activities in our first variation. We assume that a firm's total assets should noticeably decline, if it sells parts of its business. Hence, in the

upper specification ("including total assets reclassification") we do reclassify treatment firms as control firm, if not only the number of foreign subsidiaries declines by more than 50 percent, but also the firm's total assets. The other prerequisites remain unchanged compared to our main specification. This time we identify 180 firms that changed disclosure prior to the matching. After the matching, we identify 260 treatment and 664 control observations for our main variable of interest, *Foreign ETR*. We are able to confirm our results as the difference-in-differences estimators are negative and statistically significant for *Foreign ETR*, *Foreign ETR Current* and *GAAP ETR*. Moreover, the economical magnitude is of a similar size as well.

In the lower part of table 10 ("considering U.S. subsidiaries"), we do also consider U.S. subsidiaries disclosed in Exhibit 21. This time, we do not consider a firm as changing substantially its disclosure in Exhibit 21, if the firm does not also reduce its list of subsidiaries by more than 50 percent when we consider the full list of subsidiaries, i.e. including U.S. subsidiaries. Imposing this definition on our sample, we identify 179 firms that substantially shortened their list of subsidiaries prior to the matching. Doing our propensity score matching, we identify 270 treated and 654 control observations for *Foreign ETR*. The difference-in-differences coefficients are again negative and significant for our foreign tax avoidance measures (*Foreign ETR* and *Foreign ETR Current*). For *GAAP ETR*, our difference-in-differences estimator is just insignificant (p-value of 0.101). Hence, the results presented in table 10 confirm mainly our findings that our treatment firms avoid additional taxes.

2.5.   Conclusion

While it is well known that MNEs use different tax planning strategies to reduce their tax burden, there is less knowledge about how public disclosure affects the scope of international tax avoidance. Therefore, the aim of our study is to provide new insight into the relationship between public disclosure of group structures of U.S. MNEs and tax aggressiveness.

We analyze the effect of public disclosure on the attitude of tax aggressiveness by taking into account the phenomenon that several companies removed a substantial number of subsidiaries from their Exhibit 21 between 2009 and 2014. Our study identifies more than 250 U.S. MNEs that reduced more than 50 percent of their significant foreign subsidiaries. In an empirical analysis, we use PSM to compare the scope of tax avoidance of these firms with the tax avoidance behavior of U.S.-based MNEs that did not change their disclosure of foreign subsidiaries.

Our empirical results reveal a significantly different development in international tax avoidance resulting from the decision to become less transparent. Those firms with vanishing foreign subsidiaries in their Exhibit 21 become more tax aggressive after changing their public disclosure behavior compared to firms that did not change their public disclosure attitude. Our findings are supported by a series of robustness tests, applying different tax avoidance measures, matching algorithm, treatment years and treatment firm specifications.

Our study contributes to the recent debate about tax transparency. From our analysis, we conclude that tax aggressiveness and public disclosure are related. Therefore, our results suggest that publicly disclosed country-by-country information could influence MNEs' tax avoidance behavior.

APPENDIX

Variable Definitions

CAPINT	*ppeveb* / *at*
Changing Disclosure Firm	Dummy, which equals one if the number of subsidiaries has declined by > 50 percent from t_{-1} to t_0 and (i) ≥ 10 subsidiaries are vanished from Exhibit 21, (ii) this definition if still fulfilled from t_{-1} to t_1
Foreign ETR	(*txfo* + *txdfo*) / *pifo*
Foreign ETR Current	*txfo* / *pifo*
GAAP ETR	*txt* / (*pi* – *xi*)
HAVEN	Number of tax haven subsidiaries scaled by total number of foreign subsidiaries reported in Exhibit 21
LEV	(*dltt* + *dlc*) / *at*
NOL	Dummy variable, which equals one if there was a decrease in *tlcf* from fiscal year t-1 to fiscal year t
PROFITABILITY	*pi* / *at*
R&D	*xrd* / *at*
SIZE	log (*at*)

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Chapter 3

Corporate Tax Planning and the Payout Ratio of Firms – Is the Dividend Penalty Linked to ETRs?

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Abstract:

This study investigates whether firms being highly engaged in corporate tax planning react more sensitive to an exogenous variation of the relationship between personal dividend and capital gains tax rates than firms which are less engaged in corporate tax planning. We compile a large cross-country data set from 18 countries (G7 merged with the EU15 member states) over ten years with several tax rate variations. Our findings confirm prior research by showing that a firm's payout decreases if dividends are more heavily taxed than capital gains. However, applying a wide range of different measures for corporate tax planning behavior, we cannot identify significant differences in payout policy between those firms being more engaged in tax planning and other firms as reaction to the relationship of dividend to capital gains taxation.

Chapter 3

Tables

3.1. Introduction

Prior research extensively investigates all facets of corporate tax avoidance a firm uses to reduce its overall tax bill. Besides the scientific debate, the general public has drawn considerably attention to aggressive tax avoidance of multinational entities (MNEs) recently. The debate has been stimulated by very low effective tax rates (ETRs) disclosed in consolidated financial statements of well-known firms. For example, according to its 10-k filings, Google Inc. paid only $2,598 billion taxes on its worldwide profits in 2012, resulting in an ETR of 19.4 %.[21] As statutory tax rates on corporate income are mostly higher than 19 % in most industrialized countries, Google's ETR does not reflect common expectations about the tax level imposed.

Therefore, one may conclude that taxes have become more and more important for firms and the general public. The recent debate primarily focuses on corporate taxes. However, as a big party of the debate – the public – consists of potential investors, the discussion should consequently also take the investor's personal tax burden into account. In most countries corporate earnings are not only reduced by taxation at the corporate's level, but also at the investor's level in terms of capital income taxes. As all involved parties nowadays seem to be more sensitive to corporate tax burdens, we wonder whether firms being highly engaged in corporate tax planning react stronger to a country's tax law change regarding the relationship of personal dividend to capital gains taxation than other firms. The ratio behind this research question is given by the fact that a firm's management on the one hand influences the intensity of the firm's corporate tax planning (cf. Graham et al., 2014) and on the other hand also decides about the

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[21] https://www.sec.gov/Archives/edgar/data/1288776/000119312513028362/d452134d10k.htm#toc1452134_9.

amount of cash which is distributed to its shareholders via dividend payments where according to Brav et al. (2005) personal shareholder taxation has an impact.

Having this link between firms' ETRs and their payout policies in mind, it is straightforward to investigate whether dividend tax planning comes along with or follows corporate tax planning. Moreover, a deeper understanding of firms' personal tax planning behaviors also might lead to a more distinct view of a management's impact on the tax planning policy. Thereby, it might lighten the consequences of a tax rate variation regarding dividend or capital gains taxation for dividend payout in a given country.

We compile a large cross-country data set from 18 countries (G7 and the EU15 member states)[22] over ten years (from 2004 through 2013) in this study. Considering this research design, we are left with 49 variations of the relationship of dividend to capital gains tax rates and about 70,000 firm-year observations. This allows us to capture the effect of many changes in the relationship of dividend to capital gains taxation and therefrom to see whether corporate tax sensitive firms react stronger to these changes. However, our findings only show − in accordance with Jacob and Jacob (2013) − a general negative effect of the relationship of dividend to capital gains tax rates on firm payout. Thus, employing various different measures for corporate tax sensitivity, we do not identify any significant deviation from the average effect.

We contribute to the existing literature in several ways. First, we provide additional evidence and confirm prior literature findings. Firms consider existing differences in personal tax rates for dividends and capital gains when they choose the amount of dividends paid to their shareholders (Brav et al., 2005; Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013).

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[22] Table 1 lists the corresponding 18 countries.

Accordingly, the often met dividend tax penalty[23] in a country affects all dividend paying firms. This emphasizes the importance of the relationship of dividend to capital gains tax rates for all firms. Second, we provide several tests whether firms being relatively more engaged in corporate tax planning do react more sensitive to their investors' personal taxation when determining their level of payout. Our contribution ties on prior literature's surveys which indicate that a firm's management influences both corporate tax planning and the level of dividend payments where personal tax rates do play a role (Brav et al., 2005; Graham et al., 2014). However, the results of this paper indicate that a firm's sensitivity for its shareholders' personal tax burden does not necessarily go hand in hand with its corporate tax planning attitude.

The remainder of the paper is organized as follows. Section 3.2 presents prior literature and outlines the theoretical framework. Section 3.3 describes the methodology, identification strategy and the data used in this study. In Section 3.4, we depict our results and section 3.5 concludes.

3.2. Theoretical Considerations

3.2.1. Prior Literature

The question whether the way private shareholders are taxed affects a corporate's payout policy, is linked to different empirical finance literature's strands (for an overview see Allen and Michaely, 2003). To dedicate oneself to

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[23] The term dividend tax penalty was first introduced by Poterba and Summers (1984). It implicates a tax system in which the personal dividend tax rate is higher than the personal capital gains tax rate. Thus, dividends exhibit a "tax penalty".

this question, it is important to know the tax status of a firm's investors.[24] More specifically, it is of interest whether an investor is tax-exempt or not. Although empirical findings are not unambiguous, strong evidence for investors not being fully tax-exempt exists (Michaely and Vila, 1995; Dhaliwal, Erickson and Trezevant, 1999; Graham, 2008) and therefore personal capital income taxation has an impact for a private investor receiving a MNE's payout.

Prior literature identifies that the difference in taxation of dividends and capital gains is reflected in firms' payout policies (Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013). Additionally, a survey of Brav et al. (2005) reveals that a firm's management cares about its shareholders' personal tax burden. Moreover, prior research finds that rather firms than investors react to changes in dividend and capital gains taxation (Korkeamaki, Liljeblom and Pasternack, 2010). As financial executives generally classify share repurchases and dividends as equally attractive for most investors (Brav et al., 2005), a top executive paying attention to shareholders' tax burden should react sensitive to changes in the proportion of dividend to capital gains tax rates. Hence, a firm's dividend payout ratio should change accordingly.

Considering a firm's own tax bill, it is well known that firms engage in different types of tax planning to lower their corporate tax burden (for an overview see Hanlon and Heitzman, 2010). A broad literature has already analyzed different tax planning strategies used by MNEs to reduce their overall tax bill. MNEs exploit international tax rate differentials by means of transfer pricing for intra-firm sales and intra-firm royalties (Clausing, 2003; Karkinsky

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[24] For reasons of simplicity and following equilibrium arguments, we consider all investors of a given firm as marginal investors in this study. For a discussion whether to speak of price changes of investors or of a specific marginal investor in this context, cf. Guenther and Sansing (2010), p.850.

and Riedel, 2012; Griffith, Miller and O'Connell, 2014) as well as subsidiaries located in tax havens or other low-tax countries (Hines and Rice, 1994; Desai, Foley and Hines, 2006; Huizinga and Laeven, 2006; Klassen and LaPlante, 2012a, 2012b; Blouin, Robinson and Seidman, 2015).

Adding to this, prior literature not only reveals channels used for profit-shifting, but also shows ample evidence that the level a firm engages in coporate tax planning depends on individual top executives. For example, Dyreng, Hanlon and Maydew (2010) find that individual top executives have a decisive influence on firms' ETR measures that cannot be explained by firm characteristics. More specifically, they identify a difference of approximately 11 percent in effective tax rates between the top and the bottom quartiles of executives. Moreover, Graham et al. (2014) find in a survey that answers from 600 corporate tax executives are pointing towards firms' managements being highly interested in corporate tax planning. Besides reducing a firm's overall tax burden, from a management's point of view, corporate tax planning is seen as a source to increase earnings per share (Graham, Campbell and Rajgopal, 2005; Graham et al., 2014).

Even though prior literature shows ample evidence executives conduct corporate tax planning as well as personal tax planning, so far – to the best of our knowledge – no study has analyzed whether at a firm's high engagement in corporate tax planning is associated with a particularly high sensitivity to personal capital income taxation. Put differently, this study analyzes whether a management being highly engaged in corporate tax planning is also committed to reduce the personal tax bill of its investors.

3.2.2. Theoretical Framework

The relationship of dividend to capital gains taxation is important for a firm's payout policy, because investors face the following simple trade-off game: An investor can either receive a dividend payment of a firm while just holding the stock in his portfolio around the ex-day or sell the stock one day before the ex-day cum dividend and rebuy it the next day when the stock trades ex dividend. The investor receives the dividend amount in cash and finally owns the corresponding stock in both scenarios, yet the tax rate for each scenario might differ. The reason for this is that in the first case the dividend tax rate is applicable whereas in the second case the capital gains tax rate is applicable. Hence, if a firm's investor is not fully tax-exempt, he should not be indifferent between receiving the same amount of cash via dividend payments or via capital gains. An investor should rather prefer the alternative which yields a lower tax burden. Therefore, firms should adapt their payout policy to private tax rate changes for dividends or capital gains, if they care about their shareholders' tax burden. Thus, they should react to the given dividend tax penalty.

Beyond that, a management survey from Brav et al. (2005) reveals that personal tax rates for dividend and capital gains matter for the determination of a firm's level of payout dedicated to dividend payments. Moreover, a study from Desai and Jin (2011) uses a sample of institutional shareholders which are heterogeneous in their tax characteristics to analyze whether firms adapt their payout policy due to exogenous tax changes. They find convincing evidence that firms adjust their payout policy in these cases.

As already outlined in section 3.2.1, existing studies show some firms engage in corporate tax planning while others do not (Weisbach, 2002). Prior

literature results clearly show that the (top) management cares noticeably about the amount of corporate taxes paid (Dyreng, Hanlon and Maydew, 2010; Graham et al., 2014). Accordingly, the level of corporate tax avoidance depends on the individual managers' preferences and behavior.

Linking these findings to those of Brav et al. (2005) mentioned above, we conclude that a firm's management not only cares about its corporate tax burden, but also considers its shareholder's personal tax payments. Therefore, if a firm's management is relatively more involved in reducing its corporate tax burden, we suggest that it is also more engaged in reducing their shareholders' tax bills.

3.3. Research Design

3.3.1. Empirical Model

In this study, we employ an OLS regression with industry-year and firm fixed-effects. Our dependent variable is firm i's dividend yield at time *t+1* (*DIVYIELD*). We use *DIVYIELD* at time *t+1*, because the *t+1* year's dividend payment is usually linked to the accounting results of year *t*. Hence, we employ the following difference-in-differences approach to explain our dependent variable *DIVYIELD*:

$$
\begin{aligned}
DIVYIELD_{i,t+1} = \ & \alpha_0 + \alpha_1 PENALTY_{i,t+1} + \alpha_2 PENALTY_{i,t+1} x\ TAXPL_i + \\
& \alpha_3 LEV_{i,t} + \alpha_4 SALES_{i,t} + \alpha_5 TOBINSQ_{i,t} + \\
& \alpha_6 EBITDA_{i,t} + \alpha_7 CASH_{i,t} + \alpha_8 SIZE_{i,t} + \alpha_9 GDP_{i,t} + \\
& j_{s,t} + \gamma_i + \varepsilon_{i,t} \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (1)
\end{aligned}
$$

PENALTY is defined as a simplified version of the dividend penalty introduced by Poterba and Summers (1984), which is reduced in this paper to

$PENALTY_{i,t} = \frac{m^d_{i,t} - m^{cg}_{i,t}}{(1 - m^{cg}_{i,t})}$. It varies across countries and time as m^d and m^{cg} are the corresponding personal dividend and personal capital gains tax rates for year t according to firm i's resident country. We believe this measure to be appropriate, because it reflects the relationship of personal dividend and capital gains tax rates in a rather intuitive way as it is negative if $m^d < m^{cg}$ (or positive if $m^d > m^{cg}$) and thus, its coefficient α_1 is easy to interpret. We use this measure as a proxy for the firms' shareholders' tax rates. Certainly, we recognize that shares are owned by several types of national and international shareholders facing different dividend and capital gains tax rates. However, we believe this benchmark to be most compelling, because earlier studies have found a significant home-bias of investment in shares (French and Poterba, 1991; Mondria and Wu, 2010). Accordingly, we assume that each country's private shareholders account for a large part of investment in their own country. Consequently, we expect α_1 to be negative and statistically significant, if firms care on average about their investors' personal tax burden.

Our coefficient of interest is α_2 of the interaction term *PENALTY x TAXPL.* *TAXPL* is a dummy variable that equals one for firms that are considered as caring more about their corporate tax burden than other firms and zero, if this is not the case. Thus, the coefficient α_2 captures the specific effect of a country's dividend penalty for corporate tax sensitive firms on firm payout. Accordingly, if those firms caring more about their corporate tax burden also care more intense about their shareholders' tax burden, we expect α_2 to be negative and statistically significant.

Corporate tax planning literature has implemented a huge variety of proxies to measure firms' engagement in corporate tax planning. Therefore, this paper

follows different, well-established strategies to measure a firm's tax planning behavior and hence to define *TAXPL*.

One of the most popular ways to assess a firm's tax planning activity is the use of its ETR which can be calculated in different ways (cf. Hanlon and Heitzman, 2010). ETR measures are considered as being volatile on a year-to-year basis, but using ETRs of more than one fiscal year is considered as a good measure for a firm's long-term tax planning behavior (Dyreng, Hanlon and Maydew, 2008; Hanlon and Heitzman, 2010). Therefore, we start our analysis by applying 10-year averages of *GAAP ETR* and *GAAP ETR Current* to separate the calculated averages into two groups for the definition of *TAXPL*.

In our second approach, we draw on a convincing measure developed by Balakrishnan, Blouin and Guay (2012). They assess a firm's engagement in corporate tax planning by comparing its ETR with the average ETR of its size and industry peers. Once again, we separate the resulting ETR difference for all firms into two groups to define our dummy variable *TAXPL*.

Finally, an even more sophisticated approach to identify a firm's level of corporate tax planning is to run a pre-regression of a firm's ETR on different firm-level variables that are linked to corporate tax planning opportunities. Afterwards the actual level of tax planning is benchmarked by using the residuals of this pre-regression. This procedure follows the assumption that leaving variables being associated with aggressive tax avoidance out of the pre-regression shapes the resulting residuals in such a way that one can easily select those firms which are more likely to be engaged in corporate tax planning (cf. Wooldridge, 2009: 31).

Other studies show that certain firm characteristics are associated with tax avoidance. Especially a firm's affiliation to industries which are known as being

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more likely engaged in corporate tax planning than other industries are commonly used characteristics. This is usually expressed by scaled research and development expenditures (Harris, 1993; Grubert, 2003) or dummy variables that account for a firm's affiliation to industries that typically generate the most profits from intellectual property (De Simone, Mills and Stomberg, 2014). Therefore, we assume that a firm's engagement in corporate tax planning and thus our *TAXPL* variable can be defined using these characteristics.

Introduced by prior literature (Jensen, 1986; La Porta et al., 1997; Allen, Bernardo and Welch, 2000; Denis and Osobov, 2008; Skinner 2008; Jacob and Jacob, 2013), the independent variables *LEV*, *SALES*, *TOBINSQ*, *EBITDA*, *CASH, SIZE* and *GDP* represent firm-level or country-level control variables which potentially determine a firm's dividend yield. Their definitions are all explained in appendix 1. Additionally, to prevent the influence of outliers, we omit observations of our independent variable that are not within the 1st and the 99th percentile of observations. The terms $j_{s,t}$ and γ_i represent industry-year and firm-fixed effects whereas $\varepsilon_{i,t}$ is a zero mean disturbance term. Robust standard errors are clustered by country.

3.3.2. Data Description

As we are interested in a potential influence of the relationship of personal dividend taxation to capital gains taxation on the payout policy of firms which are heterogeneous in their intensity of corporate tax avoidance, we collect information about the personal dividend and capital gains tax rates applied in the 18 considered countries (G7 merged with the EU15 member states). In particular, we collect these tax rates for each year during the period from 2004 until 2013. For reasons of consistency, we consider only personal tax rates according to the

highest personal income tax bracket for countries where no flat tax on capital income applies. The personal tax rates used in this study are carefully collected from the European Tax Handbook, KPMG Individual Income Tax Rate Survey, PricewaterhouseCoopers Worldwide Individual Tax Summaries and Ernst and Young Worldwide Personal Tax Guide. Table 1 lists dividend tax rates and capital gains tax rates for each country in 2013.

Table 1: Personal Capital Income Tax Rates 2013

Country	m^d	m^{cg}
Austria	0.25	0.00
Belgium	0.25	0.33
Canada	0.36	0.25
Denmark	0.42	0.42
Finland	0.22	0.32
France	0.37	0.30
Germany	0.26	0.26
Greece	0.10	0.20
Ireland	0.20	0.30
Italy	0.20	0.20
Japan	0.10	0.10
Luxembourg	0.22	0.44
Netherlands	0.25	0.00
Portugal	0.28	0.28
Spain	0.21	0.21
Sweden	0.30	0.30
United Kingdom	0.31	0.28
United States	0.20	0.15

Notes: Table 1 shows personal dividend (m^d) and capital gains (m^{cg}) tax rates for each country in 2013.

Accounting data, dividend information and stock prices used in this study are collected from *Compustat* and *Compustat Global.* All share prices are daily closing prices from Monday to Friday each week in the considered period.[25] The corresponding accounting information belongs to each firm's prior fiscal year end, i.e. firm i's dividend and stock price information of the year 2010 is linked to its accounting information of December 31, 2009 when its fiscal year corresponds with the calendar year.

Our final sample consists of 72,623 firm-year observations. It includes 13,106 distinct firms located in 18 distinct countries. Table 2 presents summary statistics for our dependent and independent variables of equation (1).

Table 2: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	25th Percentile	75th Percentile
DIVYIELD	72,623	0.0192	0.0210	0.0000	0.0286
PENALTY	72,623	0.0096	0.0875	0.0000	0.0000
LEV	72,623	0.1973	0.1676	0.0492	0.3073
SALES	72,623	0.2959	0.5057	0.0196	0.4096
TOBINSQ	72,623	1.1009	0.9099	0.5319	1.3420
EBITDA	72,623	0.1136	0.0696	0.0644	0.1498
CASH	72,623	0.1121	0.1110	0.0291	0.1582
SIZE	72,623	6.3767	1.8265	5.0637	7.5441
GDP	72,623	29.1916	1.0933	28.6105	30.2032

Notes: Table 2 shows descriptive statistics for all variables included in equation (1). Variables are defined in appendix 1.

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[25] However, if a given daily share price information stems from a feast day in the corresponding country, the price information actually reflects the price from the last trading day.

3.4.   Results

3.4.1.   Measuring Corporate Tax Planning Affinity by ETRs

Average ETR Measures

In a first step, we use the most intuitive way to define our dummy variable *TAXPL* by using the averages of our ETR measures *GAAP ETR* and *GAAP ETR Current* between 2003 and 2012.[26] Prior research shows that firms usually sustain their tax position over time (Guenther, Matsunaga and Williams, 2013). However, ETR measures are considered as being volatile. As we are interested in a firm's general stance on tax planning, we smooth our ETRs by their 10-year average. Table 3 reports summary statistics for our average *GAAP ETR* and average *GAAP ETR Current* by firm. The total number of observations varies accordingly to missing values for *GAAP* or *GAAP ETR Current* information. Furthermore, our results face no sample selection bias, because all coefficient estimates are of similar magnitude across all specifications.

Table 3: Average ETR Measures – Summary Statistics

Variable	Obs.	Mean	Std. Dev.	25th Percentile	75th Percentile
GAAP ETR	12,403	0.3331	0.1304	0.2632	0.4057
GAAP ETR Current	9,761	0.3039	0.1534	0.2033	0.4003

Notes: Table 3 shows descriptive statistics for our 10-year average ETR measures by firm. Variables are defined in appendix 1.

Table 3 shows a 10-year average *GAAP ETR* (*GAAP ETR Current*) of all sample firms of 33.31 (30.39) percent and reasonable values for the lowest and the highest quartile.

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[26] Note that in some cases the ETR measure is not provided by *Compustat* for some of the years in our sample period. In these cases, we use the average of the years provided by *Compustat*.

The next table shows our first regression results. In Column (1) our interaction term *PENALTY x TAXPL* is not included. Thereby, column (1) depicts that our coefficient estimates are in line with prior literature. In particular, the sign and magnitude of all control variables which are significantly different from zero is reasonable. In columns (2) – (5) we include our interaction term and define *TAXPL* in two different ways: In columns (2) and (4) of table 4 *TAXPL* is equal to one for all firms that have an average ETR measure that belongs to the lowest 5 percentiles and zero otherwise. In columns (3) and (5) we use the lowest 25 percentiles instead. The used ETR measures are *GAAP ETR Current* (columns (2) and (3) of table 4) and *GAAP ETR* (columns (4) and (5) of table 4). All specifications are augmented with industry-year and firm fixed-effects. Robust standard errors are clustered by country.

Table 4: Low Average ETR Measures – Regression Results

	(1)	(2)	(3)	(4)	(5)
PENALTY	-0.0091**	-0.0100**	-0.0087**	-0.0090**	-0.0092**
	(0.0040)	(0.0035)	(0.0035)	(0.0039)	(0.0033)
PENALTY x TAXPL		0.0010	-0.0051	-0.0247	-0.0005
		(0.0149)	(0.0041)	(0.0179)	(0.0068)
LEV	-0.0087*	-0.0099**	-0.0099**	-0.0098**	-0.0098**
	(0.0041)	(0.0040)	(0.0040)	(0.0038)	(0.0038)
SALES	0.0002	0.00001	0.00002	0.0001	0.0001
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
TOBINSQ	-0.0017**	-0.0017**	-0.0017**	-0.0018**	-0.0018**
	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
EBITDA	0.0227	0.0208	0.0209	0.0224	0.0224
	(0.0130)	(0.0128)	(0.0129)	(0.0131)	(0.0131)
CASH	0.0055**	0.0054*	0.0055*	0.0052*	0.0052*
	(0.0025)	(0.0028)	(0.0028)	(0.0025)	(0.0025)
SIZE	0.0023*	0.0023	0.0023	0.0020	0.0020
	(0.0012)	(0.0015)	(0.0015)	(0.0014)	(0.0014)
GDP	-0.0004	0.0009	0.0009	-0.0001	-0.0002
	(0.0036)	(0.0051)	(0.0050)	(0.0038)	(0.0038)
CONSTANT	0.0175	-0.0216	-0.0216	0.0089	0.0108
	(0.1030)	(0.1450)	(0.1440)	(0.1090)	(0.1070)
Industry-Year FE	√	√	√	√	√
Firm FE	√	√	√	√	√
N	72,623	58,504	58,504	66,025	66,025
R²	0.710	0.681	0.681	0.698	0.697

Notes: Table 4 shows results of OLS fixed-effects regressions with *DIVYIELD* as dependent variable. The definition of *TAXPL* differs in columns (2)-(5). The *TAXPL* dummy is one for all firms whose average 10-year *GAAP ETR Current* is equal to or below the 5th (column (2)) or 25th (column (3)) percentile. The *TAXPL* dummy is one for all firms whose average 10-year *GAAP ETR* is equal to or below the 5th (column (4)) or 25th (column (5)) percentile. Robust standard errors clustered by country are shown in parentheses. *, **, and *** show significance at the level of 10%, 5% and 1%, respectively.

As all columns of table 4 show a clearly negative coefficient for *PENALTY*, we confirm the results of prior research who found that a positive increase of *PENALTY* reduces the dividend yield of firms in the corresponding country, i.e. on average firms react to more unfavorable dividend taxation by reducing their payout. Moreover, the magnitude of our effect is reasonable and in line with prior literature. Given an assumed increase of 0.1 for *PENALTY*[27] and our sample's mean average *DIVYIELD* of 0.0192, from column (1) follows a relative change of dividend yield of -4.6 percent or a decrease of 0.0009 in *DIVYIELD*.[28] The results for *PENALTY* are robust in columns (2) to (5) as neither the coefficients nor the level of significance do distinctly vary.

Considering our research question, the interaction term of *PENALTY x TAXPL* does not show any significance at all. Thus, we cannot conclude from table 4 a particularly stronger effect of *PENALTY* for firms being more engaged in corporate tax planning. Consequently, we cannot affirm that if a firm's management cares relatively more about its corporate taxes, it is also more engaged in reducing their shareholders' tax bills.

The coefficients of our other control variables are in line with our expectations and economically reasonable. Similar to prior literature, we find a statistically significant and negative influence of *TOBINSQ* and *LEV* (Jensen, 1986; Allen, Bernardo and Welch, 2000) as well as a positive influence of *SIZE* and *CASH* (Denis and Osobov, 2008; Skinner, 2008).

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[27] For example, an increase of 0.1 in *PENALTY* would result, if a tax system which primarily taxed dividends at a 10 percent rate changed to a tax rate of 20 percent without taxing capital gains at all.

[28] Assuming the same *PENALTY* increase of 0.1, the corresponding coefficient and average dividend yield of Jacob and Jacob (2013) leads to an average decrease in a firm's dividend yield of 6.2 percent.

Deviation from Size and Industry Peers

In the following, we identify firms as being relatively more engaged in corporate tax planning through their ETRs' deviation from their size and industry peers' ETR. Thereby, we follow an approach introduced by Balakrishnan, Blouin and Guay (2012). We calculate each firm's deviation from its corresponding peer group's ETR with the subsequent routine:

For each firm we gather a benchmark portfolio of firms which either belong to the same industry or are in the same quintile of firm size measured by total assets. Afterwards, we calculate the mean ETR of all firms belonging to this benchmark portfolio. In a next step, we subtract each firm's ETR measure from the respective average portfolio ETR.

Finally, we consider the resulting difference to define our dummy vaiable *TAXPL*. It is equal to one if the difference belongs to the highest 5 percentiles (columns (1) and (3) of table 5) or the highest quartile (columns (2) and (4) of table 5) and zero otherwise. Once again, the ETR measures used in this calculation are the 10-year average *GAAP ETR* and the 10-year average *GAAP ETR Current*. Besides the changed definition for *TAXPL*, we do not change any other detail in our regression. Table 5 shows the corresponding results:

Table 5: ETR Deviation from Size and Industry Peers – Regression Results

	(1)	(2)	(3)	(4)
PENALTY	-0.0120	-0.0145*	-0.0076	-0.0083*
	(0.0088)	(0.0074)	(0.0065)	(0.0046)
PENALTY x TAXPL	0.0003	0.0006	-0.0002	-0.0002
	(0.0014)	(0.0013)	(0.0012)	(0.0009)
LEV	-0.0099**	-0.0099**	-0.0098**	-0.0098**
	(0.0040)	(0.0040)	(0.0038)	(0.0038)
SALES	0.00001	0.0001	0.0001	0.0001
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
TOBINSQ	-0.0017**	-0.0017**	-0.0018**	-0.0018**
	(0.0007)	(0.0007)	(0.0006)	(0.0006)
EBITDA	0.0208	0.0208	0.0224	0.0224
	(0.0128)	(0.0128)	(0.0131)	(0.0131)
CASH	0.0054*	0.0054*	0.0052*	0.0052*
	(0.0028)	(0.0028)	(0.0025)	(0.0025)
SIZE	0.0023	0.0023	0.0020	0.0020
	(0.0015)	(0.0014)	(0.0014)	(0.0014)
GDP	0.0009	0.0009	-0.0002	-0.0002
	(0.0051)	(0.0051)	(0.0038)	(0.0038)
CONSTANT	-0.0216	-0.0220	0.0112	0.0110
	(0.1450)	(0.1450)	(0.0108)	(0.0108)
Industry-Year FE	√	√	√	√
Firm FE	√	√	√	√
N	58,504	58,504	66,025	66,025
R²	0.681	0.681	0.697	0.697

Notes: Table 5 shows results of OLS fixed-effects regressions with *DIVYIELD* as dependent variable. The definition of *TAXPL* differs in all columns. The *TAXPL* dummy is one for all firms whose 10-year average *GAAP ETR Current* difference from its size and industry peers' is equal to or above the 75th (column (1)) or 95th (column (2)) percentile. In columns (3) and (4) the similar definition for TAXPL is applied with the 10-year average GAAP ETR as measure for a firm's tax planning affinity. Robust standard errors clustered by country are shown in parentheses. *, **, and *** show significance at the level of 10%, 5% and 1%, respectively.

In line with prior literature and the prior results of this paper, table 5 depicts a negative and, in columns (2) and (4), also a significant effect of *PENALTY*.[29] Once again we do not find any significant results for our interaction term *PENALTY x TAXPL*. Hence, we again identify a negative effect of a discriminating dividend tax relative to a country's capital gains taxation. However, our results do not reveal a particularly stronger negative effect for firms which we declare through our *TAXPL* dummy to be relatively more engaged in corporate tax planning.

Pre-Regressions

In the last approach using the ETR measures to identify firms being more concerned about their corporate tax burden, we use an OLS (pre-)regression with the respective ETR as dependent variable. We include only general firm characteristics influencing a firm's ETR measure that are not considered as being part of aggressive tax planning as independent variables in our equation (2)[30]:

$$ETR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 CAPINT_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} +$$

$$j_{s,t} + w_i + u_{i,t} \tag{2}$$

Therefore, this regression leaves the aggressive part of tax planning unexplained. In other words, firms with low (i.e. negative) predicted residuals are

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[29] However, the fact that *PENALTY* is not significantly negative in columns (1) and (3) of table 5 only shows that *PENALTY* and the interaction term *PENALTY x TAXPL* are correlated in such a way that considering both of them as independent variables reduces the significance of both terms.

[30] Note that we cannot consider tax loss carry forward as independent variable for non-U.S. firms, because *Compustat Global* does not provide this variable. Therefore, even though we consider an existing tax loss carry forward as an explanatory independent variable without being linked to aggressive corporate tax planning, we do not include it in our regression for consistency reasons.

more involved in additional tax planning than firms with higher residuals.[31] As we are specifically interested in tax aggressive firms and prior research shows that firms usually sustain their tax position over time (Guenther, Matsunaga and Williams, 2013), we identify these firms as those having an average residual in our sample period lower than or equal to the 5th percentile (columns (1) and (3) of table 6) or the 25th percentile (columns (2) and (4) of table 6). For these firms our dummy variable *TAXPL* is defined as one whereas it is zero for all other firms in our sample. In columns (1) and (2) *GAAP ETR Current* is used as dependent variable for the regression of equation (2) whereas *GAAP ETR* is used in columns (3) and (4). All other independent variables (*SIZE*, *CAPINT*, *LEV* and *ROA*) are explained in appendix 1. The terms $j_{s,t}$ and w_i represent industry-year and firm-fixed effects, respectively. $u_{i,t}$ is a zero mean disturbance term.

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[31] Summary Statistics for the variables used for the OLS regression of equation (2) are reported in appendix 2. The respective OLS regression results can be found in appendix 3.

Table 6: Pre-Regression Approach – Regression Results

	(1)	(2)	(3)	(4)
PENALTY	-0.0099**	-0.0108***	-0.0089*	-0.0111***
	(0.0039)	(0.0036)	(0.0044)	(0.0037)
PENALTY x TAXPL	-0.0022	0.0045	-0.0088	0.0045
	(0.0077)	(0.0030)	(0.0087)	(0.0026)
LEV	-0.0099**	-0.0099**	-0.0098**	-0.0098**
	(0.0040)	(0.0040)	(0.0038)	(0.0038)
SALES	0.0000	0.0000	0.0001	0.0001
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
TOBINSQ	-0.0017**	-0.0017**	-0.0018**	-0.0018**
	(0.0007)	(0.0007)	(0.0006)	(0.0006)
EBITDA	0.0208	0.0208	0.0224	0.0223
	(0.0128)	(0.0128)	(0.0131)	(0.0131)
CASH	0.00543*	0.0054*	0.0052*	0.0052*
	(0.0028)	(0.0028)	(0.0025)	(0.0025)
SIZE	0.0023	0.0023	0.0020	0.0020
	(0.0015)	(0.0015)	(0.0014)	(0.0014)
GDP	0.0009	0.0008	-0.0002	-0.0001
	(0.0050)	(0.0050)	(0.0038)	(0.0038)
CONSTANT	-0.0216	-0.0196	0.0107	0.0099
	(0.1450)	(0.1440)	(0.1080)	(0.1090)
Industry-Year FE	√	√	√	√
Firm FE	√	√	√	√
N	58,504	58,504	66,025	66,025
R²	0.681	0.681	0.697	0.697

Notes: Table 6 shows results of OLS fixed-effects regressions with *DIVYIELD* as dependent variable. The dummy variable *TAXPL* is defined by using the average residuals after regression (2). In columns (1) and (2) *GAAP ETR Current* was used for the regression of equation (2) whereas *GAAP ETR* was used in columns (3) and (4). The *TAXPL* dummy is one for all firms whose average residuals are equal to or below the 5th (columns (1) and (3)) or 25th (columns (2) and (4)) percentile. Robust standard errors clustered by country are shown in parentheses. *, **, and *** show significance at the level of 10%, 5% and 1%, respectively.

Similar to all other specifications of *TAXPL*, we can confirm our expectations regarding *PENALTY* and our other control variables. However, we cannot confirm that firms caring relatively more about their corporate tax burden care also more about their shareholders' personal tax burden than other firms.

3.4.2. Alternative Measures for Corporate Tax Planning Affinity

Previous studies have confirmed that the mobility of income increases for firms with high intangible asset ownership or high expenses for R&D (Harris, 1993; Grubert, 2003; De Simone, Mills and Stomberg, 2014). This increase in mobility of income reflects in lower ETR measures and therefore potentially leads to tax aggressiveness. Hence, we use these attributes in the following for another definition of our dummy variable *TAXPL*.

Firms in high-tech and pharmaceutical industries mostly possess significant intellectual property and products with global demand. As the assignment of intellectual property to affiliates located in low-tax jurisdictions is – depending on the type of intellectual property – associated with limited effort, these firms are seen as having more opportunities to shift profits to low-tax jurisdictions via transfer pricing and hence are more sensitive about their corporate tax burden. According to De Simone, Mills and Stomberg (2014), we use three-digit SIC codes to compute *TAXPL* (column (1) of table 7) which equals one if the industry membership of the parent is supposed to be have more profit shifting opportunities.[32]

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[32] We classify the following three-digit SIC codes as income mobile industries: 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services).

In columns (2) and (3) of table 7, we use the average of R&D expenses (*xrd*) scaled by total assets (*at*) between 2003 and 2012.[33] Similar to the average ETR measures used in section 3.4.1, we use 10-year averages to smooth the effect of outliers. In column (2) (column (3)), *TAXPL* equals one for all firms that belong to the highest 5 (25) percent concerning R&D expenditures and zero otherwise.

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[33] We require companies to have non-missing values for all components of our variables. However, visual inspection of several Form 10-k filings reveals that many of the missing values, especially for R&D expenses, in Compustat should be coded as zero. Therefore, we set missing values of the variable R&D to zero.

Table 7: Industry Affiliation and R&D Activities – Regression Results

	(1)	(2)	(3)
PENALTY	-0.0092**	-0.0092**	-0.0109*
	(0.0040)	(0.0041)	(0.0054)
PENALTY x TAXPL	0.0007	0.0024	0.0073
	(0.0031)	(0.0052)	(0.0069)
LEV	-0.0087*	-0.0087*	-0.0087*
	(0.0041)	(0.0041)	(0.0041)
SALES	0.0002	0.0002	0.0002
	(0.0005)	(0.0005)	(0.0005)
TOBINSQ	-0.0017**	-0.0017**	-0.0017**
	(0.0006)	(0.0006)	(0.0006)
EBITDA	0.0227	0.0227	0.0227
	(0.0130)	(0.0130)	(0.0130)
CASH	0.0055**	0.0055**	0.0056**
	(0.0025)	(0.0025)	(0.0025)
SIZE	0.0023*	0.0023*	0.0023*
	(0.0012)	(0.0012)	(0.0012)
GDP	-0.0004	-0.0004	-0.0005
	(0.0036)	(0.0036)	(0.0036)
CONSTANT	0.0176	0.0176	0.0208
	(0.1030)	(0.1030)	(0.1040)
Industry-Year FE	√	√	√
Firm FE	√	√	√
N	72,623	72,623	72,623
R²	0.713	0.713	0.713

Notes: Table 7 shows results of OLS fixed-effects regressions with *DIVYIELD* as dependent variable. The definition of *TAXPL* differs. In column (1) *TAXPL* equals one if a firm belongs to an industry being associated with more profit shifting opportunities and zero otherwise. The definition of income mobile industries follows De Simone, Mills and Stomberg (2014). The *TAXPL* dummy is one for all firms whose average 10-year R&D expenditure scaled by total assets is equal to or above the 95th percentile (column (2)) or respectively the 75th percentile (column (3)) and zero otherwise. Robust standard errors clustered by country are shown in parentheses. *, **, and *** show significance at the level of 10%, 5% and 1%, respectively.

Similar to the results presented in our other tables, we are able to confirm prior research's findings regarding the coefficient of *PENALTY*, but we cannot confirm our additional suggestion that firms identified as being relatively more engaged in corporate tax planning are also more sensible to their shareholders' tax rates.

3.5. Conclusion

This study contributes to the existing literature by providing additional evidence and confirming prior literature that firms consider existing personal tax rates for dividends and capital gains when they choose the amount of dividends paid to the shareholders (Brav et al., 2005; Chetty and Saez, 2005, 2006; Brown, Liang and Weisbenner, 2007; Jacob and Jacob, 2013). Moreover, it provides additional tests whether this reaction is related to firm's corporate tax planning affinity.

Thereby, this paper merges prior accounting and finance literature and investigates whether a firm's corporate tax planning activity constitutes a criterion by which firms can be separated concerning their level of awareness for their shareholders' tax burden. However, applying a huge variety of specifications to identify those firms being relatively more involved in corporate tax planning activities, we conclude that firms overall care about their shareholders' dividend and capital gains taxation, but that this is not only or even more typical for firms having relatively low ETRs or relatively large possibilities for income shifting.

With this finding, we confirm prior literature. Our results show that a firm's dividend yield decreases, if dividends are more heavily taxed compared to capital gains. Moreover, the magnitude of our measured negative effect is similar to previous findings from finance literature.

However, we cannot unambiguously show that all firms are equally sensitive to the relationship of dividend to capital gains taxation. Having employed several different corporate tax planning measures, we find that a higher degree of corporate tax planning is not a valid separation criterion to identify firms whose dividend yield will react stronger to changes in the relationship of dividend to capital gains taxation. Nevertheless, as the knowledge of firms' shareholder tax sensitivity might be important to estimate firm payout consequences following a personal capital income tax variation, we are looking forward to further investigations to that topic by future research.

APPENDIX

Appendix 1: Variable Definitions

CAPINT	Property, Plant and Equipment scaled by total assets (*ppegt* / *at*)
CASH	The amount of cash divided by total assets (*ch* / *at*)
DIVYIELD	Total amount of dividends paid by one firm divided by its average share price in this year.
EBITDA	The actual EBITDA divided by total assets (*ebitda* / *at*)
GAAP ETR	Quotient of total tax expense and pre-tax income in which extraordinary items are not included (*txt* / (*pi-xi*))
GAAP ETR Current	Quotient of current taxes and pre-tax income in which extraordinary items are not included (*txc* / (*pi-xi*))
GDP	Natural logarithm of a country's gross domestic product in U.S. Dollars
LEV	Sum of long- and short-term leverage scaled by total assets ((*dlc+dltt*) / *at*)
PENALTY	Difference between a country's personal dividend tax rate and a country's personal capital gains tax rate scaled by one minus this country's personal capital gains tax rate ((m^d-m^{cg}) / (*1*-m^{cg}))
ROA	Pre-tax income divided by total assets (*pi* / *at*)
SALES	The increase of sales (*sale*) over two years divided by the amount of sales two years ago.
SIZE	Natural logarithm of total assets (*at*)
TOBINSQ	Number of shares outstanding times the share price at the end of the year plus the sum of long- and short-term leverage scaled by total assets (((*csho*prccdat*) + (*dlc+dltt*)) / *at*)

Appendix 2: Pre-Regression – Summary Statistics

Variable	Obs.	Mean	Std. Dev.	25th Percentile	75th Percentile
SIZE	59,641	6.3876	1.8218	5.0696	7.5628
LEV	59,641	0.1747	0.1671	0.0441	0.3084
ROA	59,641	0.0656	0.0617	0.0371	0.1090
CAPINT	59,641	0.4893	0.3919	0.2209	0.8313

Notes: This table shows descriptive statistics for all independent variables of our pre-regression. Variables are defined in appendix 1.

Appendix 3: Pre-Regression – Regression Results

	(1)	(2)
SIZE	0.0087	0.0404***
	(0.0081)	(0.0121)
LEV	-0.0332	-0.138*
	(0.0268)	(0.0788)
ROA	-0.480**	-0.710***
	(0.0218)	(0.222)
CAPINT	0.0225	-0.0103
	(0.014)	(0.0348)
CONSTANT	0.318***	0.162***
	(0.0526)	(0.0353)
Industry-Year FE	√	√
Firm FE	√	√
N	59,641	45,846
R²	0.556	0.54

Notes: This table shows results of OLS fixed-effects regressions with *GAAP ETR* (column (1)) and *GAAP ETR Current* (column (2)) as dependent variable. Variables are defined in appendix 1. Robust standard errors clustered by country are shown in parentheses. *, **, and *** show significance at the level of 10%, 5% and 1%, respectively.

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Chapter 4

Corporate Taxes and the Location of

U.S. Trademarks

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Abstract:

This study analyzes whether tax incentives play a role in the legal assignment of trademarks registered for the U.S. market by large multinational enterprises. Our analysis for U.S. S&P 500 firms suggests that tax considerations have a limited influence on the geographical allocation of trademarks. However, if trademarks are assigned to affiliates located offshore, we find a significant influence of corporate tax rates and U.S. withholding taxes. Comparing these results to the assignment of U.S. trademarks registered by European firms (STOXX 600 Europe), we are able to identify that U.S. firms are more sensitive to a tax rate decrease in certain tax haven countries than European firms.

Chapter 4

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4.1. Introduction

We analyze large multinational companies' geographical allocation choices regarding the ownership assignment of their U.S. trademarks and whether these are driven by tax considerations. Matching the U.S. Patent and Trademark Office's (USPTO) register with group structures of large multinational entities (MNEs) from the U.S. (S&P 500), we describe and explain the geographic origin of U.S. trademark registrations submitted by these global companies. Furthermore, we compare U.S. firms' strategies to those of large MNEs from Europe (STOXX Europe 600).

Trademarks are important intangible assets in modern business and often represent fundamental drivers of firm value. They enable companies to distinguish their products from competition and serve to convey corporate identity. Today, the world's top 100 brands, embodied within trademark rights, feature estimated market values ranging from USD 12 billion (J.P. Morgan) up to USD 128 billion (Apple).[34] Investors acknowledge the value of trademarks (Sandner and Block, 2011) and expect positive cash flow effects from new registered trademarks (Krasnikov, Mishra and Orozco, 2009).

Against this background, multinational entities may seek tax advantages in holding trademark assets offshore. There is indeed anecdotal evidence on MNEs strategically designating subsidiaries in low-tax countries to hold their trademark rights. For example, one of the world's biggest producers of sporting goods, *Nike Inc.*, has assigned numerous trademark rights to subsidiaries located in Bermuda

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[34] Brand Finance, Global 500 – The annual report on the world's most valuable global brands, February 2015. Available for download: http://brandfinance.com/images/upload/brand_finance_global_500_2015.pdf.

(McIntyre, Phillips, and Baxandall, 2015).[35] These trademarks may be used in foreign retail markets by entities which pay a royalty to the trademark-owners in Bermuda. While increasing profits in Bermuda, these royalty payments reduce Nike's taxable profits in retail markets. As there is no corporate income tax in Bermuda, this is an attractive tax saving strategy which could, among other factors, explain Nike's very low foreign effective tax rate (ETR) of only 2.2 percent in 2014.[36]

Previous empirical literature shows that MNEs engage in tax-motivated income-shifting to low-tax jurisdictions (Hines and Rice, 1994; Huizinga and Laeven, 2008; Heckemeyer and Overesch, 2014). Moreover, there exists compelling empirical evidence that this may involve the tax-efficient geographical allocation of intangible assets within the group (Grubert and Slemrod, 1998; Dischinger and Riedel, 2011; Markle and Shackelford, 2012a, 2012b). With respect to the types of intangibles at the heart of international tax saving strategies, previous work concentrates on the role of patents. Using patent data registered at the European patent office (EPO), earlier studies suggest that patent ownership within MNEs indeed responds to international tax incentives (Karkinsky and Riedel, 2012; Griffith, Miller and O'Connell, 2014; Boehm et al., 2015). Dudar and Voget (2016) analyze the tax response of patent and trademark assignments for a pooled sample of European and U.S. firms. Still, very little is known about the relevance of U.S. trademarks for international tax planning of large MNEs, considering the particularities of the U.S. context. Moreover, previous literature analyzes tax incentives for the use certain international firm

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[35] There are further examples of international tax planning strategies involving trademarks and a number of consultancies explicitly advocate such strategies. Also see Dischinger and Riedel (2011) for a discussion.

[36] See Nike Inc.'s 2014 10-k: https://www.sec.gov/Archives/edgar/data/320187/00003201871400 0097/nke-5312014x10k.htm#s1BA25FBD5706D09A386C71629FCDD9A6.

structures (Dyreng et al., 2015; Lindsey and Wilson, 2015), but does not consider the allocation of intangible assets within U.S. MNEs.

We fill this research gap and analyze the extent to which international tax incentives drive the geographical ownership allocation of trademarks filed at the USPTO within large U.S. MNEs and European MNEs. As the *Nike Inc.* example shows, trademarks, just as other intangibles, exhibit characteristics of a public good (Markusen, 1995). Thus, they can be used as a non-rival input separate from other affiliates in the group. Moreover, appropriate royalty rates should be at arm's length. As the valuation of intangibles is difficult, MNEs may be able to distort intra-group royalty prices in order to shift additional income to the trademark-owner. Whereas for other kind of intangibles R&D investment must usually take place at an early stage to finance creative inventions, most investment in a trademark is undertaken *after* its assignment and registration, because continuous extensive marketing is necessary to establish a new trademark (Sandner and Block, 2011). As a consequence, the allocation of trademarks might be relatively flexible, because value creation takes place in the long term. On the other hand, if the user of a trademark undertakes these advertising activities at his own risk, the associated expenditures have to be reflected in the royalty paid to the trademark's owner (OECD, 2015). The potential to shift profits to low-tax countries decreases accordingly.

As this study deals with trademarks registered at the U.S. Patent and Trademark Office, the particularities of U.S. trademark law must be carefully considered. Licensing of U.S. trademarks is indeed riskier than licensing other intellectual property (Chestek, 2001). In particular, there exist stringent legal requirements with respect to any licensor's control over the nature and quality of

the goods or services to which the mark is applied by license. These stringent requirements under U.S. law provide an important reason for the allocation of U.S. trademark ownership either to the parent company or the entity that actually uses the trademark (Heavner and Luepke, 2008). Moreover, firms tend to concentrate their trademark holding in the U.S., because intangible assets as key drivers of firm value should be located at home. Thereby, their protection is associated with litigations in the U.S.

Whether tax considerations are dominated by non-tax considerations, e.g. linked to trademark law, or still play a significant role in the trademark assignment within MNEs is, ultimately, an empirical issue. To investigate the tax sensitivity of trademark allocation within MNEs, we exploit a new dataset provided by the U.S. Patent and Trademark Office (USPTO) containing all trademarks registered for the U.S. market between 2003 and 2012 (for a detailed description of the dataset see Graham et al., 2013). We match the trademark registration data with international group structures of large U.S. MNEs and European MNEs listed respectively in the S&P 500 or the STOXX Europe 600 Index.[37] Eventually, our matched data sample combines rich trademark data, 96,762 USPTO registrations in total, with detailed information about the trademark-owning entities and their affiliated group. This data provides deep insight into the patterns of U.S. trademark ownership in global MNEs.

The results from the data analysis are twofold. First, we find that there is a strong home bias in trademark ownership. U.S. MNEs listed in the S&P 500 hold and register 95.7 percent of their U.S. trademarks in the United States. Similarly, European MNEs listed in the STOXX Europe 600 locate 89.9 percent of their

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[37] The matching procedure is described in the data section 4.3.

U.S. trademark portfolio either directly at a U.S. subsidiary, i.e. in the country of protection and use, or alternatively in their parent country. Only 16.6 percent of U.S. trademarks owned by S&P 500 firms in our sample are held in classical tax haven countries. Still, some tax havens turn out to be important trademark holding locations. For example, Ireland and Switzerland are popular for both U.S. and European MNEs whereas Bermuda is highly frequented by U.S. firms.

Based on these explorative results, we consider the underlying location choice to be a two-step choice: The first choice is whether to locate trademark ownership in a third country or at the headquarter location (offshore decision). Conditional on locating it in a third country, the second step is to select the respective third country (foreign location decision).

Our empirical analysis starts with the offshore decision, i.e. whether to locate trademark ownership in the U.S. or abroad. Interestingly, we do not identify tax considerations as an important factor in this choice. However, we find a strong concentration of trademarks' ownership location in Delaware which is acknowledged to be a domestic U.S. tax haven (Dyreng, Lindsey and Thornock, 2013; Lindsey and Wilson, 2015). In total numbers, U.S. firms locate 43,770 trademarks, i.e. 53.5 percent of all successful registrations, in Delaware. Accordingly, we assume that tax considerations indeed play a role when a firm chooses the U.S. affiliate for trademark ownership.

Getting to the foreign location decision, the tax elasticity of trademark location choice is indeed significant and negative. Moreover, we find that withholding taxes imposed on royalty payments between the U.S. and a potential trademark location significantly lower the respective country's probability to actually host a U.S. trademark. Simulating a one percentage point decrease in the

statutory tax rate of some selected countries, we identify that especially tax haven countries benefit from this cut in statutory tax rate. We find that Ireland reacts with a cross semi-elasticity of 21.8, i.e. compared to the base probability before the cut in tax rate, Ireland gains 21.8 percent in base probability. Similarly other tax haven countries (Bermuda and Switzerland) react rather sensitive while high tax countries like Canada and Germany have lower cross semi-elasticities of 2.5 and 0.7. Comparing these results to the location choice of European MNEs, we find that U.S. firms react slightly more sensitive to a one percentage point cut in statutory tax rate of tax haven countries.

Our results contribute to the debate on the magnitude and elasticities of international tax avoidance by IP-intensive multinational firms. Tax authorities have raised increasing concerns about the relocation of intangible assets to low-tax countries. Furthermore, the OECD has put forward an action plan to encounter base erosion and profit shifting (BEPS). One action point on the agenda deals specifically with issues related to the tax treatment of intangibles (OECD, 2015). IP-intensive firms are primary targets of this agenda, because the income deriving from intangible assets is considered to be especially mobile (De Simone, Mills and Stomberg, 2014). Moreover, the mobility of income has been shown to increase with a company's R&D and advertising expenditure (Harris, 1993; Grubert, 2003).

The remainder of the paper is organized as follows. In Section 4.2, we discuss the influence of tax considerations within the process of trademark location decision. Section 4.3 describes our dataset and methodology. Empirical results are presented in Section 4.4. Section 4.5 concludes.

4.2. Tax Avoidance Through Trademark Use

4.2.1. Trademark Registration and Ownership

In modern business, trademarks are a primary tool of corporate marketing, communication and brand building. More specifically, a trademark can be any word, name, symbol, device or any combination of these that enables one party to distinguish its goods and services from those of other parties.[38] In other words, trademarks act as a certificate of origin and quality. More generally, it can help to communicate a company's values and identity. The value of a trademark lies in the goodwill and consumer recognition it represents. Against this background, U.S. law offers several ways to protect a trademark used in the United States. Protection thereby means the ability of trademark owners to exclude unauthorized parties from using similar marks on identical or confusingly similar products (Calboli, 2007).

The ownership of a trademark derives from use. Under U.S. common law, the first user of a distinctive trademark in commerce is generally provided with protection of this trademark inside of the geographic region it is used in. It is thus not necessary to register a trademark in order to own it. However, common law trademark rights are limited in geographical scope and the owner also lacks a clear title to his mark.[39] As a consequence, absent registration, trademark rights can diminish quickly over time and place and be lost due to interrupted use and disuse. Considering these limitations, a trademark registration at the USPTO is attractive. In particular, the certificate of registration creates a presumption ('prima facie evidence') of ownership and establishes a right of priority covering

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[38] See 15 U.S.C. § 1127.
[39] Bohan Mathers, LLC: Who Owns a Trademark? URL: http://www.bohanmathers.com/who-owns-a-trademark.html.

the entire United States regardless of where the mark is actually used.[40]

Besides filing an application directly at the USPTO, the owner of a trademark might file an international application under the Madrid Protocol or the Paris Convention. International applications name the countries in which the registrant seeks protection for the respective trademark and are filed through the World Intellectual Property Organization (WIPO). These applications do not constitute a unique international registration, but rather one separate registration in each of the designated countries following the law of these countries (World Intellectual Property Organization, 2012). In other words, WIPO hands the applications to the respective office the applicant claims protection for, but each office examines the international application in the same way as applications filed directly at this office.[41] For our analysis, this difference in administrative process is not of interest.

4.2.2. International Tax Planning Strategies Built Around Trademarks

From a tax perspective, the appeal of holding U.S. trademarks away from the parent arises from the international profit shifting potential. Trademarks held in an entity set up in a low-tax jurisdiction can, in principle, be licensed to the parent company or other affiliates within the multinational group which use the mark in U.S. commerce. The royalties paid in compensation for the trademark license are treated as tax-deductible expense to the licensees which may operate in

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[40] See 15 U.S.C. § 1057. Successful registration of a trademark requires that it is in use or is intended to be in use, see 15 U.S.C. § 1051. However, the filing date of an application for registration at the USPTO constitutes "constructive use" of the mark, conferring a nationwide right of priority over a later date of actual first common law use, see 15 U.S.C. § 1057(c). Also note that a trademark registration remains active for ten years. It can be renewed in a ten-year term if the trademark is continuously used (see 15 U.S.C. §§ 1058(a), 1059(a)).

[41] In contrast to direct U.S. applications, international applications are usually not based on immediate use in the U.S. market, but on an existing foreign registration or an earlier application filed at a foreign office. We conducted our analysis in section 3.2 for international and direct U.S. applications separately. As we could not identify any noteworthy difference, we do not differentiate between international and direct applications in the following.

the U.S., whereas the royalty income received by the licensor is taxed at low rates or remains even tax-free. This income may be later repatriated as dividend payment to the parent company, the sole stockholder of the trademark owning entity.[42] The result is a reduction in the overall tax burden of the respective multinational company.

The tax reduction is definite if the MNE's home country exempts foreign dividends from taxes. The exemption system is applied in most European countries. The U.S., however, does not tax-exempt foreign dividends. International double taxation of profits is avoided by granting credits for foreign taxes paid, which reduce the U.S. home country tax liability. Accordingly, any profits shifted from high-tax countries to trademark owners in tax-favorable jurisdictions generate no ultimate tax savings for U.S. MNEs, because residual U.S. tax is levied when the foreign profits are repatriated as dividends to the U.S. parent. Whether the mere deferral of home country tax liabilities creates sufficiently strong incentives for U.S. MNEs to engage in strategic allocation of trademark ownership is ultimately an empirical question.[43] Recent empirical evidence suggests that multinationals domiciled in exemption countries, on average, shift more income than do those domiciled in credit countries (Markle, 2016).

Some further important nuances of international tax regimes may affect the tax benefits arising from income shifting via trademark allocation. In particular,

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[42] For a general description of international tax planning strategies, including the role of intangibles and holding structures, see Russo (2007) and, more specifically, Fuest et al (2013).

[43] U.S. MNEs are indeed known to hold much cash overseas to avoid the U.S. repatriation taxes: http://www.bloomberg.com/news/articles/2014-03-12/cash-abroad-rises-206-billion-as-apple-to-ibm-avoid-tax. Also see Lindsey and Wilson (2015) for a discussion. The financial reporting standards in the U.S. reflect the income tax treatment if the earnings are deemed to be indefinitely reinvested in the foreign country. In other words, under APB 23 in U.S. GAAP (and IAS 12 in IFRS), the tax expense related to the U.S. tax liability on foreign earnings is not recorded until the dividend is paid and the cash tax payment is due. Also see Markle (2015) for a discussion.

withholding taxes and controlled foreign company (CFC) legislation might militate against the license model (Cohen, 2008; Markle and Robinson, 2012). For example, according to national law, the U.S. levies a 30% withholding tax on gross royalty payments, which indeed seems particularly relevant for trademarks used in U.S. commerce. From a tax perspective, we thus expect U.S. trademarks to be allocated to foreign countries that avoid high U.S. withholding taxes on royalties through a good network of double tax treaties with the United States and/or other relevant countries involved. Moreover, to limit benefits from international tax planning that are considered as inappropriate, many capital exporting countries have introduced some form of CFC legislation. These special tax regimes target non-trading income derived by foreign entities of resident MNEs which are subject to critically low tax rates. Once a CFC rule turns binding, the advantage from the deferral of home country tax liabilities (credit countries) or from the exemption of foreign dividends (exemption countries) is effectively nullified by consolidating the foreign entity's non-trading income with that of its parent company and taxing it as it is earned. Although MNEs may find ways to overcome CFC legislation, these rules pose certain obstacles to the license model.[44]

Furthermore, the license model raises international transfer-pricing issues. Basically, the trademark owner is entitled to the income deriving from the exploitation of a trademark right. Appropriate royalty rates should be at arm's length. As the valuation of intangibles is difficult, MNEs may be able to distort

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[44] U.S. CFC rules under Subpart F of the U.S. IRC can be circumvented by so-called check-the box elections, with the consequence that intra-company royalty flows are disregarded and only revenues from transactions with customers, which due to exceptions included in the Subpart F provisions typically do not constitute Subpart F income, are considered from a U.S. perspective. In the European Union, CFC legislation has been limited by the European Court of Justice (Cadbury Schweppes, ECJ, 2006): As long as certain structures are not merely artificially motivated by tax purposes but also by economic activity, CFC rules do not apply.

intra-group royalty prices in order to shift additional income to the trademark owner. In return, if the user of a trademark undertakes advertising activities to enhance trademark value at his own risk, the associated expenditures have to be reflected in the royalty paid to the trademark's owner (OECD, 2015). The potential to shift profits to low-tax countries decreases accordingly.

After all, tax considerations might not only lead MNEs to locate their U.S. trademarks in tax attractive locations outside the U.S. Some U.S. states, Delaware in particular, offer attractive tax rules for intangible assets as well. Specifically, Delaware exempts from state-level corporate income tax those corporations whose activities are confined to the maintenance and management of their intangible investment.[45] Accordingly, a tax avoidance strategy that exploits this rule involves implementation of a Passive Investment Company (PIC) or Delaware Intangible Holding Company (DIHC) which is designated to hold ownership in intangible assets. Subsequently, income is shifted into these entities from other U.S. states principally through the same mechanism as outlined previously, i.e. intra-firm license agreements and associated royalty payments.[46]

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[45] See 30 Del. C. § 1902(b)(8). Nevada, South Dakota, Washington, and Wyoming may provide similar tax benefits as they impose not state-level corporate income tax at all.

[46] This strategy is described by an abundant legal literature. It is "probably the most well known aggressive tax planning technique" (Bankman, 2007: p. 778) in U.S. state taxation.

The role of Delaware as a domestic tax haven inside the U.S. is quantitatively explored in Dyreng, Lindsey and Thornock (2013). They show that, using a Delaware-based tax strategy, U.S. firms can decrease their U.S. state income tax burden by 15-24 percent. Still, immediate cash tax savings from domestic strategies are quantitatively smaller than those resulting from international strategies which involve non-U.S. IP locations. However, domestic strategies generate permanent benefits whereas tax savings from multinational avoidance are only temporary until the foreign profits are eventually repatriated to the United States. From this perspective, a domestic PIC strategy may be more potent than similar multinational strategies (Blouin and Krull, 2009; Markle, 2016; Dyreng, Lindsey and Thornock, 2013, Lindsey and Wilson, 2015). However, initiatives taken by other U.S. states to fight the Delaware tax strategy turn out to be effective, as well. [47]

The decision made by U.S. firms to implement subsidiaries in Delaware or rather abroad in some foreign tax haven is empirically analyzed by Lindsey and Wilson (2015). Interestingly, neither Dyreng, Lindsey and Thornock (2013) nor Lindsey and Wilson (2015) explicitly consider the distinct role of trademarks in their analysis.

4.2.3. Restrictions of Tax Avoidance Strategies Through Trademarks

A multinational company generally owns a collection of trademark related rights which, in their diverse forms of protection, together with the embodied values or goodwill represent the brand (Cohen, 2008). For an MNE, the question

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[47] Two countermeasures are considered. The first measure is combined reporting which requires a company to include the net profits of all its domestic entities in a consolidated or combined tax return, effectively eliminating intra-company transfers that make the Delaware PIC strategy possible. The second measure considered is an economic nexus doctrine that requires firms to file and pay taxes based on economic presence, thus allowing states to tax the royalty income that escapes taxation in the state of Delaware (Dyreng, Lindsey and Thornock, 2013).

arises whether and where to consolidate these rights. Some international companies with U.S. affiliates simply choose to have one of their U.S. subsidiaries file the U.S. applications in its own name. In some cases, local subsidiaries may even register a trademark at the USPTO without the knowledge of the parent company. Enforcement of marks owned by many different local subsidiaries can be difficult and lead to ineffective protection strategies on an international scale (Heavner and Luepke, 2008). Consolidating all trademark rights into one single entity which then owns all trademark registrations world-wide avoids inconsistent ownership in trademark registrations and, in addition, helps to police the marks and exploit their value to the maximum (Heavner and Luepke, 2008; Cohen, 2008). From this perspective, the entity that is designated to hold the trademark rights can be the parent company or, alternatively, a holding company. This choice will be driven by tax considerations on the one hand and by the particularities of trademark law on the other hand.

This role of trademarks might be special, however. In particular, legal literature highlights differences in the riskiness of tax avoidance strategies built around trademarks as opposed to other types of intangibles. More specifically, particularities of U.S. trademark law result in the licensing of trademarks being riskier than licensing other intellectual property. Licensing trademarks, under certain conditions, implies the risk of losing the right to use the trademark whereas no corresponding risk is incurred in the case of other intangibles (Chestek, 2001).

First, in the United States, both under common law and the Lanham Act (15 U.S.C. §§1051-1127), an assignment of a trademark without the associated goodwill ("in gross") is deemed invalid and the assignee acquires no rights in the

mark. In other words, a trademark cannot exist independently of the business it represents. If the subsidiary designated to hold the trademark rights does no business other than licensing, it may be difficult to claim that any goodwill at all is associated with the trademark.[48]

Second and perhaps more importantly, the requirements for a trademark license to be valid are higher in the United States than they are in many other countries. The main difference is that the trademark licensor in the United States must, by statute, exercise sufficient control and supervision over the nature and quality of the goods or services to which the mark is applied by its license (Heavner and Luepke, 2008). If the licensor fails to exercise such control, the license may be considered a "naked" license and that may lead to an abandonment of rights in the mark and its registration. The U.S. judiciary answers the question of adequate control on a case-by-case basis (Chestek, 2001; Calboli, 2007). Although courts have repeatedly proven reluctant in requiring a strict application of quality control and rather adopted a pragmatic approach, there remains considerable uncertainty as to what constitutes a valid license (Calboli, 2007). To avoid the risk of losing the right to use a trademark, the owner of the mark needs to set quality standards in any license agreement, list the ways in which control over these standards is exercised and, finally, be up to review and enforce these standards. In particular, an offshore subsidiary may have difficulties in arguing that it controls its parent's or sisters' use of the mark and associated goods and services (Chestek, 2001; Calboli, 2007). The stringent licensing requirements provide an important reason to designate as owner and applicant of a trademark

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[48] See Lawrence Stanley: "Trademark Holding Companies: Speculative Benefits, Certain Pitfalls", blog post, dated January 9, 2012. URL: https://webtm.com/trademark-holding-companies-speculative-benefits-certain-pitfalls/. Lawrence Stanley is Associate at Morgan, Lewis & Bockius LLP.

either the parent company or the entity that actually uses the trademark (Heavner and Luepke, 2008). In other words, U.S. trademark law militates against holding U.S. trademarks away from the parent or from the using U.S. entity.[49]

Whether tax considerations are dominated by non-tax considerations, e.g. linked to trademark law, or still play a significant role in the trademark assignment within multinational companies is, ultimately, an empirical issue.

4.3. Data and Methodology

4.3.1. Data

In order to conduct our empirical analysis we require information on the legal ownership of U.S. trademarks within MNEs' group structures. The trademark data is taken from the USPTO register.[50] A trademark application at the USPTO needs to be filed by the mark's legal owner (Graham et al., 2013). Thus, we can infer from the USPTO data the legal owners of the registered trademarks and where those entities reside. Besides information on trademark ownership including name, address and further applicant information, the USPTO database contains, for each trademark respectively, the date of filing, registration and the classes of goods and services covered. We use the update 2012 dataset which includes registrations until January 2013 and consider trademarks successfully registered between 1st January 2003 and 31st December 2012. We do not include renewal registrations. Trademark renewal will certainly follow the primary filing,

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[49] Of course, the parent company can itself be located in a tax attractive jurisdiction. For example, Delaware is by far the most common state of parent company incorporation among publicly traded U.S. enterprises. The role of Delaware as primary location for incorporation of parent companies is due to legal benefits that evolved from regulatory competition among U.S. states (Bebchuk, Cohen and Ferrell, 2002; Roe, 2003; Dyreng, Lindsey and Thornock, 2013).
[50] The full dataset is available for download at http://www.uspto.gov/learning-and-resources/ electronic-data-products/trademark-case-files-dataset-0. For a more detailed description of the dataset see Graham et al. (2013).

potentially leading to strong dependence of the respective data points and problems of double counting.

We match this information to the ownership structures of U.S. companies, i.e. companies that do have their headquarters and/or their incorporation in the U.S., listed in the S&P 500 Index and, in addition, to European companies listed in the STOXX Europe 600 Index. With respect to the ownership structures of the S&P 500 firms, we exploit the information disclosed in Exhibit 21 of Form 10-k. As already established by prior literature (see for example Dyreng and Lindsey, 2009; Lindsey and Wilson, 2015), Exhibit 21 reveals information about a firm's significant subsidiaries and their countries of incorporation.[51] Exhibit 21 is available at the SEC's database EDGAR.[52] We have collected this information for the fiscal year 2007. As the transfer of intangible assets usually results in heavy tax consequences, we assume that the trademark is registered by a company remaining in the group and changes in ownership structure within the group of companies should not be of any interest for our analysis. In our matching procedure, we use legal names and countries of incorporation. We require the country of incorporation to perfectly match and the company name to match at least to 99.4 percent.[53]

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[51] According to SEC Regulation (17 CFR 210.1-02(w)), a subsidiary can be deemed not to be a significant subsidiary if all of the following three conditions are met: (1) the parent company's and its other subsidiaries' investments in the subsidiary do not exceed ten percent of the parent company's total assets; (2) the parent company's and its other subsidiaries' proportionate share of the assets of the subsidiary do not exceed ten percent of the consolidated firm's total assets; and (3) the parent company's and its other subsidiaries' proportionate share of the subsidiary's pre-tax income from continuing operations does not exceed ten percent of the consolidated income from continuing operations.

[52] https://www.sec.gov/edgar/searchedgar/companysearch.html. Note that the country Georgia cannot be distinguished from the U.S. state Georgia in our dataset, and we therefore deleted Georgia from our sample.

[53] The challenge is to match the legal name as little misspellings or the usage of abbreviations for companies' legal forms might hinder the matching. Therefore, we searched the company names for commonly used legal forms and replaced all written out legal forms with its abbreviations. More-over, we deleted space characters from the spelling and changed it to the use of small letters only.

Moreover, we add financial data obtained from COMPUSTAT. Statutory corporate tax rates, information on CFC legislation in the U.S. and European countries as well as special tax treatment of trademark income (trademark boxes) are collected from the International Bureau of Fiscal Documentation (IBFD) and tax surveys provided by EY, KPMG and PwC. Macroeconomic data is obtained from the World Bank and CEPII GEODIST. U.S. Marginal Tax Rates derive from Graham's database.[54] All variables used are described in Appendix 1. We require non-missing values for all country characteristics. After all, our final dataset includes 478 S&P firms that registered 81,766 new trademarks for use in U.S. commerce between 2003 and 2012. A detailed overview regarding data collection is reported in Appendix 2.

For additional analysis, we match the USPTO information to the ownership structures of European companies listed in the STOXX Europe 600 Index during 2007. The information on ownership structures is obtained from the AMADEUS database provided by Bureau van Dijk and financial information from COMPUSTAT GLOBAL. All other control variables reveal from the same sources as used for the U.S. firms. The data covers 235 STOXX Europe 600 firms based in sixteen countries which are reported in Appendix 3. These firms registered 14,984 new U.S. trademarks during the same time period.

4.3.2. Methodology

In our empirical framework, we model the MNE's trademark allocation decision as a two-step process: We first analyze the determinants of the corporate decision to locate legal ownership of U.S. trademarks offshore and then, in a second step, investigate the tax and non-tax country characteristics that attract

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[54] Simulated marginal tax rates (*MTR*), based on the methodology of Graham (1996), are available for download at: https://faculty.fuqua.duke.edu/~jgraham/taxform.html.

legal ownership of U.S. trademarks, conditional on offshoring ownership. This two-step framework for analysis is consistent with other studies modeling the geographical allocation of intangible asset ownership within MNEs, e.g. with Boehm et al. (2015) who investigate the geographical split between R&D activity and patent ownership, or more generally, with the framework for analysis of MNEs' choice on transnational capital investment as proposed by Horstmann and Markusen (1992) and extended by Devereux (2007).

Accordingly, in the first part of our empirical analysis, we assess potential determinants of the decision whether to locate trademark ownership in the U.S. or offshore ("offshore decision"). Specifically, we define a binary variable $OFFSHORE_{i,n,t}$ which takes on the value 1 if firm i locates the ownership of trademark n at time t in a foreign country and 0 otherwise. Following the latent variable approach to binary choice models, we specify an unobserved underlying latent variable OFFSHORE[*] as

$$OFFSHORE^*{}_{i,n,t} = \beta_0 + \beta_1 MTR_{i,n,t} + \beta_2 V_{i,n,t} + \beta_4 X_{i,n,t} + \varepsilon_{i,n,t} \qquad (1)$$

Our model accounts for a set of explanatory variables. On the one hand, these encompass factors that reflect the incentive to shift income and allocate assets offshore. More specifically, *US MTR* is a firm's simulated marginal federal corporate income tax rate according to the methodology put forward by Shevlin (1990) and Graham (1996, 1999). Simulated marginal tax rates take into account the most important dynamic features of the U.S. tax code, i.e. net operating loss

carry-forwards and carry-backs, investment tax credits etc.[55] Along the lines of Lindsey and Wilson (2015) who model firm-level characteristics associated with the location of subsidiaries in domestic versus foreign tax haven jurisdictions, we expect a significant positive coefficient for *US MTR*. The higher the tax costs for an additional dollar of U.S. income, the higher should be the incentives to allocate trademark ownership abroad.

Moreover, valuable trademarks should carry more income shifting potential than less valuable ones and, thus, we expect valuable trademarks to be located offshore with higher probability.[56] We follow Sandner and Block (2011) and approximate trademark value by the number of goods and service classes for which it is registered. When filing an application, it is possible to seek protection for several goods and service classes. Trademarks with few classes tend to protect single products or narrow product lines whereas trademarks awarded to many classes rather protect wider product lines or so-called umbrella-brands (Erdem, 1998; Cabral, 2000; Sandner and Block, 2011). The breadth and market scope of a trademark, as reflected in the number of goods and services for which it is registered, should correlate positively with its ability to influence consumer behavior and purchasing decisions, and, thus, with its value (Economides, 1988; Sandner and Block, 2011).

Furthermore, we follow Lindsey and Wilson (2015) and try to capture firm-specific characteristics that reflect a firm's 'operational wherewithal' to use foreign

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[55] According to Graham (1996), simulated marginal tax rates are calculated for each firm and year separately by assuming that taxable income follows a random walk with drift over 18 years into the future. Then, the present value of the tax bill is calculated. Subsequently, it is recalculated after adding one dollar to taxable income in the current period. Results from 50 simulations (based on 50 separate forecasts of taxable income) are averaged to finally represent the firm-specific marginal tax rate. We obtained simulated marginal tax rates from John Graham's homepage: https://faculty.fuqua.duke.edu/~jgraham/taxform.html.

[56] The role of patent value in international tax planning strategies built around patents is highlighted by Boehm et al. (2015).

low-tax jurisdictions and shift profits abroad. To this aim, we include in vector *X* of equation (1) the variables *ADVERT EXPENSE*, defined as advertising expense scaled by total assets, and *PROFITABILITY*, defined as the ratio of gross profit to total sales, as well as *INCOME MOBILE*, i.e. a dummy variable that marks parent company industries classified by three-digit SIC codes, that turn out to be particularly functional for profit shifting according to research by De Simone, Mills and Stomberg (2014).[57] Moreover, we add a dummy variable DELAWARE which marks companies with corporate domicile in Delaware.

Multinational companies that seek the flexible regulatory environment of Delaware might be more apt or willing to engage in a flexible and tax efficient allocation of valuable intangibles. In addition, similar to Lindsey and Wilson (2015), *SIZE* and *MARKET TO BOOK* are included to control for general firm characteristics that may influence the decision to locate U.S. trademark ownership abroad. *SIZE* is defined as the natural logarithm of total assets and *MARKET TO BOOK* is the ratio of a firm's market value to its book value of equity. Eventually, the vector *X* includes the variable *FOREIGN ACTIVITIES*, defined as the number of foreign subsidiaries of a multinational firm divided by the total number of subsidiaries. Companies with a strong footprint outside of the U.S. may be more likely to hold intangibles offshore. For example, after the acquisition of a non-U.S. subsidiary, control and management of the associated IP might remain with the subsidiary just for some non-tax reasons. Summary statistics for all independent variables used in Equation (1) are reported in table 1.

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[57] We classify the following three-digit SIC codes as income mobile industries: 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services).

Table 1: Summary Statistics – Offshore Decision U.S. Firms

Variable	Obs	Mean	Median	Std. Dev.	25%	75%
US MTR	54,970	0.2142	0.3499	0.1570	0.0238	0.3500
TRADEMARK VALUE	54,970	4.1577	4.0000	1.8166	3.0000	5.0000
PROFITABILITY	54,970	0.4367	0.4334	0.2136	0.2637	0.5873
ADVERT EXPENSE	54,970	0.0286	0.0050	0.0517	0.0000	0.0388
INCOME MOBILE	54,970	0.1812	0.0000	0.3852	0.0000	0.0000
HQ DELAWARE	54,970	0.6183	1.0000	0.4858	0.0000	1.0000
SIZE	54,970	9.8872	9.6725	1.5140	8.6478	10.8961
FOREIGN ACTIVITIES	54,970	0.4799	0.5667	0.2726	0.2800	0.7202
MARKET TO BOOK	54,970	3.7911	2.8569	18.8289	1.7645	4.1466

Notes: Table 1 shows descriptive statistics for all variables included in Equation (1). Variables are defined in Appendix 1.

The unobserved latent variable $OFFSHORE^*_{i,n,t}$ modeled in (1) reflects the net benefit from offshoring trademark ownership and our observation is

$$OFFSHORE_{i,n,t} = 1 \quad if \quad OFFSHORE^*_{i,n,t} > 0 \tag{2}$$

$$OFFSHORE_{i,n,t} = 0 \quad if \quad OFFSHORE^*_{i,n,t} \leq 0 \tag{3}$$

Assuming that the error term $\varepsilon_{i,n,t}$ in equation (1) is logistically distributed, the probability to observe a U.S. trademark being registered by an offshore entity can be written as $P(OFFSHORE_{i,n,t} = 1) = \Lambda(\beta_0 + \beta_1 MTR_{i,n,t} + \beta_2 V_{i,n,t} + \beta_4 X_{i,n,t})$, where $\Lambda(.)$ indicates the logistic cumulative distribution function. We obtain parameter estimates by estimating this model with maximum likelihood techniques.

In the second part of our empirical analysis, we employ a mixed logit model to analyze which host country characteristics determine the location of legal trademark ownership *conditional* on offshore location. The mixed logit model has

been employed in other empirical analyses investigating determinants of ownership allocation of intangibles (Griffith et al, 2014; Dudar and Voget, 2016). It represents a variant of the conditional logit model, but with a random coefficient formulation (Train, 2003; Greene, 2012).

To model the determinants of the geographical allocation of trademark ownership, we specify a mixed logit model that accommodates unobserved heterogeneity in preference parameters with firm i's payoff from locating legal ownership of trademark n in country j given as $\pi_{inj} = \text{Tax}'_{ij}\beta_i + X'_{inj}\delta + \varepsilon_{inj}$. The vector Tax_{ij} includes tax factors *STR*, *USWHT*, *CFC* and *TMBOX*. Along the lines of Griffith et al. (2014), we model the coefficients of the variables in Tax_{ij} with a random component, i.e. $\beta_i = \beta + v_i$, with $v_i \sim N(0, \Sigma_\beta)$.[58] Firm i assigns trademark ownership to host country j^* if $\pi_{inj^*} > \pi_{inj} \ \forall \ j^* \neq j$. Considering the probability of choosing country j^* over alternatives j, conditional on realizations of the random part of the coefficient v_i, gives a conditional logit model. The unconditional probability is obtained by integrating out the random term. The model is estimated by using simulated maximum likelihood (Train, 2003).[59]

The random coefficients are best interpreted as reflecting unobserved heterogeneity in preferences. More intuitively, an equivalent formulation of the mixed logit model can be used without a random-coefficients interpretation, as simply representing error components that create correlations among the benefits for different locations (Train, 2009). These correlations over alternatives allow for more realistic substitution patterns than a conditional logit model. In other words, mixed logit does not exhibit independence from irrelevant alternatives. Referring

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[58] This formulation is along the lines of Cameron and Trivedi (2009: 508).

[59] We assume that each firm's choice set consists of all foreign countries where at least one trademark has been assigned to. This is not particularly restrictive as all firms in our sample are large MNEs represented in nearly all host countries included in the sample.

to these two, ultimately equivalent, interpretations, the random coefficients reflect heterogeneity in preferences with respect to tax or, put differently, allow for flexible substitution patterns between choice alternatives with respect to host country tax factors.

STR is the statutory corporate tax rate of a host country. In addition, we consider the U.S. withholding tax (*USWHT*) levied on royalty payments from the U.S. to the respective host country. We expect both tax factors to have a negative effect on the probability of trademark allocation to the potential host country. Moreover, we define a dummy variable *CFC* as 1, if the home country CFC regime, according to the respective minimum effective tax rate criteria, potentially applies for subsidiaries located in host country *j*; it is 0 otherwise. Furthermore, the dummy variable *TM BOX* indicates if a host country offers special tax treatment of income generated by trademark usage.

Vector *X* captures gravity variables such as *GDP*, GDP per capita (*GDPCAP*), the geographical distance (*DIST*) between country-alternative j and the U.S., and *COMLANG*, a dummy that marks English speaking countries. More-over, we include the World Bank's control of corruption perception index (*CPI*) as an indicator for the quality of institutions. We hypothesize that U.S. trademarks are more likely to be located in large and developed economies geographically and culturally close to the United States. In other words, we expect the coefficients of the gravity variables to be positive. *CPI* captures perceptions of the extent to which public power is exercised for private gain on a scale from -2.5 (weak governance) and 2.5 (strong governance). In accordance with Dharmapala and Hines (2009), we expect that trademark ownership is rather located in countries with stronger governance. Summary statistics for all independent

variables are reported in table 2 for U.S. firms and in table 3 for European Firms.

Table 2: U.S. Firms' Summary Statistics – Foreign Location Decision

Variable	Obs	Mean	Median	Std. Dev.	25%	75%
STR	3,543	0.2972	0.3000	0.1008	0.2600	0.3660
USWHT	3,543	0.0405	0.0000	0.0846	0.0000	0.0500
CFC	3,543	0.5848	1.0000	0.4928	0.0000	1.0000
TMBOX	3,543	0.0162	0.0000	0.1262	0.0000	0.0000
GDP	3,543	27.7101	28.2069	1.6020	27.0884	28.7291
GDPCAP	3,543	10.6045	10.6262	0.6171	10.4684	10.8266
CPI	3,543	1.6154	1.7369	0.6023	1.3437	2.0232
DIST	3,543	8.5404	8.7054	0.8709	8.6252	8.9960
COMLANG	3,543	0.3878	0.0000	0.4873	0.0000	1.0000

Notes: Table 2 shows U.S. firms' descriptive statistics for all variables included in Equation (2), if *LocTM* is equal to one. Variables are defined in Appendix 1.

Table 3: European Firms' Summary Statistics – Foreign Location Decision

Variable	Obs	Mean	Median	Std. Dev.	25%	75%
STR	1,513	0.2733	0.2800	0.0738	0.2225	0.3300
USWHT	1,513	0.0230	0.0000	0.0704	0.0000	0.0000
CFC	1,513	0.0476	0.0000	0.2130	0.0000	0.0000
TMBOX	1,513	0.0628	0.0000	0.0243	0.0000	0.0000
CFC	1,513	0.0476	0.0000	0.2130	0.0000	0.0000
GDP	1,513	27.5864	27.5599	1.0901	27.0139	28.5482
GDPCAP	1,513	10.7143	10.7408	0.6416	10.6027	10.9443
CPI	1,513	1.7513	1.8595	0.5316	1.6390	2.0833
DIST	1,513	8.3996	8.6769	0.8463	8.6252	8.7439
COMLANG	1,513	0.4005	0.0000	0.4902	0.0000	1.0000

Notes: Table 3 shows European firms' descriptive statistics for all variables included in Equation (2), if *LocTM* is equal to one. Variables are defined in Appendix 1.

4.4. Empirical Analysis

4.4.1. Choice between U.S. and Foreign Trademark Assignment

The 478 S&P 500 firms included in this study designate ownership of their U.S. trademarks to 1.9 countries. As this average includes the U.S., this can be interpreted as the average use of 0.9 foreign countries.

Figure 1: Trademark Holding by U.S. Firms

☐ Firms assigning full U.S. trademark portfolio to U.S. entities

■ Firms assigning full U.S. trademark portfolio to to non-U.S. affiliates

☐ Firms assigning U.S. trademark portfolio to to U.S. and non-U.S. entities
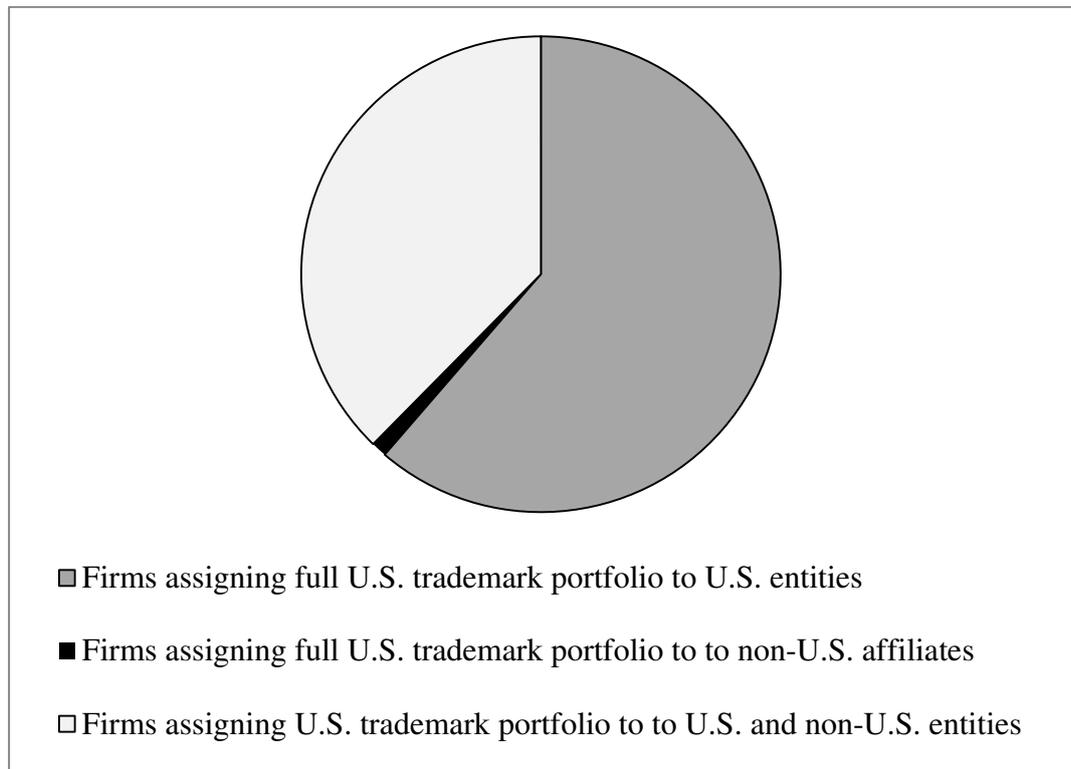
Notes: Figure 1 shows the distribution of firms assigning their U.S. trademark portfolio either only to U.S. entities, only to non-U.S. affiliates or to both.

However, as figure 1 illustrates the proportion of foreign ownership in U.S. trademark portfolios is highly skewed: 293 of the 478 S&P firms did not locate any of their trademarks outside the U.S. whereas five companies have assigned their full U.S. trademark portfolio to non-U.S. affiliates.

Accordingly, a first view at the data reveals a strong home bias for trademark registrations at the USPTO. Home bias in intangible asset investment is already identified in previous research. For example, Karkinsky and Riedel (2012)

find that, on average, European MNEs file 57.1 percent of their patent applications at the European Patent Office in the name of the parent company. The home bias in trademark registrations submitted by U.S. MNEs at the USPTO, however, is much more pronounced. Specifically, 95.7 percent of the 81,766 U.S. trademarks registered by S&P firms between 2003 and 2012 were owned by U.S. entities. Thus, the proportion (number) of trademarks these firms hold outside the U.S. amounts to only 4.3 percent (3,543 trademarks). Still, these foreign held trademarks spread over a remarkable number of countries. In total, 40 countries turn out to be holding locations for registered U.S. trademarks in S&P 500 firms.[60] On average, a U.S. firm locates 5 percent of its U.S. trademarks offshore. Figure 2 illustrates these relations.

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[60] U.S. firms located their U.S. trademark ownership in the following countries: Argentina, Australia, Austria, Barbados, Belgium, Bermuda, Brazil, Canada, Chile, China, Czech Republic, Denmark, Equatorial Guinea, Finland, France, Germany, Great Britain, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Luxembourg, Malaysia, Marshall Islands, Mexico, Netherlands, New Zealand, Norway, Poland, republic of Korea, Singapore, Spain, Sweden, Switzerland, Turkey, Uruguay and Venezuela.

Figure 2: U.S. Firms – Distribution of Trademark Ownership
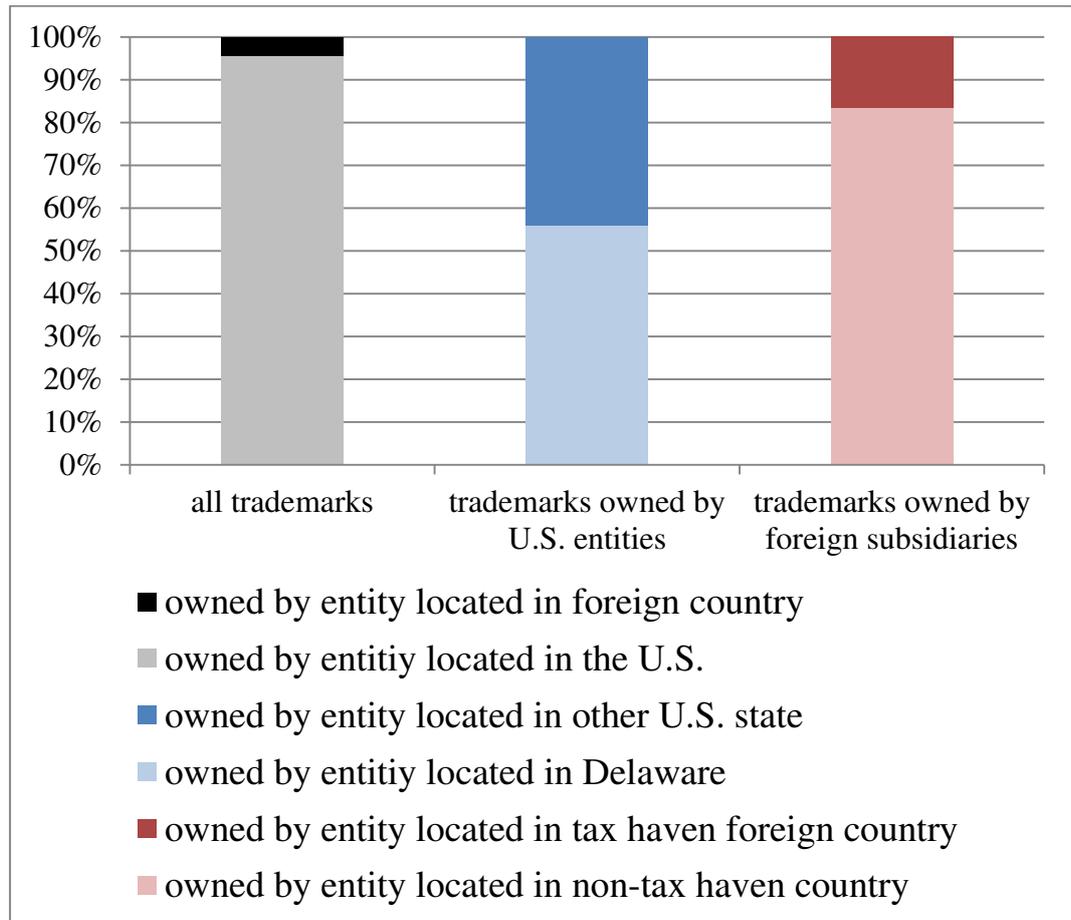
Notes: Figure 2 shows the distribution of trademark ownership to entities located in the U.S. or a foreign country for all trademarks registered by U.S. firms. For trademark ownership allocated to U.S. entities, the column "trademarks owned by U.S. entities" shows the distribution of trademark ownership to entities located in Delaware or other U.S. states. For trademark ownership allocated to foreign countries, the column "trademarks owned by foreign subsidiaries" shows the distribution of trademark ownership to tax haven and non-tax haven countries. The definition for tax havens follows Dyreng and Lindsey (2009).

Notably, the tax treatment of intangible assets is not homogenous even within the U.S., but rather varies considerably across the federal states. In particular, Delaware is acknowledged to be a domestic U.S. tax haven. Delaware exempts income derived from intangible assets from state-level taxes. By transferring their intangibles to Delaware, firms can thus achieve permanent tax savings and lower their effective state tax rates on average by 0.7-1.1 percentage points and thus their U.S. state income tax burden by 15-24 percent compared to firms that do not base their tax planning strategy on Delaware's tax system (Dyreng, Lindsey and Thornock, 2013; Lindsey and Wilson, 2015). Using our

matched data sample, we can consider and compare the level of U.S. trademark ownership, in terms of trademark registrations at the USPTO, concentrated in the domestic U.S. tax haven Delaware relative to foreign non-U.S. tax havens (figure 2). In total numbers, U.S. firms locate 43,770 trademarks, i.e. 53.5 percent of all successful registrations, in Delaware while they locate only 587 trademarks in foreign tax haven countries.[61]

Taking into account the pattern of trademark allocation, we assume a two-step location choice as the underlying decision process. The first choice is whether to locate trademark ownership in a third country, while the location choice is only the second step. Therefore, we start with an analysis of the determinants of assigning a trademark offshore. We use the logistic regression approach described in Section 4.3 which considers *OFFSHORE* as dependent variable. Table 4 presents the respective results.

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[61] Note: Our tax haven definition follows Dyreng and Lindsey (2009).

Table 4: U.S. Firms –Choice between U.S. and Foreign Trademark Assignment

	(1)	(2)	(3)
US MTR	-0.217	-0.246	0.160
	(0.679)	(0.684)	(0.647)
TRADEMARK VALUE		0.179***	0.176***
		(0.053)	(0.054)
PROFITABILITY			-0.343
			(0.776)
ADVERT EXPENSE			-2.043
			(5.485)
INCOME MOBILE			0.829
			(0.800)
HQ DELAWARE			0.917**
			(0.395)
SIZE	0.011	0.008	0.027
	(0.192)	(0.193)	(0.169)
FOREIGN ACTIVITIES	3.148***	2.882***	2.665***
	(0.813)	(0.774)	(0.822)
MARKET TO BOOK	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)
N	54,970	54,970	54,970

Notes: Table 4 presents results from logit regressions with *OFFSHORE* as dependent variable. Numbers in parentheses are robust standard errors clustered by firms. Variables are defined in Appendix 1. *, ** and *** show significance at the level of 10%, 5% and 1%, respectively.

In column (1) we only consider some firm level control variables and the U.S. marginal tax rate (*US MTR*). In column (2) we add our measure for the trademark value and in column (3) we consider additional variables that capture incentives for international tax planning. The results show that most of the firm characteristics do not contribute much to explain the offshore decision. Only the

size of foreign activities is associated with a higher probability to hold a trademark offshore.

Interestingly, our results suggest that the U.S. marginal tax rate of the firm (*US MTR*) does not play a decisive role in the decision whether to locate U.S. trademark ownership abroad. However, the probability to hold a trademark abroad is significantly higher, if the firm has chosen the state of Delaware as headquarter location. This finding suggests a firm that has already considered an attractive regulatory and tax environment into account might also be aware of international tax planning opportunities associated with trademark offshoring.

Finally, our results show that a higher trademark value increases the probability of holding a trademark abroad. This finding might also hint at tax planning considerations because more valuable trademarks are associated with more profit shifting opportunities. We therefore expect tax considerations to play a more decisive role, if the decision to assign trademark ownership to a foreign affiliate is taken.

4.4.2. Foreign Trademark Assignments of U.S. Firms

The S&P firms do not solely locate the ownership for their U.S. trademarks inside the U.S., they also assign 3,543 trademarks to non-U.S. affiliates. 587 of these are located in nine tax haven countries (Barbados, Bermuda, Hong Kong, Ireland, Luxembourg, Marshall Islands, Singapore, Switzerland and Uruguay), i.e. 16.57 percent of the offshore trademarks are located in foreign tax haven countries.

Table 5: U.S. Firms – Top 10 Countries by Total and Average Number of Registrations

country	total number of registrations	country	average number of registrations per firm
United States	*78,223*	*United States*	*165.73*
Japan	598	Japan	85.43
Great Britain	502	Bermuda *	37.00
Germany	444	Ireland *	16.63
Canada	326	Turkey	12.33
Netherlands	273	Sweden	11.00
Switzerland *	202	Netherlands	10.50
Bermuda *	185	Germany	10.09
Sweden	165	Finland	8.80
Ireland *	133	Switzerland *	8.08
France	123	Great Britain	7.49

Notes: Table 5 shows the top 10 countries of U.S. trademark ownership location regarding the total number of registrations (left) and the average number of registrations per firm that registered U.S. trademarks by affiliates located in the respective country (right) for the S&P 500 firms. Trademarks owned by entities located in the U.S. are not considered. Countries marked with a * are tax havens following Dyreng and Lindsey's (2009) definition.

Table 5 shows the top ten countries in terms of the total number of U.S. trademarks owned by subsidiaries located in these countries (left) and the average number of U.S. trademarks owned by subsidiaries located in a country per firm (right). Interestingly, considering the total number of trademarks U.S. companies locate most trademarks in countries with rather high tax rates like Japan, Canada and Germany.

If no double tax treaty is in place, the U.S. withholds a 30 percent tax on royalty payments paid to a foreign entity. Interestingly, the U.S. signed double tax treaties that reduce the withholding tax on royalty payments with most of the countries presented in Table 5. For this reason, especially Ireland and Switzerland are interesting options for the location of trademark ownership as they have agreed with the U.S. on a withholding tax of zero percent on royalty payments.

Considering the average number of U.S. trademarks owned by subsidiaries located in a country per firm, Table 4 shows that tax havens become more important. Two tax haven countries rank among the top five trademark locations

of U.S. MNEs, whereas no tax haven figured among the top five for the total number of registrations. One of these tax haven countries (Ireland) combines tax haven status with a withholding tax of zero percent on royalties received from the U.S. In sum, the explorative analysis indicates that tax havens are not excessively sought in the geographical allocation of trademark ownership. However, those firms which actually allocate their U.S. trademarks to tax havens tend to do so in a more extensive way.

Previous literature shows that tax haven operations and intangible asset ownership is associated with additional tax avoidance (Harris, 1993; Grubert, 2003; Markle and Shackelford, 2012a and 2012b). Therefore, we expect a different pattern of trademark ownership, in particular, for firms with high intangible asset ownership or intense tax haven activities.[62]

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[62] Variables are defined in Appendix 1.

Figure 3: U.S. Firms – Trademarks owned by entities located offshore
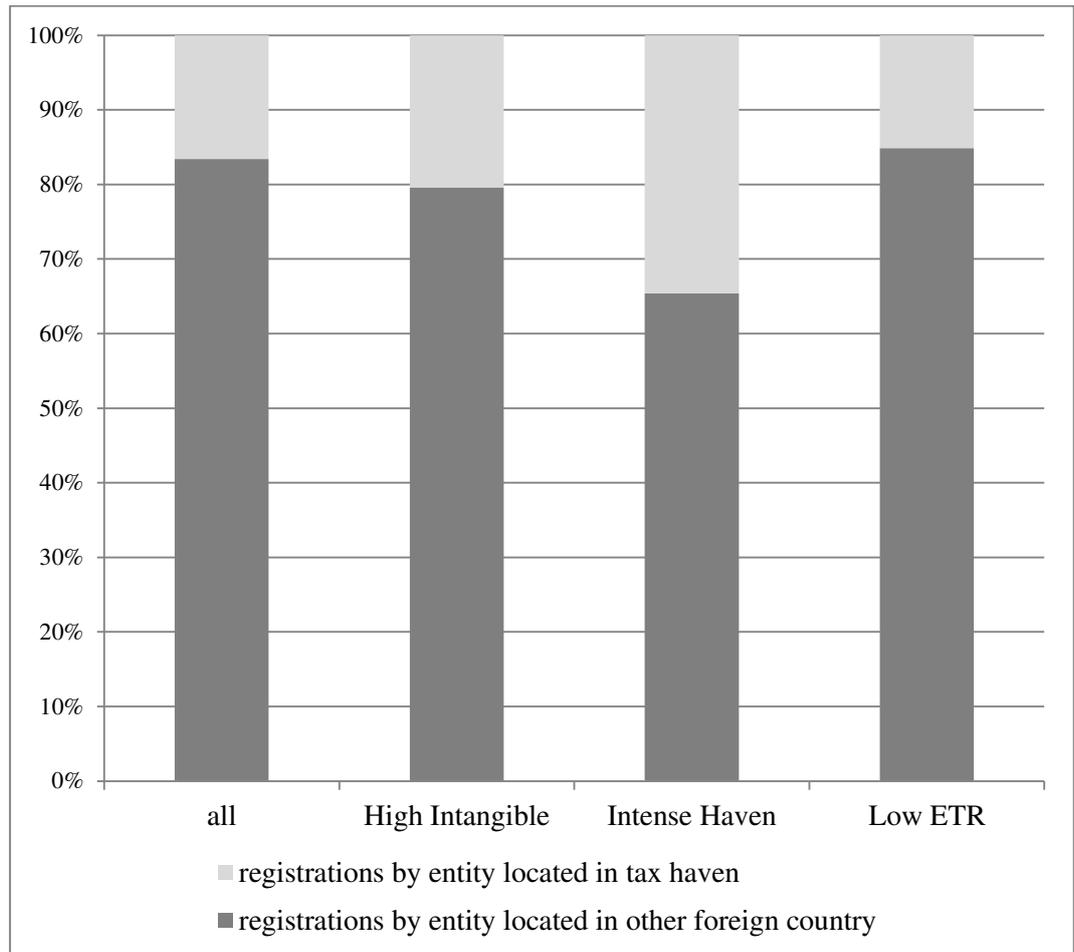
Notes: Figure 3 shows the distribution of trademark ownership located in foreign countries distinguished between tax haven countries and other foreign countries for the S&P 500 firms. The definition for tax havens follows Dyreng and Lindsey (2009). The first bar includes all U.S. firms of our sample, the second bar includes only firms in the upper quartile of the share of intangible assets to total assets; the third bar includes only firms in the quartile with the lowest ETR; and the fourth bar includes only firms in the upper quartile of number of affiliates located in a tax haven scaled by total number of affiliates.

Figure 3 however depicts only a meaningful difference for firms with extensive use of tax haven subsidiaries. They locate 34.58 percent of their third-country trademarks in tax havens while all S&P 500 firms do only locate 16.57 percent there. Firms with a high share of intangible assets locate only slightly more trademarks in tax havens (20.37 percent). We find similar results for the relation of the average number of registrations per third country to the average number of registrations per tax haven used. Only firms with intense tax haven operations locate on average a considerably higher amount of trademarks (11.75) in each tax haven country.

Effective tax rates (ETRs) are well-accepted proxies for the overall tax avoidance of a firm, as a lower ETR suggests that a firm is more effectively avoiding income taxes compared to firms with higher ETRs (Dyreng and Lindsey, 2009). Interestingly, firms with low ETRs do not locate more trademarks in tax haven countries. They even locate slightly less trademarks at tax havens (15.12 percent).

In sum, the descriptive results of table 5 and figure 3 show that trademark ownership is not primarily located in tax haven countries, but rather in other countries.

Table 6: U.S. Firms – Mixed Logit Results

	(1)		(2)		(3)	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Random Variables						
STR	-9.494***	18.39***	-13.31***	17.74***	-5.775***	18.39***
	(1.973)	(1.369)	(2.631)	1,769	(1.943)	(1.369)
USWHT			-14.29***	13.29***	-7.821***	19.60***
			(1,557)	1,197	(1.718)	(2.169)
CFC					-0.198	-3.028***
					(0.263)	(0.416)
TMBOX					0.806**	1.256***
					(0.405)	(0.414)
Fixed Variables						
GDP	-0.200*		-0.181		-0.192**	
	(0.115)		(0.160)		(0.0928)	
GDPCAP	1.206***		0.954***		0.933***	
	(0.118)		(0.144)		(0.119)	
DIST	-0.392***		-0.253**		-0.290**	
	(0.108)		(0.0989)		(0.116)	
CPI	1.170***		0.660**		0.657**	
	(0.268)		(0.289)		(0.261)	
COMLANG	0.0121		0.186		0,152	
	(0.370)		(0.324)		(0.302)	
N	141,720		141,720		141,720	

Notes: Table 6 presents the mixed logit estimates for U.S. firms. 3,543 positive trademark registrations from third countries are included. Numbers in parentheses are robust standard errors. Variables are defined in Appendix 1. *, ** and *** show significance at the level of 10%, 5% and 1%, respectively.

In order to analyze whether host country tax incentives determine foreign trademark assignment of U.S. firms, we use the mixed logit approach described in Section 4.3. Table 6 presents the basic results for the mixed logit regression. The results suggest that a higher corporate tax rate (*STR*) leads to a lower probability

that a trademark is located in the respective host country. The same effect can be observed for *USWHT*. A higher withholding tax levied by the U.S. on royalty payments to a host country leads to a lower probability that a trademark is located there. For both, *STR* and *USWHT,* our results are highly statistically significant across all specifications. Moreover, the results in table 6 confirm that firms respond heterogeneously to taxes. The highly significant standard deviations for our random coefficients indicate that parameters do indeed vary among firms. Interestingly, the U.S. CFC rule as well as preferential tax regimes for income generated by trademarks (so called trademark boxes) to do not significantly affect the location choice of trademarks.

Concerning our control variables, we find coefficients that are in line with our expectations. We find a statistically significant positive relationship for *GDP* per Capita and *CPI* as well as a negative for geographical distance (*DIST*).

Table 7: U.S. Firms – Base Probabilities

Country	Base Probability
Canada	0.1225
Japan	0.1122
Germany	0.1117
Great Britain	0.1048
Ireland *	0.0900
Bermuda *	0.0676
Switzerland *	0.0478
France	0.0388
Netherlands	0.0381
Hong Kong *	0.0288

Notes: Table 7 presents the predicted base probabilities after regression 1 of table 6 for the top 10 countries regarding base probability. Countries marked with a * are tax havens following Dyreng and Lindsey's (2009) definition.

As the results presented in table 6 cannot be interpreted quantitatively, we predict base probabilities for our results of column (1). The base probabilities of the most preferred countries are presented in table 7. The predicted base probabilities for one country to be chosen as location for U.S. trademarks vary from above ten percent to below one percent. In table 5, we identified Japan as the most popular foreign trademark location concerning the total as well as the average number of registrations per firm. Our predicted probabilities confirm this observation as Japan is among the most popular countries with a base probability of 0.1122. Only Canada (0.1225) has a higher base probability. In line with our observations in the descriptive part, we find that tax havens are amongst the most popular countries, but do not dominate extensively. Other high-tax third countries like Canada, Japan and Germany are chosen with much higher probabilities. Moreover, our approach allows us to identify which tax havens are preferred by U.S. firms. We find that they rather use Ireland (0.0900), Bermuda (0.0676) and Switzerland (0.0478) than Barbados (0.00005), Marshall Islands (0.00009) and Luxembourg (0.0007) for the location of their U.S. trademarks.

The benefit of our mixed logit model is that it does not only allow us to simulate the probability firms locate their trademark in a certain country, but also enables us to find out how a change in a host country *STR* affects this probability as well as the probabilities of other host countries. In the following, we simulate how a one percentage point decrease in *STR* of certain countries would affect the probability a trademark is located in the countries we identified as the most popular countries in table 7. Table 8 presents the result as relative change compared to the base probability in the original scenario.

Table 8: U.S. Firms – Cross Semi-Elasticities

	Canada	Japan	Germany	Great Britain	Ireland	Bermuda	Switzerland	France	Netherlands	Hong Kong
Canada	**2.473**	1.183	0.382	-0.662	-0.650	-0.216	-0.484	0.042	-0.261	-0.268
Japan	1.229	**-4.585**	1.966	0.115	-0.123	-0.022	-0.088	0.562	0.047	-0.054
Germany	0.206	1.720	**0.745**	-0.386	-0.523	-0.157	-0.364	0.142	-0.210	-0.203
Great Britain	-0.858	0.188	-0.461	**8.637**	-1.534	-0.584	-0.904	-0.180	-0.511	-0.568
Ireland	-1.161	-0.146	-0.710	-1.927	**21.786**	-6.517	-2.139	-0.230	-0.837	-1.882
Bermuda	-0.534	-0.035	-0.282	-0.977	-9.413	**18.174**	-1.674	-0.078	-0.477	-1.894
Switzerland	-1.293	-0.182	-0.833	-1.967	-3.692	-2.033	**17.887**	-0.295	-0.782	-1.154
France	0.145	1.864	0.440	-0.543	-0.548	-0.136	-0.366	**0.779**	-0.184	-0.221
Netherlands	-0.858	0.205	-0.402	-1.257	-1.652	-0.640	-0.911	-0.174	**9.762**	-0.553
Hong Kong	-1.293	-0.190	-0.821	-2.056	-5.388	-3.839	-1.943	-0.279	-0.854	**23.716**

Notes: Table 8 presents the cross semi-elasticities for a one percentage point cut in *STR*.

Interestingly, we find that trademark assignment to Hong Kong, Ireland, Bermuda and Switzerland which are all defined as tax havens react most pronounced to a tax rate cut. Ireland as the most popular tax haven considering base probabilities is chosen with 21.8 percent higher probability compared to the probability of 0.09 before a tax rate cut. In other words, Ireland is chosen with a base probability of 0.1096 after a tax rate cut. Translated into trademarks this means an increase of about 68 trademarks.

Trademarks can either refer to single goods or wider product lines (Cabral, 2000). Interestingly, the USPTO dataset provides information for how many of potentially 52 classes of goods and services a trademark is registered. Following Sandner and Block (2011), we assume that the value of a trademark positively correlates with the number of classes it covers. This assumption seems plausible, because a successful registration requires the owner of the application to prove the actual use of the trademark for each individual class of goods or services it is supposed to cover.

Firms in our dataset protect their trademarks for between one and eight classes. We classify trademarks covering one or two classes as having low value whereas trademarks covering seven or eight classes are considered to be of high value. We find that the S&P 500 firms included in this study designate ownership of 4.35 percent of their less valuable U.S. trademarks covering one or two classes of goods or services to entities outside the U.S. while they locate 6.72 percent of their more valuable trademarks there. This indicates that firms locate their trademarks covering more classes rather in foreign countries.

Therefore, we re-run our regression for two sub-groups: The first group contains trademarks covering one or two classes of goods and services (*low*

value). The second sub-group pitches on trademarks covering seven or eight classes (*high value*).

Table 9: U.S. Firms – Low and High Value Trademarks

	(1)		(2)	
	low value		*high value*	
	Mean	*SD*	*Mean*	*SD*
Random Variables				
STR	-5.938 ***	15.244***	-3.693*	14.395***
	(2.027)	(2.486)	(2.100)	(3.262)
Fixed Variables				
GDP	0.072		0.117	
	(0.210)		(0.164)	
GDPCAP	0.806***		1.264***	
	(0.089)		(0.122)	
CPI	0.222		0.732***	
	(0.322)		(0.255)	
DIST	-0.655***		-0.462*	
	(0.192)		(0.245)	
COMLANG	0.156		0.283	
	(0.599)		(0.314)	
N	22,440		23,840	

Notes: Table 9 presents the mixed logit estimates for sub-groups of the sample. Both, specification (1) and specification (2) consider only trademarks allocated to non-U.S. subsidiaries. Specification (1) considers only trademarks covering 1 or 2 classes of goods and services (*low value*). Specification (2) considers only trademarks covering 7 or 8 classes of goods and services (*high value*). Numbers in parentheses are robust standard errors. Variables are defined in Appendix 1. *, ** and *** show significance at the level of 10%, 5% and 1%, respectively.

Table 9 presents the results for these sub-group regressions. We can confirm our main results, which show that tax rates have a negative impact on the probability that a third country is chosen as trademark location. However, we cannot confirm that tax havens play a more important role for trademarks of high

value than for those being of low value. Concerning base probabilities predicted after specifications (1) and (2) of table 9, Canada, Japan and Germany stay among the four most popular countries for both, *low value* and *high value*, trademarks.

4.4.3. Comparison to Foreign Trademark Assignments of European Firms

In additional analysis, we compare the location of U.S. trademark ownership of U.S. firms to European firms. Our data covers 235 *STOXX Europe 600* firms. These firms registered 14,984 new U.S. trademarks during the same time period. Similar to U.S. firms, we find a strong home as well as a U.S. bias for European firms. The analysis of European firms allows distinguishing between holding a trademark in the home country of the firm and holding a trademark in the country of use, here the U.S. As figure 4 illustrates, 51.22 percent of the 14,984 U.S. trademarks newly registered by European firms between 2003 and 2012 are indeed held in the sixteen respective home countries[63] while 38.68 percent are located in the United States. The proportion of U.S. trademarks these firms hold neither in their respective parent countries nor in the U.S. is only 10.1 percent.

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[63] Home country means the country where the global ultimate owner is domiciled according to Amadeus.

Figure 4: European Firms – Distribution of Trademark Ownership
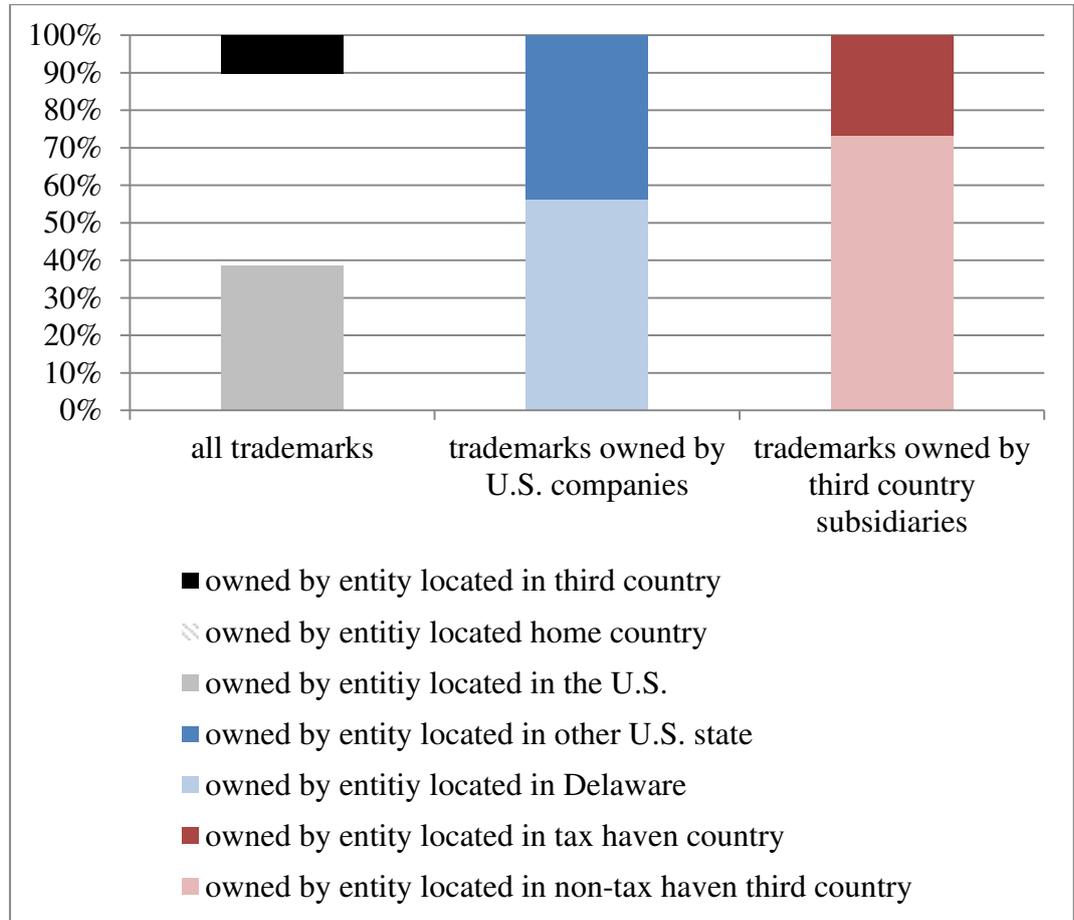
Notes: Figure 4 shows the distribution of trademark ownership to entities located in the U.S., the home country or a third country where third country is every country that is not the U.S. nor the home country for all trademarks registered by STOXX 600 Europe firms. For trademark ownership allocated to U.S. entities, the column "trademarks owned by U.S. companies" shows the distribution of trademark ownership to entities located in Delaware or other U.S. states. For trademark ownership allocated to third countries, the column "trademarks owned by third country subsidiaries" shows the distribution of trademark ownership to tax haven and non-tax haven countries. The definition for tax havens follows Dyreng and Lindsey (2009).

Nonetheless, U.S. trademark ownership within these STOXX 600 firms spread over 37 different third countries of which 24 are home country for neither of these firms. On average, each firm designates U.S. trademark ownership to 2.6 different countries. However, the proportion of third country ownership in U.S. trademark portfolios is again skewed: 109 of the 235 STOXX 600 companies locate their full U.S. trademark portfolio either in the U.S. or their home country,

but never in a third country. Only six firms locate all of their U.S. trademarks neither in the U.S. nor their home country, but in some third country.[64]

Considering tax haven usage by the STOXX 600 MNEs, the data show that 3,264 (i.e. 56.3 percent) of those U.S. trademarks which were filed from within the U.S. are held in Delaware, the U.S. tax haven. This contrasts with 404 U.S. trademarks designated to third country tax havens. Still, those 404 trademarks represent 26.70 percent of all third-country trademarks filed in foreign non-U.S. tax havens which is a disproportionally high share given that only seven of the 37 third countries recorded used the European MNEs are tax havens (Bermuda, Hong Kong, Ireland, Luxembourg, Singapore, Switzerland and Uruguay).

In the following, we include only trademarks located in third countries in our analysis. Considering ETR as measure of the overall tax avoidance of European MNEs, low ETR firms locate 44.55 percent of their third country trademark ownership in tax havens while all firms locate only 26.70 percent there. This indicates that low ETR firms tend to geographically allocate their trademarks more tax efficiently than other sub-groups.

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[64] Third country is every country that is neither the U.S. nor the home country of a firm.

Table 10: European Firms – Top 10 Countries by Total and Average Number of Registrations

country	total number of registrations	country	average number of registrations per firm
Home Country	*7,675*	*United States*	*39.43*
United States	*5,796*	*Home Country*	*35.53*
Switzerland *	226	Ireland *	16.63
Netherlands	217	Switzerland *	14.13
Great Britain	215	Netherlands	9.43
Canada	198	Great Britain	8.60
Germany	183	Colombia	8.00
Ireland *	133	Bermuda *	7.00
France	79	El Salvador	7.00
Luxembourg *	23	Canada	6.39
Japan	23	Germany	6.31
Australia	22	France	4.94

Notes: Table 10 shows the top 10 countries of trademark ownership location regarding the total number of registrations (left) and the average number of registrations per firm that registered trademarks by affiliates located in the respective country (right) for STOXX firms. Only trademarks owned by entities located in third countries are considered. Countries marked with a * are tax havens following Dyreng and Lindsey's (2009) definition.

Table 10 shows the top ten third countries in terms of the total number of U.S. trademarks located there (left) and the average number of U.S. trademarks located in a third country per European firm (right). In contrast to U.S. firms, for European firms not only high-tax countries rank among the top three countries, but also the tax haven Switzerland. Once again, tax haven countries gain of importance, if we consider the average number of trademarks owned by subsidiaries located in a third country per firm. European firms locate most trademarks in Ireland and Switzerland, which combine tax haven status with a withholding tax of zero percent on royalties received from the U.S. Interestingly, Ireland seems to be an interesting tax efficient location for both, U.S. and European firms. Similar to the analysis for U.S. firms, our explorative analysis for European firms indicates that overall tax havens are not excessively sought in the geographical allocation of U.S. trademark ownership. However, those firms which actually allocate their U.S. trademarks to tax havens tend to do so in an extensive way.

Table 11: European Firms – Mixed Logit Results

	(1)		(2)		(3)	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Random Variables						
STR	-7.659**	10.510***	-5.076*	11.54***	-7.089**	13.83***
	(3.379)	(2.956)	(2.948)	(1.230)	(3.031)	(1.586)
USWHT			-8.277***	22.66***	-17.13***	26.170***
			(-1.528)	(2.342)	(3.006)	(5.035)
CFC					-1.198***	4.555***
					(0.383)	(0.549)
TMBOX					-5.969**	7.622***
					(2.780)	(2.209)
Fixed Variables						
GDP	0.087		0.102		0.0042	
	(0.162)		(0.243)		(0.221)	
GDPCAP	1.205***		0.937***		1.000***	
	(0.259)		(0.165)		(0.225)	
CPI	-0.551***		-0.499***		-0.526**	
	(0.143)		(0.238)		(0.242)	
DIST	1.233***		0.772***		0.774***	
	(0.291)		(0.171)		(0.284)	
COMLANG	-0.450		-0.364		-0.328	
	(0.504)		(0.669)		(0.644)	
N	55,981		55,981		55,981	

Notes: Table 11 presents the mixed logit estimates for European firms. 1,513 positive trademark registrations from third countries are included. Numbers in parentheses are robust standard errors. Variables are defined in Appendix 1. *, ** and *** show significance at the level of 10%, 5% and 1%, respectively.

Table 11 presents mixed logit regression results for the European firms. Similar to the results for U.S. firms in Table 6, we can confirm that European firms respond heterogeneously on taxes. Once again, we find coefficients that are in line with our expectations. For both, *STR* and *USWHT,* our results are highly

statistically significant. Our result for *CFC* is also in line with our expectations. If a CFC rule is potentially applicable on the royalties deriving from the respective trademark, this country is chosen with a lower probability.[65] Thus, our results suggest a somewhat different effect of CFC rules of European countries and the U.S. While European CFC rules affect trademark location choices, the U.S. Subpart F rule does not. This finding might be explained by well-known strategies to circumvent application of Subpart F like "check-the-box". With regard to trademark boxes (*TMBOX*), we find a negative effect. The sign of the effects might be also attributed to the effectiveness of European CFC rules because the low tax rates applicable under a trademark box regime are subject to the CFC rules of the home countries.

Concerning our fixed variables, we find a statistically significant positive relationship for *GDP* per Capita and *CPI* as well as a negative for geographical distance (*DIST*).

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[65] Our CFC Dummy does not consider the Cadbury-Schweppes decision of the European Court of Justice. To make sure that our results are not influenced by this, we repeated the regression considering that CFC rules are not applicable within the European Union after the decision. The results are similar to those reported in this paper.

Table 12: European Firms – Base Probabilities

Country	Base Probability
Canada	0.1684
Germany	0.1371
Japan	0.0919
Great Britain	0.0897
Switzerland *	0.0699
France	0.0698
Netherlands	0.0627
Ireland *	0.0464
Sweden	0.0346
Denmark	0.0305

Notes: Table 12 presents the predicted base probabilities after regression 1 of table 11 for the top 10 countries regarding base probability. Countries marked with a * are tax havens following Dyreng and Lindsey's (2009) definition.

We again predict base probabilities for some countries. Table 12 presents the predicted base probabilities for those countries being the most popular countries concerning base probabilities. Interestingly, European MNEs choose tax havens with a lower base probability than U.S. firms.

The top four countries chosen with the highest probability by European firms are the same countries as for U.S. firms. In particular, these countries are Canada, Germany, Great Britain and Japan which are all rather high-tax countries. Though, sorted by base probability the order differs. Once again, we do not identify tax haven countries among the most popular countries. If European firms decide to locate their trademark in a tax haven, they choose Switzerland (0.0699) and Ireland (0.0464) with the highest probability. Rather unpopular tax haven countries are Uruguay (0.0004) and Luxembourg (0.0023).

Once again, we test whether trademarks covering 7 or more classes are

rather located in low tax jurisdictions by repeating our regression for this sub-group and predicting base probabilities afterwards.[66] Similar to the results for U.S. firms, we cannot confirm that low tax countries are more preferred than high tax countries for the location of valuable trademarks.

For European firms, we do also simulate the reaction to a one percentage point decrease in *STR* for those countries identified as most popular in table 12. Table 13 presents the cross semi-elasticities.

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[66] Results are reported in Appendix 4.

Table 13: European Firms – Cross Semi-Elasticities

	Canada	Germany	Japan	UK	Switzerland	France	Netherlands	Ireland	Sweden	Denmark
Canada	**4.664**	-0.468	0.136	-0.633	-0.694	-0.197	-0.475	-0.430	-0.262	-0.238
Germany	-0.650	**4.160**	0.243	-0.509	-0.589	-0.138	-0.440	-0.386	-0.228	-0.220
Japan	0.252	0.390	**0.051**	-0.161	-0.226	0.261	-0.117	-0.137	-0.067	-0.067
UK	-1.279	-0.866	-0.136	**8.365**	-1.055	-0.389	-0.709	-0.803	-0.390	-0.360
Switzerland	-1.736	-1.197	-0.288	-1.359	**13.015**	-0.537	-1.050	-1.719	-0.567	-0.533
France	-0.462	-0.274	0.435	-0.518	-0.519	**3.607**	-0.368	-0.364	-0.206	-0.192
Netherlands	-1.333	-0.921	-0.158	-0.960	-1.121	-0.411	**9.253**	-0.919	-0.408	-0.389
Ireland	-1.954	-1.300	-0.267	-1.644	-2.679	-0.538	-1.367	**17.913**	-0.713	-0.693
Sweden	-1.294	-0.914	-0.159	-1.011	-1.122	-0.419	-0.751	-0.920	**9.648**	-0.383
Denmark	-1.387	-0.984	-0.194	-1.042	-1.195	-0.440	-0.812	-0.995	-0.434	**10.363**

Notes: Table 13 presents the cross semi-elasticities for a one percentage point cut in STR.

Interestingly, once again the tax haven countries identified as popular in table 12 are those benefiting the most from their own tax rate decrease. Ireland's base probability increases about 17.9 percent and Switzerland's about 13 percent. Transferred into a number of trademarks this indicates an increase of trademark assignments of 13 trademarks for Ireland and 14 trademarks for Switzerland. Compared to the reaction of U.S. firms to a one percentage point decrease in Ireland's *STR*, European firms react less sensitive.

Overall, our results indicate that U.S. and European firms choose to locate the ownership of their trademarks used in the U.S. market rather in the U.S. or their home country. If they decide to locate the ownership in a third country, the most popular countries are most likely not particular tax attractive. However, we are able to identify that tax considerations play a significant role in the selection of trademark host countries for trademarks used in the U.S. market. For both, U.S. and European firms, the tax havens Ireland and Switzerland are amongst the most popular trademark ownership locations whereas Bermuda and Hong Kong are more preferred by U.S. firms. However, U.S. firms react slightly more sensitive to a tax rate decrease than European firms. Nevertheless, this sensitivity results in about 50 trademark assignments less for certain tax havens. Considering that Krasnikov, Mishra and Orozco (2009) estimate on average $ 7.8 million of future cash flows for each additional registration of a brand-association trademark, this difference can be seen as a notable profit shifting potential for the respective firms.

4.5.   Conclusion

It is well-known that firms profit from tax planning strategies enabling them to shift profits to low-tax countries. Even though prior literature confirms the importance of intellectual property for these strategies, little is known about the actual location of intellectual property. We therefore analyze the role that tax considerations play in the allocation of trademark ownership to foreign subsidiaries. This paper uses a new and unique dataset that links the location of trademarks registered by MNEs for the U.S. market with group structures of large MNEs from the U.S. (S&P 500) and Europe (STOXX Europe 600). We analyze whether tax incentives play a decisive role in the legal assignment of U.S. trademarks to entities outside the U.S.

Interestingly, we identify for both, U.S. and European MNEs, a strong home-bias. However, our findings indicate also the importance of tax considerations, if a firm decides to assign trademark ownership to an affiliate located in a foreign country. We find a statistically significant negative relationship between host country tax rates as well as U.S. withholding taxes and trademark location choice.

Admittedly, interpreting our results from an economical perspective indicates that profit shifting with the use of trademarks is limited. Our results suggest that U.S. firms react to a corporate tax rate decrease of one percentage point in Ireland with an increase in trademark assignment of about 70 trademarks. The numbers suggest a limited effect of tax considerations within the process of trademark location considering that U.S. firms registered 81,766 new trademarks in our research period. The same is true for European firms though European firms react even less sensitive to tax rate decreases.

One explanation for our results might be the nature of trademarks. In contrast to patents, most investments in trademarks are undertaken after the geographical assignment. Tax sensitive firms usually try to locate their income to low tax countries while they prefer to generate their expenses at high tax countries. As transfer pricing rules require that investments undertaken for the establishment of a trademark by a trademark's user have to be considered in the analysis of functions, the potential to locate expenses at high tax countries and income at low tax countries for trademarks is limited.

Our results contribute to the ongoing debate on BEPS and the current discussion about the use of intellectual property for aggressive tax planning strategies resulting in low ETRs. Besides showing where U.S. and European firms actually locate the ownership some kind of intellectual property (trademarks), we are able to identify that firms integrate tax considerations to a limited degree in their decision process. However, most firms locate their trademarks rather in other countries.

APPENDIX

Appendix 1: Variable Definitions

ADVERT EXPENSE	advertising expense (*xad*) scaled by total assets (*at*)
CFC	Dummy variable with the value one if the home country CFC regime, according to the respective minimum effective tax rate criteria, potentially applies for subsidiaries located in host country *j*; it is 0 otherwise
COMLANG	Dummy variable with the value of one if English is an official language in the host country (Source: World Bank)
CPI	Control of Corruption Index (Source: World Bank, Worldwide Governance Indicators)
DIST	Distance between U.S. and country i (Source: CEPII GEODIST)
FOREIGN ACTIVITIES	Share of foreign subsidiaries in total number of subsidiaries
GDP	Natural logarithm of gross domestic product (Source: World Bank)
GDPCAP	Natural logarithm of gross domestic product per capita (Source: World Bank)
HQ DELAWARE	Dummy variable with the value of one if the headquarter of the firm is located in Delaware
INCOME MOBILE	Dummy variable with the value of one if the parent company belongs to the following three-digit SIC codes: 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services).
MARKET TO BOOK	ratio of a firm's market value (*prcc_f*) to its book value (*bkvlps*)
OFFSHORE	Dummy variable with the value of one if trademark ownership is assigned to an affiliate located offshore.
PROFITABILITY	ratio of gross profit (*gp*) to total sales (*sale*)
SIZE	natural logarithm of total assets (*at*)

STR	Statutory corporate tax rate of the host country
TMBOX	Dummy variable indicating host countries that offer a special tax rate for income from trademark usage (trademark box)
TRADEMARK VALUE	Number of classes a trademark is registered for (Source: USPTO)
US MTR	firm's simulated marginal U.S. federal corporate income tax rate based on Graham (1996)
USWHT	Withholding tax rate levied on royalty payments of U.S. entities to foreign countries

Appendix 2: Sample Selection

U.S. firms	number of firms	number of trademarks
Registering Firms being in the S&P 500 Index in 2007	536	85,911
Firms having neither headquarters nor incorporation in the U.S.	27	4,094
	509	81,817
Missing country characteristics	31	195
Sample	**478**	**81,622**

European Firms	number of firms	number of trademarks
Registering Firms being in the STOXX Europe 600 Index in 2007	235	14,996
Missing country characteristics	0	12
Sample	**235**	**14,984**

Appendix 3: Home Countries of European Firms

Home Country	Number of Firms
Austria	2
Belgium	2
Denmark	6
Finland	13
France	38
Germany	29
Great Britain	88
Ireland	5
Italy	3
Luxembourg	2
Netherlands	13
Norway	4
Portugal	1
Spain	12
Sweden	16
Switzerland	1
Total	*235*

Notes: Appendix 3 presents the Home Country for
the STOXX 600 Europe firms.

Appendix 4: European Firms – Low and High Value Trademarks

	(1) low value		(2) high value	
Random Variables				
STR	-15.474***	12.906***	-10.898**	12.726***
	(3.392)	(2.121)	(5.152)	(2.496)
Fixed Variables				
GDP	0.002		-0.025	
	(0.248)		(0.236)	
GDPCAP	1.693***		1.483***	
	(0.202)		(0.427)	
CPI	1.711***		1.513***	
	(0.485)		(0.355)	
DIST	-0.318		-0.544***	
	(0.278)		(0.175)	
COMLANG	-0.334		-0.706**	
	(0.887)		(0.322)	
N	14,430		9,842	

Notes: Appendix 4 presents the mixed logit estimates for sub-groups of the European firm sample. Both, specification (1) and specification (2) consider only trademarks allocated to third country subsidiaries. Specification (1) considers only covering 1 or 2 classes of goods and services (*low value*). Specification (2) considers only trademarks covering 7 or 8 classes of goods and services (*high value*). Numbers in parentheses are robust standard errors. Variables are defined in Appendix 1. *, ** and *** show significance at the level of 10%, 5% and 1%, respectively.

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