Determinants of Aggressive Tax Avoidance

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Vorwort

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Köln, im Oktober 2015 *Tanja Herbert*

Content

Chapter 1

Motivation and Research Questions

Content

1.1. Motivation

The aggressive tax avoidance of some multinational enterprises (MNEs) has received much attention recently. The debate has been stimulated by very low reported effective tax rates (ETRs). In 2010, for example, large profitable U.S. corporations disclosed on average an ETR of 16.9 %, although with 35 % they face one of the highest official statutory tax rates in the world (U.S. Government Accountability Office, 2013). Google Inc. was even able to reduce its overseas ETR to 2.4 %.[1]

In 2013, as a response to this tax avoidance behavior, the Organisation for Economic Cooperation and Development (OECD) proposed an action plan against base erosion and profit-shifting (BEPS) activities of MNEs. This action plan consists of 15 specific action items that are intended to 'better align rights to tax with economic activities' (OECD, 2013).

However, although ETRs are at the heart of this recent public debate, there is still an ongoing discussion in the tax avoidance literature about the appropriateness of the ETR as a tax avoidance measure (Hanlon and Heitzman, 2010: 139). The ETR is easily available as firms have to disclose ETRs in their consolidated financial statements (ASC 740; IAS 12). But is the ETR really a reliable measure to depict a company's overall performance in terms of the reduction of tax burden? Or is the reliability of the ETR biased by the consolidation processes, consideration of deferred taxes or other determinants?

One challenge for the evaluation of this research question is that there are still no universally accepted definitions of, or constructs for, tax avoidance and its magnitude. In

[1] Cf.www.bloomberg.com/news/2010-10-21/google-2-4-rate-shows-how-60-billion-u-s-revenue-lost-to-tax-loopholes.html.

previous studies, the definition of tax avoidance often comprises the reduction of explicit taxes. However, this definition does not distinguish between real activities that are tax-favored and avoidance activities that are specifically undertaken to reduce taxes (Hanlon and Heitzman, 2010: 137). The development of a scope of tax avoidance behavior is also requested by the recent OECD discussion about base erosion and profit-shifting (OECD, 2013).

A second challenge for the tax avoidance literature is the research on tax avoidance determinants (Shackelford and Shevlin, 2001) and especially on the so-called undersheltering puzzle which covers the question why some corporations avoid more taxes than others (Weisbach, 2002). An increasing number of research studies have already investigated the influence of firm-specific characteristics including firm size, capital structure, asset mix and profitability (Stickney and McGee, 1982; Gupta and Newberry, 1997; Plesko, 2003; Rego, 2003; Richardson and Lanis, 2007). A few studies also provide insight into the impact of foreign activities and international tax planning. Rego (2003), Collins and Shackelford (1995, 2003) as well as Markle and Shackelford (2012a) compare the ETRs of MNEs to those of domestic firms. In addition, Dyreng and Lindsey (2009) and Markle and Shackelford (2012b) consider tax haven operations and proxies for profit-shifting channels as determinants of tax avoidance.

However, about some determinants of the ETR as tax avoidance measure still very little is understood. One field where more research work is required is the effect of ownership structures on tax avoidance (Hanlon and Heitzman, 2010: 146). While there are some studies investigating concentrated ownership structure such as family firms (Chen et al., 2010), there is still less known about the influence of the government as a

shareholder. Especially in the light of the financial crisis this topic became of certain interest as a number of multinational banks received capital injections which strengthened the respective government's shareholder position.

Another field where more empirical research is necessitated is the influence of public disclosure on tax avoidance. Recently, there is a focus on this topic as the current BEPS action plan requests more transparency concerning disclosure and tax planning activities (OECD, 2013). Additionally, the discussion was intensified by the recent case of Amazon that showed the impact public pressure caused by more accounting transparency has on tax avoidance.[2]

In three essays, this thesis aims to contribute to these research gaps of the empirical tax avoidance literature. A new, more refined methodology based on the ETR for measuring tax avoidance is provided which aims to identify firms that pursue more tax aggressive strategies. In addition, well-known as well as so far less investigated determinants of tax avoidance such as government ownership and public disclosure are examined.

The first essay "*Measuring the Aggressive Part of International Tax Avoidance"*, co-authored with Michael Overesch, Chair of Business Taxation at the University of Cologne, proposes a new measure that isolates the additional or even aggressive part in international tax avoidance and analyzes the determinants of aggressive tax avoidance of MNEs. A previous version of the paper was presented at the *1st Doctoral Research Seminar in Vienna 2014*, the *37th European Accounting Association Annual Congress in Tallinn 2014*, and the *4th EIASM Workshop on Current Research in Taxation in Muenster 2014*.

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

In the second essay "*Capital Injections and Aggressive Tax Planning - Can Banks Have It All?",* we investigate governments' influence on tax aggressiveness of multinational banks. We measure this impact by analyzing the change in banks' ETRs caused by capital injections during the financial crisis. The essay is based on a working paper with Julia Merz, former doctoral research assistant at the Chair of Business Taxation at the University of Cologne, and was presented at the *Doctoral Research Seminar in Berlin 2015*.

The thesis concludes with the essay "*Public Disclosure of Foreign Subsidiaries and Aggressive International Tax Avoidance"*, co-authored with Michael Overesch, Chair of Business Taxation at the University of Cologne and Pia Olligs, doctoral research assistant at the Chair of Business Taxation at the University of Cologne. This essay analyzes 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).*

1.2. Measuring the Aggressive Part of International Tax Avoidance

1.2.1. Research Question and Design

The essay *"Measuring the Aggressive Part of International Tax Avoidance"* provides a new measure for the aggressive part of international tax avoidance of MNEs. Our new measure ETRDIFF is computed as the difference between the average of the statutory tax rates imposed by all countries worldwide that host a subsidiary and the

ETR. A firm is classified as more tax aggressive if the gap between its ETR and its expected benchmark tax level according to the average statutory tax rate increases. Hence, our approach enables us to isolate more aggressive international tax planning from the simple influence of differences in host country tax levels.

We compute the ETRDIFF measure for the S&P 500 firms over a period from 2002 to 2012 by combining information of the location of subsidiaries disclosed in Exhibit 21 of Form 10-k and Compustat data. In addition, we consider a comparable data sample for German listed MNEs which have to disclose their subsidiaries according to § 313 (2) HGB and IFRS 12. For the manual collection of the statutory tax rates we use the worldwide corporate tax summaries of PwC, KPMG and E&Y.

Our main analysis refers to the *GAAP ETRDIFF* and *Foreign ETRDIFF*. We identify the scope of international tax avoidance in explorative analyses by evaluating sample means of our ETRDIFF measures in the total sample and in various subsamples which are associated with tax aggressive behavior. In particular, we consider subsamples containing firms with intense tax haven operations, firms with intense R&D activities and income mobile firms. In additional regression analyses, we use the ETRDIFF measures to identify the impact of firm characteristics and international tax planning strategies such as tax haven operations and profit-shifting opportunities on the scope of tax avoidance.

We also conduct several robustness checks with respect to further ETRDIFF measures (*Current ETRDIFF*, *Cash ETRDIFF* and *Foreign Current ETRDIFF*) and well-established ETR measures (*GAAP ETR* and *Foreign ETR*). In addition, we consider an alternative definition of our benchmark tax level and weight the host countries'

statutory tax rates by domestic sales as well as sales of a typical foreign subsidiary (adjusted ETRDIFF).

1.2.2. Results and Contribution to the Literature

Our explorative results confirm significant positive values for the ETRDIFF measures in particular for the U.S. firms suggesting additional tax avoidance beyond the benchmark tax level of the firms. We find even more positive values if we take the subsamples into consideration which reflect tax avoidance behavior.

The findings of the regression analyses confirm that aggressive international tax avoidance is determined by tax haven operations and opportunities to manipulate transfer prices. We conclude that the ETRDIFF measures are not only more sufficient to measure the amount of aggressive tax avoidance but also helpful to analyze the influence of certain tax planning strategies.

If we compare the results for U.S. and German firms, we receive similar effects for the influence of certain tax planning characteristics. Our results suggest that MNEs from the U.S. and from Germany can benefit from certain tax planning opportunities to the same extent. However, our explorative analysis of the total scope of tax avoidance suggests that U.S. MNEs are particularly aggressive. Our findings from the explorative and regression analyses are robust if we consider the adjusted ETRDIFF.

The study contributes to the previous literature investigating determinants of tax avoidance (Hanlon and Heitzman, 2010). Especially, it refers to a small strand of studies which isolate an unexplained residual that might be attributed to international tax avoidance (Desai and Dharmapala, 2006, 2009; Frank, Lynch and Rego, 2009; Balakrishnan, Blouin and Guay, 2012). Thus, we also contribute to the current OECD

BEPS discussion (OECD, 2013) which requests new measures to analyze the scope and determinants of base erosion and profit-shifting.

1.3. Capital Injections and Aggressive Tax Planning - Can Banks Have It All?

1.3.1. Research Question and Design

The essay "*Capital Injections and Aggressive Tax Planning - Can Banks Have It All?"* analyzes government influence on tax planning activities of multinational banks. For this analysis we use the fact that during the recent financial crisis a number of financial institutions received capital injections by their respective government. Based on empirical evidence of previous studies investigating the influence of state ownership on tax avoidance (Desai and Dharmapala, 2008; Desai, Dyck and Zingales, 2007), we assume that banks will change their tax aggressiveness after they receive public funds.

The optimal setting to investigate this research question would require observing the tax aggressiveness measured by a bank's ETR with and without recapitalization. As this is not observable and the treatment status is not random, we create a counterfactual control group as similar as possible to the recapitalized banks (treated group) by employing propensity score matching.

We use a five to one nearest neighbor propensity score matching in a difference-in-differences framework (DID-PSM approach) and measure the effect of the recapitalization treatment by comparing the change in tax aggressiveness of the treatment group before (2007) and after (2011) receiving government support to the counterfactual trend of the control group in absence of recapitalization. By combining the strength of these two approaches towards causal inference our analysis is robust to

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

To avoid possible bias due to our chosen event window or our matching method, we also conduct several robustness checks. Therefore, we consider different matching algorithms (one to one nearest neighbor and kernel matching) and set 2010 instead of 2011 as our relevant after-crisis year. Moreover, we examine effects for subsamples with respect to different regions (European and U.S. based banks).

Our empirical analysis is based on a unique hand-collected data set of 93 banks located in 10 OECD countries which received capital injections in 2008 and/or 2009. Our control group of non-recapitalized banks consists of 763 banks in the respective countries. The consolidated financial statement information is collected from the Bankscope Database provided by Bureau van Dijk.

1.3.2. Results and Contribution to the Literature

The results of our analysis indicate that a government influence in form of capital injections had a limiting effect on banks' tax aggressiveness. Our difference-in-differences approach provides evidence that banks receiving public funds had significantly lower ETRs and were thus more tax aggressive one year before the financial crisis in 2007. After the recapitalization in 2008 and/or 2009, however, the ETRs for the treated and the control group converged and we cannot confirm significantly different ETRs. Our results are supported by our robustness checks, applying another event window and different matching methods. A split of our sample suggests that the limiting effect differs among regions and is especially pronounced in Europe.

We attribute this finding to governments' strengthened shareholder position due to capital injections during the financial crisis. Interestingly, our analysis shows that banks changed their tax aggressiveness although there were no contractual conditions tied to receiving such funds which targeted tax payments.

The paper contributes to the previous studies analyzing the influence of ownership structure and corporate governance on the tax avoidance of multinational firms (Chen et al., 2010; Chyz et al., 2013; Desai and Dharmapala, 2008; Desai, Dyck and Zingales, 2007). In the context of financial institutions, however, there is still less understood about the effect of ownership structure and especially about the impact of state ownership on tax planning activities. Although banks' tax aggressiveness in general has already been investigated (Keen and de Mooij, 2012; Heckemeyer and de Mooij, 2013; Huizinga, Voget and Wagner, 2014), we are the first to investigate the relationship between governments' position as a shareholder due to recapitalizations and banks' tax avoidance.

Thus, this paper also contributes to an increasing number of studies about banks which received government support during the financial crisis and their characteristics (Brei, Gambacorta and von Peter, 2013; Mariathasan and Merrouche 2012; Panetta et al., 2009).

1.4. Public Disclosure of Foreign Subsidiaries and Aggressive International Tax Avoidance

1.4.1. Research Question and Design

The essay *"Public Disclosure of Foreign Subsidiaries and Aggressive International Tax Avoidance"* explores the impact of public disclosure of subsidiaries in

Exhibit 21 of Form 10-k on the tax aggressiveness of U.S. MNEs. Our research question is based on the phenomenon that since 2008 several U.S. multinational firms have removed a substantial number of subsidiaries from their Exhibit 21, although they still exist.[3] We consider Exhibit 21 as a simplified country-by-country reporting. The prior tax literature finds that less accounting transparency concerning different types of country-by-country reporting leads to more aggressive tax behavior (e.g., Hope, Ma and Thomas, 2013; Dyreng, Hoopes and Wilde, 2014).

Therefore, we expect firms which have decided to publicly disclose fewer foreign subsidiaries in their Exhibit 21 to become more tax aggressive compared to firms that do not change their public disclosure attitude. Moreover, we investigate the influence of other well-known determinants of international tax avoidance such as tax haven operations and profit-shifting opportunities. As tax avoidance measure we consider the *Foreign ETR* in our main analysis.

For our empirical study we use a pooled data set of listed U.S. MNEs for 2007 and 2012 as these years can be considered the beginning and the end period of significant changes in reporting of foreign subsidiaries. During this period we identify more than 30 diminishing firms which significantly reduced the number of foreign subsidiaries disclosed in Exhibit 21.

We contacted each of these diminishing firms in order to evaluate their reasons to change their disclosure behavior. As those firms which responded to our request refer to M&A activities as particular reason, we control for changes in Exhibit 21 due to M&A in our study. Furthermore, to show the robustness of our results, we also conduct several

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

alternative analyses concerning different specifications of diminishing and different measures of international aggressive tax avoidance (*Foreign Current ETR*, *GAAP ETR* and ETRDIFF measures).

The information of Exhibit 21 is taken from the SEC's database EDGAR. The consolidated financial statement information is extracted from Compustat North America. Tax data is hand-collected from the worldwide corporate tax summaries of PwC, KPMG and E&Y.

1.4.2. Results and Contribution to the Literature

The findings of our difference-in-differences estimations suggest a significant rise in tax avoidance as a response to less public disclosure of foreign subsidiaries. In addition, our analysis confirms that international tax planning behavior by U.S. based firms is associated with tax haven operations and profit-shifting opportunities. The effect of public disclosure on tax avoidance is robust across our robustness checks.

One restriction to our results is a potential endogeneity problem, as some firms might diminish the number of subsidiaries disclosed in their Exhibit 21, because they are already tax aggressive. However, as none of the diminishing firms we contacted refer to tax planning as reason of main interest, we do not expect endogeneity to be problematic. To corroborate this idea, we use the regression-based form of the Hausman test for endogeneity (Hausman 1978, 1983) which also confirms that the potential endogeneity is not of further interest.

The study contributes to a small strand of research which analyzes the relationship between public disclosure and the scope of international tax avoidance (Hope, Ma and Thomas, 2013; Dyreng, Hoopes and Wilde, 2014). It provides new insights into the

discussion whether firms are less tax aggressive if they perceive costs associated with public pressure (Gallemore, Maydew and Thornock, 2014; Jacob, Rohlfing-Bastian and Sandner, 2014). Thus, our results suggesting that publicly disclosed country-by-country information could influence MNEs' tax avoidance behavior also contribute to the recent BEPS discussion in which more accounting transparency is requested.

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Chapter 2

Measuring the Aggressive Part of International Tax Avoidance

Measuring the Aggressive Part of International Tax Avoidance

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Abstract:

We propose a new measure that isolates the additional or even aggressive part in international tax avoidance from well-known determinants of effective tax rates (ETRs). Our new measure ETRDIFF is computed as the difference between the average of the statutory tax rates imposed by all countries worldwide that host a subsidiary of the respective MNE and the ETR. We classify a firm as more tax aggressive if the difference between its ETR and its benchmark tax rate according to the average statutory tax rate of its host countries increases. We apply our new measure to multinational enterprises (MNEs) from the U.S. and from Germany. Our results suggest that in particular U.S. MNEs are tax aggressive in terms of international tax avoidance. Additional analysis reveals that the aggressive part of international tax avoidance is associated with tax haven operations and profit-shifting opportunities.

Key words: Effective Tax Rate, Tax Accounting, Tax Aggressiveness, International Tax Planning

We thank Lorenz Schwittmann and Pia Olligs for their valuable support regarding the collection of our Exhibit 21 data set. We appreciate comments from Pia Olligs and conference participants at the EAA Annual Congress in Tallinn, at the Vienna University of Economics and Business and at the EIASM Workshop on Current Research in Taxation in Muenster.

Content

Tables

2.1. Introduction

It is well-known that multinational enterprises (MNEs) can avoid taxes. However, there is no broad agreement about the definition of "aggressive" tax avoidance. We propose a new measure for the aggressive part of international tax avoidance of multinational enterprises and analyze the determinants of aggressive tax avoidance. The new measure is used to analyze the tax aggressiveness of MNEs from the U.S. and from Germany.

The public debate on the aggressive tax avoidance of some MNEs has been stimulated by very low effective tax rates (ETRs).[4] For example, Google Inc. paid only $0.36 billion foreign taxes on $8.1 billion of non-U.S. profits in 2012 which leads to a foreign ETR lower than 5 %.[5] As statutory tax rates on corporate income are significantly higher in most industrialized countries, this creates an expectation gap between the disclosed tax position and common expectations about the tax level imposed.

We propose a new measure of international tax avoidance determining the expectation gap explained above. Our new measure ETRDIFF is computed as the difference between a firm's individual benchmark tax level and an ETR. As benchmark tax level we consider the average of the statutory tax rates imposed by all countries worldwide that host a subsidiary of the respective MNE. The ETRDIFF measure considers that tax levels of MNEs vary in accordance with the variation in statutory tax rates of their host countries and isolates only the additional or even aggressive part of

[4] Cf. public hearings on tax avoidance in the U.S. or United Kingdom, e.g. U.S. Senate, Permanent Subcommittee on investigations, Hearing On Offshore Profit-Shifting and the U.S. Tax Code, 9/20/2012; House of Commons, Committee of Public Accounts, 11/12/2012.
[5] Cf. Google U.K. paid £ 11.2m in corporate tax, The Financial Times, 30/09/2013.

international tax avoidance. Accordingly, we classify a firm as more tax aggressive if the gap between its ETR and its expected benchmark tax rate according to the average statutory tax rate increases.

The previous literature has already investigated the determinants of tax avoidance in financial accounting data (for an overview cf. Hanlon and Heitzman, 2010). Most of the literature refers to different types of ETRs (Collins and Shackelford, 1995, 2003; Rego, 2003; Plesko, 2003; Dyreng, Hanlon and Maydew, 2008). A few studies isolate some unexplained residual that might be attributed to international tax avoidance and analyze abnormal or permanent differences between book and tax income (Desai and Dharmapala, 2006, 2009; Frank, Lynch and Rego, 2009). Balakrishnan, Blouin and Guay (2012) consider a firm's deviation from the industry mean of several tax measures as an indicator of tax aggressiveness. However, these studies do not take into account the simple fact of significantly varying host country tax rates. Accordingly, previous evidence has not disentangled the elementary effect of tax rate variation across host countries from additional or even aggressive tax avoidance like transfer pricing, royalties or 'check-the-box' techniques.

We compute our new ETRDIFF measure for the S&P 500 firms over a period from 2002 to 2012. For the computation, we use the fact that U.S. listed firms are obliged to publish a list of their significant subsidiaries' location in Exhibit 21 of Form 10-k and combine this information with Compustat data. Different versions of our ETRDIFF measure referring to the GAAP ETR and the Foreign ETR are considered.

Our explorative analyses depict positive ETRDIFF measures for U.S. MNEs suggesting additional tax avoidance beyond the benchmark tax level of the firms. We

find a mean *Foreign ETRDIFF* of 5 percentage points. That means the difference between the Foreign ETR and the average of the statutory corporate tax rates of all host countries of a firm is 5 percentage points. As robustness test, we also consider alternative definitions of our benchmark tax level and weight host country taxes by sales of subsidiaries. We find that the adjusted definition is associated with slightly larger ETRDIFF measures, but differences between adjusted and unadjusted ETRDIFF measures are small.

In additional regression analyses, we use our ETRDIFF measure to identify the impact of firm characteristics and certain international tax planning strategies on the scope of aggressive international tax avoidance. The findings confirm the influence of some well-known determinants of tax avoidance like size or profitability but also of proxies for certain tax planning opportunities. In particular, the amount of additional tax avoidance is determined by tax haven operations and the opportunities to manipulate transfer prices.

In addition to our analysis of tax aggressiveness of U.S. firms, we also investigate the amount of aggressive tax avoidance of MNEs from Germany as Europe's biggest economy. A comparison of U.S. firms and German firms is interesting for several reasons. Since taxes are high both in the U.S. and Germany, MNEs from both countries have the same strong incentives to use international tax planning strategies. However, U.S. taxation of foreign income differs from the international tax system in most countries. While foreign income of U.S. MNEs is also subject to U.S. corporate income taxes, most other countries in the world apply an exemption system to foreign business income that is very similar to the German tax system. Moreover, anecdotal evidence

suggests that some U.S. firms use aggressive tax planning strategies because U.S. controlled foreign company (CFC) rules are not very effective under certain conditions (Altshuler and Grubert, 2006). However, these rules ('check the box') are specific to the U.S. tax code and MNEs from other countries cannot benefit from these tax planning opportunities.[6]

A comparison between U.S. and German firms reveals that U.S. MNEs are particularly tax aggressive. Further regression analysis of the potential determinants of aggressive tax avoidance, however, suggests that MNEs from the U.S. and from Germany benefit from certain tax planning opportunities to the same extent.

Our measure allows identification of the aggressive part in tax avoidance. We therefore contribute to the current discussion about base erosion and profit-shifting (BEPS) of MNEs (OECD, 2013). This is of particular interest, as the OECD requests new measures to analyze the scope and the determinants of base erosion and profit-shifting. [7]

The remainder of the paper is organized as follows. In Section 2.2, we describe our new ETRDIFF measure. In Section 2.3, we use the measure to compute the amount of tax aggressiveness for MNEs from the U.S. and Germany. Section 2.4 provides a regression analysis of the determinants of aggressive international tax avoidance. Section 2.5 concludes.

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[6] A study by Ruf and Weichenrieder (2012) suggests that the German CFC rules effectively prevent German MNEs from using tax planning strategies in terms of financial structures at tax haven locations.
[7] Cf. http://www.oecd.org/ctp/oecd-releases-public-request-for-input-on-beps-action-11.htm.

2.2. Aggressive International Tax Avoidance

2.2.1. A New Measure for Aggressive International Tax Avoidance

To analyze aggressive international tax avoidance, convincing measures are needed. ETRs are commonly used proxies for tax avoidance and well-accepted measures for tax behavior in previous literature (Hanlon and Heitzman, 2010). A lower ETR suggests that a firm is more effectively avoiding income taxes than other firms with higher ETRs. A few studies have investigated the impact of foreign activities on this already well-established tax avoidance measure. Rego (2003), Collins and Shackelford (1995, 2003) as well as Markle and Shackelford (2012a) compare ETRs of MNEs with those of domestic firms. Expectations for the impact of international activities on the ETR are ambiguous. On the one hand, investments in high tax countries like the U.S., Canada, Germany or Japan are associated with increasing ETRs. On the other hand, MNEs invest in low-tax countries or even tax havens.

As international differences in corporate tax rates are significant and subsidiaries are subject to taxation in their host countries, we argue that a reduction in the ETR just because of establishing an additional foreign subsidiary in a host country with a moderate tax level should not be denoted as "aggressive" tax avoidance. We therefore propose a new type of measures that isolate more aggressive international tax planning from the simple influence of differences in host country tax levels. We characterize strategies like, for example, income shifting to low-tax countries or tax havens as aggressive tax avoidance (cf. Section 2.2.2 for an overview).

More precisely, our measure follows the idea that additional or even aggressive tax planning is associated with significantly lower ETRs compared with an expected

benchmark tax level. Therefore, our new measure ETRDIFF is computed as the difference between a firm's individual benchmark tax level and an ETR. We compute the following measures for each multinational firm *i* in fiscal year *t*:

$$ETRDIFF_{i,t} = \overline{STR}_{i,t} - ETR\ Measure_{i,t}$$

where:

$\overline{STR}$:	Worldwide average of the statutory corporate tax rates of all host countries of the firm *i* where a subsidiary is located (no consideration of tax haven countries).
ETR Measure:	Effective tax rate measure like the GAAP ETR, Current ETR, Cash ETR, Foreign ETR or Foreign Current ETR.

Our ETRDIFF measures identify abnormally small ETRs that cannot be explained by a benchmark tax level. Accordingly, an MNE is tax aggressive if its ETRDIFF is positive. This means its ETR is abnormally low compared to a benchmark tax level that would be expected in the absence of any profit-shifting strategies and shell corporations in tax haven countries. We use different versions of our ETRDIFF, considering the GAAP ETR, Current ETR, Cash ETR, Foreign ETR or Foreign Current ETR.

Our benchmark $\overline{\text{STR}}$ is the average of the statutory corporate income tax rates of all countries worldwide that host a subsidiary of the respective firm. Since $\overline{\text{STR}}$ is used as a proxy for the expected tax level according to the distribution of real economic activities, we do not consider tax haven countries for the computation. Thus, our benchmark tax level is determined by a firm's individual business model, i.e., by location choices, but is not affected by particular aggressive tax planning strategies.

We argue that the statutory corporate tax rate of a host country is a convincing benchmark for the proper tax level of an MNE's subsidiary in the absence of any

additional tax planning activities. Foreign income of U.S. MNEs is also subject to U.S. corporate income taxes at repatriation. Since U.S. taxes can be deferred if foreign income is retained, many U.S. firms avoid redistribution and prefer to reinvest or hold just cash in their foreign subsidiaries (Foley et al., 2007). Moreover, ASC 740-30-25-3 provides an exception to deferred tax accounting for permanently reinvested foreign earnings.[8] In contrast to the U.S. tax system, most other countries in the world apply an exemption system to foreign business income.

A higher ETRDIFF measure indicates more aggressive tax avoidance. An additional subsidiary in a host country imposing only a low corporate tax rate affects the ETR as well as the $\overline{STR}$. If an MNE benefits from additional tax savings due to profit-shifting or other aggressive international tax planning, the ETR decreases while the $\overline{STR}$ remains constant. The more extensively an MNE uses tax planning strategies to decouple the locations of its business activities from those of taxable income, the more $\overline{STR}$ and ETR differ.

While we are the first to propose a measure of tax avoidance that isolates the effect of more aggressive international tax planning strategies from the influence of differences in tax rates, the idea of using a differential between ETR and statutory tax rate as tax avoidance measure is well-known in the tax literature (Hanlon and Heitzman, 2010). Considering the influence of international taxation, we replace the statutory tax rate of the home country by the average of all statutory tax rates imposed by all host countries of an MNE. Our ETRDIFF also relates to a measure proposed by Balakrishnan, Blouin

[8] ASC 740-30-25-3 (formerly APB 23) allows a U.S. multinational to assert that its investment (outside basis) in a foreign subsidiary is permanent and those foreign earnings will be indefinitely reinvested, so there is no current or deferred incremental U.S. tax liability.

and Guay (2012) that benchmarks a firm's tax level with the industry mean of this respective tax measure. Using the industry mean as a benchmark, however, might lead to some underestimation of the scope of international tax avoidance if almost all firms in a certain industry avoid taxes through international structures.

Compared to previous studies, our approach allows to isolate the aggressive part of international tax avoidance as it considers that tax levels of MNEs vary in accordance with the variation in statutory tax rates of their host countries. The ETRDIFF reflects the scope of additional tax planning that cannot be explained by the distribution of a firm's real activities, i.e., the subsidiary locations. Put differently, our measure might also be interpreted as a performance indicator for the international tax planning strategies of an MNE.

2.2.2. Determinants of Aggressive International Tax Avoidance

Some of the variation in the ETRs of MNEs can be explained by the international variation of corporate tax rates. The remaining variation should be mainly attributed to additional tax planning strategies. A broad literature has analyzed subsidiary level data and provides evidence for income shifting. Profits are shifted and disclosed by subsidiaries subject to low tax rates. Previous studies have found that reported profits of multinational subsidiaries are inversely related to the local tax level suggesting intra-firm shifting of taxable profits (cf. Hines and Rice, 1994; Huizinga and Laeven, 2008; Blouin, Robinson and Seidman, 2015; Klassen and LaPlante, 2012a, 2012b). Moreover,

MNEs establish subsidiaries in tax haven countries (Desai, Foley and Hines, 2006)[9] and benefit from different definitions of residence (Ting, 2014).

While several studies find evidence for tax planning in subsidiary level data, in Section 2.4 we analyze how certain strategies of international tax avoidance affect tax measures computed for the consolidated financial statements of MNEs. Our analysis is related to studies by Dyreng and Lindsey (2009) and Markle and Shackelford (2012a, 2012b) that consider tax haven operations and proxies for profit-shifting channels as determinants of ETR measures. These studies, however, analyzed ETR measures, whereas our measurement of tax avoidance is already adjusted for the influence arising from very different tax levels across foreign subsidiaries.

In addition, we also provide empirical evidence from German MNEs. To the best of our knowledge, there are only two empirical studies which investigate influence factors on the ETRs of German MNEs. However, these studies do not provide an in-depth analysis of international tax planning. Sureth, Halberstadt and Bischoff (2009) conclude from their analysis that foreign operations have no effect on ETRs of German firms, whereas Kraft (2014) finds a negative impact of foreign operations on ETRs.

2.3. Measuring Aggressive Tax Avoidance of U.S. and German MNEs

In this section, we compute our new ETRDIFF measure for the S&P 500 firms. Moreover, we apply our measure to a comparable sample of listed firms from Germany as the biggest economy in Europe. Although the public debate about aggressive base erosion and tax planning is particularly focused on U.S. MNEs, it has attracted

[9] 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.

increasing global attention in recent years (Dharmapala, 2014). Therefore, we also investigate the tax aggressiveness of European MNEs.

2.3.1. Sample Selection

First, we consider a panel of U.S. firms listed in the S&P 500 over the period from 2002 to 2012. We take financial data from Compustat North America (5,907 firm-year observations). The construction of our ETRDIFF measure requires information about subsidiary locations. Exhibit 21 of Form 10-k contains information about significant subsidiaries (Item 601 of SEC Regulation S-K).[10] Similar to Dyreng and Lindsey (2009), we use the subsidiary information disclosed in Exhibit 21 and available at the SEC's database EDGAR.[11] On average, a U.S. firm in our sample has 132 subsidiaries. Companies which do not provide an Exhibit 21 in EDGAR are not included in our data sample. We refer to the group structure disclosed in the Exhibit 21 from 2007, because U.S. companies removed hundreds of offshore subsidiaries from their publicly disclosed financial filings in the upcoming years (Herbert, Olligs and Overesch, 2015).[12] Moreover, we limit our sample to multinational U.S. based firms and thus delete all firms which are not headquartered in the U.S. and have only domestic subsidiaries. Imposing these prerequisites on the data set creates a sample of 4,345 firm-year observations.

[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 10 % 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 10 % 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 10 % of the consolidated income from continuing operations.

[11] https://www.sec.gov/edgar/searchedgar/companysearch.html.

[12] Cf. The Incredible Vanishing Subsidiary – From Google to FedEx, Wall Street Journal, 5/22/2013.

Furthermore, we limit the sample to companies having a positive pre-tax income (pi) as it is difficult to analyze our results concerning the tax planning activities of loss firms (cf. Stickney and McGee, 1982; Zimmermann, 1983; Gupta and Newberry, 1997; Rego, 2003).[13] We exclude observations with ETRs < 0 and ETRs > 1 to limit the influence of outliers. In addition, we delete observations due to missing values in financial information used as control variables in supplement analysis in Section 2.4.

We derive 2,422 firm-year observations for the *GAAP ETRDIFF* (Panel A) and 1,760 firm-year-observations for the *Foreign ETRDIFF* (Panel B). Summary statistics of all variables used can be found in the Appendix 2.

In an additional analysis, we also compute the *GAAP ETRDIFF* for a sample of German listed firms that is comparable to the sample of U.S. firms. We consider all firms listed on the indices DAX, MDAX, SDAX and TecDAX in 2010. Real estate investment trusts, banks and insurance companies are excluded from our sample. Furthermore, we eliminate MNEs without German headquarters and firms having no foreign subsidiaries. Financial statement information is taken from the database Compustat Global. Our analysis considers data for the fiscal years 2007 – 2012.[14]

Comparable to Exhibit 21 of form 10-k, for German listed firms § 313 (2) HGB and IFRS 12 oblige a detailed public disclosure of the worldwide subsidiaries in form of a complete listing. We consider all subsidiaries that are directly or indirectly owned by the German parent firm to a degree of at least 50 % in 2010. We collect information about the corresponding host country and statutory corporate income tax rates of

[13] In case of the foreign ETRDIFF measures, we require a positive pre-tax foreign income.
[14] We consider only data from 2007 – 2012 to avoid any influence from different accounting standards. Prior to 2007, German listed firms prepared their financial report in accordance with local German GAAP, IAS or even U.S. GAAP.

subsidiaries in 177 countries in 2010. A German listed firm in our sample has on average 152 subsidiaries.

Again, MNEs with a negative group profit before tax or ETRs < 0 and ETRs > 1 and missing data in Compustat Global were excluded. Our final sample consists of 562 firm-year observations (Panel C). Summary statistics can be found in Appendix 2.

2.3.2. Aggressive Tax Avoidance of U.S. and German MNEs

We apply the methodology described in Section 2.2.1 to compute our ETRDIFF measures for each firm included in our samples. Table 1 depicts mean values for the *GAAP ETRDIFF* of MNEs from the U.S. and Germany as well as the *Foreign ETRDIFF* of U.S. MNEs. Unfortunately, Compustat Global does not provide information to compute the Foreign ETR. Thus, we cannot compute the corresponding *Foreign ETRDIFF* for German firms.

Considering U.S. firms, the mean *GAAP ETRDIFF* is 0.018 (Panel A). The value of 0.018 means that the difference between the GAAP ETR (sample mean: 30.3 %) and the mean of the statutory corporate tax rates of all host countries of a firm (sample mean: 32.1 %) is 1.8 percentage points. The mean value for the *Foreign ETRDIFF* is larger and amounts to 0.05. The positive ETRDIFF shows additional tax avoidance beyond the benchmark tax level associated with the international tax rate distribution across host countries.

As benchmark tax level we consider the mean of the statutory corporate tax rates of all host countries of a firm ($\overline{STR}$). Tax haven countries are neglected because setting up a tax haven subsidiary might be already interpreted as an aggressive form of tax avoidance. The mean value for the $\overline{STR}$ is approximately 0.32 which is nevertheless

smaller than the U.S. tax level due to smaller corporate tax rates imposed by several host countries.

Interestingly, the mean *GAAP ETRDIFF* for our sample of German listed firms (Panel C) is negative with -0.03. On average, firms in our sample report a GAAP ETR that is larger than its benchmark tax level determined by the statutory corporate tax rates of its host countries. A potential reason for the German firms' GAAP ETRs being higher compared to those of the U.S. firms could be the smaller percentage of income mobile firms in Germany (14 % vs. 22 %) which are associated with more tax avoidance (cf. Tables 1 and 2).[15] The mean value for the benchmark $\overline{STR}$ is 0.28 which is significantly smaller compared to U.S. firms. German firms are more often active in host countries offering smaller nominal tax rates.

A comparison between the ETRDIFF measures for the German and the U.S. sample in Table 1 suggests that U.S. firms are particularly more successful in terms of additional or even aggressive international tax avoidance.

TABLE 1: Summary Statistics Subsamples – ETRDIFF

	U.S. Firms				**German Firms**	
	GAAP ETRDIFF		***Foreign ETRDIFF***		***GAAP ETRDIFF***	
	N	Mean	N	Mean	N	Mean
(1) TOTAL	2,422	0.0179	1,760	0.0502	562	-0.0304
(2) HAVEN	513	0.0328	274	0.0947	136	0.0076
(3) R&D	705	0.0577	648	0.1042	135	-0.0024
(4) INCOME MOBILE = 1	528	0.0556	481	0.1189	77	-0.0095

Notes: Table 1 shows descriptive results for the dependent variables *GAAP ETRDIFF* and *Foreign ETRDIFF* for U.S. and German firms for different (sub)samples: (1) Total number of observations; (2) *HAVEN* in top-75% percentile; (3) *R&D* intensity in top-75% percentile; (4) *INCOME MOBILE* = 1.

[15] The high GAAP ETRs of German MNEs in our sample are also attributed to high deferred taxes. The mean Current ETR is approximately 17.54 %.

Moreover, Table 1 reports sample means of ETRDIFF measures for different subsamples that might be more tax aggressive: (i) firms with tax haven operations in the top-75% percentile, (ii) firms with an R&D intensity in the top-75% percentile, and (iii) income mobile firms. The additional data clearly illustrates that compared to the total sample, ETRDIFF measures increase if we only consider firms with intense tax haven operations, income mobile firms, or firms with intense R&D activities. The mean *GAAP ETRDIFF* of U.S. MNEs doubles for firms with intense tax haven usage or when firms from income mobile industries are considered. The differences become even more apparent for the *Foreign ETRDIFF*. The mean value computed for firms in income mobile industries is 0.12. The *Foreign ETRDIFF* of 0.12 translates into a Foreign ETR that is about 60 % of the benchmark tax level derived from host country tax rates.

A similar pattern can be observed for German firms. Compared to the total sample, the ETRDIFF significantly increase if we only consider firms with intense tax haven operations or firms with intense R&D activities.

This explorative analysis is, however, only a first indication for the influence of certain tax planning strategies on taxes effectively avoided. In Section 2.4, we will use regression analysis to identify the impact of firm characteristics and certain international tax planning strategies on the scope of aggressive international tax avoidance.

2.3.3. Adjusted Benchmark Tax Level

As benchmark tax level for our ETRDIFF measures we consider the mean of the statutory corporate tax rates of all host countries of a firm ($\overline{STR}$). The most important concern with the use of a simple mean of the corporate tax rates across all locations of an MNE is the asymmetric economic relevance of locations. However, as a country-by-

country reporting is neither required for the U.S. nor for the German firms, financial data of each subsidiary are not available. Unfortunately, no additional financial information is included in Exhibit 21.

However, as a robustness check, we try to approximate the economic weights of subsidiaries. For the U.S. firms, we do so by using statistics on the outward activities of U.S. MNEs provided by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). These statistics provide information about sales of U.S. controlled foreign subsidiaries for each host country and the number of U.S. subsidiaries located in the respective country.[16] We use this sales data and construct a new weighting scheme for the host countries of each individual firm. $\overline{STR}$ is now computed as a weighted average of the host counties' statutory tax rates using domestic sales as well as sales of typical foreign subsidiaries as weights.[17]

For the German firms, we refer to adequate statistics about outward activities provided by the German Federal Reserve (*Deutsche Bundesbank*).[18] As alternative weights for computing our benchmark tax level $\overline{STR}$ we consider the average amount of sales carried out by German controlled subsidiaries in a host country.[19]

[16] Available for download on http://www.bea.gov/international/di1usdop.htm.
[17] Average domestic sales of a typical U.S. subsidiary is assumed to be 55 % of total sales. http://us.spindices.com/documents/research/research-sp-500-2014-global-sales.pdf?force_download=true
[18] Available for download on http://www.bundesbank.de/Navigation/DE/Veroeffentlichungen/Statistische_Sonderveroeffentlichungen/Statso_10/statistische_sonderveroeffentlichungen_10.html.
[19] Average domestic sales of a typical German subsidiary is assumed to be 25 % of total sales. http://www.wiwo.de/unternehmen/industrie/umsatzanteile-welche-dax-konzerne-vor-allem-im-ausland-verdienen/9789206.html.

TABLE 2: Summary Statistics Subsamples – ETRDIFF adjusted

	U.S. Firms				German Firms	
	GAAP ETRDIFF adjusted		***Foreign ETRDIFF adjusted***		***GAAP ETRDIFF adjusted***	
	N	Mean	N	Mean	N	Mean
(1) TOTAL	2,422	0.0331	1,760	0.0644	562	-0.0180
(2) HAVEN	513	0.0492	274	0.1112	136	0.0179
(3) R&D	705	0.0718	648	0.1174	135	0.0050
(4) INCOME MOBILE = 1	528	0.0701	481	0.1322	77	0.0021

Notes: Table 2 shows descriptive results for the dependent variables *GAAP ETRDIFF* adjusted and *Foreign ETRDIFF* adjusted for U.S. and German firms for different (sub)samples: (1) Total number of observations; (2) *HAVEN* in top-75% percentile; (3) *R&D* intensity in top-75% percentile; (4) *INCOME MOBILE* = 1.

Table 2 depicts adjusted ETRDIFF measures using this alternative weighting scheme for $\overline{STR}$. For U.S. and German firms, mean values for the adjusted ETRDIFF measures are slightly larger compared to the values computed without any adjustment. We conclude that the MNEs in our samples tend to have larger economic activities (measured by sales) in high tax countries. Therefore, the arithmetic mean of statutory tax rates across all host countries underestimates the benchmark tax level. Accordingly, the values reported for our standard definition of the ETRDIFF might underestimate the aggressive part of international tax avoidance to some extent.

Although the differences between adjusted and unadjusted ETRDIFF measures are small, this exercise suggests that more refined data about relevance of economic activities of subsidiaries for the individual firm would be helpful to better infer the amount of aggressive international tax avoidance. Therefore, a detailed country-by-country reporting as discussed in the OECD action plan against base erosion and profit-shifting would be welcome (OECD, 2013).

2.4. Determinants of Aggressive Tax Avoidance

2.4.1. Research Design

We estimate the following OLS regression to analyze the determinants of aggressive (international) tax avoidance of firm *i* in year *t*:

$$ETRDIFF_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 PROFITABILITY_{i,t} + \beta_3 CAPINT_{i,t} + \beta_4 LEVERAGE_{i,t} + \beta_5 HAVEN_{i,t} + \beta_6 INCOME\ MOBILE_{i,t} + \beta_7 R\&D_{i,t} + Year\ Dummies + Industry\ Dummies + \varepsilon_{i,t} \quad (1)$$

We analyze different versions of our ETRDIFF, considering the GAAP ETR and Foreign ETR. We consider determinants of general tax avoidance that have been widely used in the previous literature. Moreover, we add variables reflecting certain international tax planning opportunities of the firm. A description of all variables and descriptive statistics are shown in the Appendix.

As a general determinant of tax avoidance we consider *SIZE* measured by total assets (in logs). Some studies reveal a positive correlation between size and ETR (Zimmermann, 1983; Wang, 1991; Plesko, 2003; Rego, 2003), whereas other studies find a negative influence (Chen et al., 2010). Moreover, we take account of *PROFITABILITY* measured as pre-tax income divided by total assets. Most studies find a positive correlation of ETR and profitability (Gupta and Newberry, 1997; Plesko, 2003; Chen et al., 2010). However, some papers also detect the opposite (Rego, 2003).

The variable capital intensity (*CAPINT*) is the quotient between property, plant and equipment and total assets. The most widely obtained result is a negative correlation with ETR (Gupta and Newberry, 1997) which leads to the assumption that a high level of property, plant and equipment causes a reduction in ETR due to the deductibility of

high depreciation. However, not all studies have reached the same conclusion (Plesko, 2003). In the context of international tax planning, higher capital intensity might also indicate less mobility of income. In this case, we expect a negative effect of capital intensity on the ETRDIFF.

Additionally, we include the variable *LEV* in our analysis which is defined as short-term liabilities divided by total assets. Firms with a high level of debt can use the deductibility of interest expenses to reduce tax burden. However, the effect of leverage on tax avoidance is ambiguous since interest payments do not only reduce taxable profits, and thus, tax expenditures, but also pre-tax earnings (Hanlon and Heitzman, 2010). Moreover, interest deductibility is additionally restricted due to thin-capitalization rules (Buettner et al., 2012). While some previous research studies find an inverse relation (Stickney and McGee, 1982; Plesko, 2003; Markle and Shackelford, 2012b), others found the opposite (Chen et al., 2010). Therefore, we have no clear prediction concerning aggressive international tax avoidance.

Furthermore, we consider variables for international tax planning via the use of tax havens and profit-shifting. We expect positive effects for all proxies for international tax planning activities on the ETRDIFF measures.

First, we construct a variable *HAVEN* which is the number of tax haven countries in which the group has subsidiaries scaled by the total number of countries in which the company operates.[20] In addition, we include a variable *R&D* which is defined as R&D expenses scaled by total assets in our analysis as firms with a large amount of R&D are

[20] The definition of tax haven countries follows Dyreng and Lindsey (2009). Note that tax haven subsidiaries are not considered when computing the benchmark tax level used for the ETRDIFF.

able to locate their provisions associated with R&D expenses in low-tax countries (Harris, 1993; Grubert, 2003).[21]

Especially firms in high-tech and pharmaceutical industries ("income mobile industries") have significant intellectual property and products which allow them to implement tax avoidance strategies by shifting profits to low-tax jurisdictions via transfer-pricing. Therefore, according to De Simone, Mills and Stomberg (2014), we classify the following three-digit SIC codes as income mobile industries: 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services). We compute a dummy variable *INCOME MOBILE* which equals one if the industry membership of the parent is supposed to be income mobile.

As tax avoidance opportunities differ across industries due to the different business models (Balakrishnan, Blouin and Guay, 2012), we consider industry-fixed effects in accordance with the Fama and French classification of 17 different industry groups.[22]

2.4.2. Tax Avoidance Determinants for U.S. Firms

We start our empirical analysis with the sample of U.S. MNEs and consider the *GAAP ETRDIFF* and *Foreign ETRDIFF* as dependent variables. Table 3 depicts the respective regression results. Columns (1) and (5) contain variables concerning firm characteristics and general tax planning activities. The other columns also consider

[21] We require companies to have non-missing values for all components of the dependent and independent 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 *R&D* to zero.

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

additional variables for international tax planning activities.[23] Remember that a positive ETRDIFF is associated with aggressive international tax avoidance.

First, we take into account the *GAAP ETRDIFF* in specifications (1) – (4). The GAAP ETR is defined as total taxes divided by pre-tax profit less extraordinary items. Accordingly, our *GAAP ETRDIFF* measure considers a firm's overall tax avoidance behavior and not exclusively foreign activities.

Across all specifications, our analysis shows a positive effect of *SIZE* on the *GAAP ETRDIFF*. This result refers to the political power theory (Siegfried, 1972). Larger firms have greater resources to influence political processes in a tax-efficient manner. Moreover, tax planning activities might be associated with economies of scale which leads to a more aggressive tax avoidance behavior. The variables *PROFITABILITY* and *LEV* only exert a weak and less robust negative influence on the *GAAP ETRDIFF*, whereas *CAPINT* is not significant at any conventional level.

Interestingly, while the more general tax planning determinants do not provide a high explanatory power, the additional variables for international tax planning activities have highly significant effects on the *GAAP ETRDIFF*.

Our results in Columns (2) – (4) of Table 3 support the expectation that international tax avoidance is significantly more aggressive if an MNE operates in tax haven countries. Comparing a firm not having any tax haven activities to a firm having these at sample mean of about 0.2208 [cf. Appendix 2, Panel A], our prediction for

[23] Due to missing data in Compustat Global for our German sample, we do not consider the influence of tax loss carry forwards in our analysis. However, the results stay robust if we include a dummy variable which equals one if there has been a decrease in tax loss carry forwards (tlcf) from fiscal year t-1 to fiscal year t and zero otherwise.

GAAP ETRDIFF is about 1.9 percentage points higher if we consider, for example, the coefficient of 0.085 for the variable *HAVEN* in columns (4).

Recent evidence suggests that multinationals can particularly shift some types of taxable profits that are more mobile. Therefore, we analyze whether the *GAAP ETRDIFF* is larger if income is supposed to be highly mobile by adding the variables *INCOME MOBILE* and *R&D*. Indeed, we find a positive and significant effect of both variables on the *GAAP ETRDIFF* in all specifications. Considering the coefficient 0.396 of the variable *R&D* in column (4) we find that evaluated at sample mean, R&D intense firms have a higher *GAPP ETRDIFF* of approximately 1.1 percentage points [cf. Appendix 2, Panel A].

In specifications (5) – (8) of Table 3, we examine the *Foreign ETRDIFF* as dependent variable to focus more on international tax avoidance. The Foreign ETR is the quotient between the sum of foreign current taxes and foreign deferred income taxes and foreign pre-tax income. Interestingly, in contrast to our findings regarding the *GAAP ETRDIFF*, the more general firm characteristics have a highly significant influence on the *Foreign ETRDIFF*. Across all specifications, *PROFITABILITY* exerts a strong positive effect on the *Foreign ETRDIFF*. This positive relationship is very reasonable because more profitable firms have more opportunities and incentives to reduce tax expenses by engaging in tax avoidance, e.g., widely used transfer pricing methods such as the cost plus method, the resale pricing method or the transactional net margin method are associated with particular profit-shifting opportunities if profitability is abnormally high.

CAPINT exerts a negative and significant influence on *Foreign ETRDIFF* in all specifications. The negative effect suggests less aggressive tax avoidance if a firm has a high level of property, plant and equipment which is in line with the expectation that profit-shifting is more associated with intangibles.

In addition, *LEV* has a negative and significant influence on the *Foreign ETRDIFF* which shows that the foreign pre-tax profits are more reduced by the deductibility of the interest payments than the tax expenses.

Especially the *Foreign ETRDIFF* allows a detailed analysis of the effects of enhanced international tax planning activities. Results depicted in columns (6) – (8) confirm that aggressive international tax avoidance is positively associated via the membership to income mobile industries, the use of tax havens, and profit-shifting opportunities. The coefficients, especially for the variable *HAVEN*, are higher compared to the *GAAP ETRDIFF*. Evaluated at sample means (0.2152), tax havens are responsible for an increase in *Foreign ETRDIFF* of 5.8 percentage points [cf. Appendix 2, Panel B].

Moreover, in column (8), *INCOME MOBILE* is associated with a *Foreign ETRDIFF* that is 4 percentage points higher. Taking into consideration the coefficient of 0.432 for the variable *R&D* in column (8) of Table 3, we receive an additional effect of approximately 2 percentage points on the *FOREIGN ETRDIFF* for a firm with an R&D intensity that is one standard deviation higher [cf. Appendix 2, Panel B].

TABLE 3: GAAP and Foreign ETRDIFF – U.S. Sample

U.S. Firms	***GAAP ETRDIFF***				***Foreign ETRDIFF***			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SIZE	0.0076**	0.0066*	0.0090**	0.0082**	0.0088	0.0092	0.0140**	0.0122**
	(0.0038)	(0.0037)	(0.0035)	(0.0036)	(0.0062)	(0.0057)	(0.0056)	(0.0058)
PROFITABILITY	-0.0583	-0.0678	-0.1020**	-0.0997**	0.2770***	0.2750***	0.2770***	0.2730***
	(0.0505)	(0.0495)	(0.0500)	(0.0505)	(0.0830)	(0.0796)	(0.0801)	(0.0795)
CAPINT	-0.0275	-0.0197	-0.0174	-0.0155	-0.100***	-0.0799***	-0.0776***	-0.0736***
	(0.0170)	(0.0166)	(0.0164)	(0.0167)	(0.0265)	(0.0247)	(0.0243)	(0.0246)
LEV	-0.0682*	-0.0562	-0.0719*	-0.0592	-0.1700**	-0.1430**	-0.1690**	-0.1390**
	(0.0406)	(0.0409)	(0.0408)	(0.0412)	(0.0804)	(0.0706)	(0.0684)	(0.0705)
HAVEN		0.0863**	0.0864**	0.0851**		0.2670***	0.2700***	0.2680***
		(0.0366)	(0.0370)	(0.0365)		(0.0647)	(0.0617)	(0.0635)
INCOME MOBILE		0.0424***		0.0218*		0.0661***		0.0428**
		(0.0112)		(0.0118)		(0.0185)		(0.0193)
R&D			0.5090***	0.3960***			0.6070***	0.4320***
			(0.1080)	(0.1170)			(0.1290)	(0.1330)
CONSTANT	-0.0069	-0.0197	-0.0395	-0.0337	0.00537	-0.0571	-0.1060*	-0.0921
	(0.0381)	(0.0391)	(0.0383)	(0.0385)	(0.0573)	(0.0569)	(0.0569)	(0.0579)
Industry-FE	✓	✓	✓	✓	✓	✓	✓	✓
Year-FE	✓	✓	✓	✓	✓	✓	✓	✓
N	2,422	2,422	2,422	2,422	1,760	1,760	1,760	1,760
R^2	0.141	0.173	0.181	0.185	0.176	0.239	0.241	0.250

Notes: Table 3 presents results of OLS regressions with the *GAAP ETRDIFF* in columns (1) – (4) and *Foreign ETRDIFF* in columns (5) – (8) as dependent variables. Robust standard errors clustered by firms are shown in parentheses. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

2.4.3. Tax Avoidance Determinants for German Firms

Equivalent to our U.S. firms we also use the sample of German firms to analyze determinants of tax avoidance. We again consider the *GAAP ETRDIFF* as dependent variable. As explained in Section 2.3.2, we are unfortunately not able to compute the foreign ETRDIFF measures for the German firms. Table 4 shows the regression results considering the same variable specifications as in Table 3.

TABLE 4: GAAP ETRDIFF – German Sample

German Firms	***GAAP ETRDIFF***			
	1	**2**	**3**	**4**
SIZE	-0.0027	-0.0027	-0.0022	-0.0019
	(0.0053)	(0.0051)	(0.0048)	(0.0049)
PROFITABILITY	0.1640	0.2020**	0.2170**	0.2240**
	(0.1010)	(0.0965)	(0.0966)	(0.0973)
CAPINT	-0.0084	0.0133	0.0083	0.0129
	(0.0335)	(0.0341)	(0.0310)	(0.0321)
LEV	-0.0127	0.0009	0.0326	0.0327
	(0.0854)	(0.0893)	(0.0949)	(0.0939)
HAVEN		0.1840**	0.2310***	0.2220***
		(0.0841)	(0.0777)	(0.0788)
INCOME MOBILE		0.0456**		0.0190
		(0.0230)		(0.0215)
R&D			0.6280***	0.5620***
			(0.1880)	(0.2030)
CONSTANT	0.0250	-0.0021	-0.0309	-0.0342
	(0.0711)	(0.0690)	(0.0766)	(0.0756)
Industry-FE	✓	✓	✓	✓
Year-FE	✓	✓	✓	✓
N	562	562	562	562
R^2	0.115	0.140	0.157	0.159

Notes: Table 4 presents results of OLS regressions with the *GAAP ETRDIFF* as dependent variable. Robust standard errors clustered by firms are shown in parentheses. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

Comparable to our findings for the U.S. firms, we find that the additional variables for international tax planning activities provide high explanatory power on the

GAAP ETRDIFF of German MNEs, whereas the more general tax planning determinants only have a weak significant influence. Only *PROFITABILITY* exerts a significant positive influence in columns (2) – (4).

Especially for the variables *R&D* and *HAVEN*, we can confirm a strong positive influence indicating that German firms are also engaged in international tax avoidance. Evaluated at sample means (0.029), we find that R&D intensive firms have a higher *GAAP ETRDIFF* of approximately 1.6 percentage points. Considering the coefficient 0.222 operations in tax havens even lead to an increase in *GAAP ETRDIFF* of about 2.7 percentage points [cf. Appendix 2, Panel C]. The effect of *INCOME MOBILE* is not robust across all specifications. However, this finding might be attributed to our smaller sample for German MNEs including only 77 observations for income mobile firms.

If we compare the results for U.S. and German firms, we receive comparable effects for the influence of certain tax planning characteristics if we consider the *GAAP ETRDIFF*. We find an even higher significant impact for the U.S. sample if we consider the *Foreign ETRDIFF*. Our results show that the investigated tax planning characteristics exert similar influence on the amount of international tax avoidance of U.S. and German MNEs. Nevertheless, our analysis of the total amount of aggressive international tax avoidance in Section 2.3 suggests that U.S. MNEs are particularly successful in aggressive tax avoidance. The additional amount of tax avoidance, however, might be attributed to more complex and less observable tax planning strategies like check-the-box or different definitions of residence.

2.4.4. Alternative Measures of Tax Avoidance

We provide additional regressions using alternative measures of tax avoidance that have been used in the literature. First, in accordance with prior studies, we consider the Current ETR (Gupta and Newberry, 1997; Rego, 2003; Markle and Shackelford, 2012a, 2012b) and the Cash ETR (Dyreng, Hanlon and Maydew, 2008) for the construction of our ETRDIFF measure. The alternative ETRDIFF measures are used to run additional regressions as depicted in Table 5.

Columns (1) – (3) of Table 5 indicate regression results regarding *Current ETRDIFF* as dependent variable. The Current ETR includes only current tax expenses in the numerator; the Foreign Current ETR is defined as the quotient between foreign current income taxes and foreign pre-tax income. Columns (1) and (2) show the findings for the *Current ETRDIFF* and the *Foreign Current ETRDIFF* for the U.S. sample. Column (3) contains regression results for the German sample using *Current ETRDIFF*.

Regarding the *Foreign Current ETRDIFF* the results for the influence of aggressive international tax planning are very similar compared with the results for our basic specification of *Foreign ETRDIFF* in Table 3. We receive a positive and significant impact for all proxies of international tax planning activities. However, if we consider the findings for the *Current ETRDIFF,* we only find a significant effect of operations in tax havens. Similar to the *GAAP ETRDIFF* analysis, the *Current ETRDIFF* provides comparable results for both data samples.

TABLE 5: Current and Cash ETRDIFF Measures

	U.S. Firms		German Firms	U.S. Firms	German Firms
	Current ETRDIFF	***Foreign Current ETRDIFF***	***Current ETRDIFF***	***Cash ETRDIFF***	***Cash ETRDIFF***
	1	**2**	**3**	**4**	**5**
SIZE	0.0086	0.0086	-0.0241***	0.0078	-0.0075
	(0.0053)	(0.0054)	(0.0084)	(0.0053)	(0.0056)
PROFITABILITY	0.0392	0.3010***	0.3830**	0.1170	0.0572
	(0.0825)	(0.0826)	(0.1460)	(0.0834)	(0.0881)
CAPINT	0.0057	-0.0287	0.0228	-0.0045	-0.0045
	(0.0205)	(0.0253)	(0.0395)	(0.0213)	(0.0289)
LEV	-0.1670**	-0.1590*	-0.0212	-0.0638	-0.0156
	(0.0654)	(0.0805)	(0.1250)	(0.0524)	(0.1650)
HAVEN	0.1370***	0.2470***	0.3280***	0.1690***	0.1860*
	(0.0449)	(0.0661)	(0.1110)	(0.0495)	(0.1010)
INCOME MOBILE	0.0040	0.0441**	-0.0228	0.0318**	0.0219
	(0.0159)	(0.0193)	(0.0491)	(0.0157)	(0.0261)
R&D	0.1880	0.4790***	0.5880	0.1600	0.4740**
	(0.1490)	(0.1380)	(0.3830)	(0.1470)	(0.2160)
Industry-FE	✓	✓	✓	✓	✓
Year-FE	✓	✓	✓	✓	✓
N	2,228	1,963	354	2,351	527
R^2	0.127	0.179	0.495	0.153	0.186

Notes: Table 5 presents results of OLS regressions with the *Current ETRDIFF* and *Foreign Current ETRDIFF* in columns (1) – (3) and the *Cash ETRDIFF* in columns (4) – (5) as dependent variables. Robust standard errors clustered by firms are shown in parentheses. All specifications include a constant. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

Columns (4) and (5) of Table 5 show the results for the *Cash ETRDIFF* as dependent variable for U.S. and German MNEs.[24] The numerator of the Cash ETR is computed by using cash taxes paid.

Again, we find similar results for both samples. While the more general tax planning determinants do not exert any influence on the *Cash ETRDIFF*, almost all proxies for international tax planning opportunities have a significant positive impact.

Table 6 presents additional regressions using the well-known ETR measures as dependent variable. In correspondence with our main regression results in Sections 2.4.2 and 2.4.3, we consider the *GAAP ETR* and the *Foreign ETR*. Note that we expect the opposite effects for potential determinants of tax avoidance due to the different definition of the ETR.

Concerning the impact of general firm characteristics, the results in Table 6 show similar effects for ETRs for U.S. and German MNEs compared to our results for the ETRDIFF measures in Tables 3 and 4. Considering our proxies for aggressive international tax planning strategies, we receive similar results for the *Foreign ETR* and *Foreign ETRDIFF*. However, we get more robust results if we consider the *GAAP ETRDIFF* instead of the *GAAP ETR* for both the U.S. and German sample. We therefore conclude that the ETRDIFF measures are not only more sufficient to measure the amount of aggressive tax avoidance but also helpful to analyze the influence of certain tax planning strategies.

[24] Unfortunately, information on foreign cash taxes is not available in Compustat North America and in Compustat Global.

TABLE 6: ETR Measures

	U.S. Firms				German Firms	
	GAAP ETR		*Foreign ETR*		*GAAP ETR*	
	1	**2**	**3**	**4**	**5**	**6**
SIZE	-0.0101***	-0.0107***	-0.0103*	-0.0130**	-0.0012	-0.0021
	(0.0033)	(0.0032)	(0.0056)	(0.0053)	(0.0052)	(0.0049)
PROFITABILITY	0.0021	0.0489	-0.2890***	-0.2820***	-0.1660*	-0.2150**
	(0.0453)	(0.0458)	(0.0798)	(0.0780)	(0.0999)	(0.0977)
CAPINT	0.0302**	0.0182	0.0919***	0.0689***	0.0057	-0.0133
	(0.0150)	(0.0152)	(0.0234)	(0.0223)	(0.0308)	(0.0304)
LEV	0.0416	0.0176	0.1460**	0.1050	0.0109	-0.0198
	(0.0383)	(0.0377)	(0.0717)	(0.0659)	(0.0904)	(0.0986)
HAVEN		-0.0128		-0.1700***		-0.1380*
		(0.0280)		(0.0530)		(0.0792)
INCOME MOBILE		-0.0218**		-0.0418**		-0.0317
		(0.0110)		(0.0181)		(0.0249)
R&D		-0.3820***		-0.3970***		-0.3130
		(0.1160)		(0.1340)		(0.1960)
Industry-FE	✓	✓	✓	✓	✓	✓
Year-FE	✓	✓	✓	✓	✓	✓
N	2,422	2,422	1,760	1,760	562	562
R^2	0.170	0.203	0.202	0.252	0.093	0.118

Notes: Table 6 presents results of OLS regressions with the *GAAP ETR* and *Foreign ETR* as dependent variables for the U.S and Germany. Robust standard errors clustered by firms are shown in parentheses. All specifications include a constant. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

2.4.5. Alternative Tax Level Benchmark

Our ETRDIFF captures the aggressive part of international tax avoidance as the difference between an ETR and a firm's individual benchmark tax level ($\overline{STR}$) in the absence of any profit-shifting or enhanced tax avoidance activity. So far, we have considered the mean of the statutory corporate tax rates of all host countries of a firm as the respective benchmark tax level. In additional robustness checks, we apply the

alternative weighting schemes to compute the benchmark tax level used for the ETRDIFF measures which we have introduced in Section 2.3.3.

We compute the *GAAP ETRDIFF* and the *Foreign ETRDIFF* using this alternative weighting scheme for $\overline{\text{STR}}$ taking into account sales of subsidiaries. Table 7 depicts regression results using the adjusted ETRDIFF measures for the U.S. sample in columns (1) – (4) and for the German firms in columns (5) – (6). The regression results in Table 7 are qualitatively very similar to the findings for our standard definition of the ETRDIFF measures (cf. Tables 3 and 4).

We conclude that our standard definition of the ETRDIFF is already helpful to detect determinants of international tax avoidance, while a more refined definition of the benchmark tax level of the firm might be helpful to better infer the amount of aggressive tax avoidance.

TABLE 7: Alternative Benchmark Tax Levels – ETRDIFF adjusted

	U.S. Firms				German Firms	
	GAAP ETRDIFF adjusted		***Foreign ETRDIFF adjusted***		***GAAP ETRDIFF adjusted***	
	1	**2**	**3**	**4**	**5**	**6**
SIZE	0.0074**	0.0080**	0.0082	0.0115**	-0.0032	-0.0026
	(0.0038)	(0.0036)	(0.0063)	(0.0058)	(0.0051)	(0.0048)
PROFITABILITY	-0.0452	-0.0872*	0.2810***	0.2760***	0.1620	0.2160**
	(0.0502)	(0.0500)	(0.0834)	(0.0798)	(0.0989)	(0.0968)
CAPINT	-0.0291*	-0.0169	-0.0995***	-0.0728***	-0.0053	0.0154
	(0.0166)	(0.0163)	(0.0269)	(0.0250)	(0.0330)	(0.0320)
LEV	-0.0678*	-0.0557	-0.1670**	-0.1350*	-0.0025	0.0348
	(0.0392)	(0.0397)	(0.0810)	(0.0699)	(0.0898)	(0.0997)
HAVEN		0.0770**		0.2630***		0.2000**
		(0.0346)		(0.0626)		(0.0794)
INCOME MOBILE		0.0243**		0.0445**		0.0250
		(0.0117)		(0.0195)		(0.0221)
R&D		0.3840***		0.4210***		0.4230**
		(0.1180)		(0.1350)		(0.2000)
Industry-FE	✓	✓	✓	✓	✓	✓
Year-FE	✓	✓	✓	✓	✓	✓
N	2,422	2,422	1,760	1,760	562	562
R^2	0.143	0.187	0.168	0.241	0.113	0.147

Notes: Table 7 presents results of OLS regressions with the adjusted GAAP ETRDIFF and adjusted Foreign ETRDIFF as dependent variables for the U.S. and Germany. Robust standard errors clustered by firms are shown in parentheses. All specifications include a constant. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

2.5. Conclusion

Our study proposes a new measure for the aggressive part of international tax avoidance. The ETRDIFF measure is the difference between the average of the statutory tax rates imposed by all countries worldwide that host a subsidiary of the respective MNE and an ETR of the firm. Accordingly, we characterize an MNE as tax aggressive if its ETR is abnormally low compared to a firm's individual benchmark that would be

expected in the absence of any profit-shifting strategies and additional subsidiaries in tax haven countries.

We compute our new ETRDIFF measure for a sample of S&P 500 firms and for a comparable sample of German listed firms. We use the fact that listed firms are already obliged to publish a list of their significant subsidiaries. In particular for the U.S. firms, we find significant positive values for the ETRDIFF measures suggesting additional tax avoidance beyond the benchmark tax level of the firms.

In additional regression analyses, we investigate which firm characteristics and tax planning opportunities affect the scope of international tax avoidance. Our findings reveal that aggressive international tax avoidance is determined by tax haven operations and opportunities to manipulate transfer prices. We conclude that the ETRDIFF measures are not only sufficient to measure the amount of aggressive tax avoidance but also helpful to analyze the influence of certain tax planning strategies.

Our findings can contribute to the recent debate about base erosion and profit-shifting. Very recently, the OECD has requested new measures to analyze the scope and the determinants of base erosion and profit-shifting. The methodology proposed in this paper allows to isolate the aggressive part of international tax avoidance and to identify important determinants such as tax haven usage and opportunities to manipulate transfer prices.

In additional computations, we approximate the economic relevance of the subsidiaries by sales data taken from FDI statistics and provide adjusted values for our ETRDIFF measures. However, the differences between adjusted and unadjusted ETRDIFF measures are small. Although the regression results suggest that our standard

definition of the ETRDIFF is already helpful to detect determinants of international tax avoidance, a more refined definition of the benchmark tax level of the firm would be helpful to better infer the amount of aggressive tax avoidance. Therefore, if data from a detailed country-by-country reporting as discussed at the OECD (2013) were available, computation of benchmark tax levels could be augmented by firm-level information about the economic relevance of subsidiaries. This would further improve the measurement of the aggressive part of international tax avoidance.

Appendix

Appendix 1: Variable Definitions

GAAP ETR	*txt* / (*pi* – *xi*)
GAAP ETRDIFF	$\overline{\text{STR}}$ – GAAP ETR
Current ETR	*txc* / (*pi* – *xi*)
Current ETRDIFF	$\overline{\text{STR}}$ – Current ETR
Cash ETR	*txpd* / (*pi* – *xi*)
Cash ETRDIFF	$\overline{\text{STR}}$ – Cash ETR
Foreign ETR	(*txfo* + *txdfo*) / *pifo*
Foreign ETRDIFF	$\overline{\text{STR}}$ – Foreign ETR
Foreign Current ETR	*txfo* / *pifo*
Foreign Current ETRDIFF	$\overline{\text{STR}}$ – Foreign Current ETR
$\overline{\text{STR}}$	Worldwide average of the statutory corporate income tax rates of all countries where subsidiaries are located
SIZE	log (*at*)
PROFITABILITY	*pi* / *at*
CAPINT	*ppeveb* / *at (Compustat North America); ppegt* / *at (Compustat Global)*
LEV	*dlc* / *at*
HAVEN	Number of tax havens in which the group has subsidiaries scaled by total number of countries in which the company operates in
INCOME MOBILE	Dummy, which is one if the SIC Codes of the parent is: 283, 357, 367, 737, or 738
R&D	*xrd* / *at*

Appendix 2: Summary Statistics

PANEL A: U.S. Sample – GAAP ETR and GAAP ETRDIFF

U.S. Sample	Obs	Mean	Std. Dev.	Min	Max
GAAP ETR	2,422	0.3028	0.1002	0.0005	0.9818
$\overline{\text{STR}}$	2,422	0.3207	0.0367	0.2059	0.4159
GAAP ETRDIFF	2,422	0.0179	0.1042	-0.6975	0.3855
SIZE	2,422	9.3512	1.3276	6.4483	13.9294
PROFITABILITY	2,422	0.1134	0.0709	0.0012	0.5243
CAPINT	2,422	0.4771	0.3539	0.0030	1.7698
LEV	2,422	0.0429	0.0757	0	0.7142
INCOME MOBILE	2,422	0.2180	0.4130	0	1
R&D	2,422	0.0284	0.0426	0	0.2830
HAVEN	2,422	0.2208	0.1377	0	0.7500

Notes: The table shows descriptive statistics for all variables included in our main regression analysis regarding the *GAAP ETRDIFF*. Variables are defined in Appendix 1.

PANEL B: U.S. Sample – Foreign ETR and Foreign ETRDIFF

U.S. Sample	Obs	Mean	Std. Dev.	Min	Max
FOREIGN ETR	1,760	0.2616	0.1495	0.0014	0.9837
$\overline{\text{STR}}$	1,760	0.3117	0.0322	0.2400	0.4118
FOREIGN ETRDIFF	1,760	0.0502	0.1529	-0.6890	0.4051
SIZE	1,760	9.3230	1.3227	6.4484	13.9287
PROFITABILITY	1,760	0.1047	0.0843	-0.4671	0.4676
CAPINT	1,760	0.4759	0.3419	0.0044	1.7698
LEV	1,760	0.0425	0.0703	0	0.6286
INCOME MOBILE	1,760	0.2733	0.4458	0	1
R&D	1,760	0.0367	0.0499	0	0.6799
HAVEN	1,760	0.2152	0.1187	0	0.7500

Notes: The table shows descriptive statistics for all variables included in our main regression analysis regarding the *Foreign ETRDIFF*. Variables are defined in Appendix 1.

PANEL C: German Sample – GAAP ETR and GAAP ETRDIFF

German Sample	Obs	Mean	Std. Dev.	Min	Max
GAAP ETR	562	0.3052	0.1251	0.0034	0.9894
$\overline{\text{STR}}$	562	0.2748	0.0299	0.1782	0.4031
GAAP ETRDIFF	562	-0.0304	0.1293	-0.7323	0.3062
SIZE	562	7.7901	1.9732	3.7667	12.6432
PROFITABILITY	562	0.0946	0.0795	0.0024	0.5371
CAPINT	562	0.4445	0.3043	0.0019	1.7099
LEV	562	0.0580	0.0745	0	0.7680
INCOME MOBILE	562	0.1370	0.3442	0	1
R&D	562	0.0290	0.0387	0	0.2508
HAVEN	562	0.1249	0.0876	0	0.4000

Notes: The table shows descriptive statistics for all variables included in our main regression analysis regarding the *GAAP ETRDIFF*. Variables are defined in Appendix 1.

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Chapter 3

Capital Injections and Aggressive Tax Planning - Can Banks Have It All?

Capital Injections and Aggressive Tax Planning - Can Banks Have It All?

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Abstract:

This paper analyzes the impact of recapitalizations on banks' tax planning activities. Our empirical analysis uses a unique hand-collected firm-level data set of 93 banks located in 10 OECD countries which received public funds in form of capital injections. Tax aggressiveness is measured based on banks' effective tax rates (ETRs). Since treatment status is not random, we obtain a control group as similar to our treated group as possible by employing propensity score matching. Using a difference-in-differences approach we compare changes of banks' tax planning behavior before and after receiving government support. The main finding indicates a positive impact of recapitalizations on banks' ETRs. Before banks received capital injections we measure lower ETRs and thus, more tax aggressiveness for receiving banks. In 2011, however, the ETRs of the treated and control group converge. Our findings are robust against time-invariant unobserved heterogeneity.

Key Words: International Tax Planning, Recapitalization, Financial Sector, Propensity Score Matching

We thank the participants at the Doctoral Research Seminar in Berlin for their comments.

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3.1. Introduction

"Although participation in the program was not necessary from a capital adequacy perspective, as our capital position was strong, it was determined to be financially beneficial and provided U.S. Bancorp with the ongoing capacity for additional loan growth and for funding growth initiatives."

U.S. Bancorp Annual Report, 2008

The financial crisis in 2008/2009 caused intensive liquidity issues for banks in various countries. Fearing an even more severe effect on the overall economy, many governments bailed out banks to stabilize the financial sector. As there was no coordinated approach, the design of these rescue packages varied among countries.[25] Nevertheless, a rough classification can be made between guarantees and capital injections. Guarantees on bank credits were given by several governments in an attempt to calm down markets and increase vanishing liquidity. However in some cases, this was not enough to save institutions from bankruptcy. Therefore, as an additional instrument capital was given to institutions in financial disrupt.

With this being the most extensive and costly form of support and also attracting attention from tax payers, a broad discussion on banks' responsibility for the crisis and the necessity of government rescue packages followed. Public opinion was highly critical suspecting moral hazard among banks being one major trigger. Being considered too big to fail for a long time, financial institutions were able to profit from a lower risk

[25] A valuable overview is given by Panetta et al. (2009).

premium due to assumed government support in case of bankruptcy.[26] This is suspected to lead banks to engage in high risk transactions to maximize their profits while shifting costs of default towards the tax payer. However, one could also argue that banks substantially contribute to tax revenue and countries' welfare and therefore deserve to be rescued. Whereas there seems to be some agreement on the necessity of bailouts since the bankruptcy of Lehman Brothers in 2008, the discussion on lessons to be learned from the crisis has targeted various topics.

In this context, public debate has focused mainly on (recapitalized) banks' business models and compensation plans; however, banks' role as tax payers was widely ignored. This is surprising, since one major aspect of the discussion was how the crisis related costs could be shifted towards the financial sector. Existing empirical studies already investigated recapitalized banks concerning bank lending (Mariathasan and Merrouche, 2012; Brei, Gambacorta and von Peter, 2013) and risk taking behavior (Brei and Gadanecz, 2012). However, although there is some evidence of banks' tax aggressiveness in general (Keen and de Mooij, 2012; Heckemeyer and de Mooij, 2013; Huizinga, Voget and Wagner, 2014), there is so far no research on the link between recapitalized banks and their tax strategy. For this purpose, the recent financial crisis gives us optimal conditions to evaluate a change in tax aggressiveness of troubled banks before and after the crisis.

In contrast to other rescue packages (e.g. guarantees) capital injections give governments shareholder power. The previous literature shows an impact of government ownership on corporations' behavior. Iannotta, Nocera and Sironi (2013) find that

[26] O'Hara and Shaw (1990) provide an early study of this effect, more recent Acharya, Anginer and Warburton (2013).

government-owned banks have a different risk taking behavior than private banks. Other studies report a change in tax aggressiveness due to ownership structure and corporate governance influence (Desai, Dyck and Zingales, 2007; Desai and Dharmapala, 2008; Chen et al., 2010; Chyz et al., 2013). We want to contribute to this discussion by investigating the influence of government support on banks' tax planning behavior. Results of our study can give us some insight into whether capital injections should be tied to additional conditions in the future.

In our empirical analysis we use consolidated balance sheet and income statement information from the Bankscope Database provided by Bureau van Dijk for 856 multinational banks headquartered in 10 OECD countries. We manually identify 93 banks that received government support during the financial crisis. Our study applies propensity score matching in a difference-in-differences framework (DID-PSM approach) and contributes to recent studies applying propensity score matching in the context of taxation (Wamser, 2008; Finke, 2014).

We investigate the influence of recapitalization by comparing the change in the tax aggressiveness, as measured by the effective tax rate (ETR), of rescued banks between 2007 and 2011 to the counterfactual trend of a control group that consists of non-rescued banks. Our results provide evidence that the recapitalizations caused a significant change in the tax aggressiveness of rescued banks. Recapitalized banks had significantly lower ETRs measured one year before the financial crisis. However, rescued and non-rescued banks' ETRs converge after the financial crisis. We associate the change in tax aggressiveness with an increased shareholder power and influence of the government associated with capital injections.

The remainder of the paper is organized as follows. In Section 3.2, a discussion of the relationship between banks' international tax planning and recapitalization measures in the previous literature is provided. Section 3.3 shows an overview of our data set. Section 3.4 describes the methodology, i.e., the matching procedure. Here, we also assess the matching quality which is a prerequisite for drawing valid conclusions. Empirical results are presented in Section 3.5. Section 3.6 concludes.

3.2. Recapitalization and International Tax Planning of Banks

The aim of this study is to link banks' tax aggressiveness with capital injections during the financial crisis. We want to investigate whether receiving government support had any impact on banks' tax planning activities.

As a reaction to the events of the financial crisis many banks announced plans to change their corporate culture. Some of these changes were not merely voluntary, but a reaction to conditions tied to the respective support measure. Most rescue packages entailed specific conditions targeting remuneration and lending policy. To enforce these conditions governments implemented additional monitoring options. As an example, the U.S. Treasury demanded to send an observer if certain conditions were not met.[27] However, none of the recapitalization schemes we analyze had any specific tax conditions attached to receiving capital.

We want to emphasize the importance of this point for two reasons. First, most headquarters of multinational banks are located in rather high-tax jurisdictions such as the U.S. and the U.K.; therefore, tax avoidance equals a reduction in tax revenue in these

[27] Members of the Capital Purchase Program (CPP) agreed to allow a government-appointed observer in their board meetings in case of repayment delays.

countries.[28] In contrast, the majority of rescue packages were issued to the respective headquarters of multinational banks – in high-tax jurisdictions. Thus, while tax revenue is shifted to favorable destinations, government support is received from generous governments at home. Second, a meaningful ex-post contribution of banks to the crisis-related costs can most likely be collected in form of taxes. Therefore, banks' tax aggressiveness after the crisis should be evaluated. Although previous literature has already investigated banks' tax aggressiveness in general (Keen and de Mooij, 2012; Heckemeyer and de Mooij, 2013; Huizinga, Voget and Wagner, 2014), there is so far no research on the impact of recapitalization on tax planning strategies.

Governments can be considered the largest minority shareholder in almost all corporations due to its tax claim on cash flows (Desai, Dyck and Zingales, 2007). Capital injections can be assumed to increase governments' influence and supervision as shareholders. Since governments are receivers of tax payments, we expect them to attempt to limit tax planning of the respective bank. This assumption is supported by evidence on government ownership. Several studies report a change in bank risk (Iannotta, Nocera and Sironi, 2013) and in tax aggressiveness (Desai, Dyck and Zingales, 2007; Desai and Dharmapala, 2008; Chen et al., 2010; Chyz et al., 2013) due to ownership structure and corporate governance influence. In addition, it can be assumed that banks profiting from government support were eager to reinstate their reputation; and, in response to public attention, reduced their degree of tax planning.

However, it is also imaginable that banks do not show any loyalty and continue to engage in aggressive tax planning activities. This would show in smaller or at least unchanged ETRs. A potential reason could be that governments' possibilities to monitor

[28] The average statutory tax rate in our sample is 27.94 %.

banks' behavior were limited and not sufficient to influence banks' tax planning. Studies using a similar data set found no evidence for a change in risk taking (Brei and Gadanecz, 2012). Tax avoidance strategy goes along with increased risk of future payments caused by tax audit detections. Banks staying risk prone in general might also continue their tax planning strategy. In consequence, it might be that tax aggressiveness did at least not decrease.

We contribute to a number of studies investigating the effects of rescue packages on banks' behavior. Panetta et al. (2009) give a valuable overview of governments' rescue measures between 2008 and 2009. Brei, Gambacorta and von Peter (2013) and Mariathasan and Merrouche (2012) document determinants of recapitalization and examine the effect rescue measures had on the supply of bank lending. They find similar results suggesting that only capital injections of a certain amount can be associated with loan growth. Focusing on market reactions to government measures, King (2009) finds that creditors benefited from rescue packages at the expense of shareholders. To the best of our knowledge, there is so far no research on the taxation and tax planning activities of recapitalized banks.

As a measure of tax aggressiveness, we use the ETR disclosed in consolidated financial statements according to ASC 740 or IAS 12 (depending on the accounting standard), which is defined as the sum of current and deferred taxes divided by profit before tax. This commonly used proxy for tax avoidance is widely available to investors and to the public. It is a well-accepted measure for tax behavior in the previous literature (Hanlon and Heitzman, 2010). Due to missing tax data and incomplete group structure information in Bankscope we are not able to test further tax avoidance measures like the

Current or Cash ETR (Hanlon and Heitzman, 2010) or the new tax measure ETRDIFF (Herbert and Overesch, 2015).

3.3. Data

Key asset for the following analysis is the identification of recapitalization measures on individual bank level. This data was hand-collected for large multinational banks headquartered in 10 OECD countries for which public rescue information were available. Our control group consists of all other banks in the respective countries. As there is no comprehensible list of capital injections in general, we must rely on intensive research. In order to identify rescued banks, we use public sources (e.g., news reports, official websites of national authorities) and confirm our findings through banks' annual reports.

In total, we have collected information on 93 banks that received government support in form of capital in 2008 and/or 2009. By hand-collecting this unique data set we are able to differentiate between rescued and non-rescued banks for all major countries affected by the financial crisis. A bank must have received capital injections from a public fund to be considered recapitalized in our sample. There have been additional measures, such as guarantees, nevertheless for our study we focus only on capital injections.[29] We do not include banks receiving guarantee measures in our analysis for two reasons. First, our research question assumes an increasing influence of governments on banks' business decisions. Although there was a variety of measures valuable to banks, we believe that only an increasing shareholder power would give

[29] Capital injections came in the following forms: Common equity, Preference capital, Hybrid capital, Subordinated notes, Contribution to reserves, Conversion of subordinated debt into equity capital.

governments sufficient information and possibilities to influence banks' tax avoidance strategies. Second, guarantee measures were often provided to the whole banking sector and therefore would have limited our control group of non-treated banks substantially.

Our group of banks which did not receive government support consists of 763 banks. Table 1 provides a detailed overview of the 10 countries in which the rescued and non-rescued banks are located.

TABLE 1: Country Overview

Country	RECAP = 1	RECAP = 0	Total
Germany	6	81	87
France	6	148	154
The Netherlands	3	46	49
U.K.	5	150	155
Ireland	2	23	25
Belgium	3	27	30
Luxembourg	1	19	20
Austria	3	46	49
Switzerland	1	73	74
U.S.	63	150	213
TOTAL	**93**	**763**	**856**

Notes: Table 1 shows an overview where the rescued and non-rescued banks are located in our sample.

For all 856 banks we collect balance sheet and income statement information from the Bankscope Database provided by Bureau van Dijk for the years 2007 and 2011.[30] We rely on consolidated statements because they provide relevant information on the internationally active banking groups' tax burden. Moreover, public capital injections were typically given to consolidated entities, rather than subsidiaries or branches.

[30] For our robustness check, we also collected data for the year 2010 [cf. Section 3.5.2].

We conduct several data set adjustments. To obtain a sufficiently balanced sample, we restrict attention to the 150 largest banks in the U.S. and U.K.[31] Moreover, recapitalizations are only considered if provided in 2008 and/or 2009. This is necessary to define a clear treatment window which enables us to analyze before and after treatment effects.[32] Acquisitions in general pose no risk to our analysis, since tax aggressiveness is expected to be extended to a newly acquired entity. However, we eliminated banks from our sample which were nationalized, went bankrupt or merged to a new entity during the crisis. In addition, we eliminate loss banks as they have different tax planning strategies. ETRs[33] with a negative component have a different interpretation and are therefore eliminated accordingly (Gupta and Newberry, 1997; Rego, 2003; Stickney and McGee, 1982; Zimmermann, 1983).

3.4. Methodology

3.4.1. Difference-in-Differences Propensity Score Matching Approach

The optimal setting to investigate the effect of the governmental recapitalizations on banks' tax aggressiveness would require observing each bank in both states (with and without treatment) in each period. However, as it is not possible to observe how the bank would have performed without receiving the treatment, the best alternative is to build an adequate control group that is similar to the treated group with respect to as many criteria as possible.

[31] In the U.S. more than 700 banks profited from CPP. Since data on smaller banks are limited we restrict our control group to the 150 largest banks, measured by total assets, to avoid a mix-up of both groups. The same was done for the U.K.

[32] Rescue packages in Spain, for example, were still ongoing in 2012. Therefore, Spain is not included in our sample. In the case of Japan, the major earthquake of 2011 distorts results and led us to exclude Japanese banks.

[33] To limit the influence of outliers, we winsorize the ETRs at the interval [0; 1].

Therefore, we identify banks which received recapitalization (RECAP=1) as our treatment group and assign banks which are not subject to treatment (RECAP=0) to our control group. We use propensity score matching which is a popular method to estimate causal effects and obtain a control group as similar to our treatment group as possible. This involves a two-step procedure: In the first step, we predict the probability of being treated by government support (propensity score) using a probit regression with respect to a vector of relevant pre-treatment observables X_i (Rosenbaum and Rubin, 1983). In our binary model the choice of the underlying model is relatively unproblematic (Caliendo and Kopeinig, 2008):

$$p(X_i) = Pr\ (RECAP_i=1|\ X_i) = \phi\ (\beta_0 + \beta_1 X_i) \qquad (1)$$

In the second step, we match each treated bank (RECAP=1) to one or more non-treated banks (RECAP=0), being sufficiently similar with respect to the observables X_i. The matching procedure is based on the propensity score from the first step. In our study, we use different matching algorithms to match the treated and the non-treated group in order to avoid bias due to the chosen matching method [cf. Section 3.5].

Applying propensity score matching requires two assumptions to be fulfilled. First, for the probit regression the propensity score as a probability must lie between zero and one for both groups, i.e., banks with the same value of observables X_i have the identical positive probability of being both treated and non-treated (Heckman, Lalonde and Smith, 1999). This Common Support Condition ensures that only banks with suitable control units are considered:

$$0 < Pr\ (RECAP_i =1|\ X_i) <1 \qquad (2)$$

As the aim of applying propensity score matching is to avoid bias due to selection observables, the second main prerequisite for the application of propensity score matching is the Conditional Independence Assumption (CIA). The CIA requires the selection into the group of recapitalized (RECAP=1) or non-recapitalized (RECAP=0) to be only driven by observables (a vector of characteristics X_i). This is to say that there exists a set X_i of observables such that after controlling for these characteristics, potential outcomes, in our case ETRs, are independent of treatment status, i.e., recapitalization status. It can then be assumed that this condition is exogenous:

$$ETR_i(1), ETR_i(0)) \perp RECAP_i | X_i \quad (3)$$

Having obtained two groups only differing in their treatment status, we are able to compare banks' tax aggressiveness. In order to capture a bank's tax avoidance behavior we use ETRs as reported in the financial statements as outcome variable. A change in the outcome variable due to the treatment is usually called ATT (Average Treatment Effect on the Treated). Theoretically, this effect is the difference Δ_i between the tax aggressiveness $ETR_i(1)$ of a bank i which received government support and the tax aggressiveness of the same bank i in the hypothetical case of not receiving government support $ETR_i(0)$:

$$\Delta_i = ETR_i(1) - ETR_i(0) \quad (4)$$

$$ATT = E(ETR_i(1) - ETR_i(0) \mid RECAP=1) \quad (5)$$

However, this effect does not control for the counterfactual trend of both groups. Our study therefore applies a difference-in-differences framework (Heckman, Ichimura and Todd, 1998). According to the difference-in-differences method the effect of a

recapitalization treatment is identified by comparing the change in tax aggressiveness of the treatment group between two periods (here 2007 and 2011) to the counterfactual trend in tax aggressiveness they would have experienced in the absence of the treatment. The counterfactual trend is approximated by the actual change in tax aggressiveness of the control group between 2007 and 2011.

By forming "statistical twin pairs" before performing the DID estimator, propensity score matching makes the standard difference-in-differences assumption more plausible as the between-comparison removes common period effects that identically affect the treatment and control group. The plausibility of this common trend assumption is based on the similarity in propensity scores of treated and control group. Compared to the alternative of controlling linearly for the X_i observable variables in a DID regression, the DID-PSM approach has two advantages. It guarantees a more appropriate weighting of covariates and does not extrapolate beyond the region of common support avoiding comparison of non-comparable units.

3.4.2. Selection of Relevant Characteristics

A central issue for propensity score matching is the choice of observable variables driving the self-selection process and thus being relevant for computing the propensity score. Only variables that influence both the treatment decision and the outcome variable should be included.[34] In addition, only variables that are unaffected by the treatment (or the anticipation of it) should be considered to avoid endogeneity problems. Therefore,

[34] Explanatory variables can be divided into three sets: (1) Covariates which strongly influence the treatment decision but weakly influence the outcome variable, (2) Covariates which are relevant to the outcome variable but irrelevant to the treatment decision and (3) Covariates which influence both. The propensity score estimation should at least include set (3) (Augurzky and Schmidt, 2001; Caliendo and Kopeinig 2008).

we use the 2007 values of the covariates, i.e., the values before the financial crisis and government support for our matching procedure (Caliendo and Kopeinig, 2008).

In the propensity score matching we take into account banks' characteristics that are expected to differ across the respective treatment and control groups. The DID-PSM approach allows us to balance the treatment and control group with respect to these characteristics making the common trend assumption more plausible. For this purpose, we follow Mariathasan and Merrouche (2012) and Brei, Gambacorta and von Peter (2013) who investigate differences between rescued and non-rescued banks with a sample similar to ours. We can therefore rely on these results when determining relevant characteristics of recapitalized banks that can affect treatment assignment.

We choose the variable *SIZE*, which is the sum of total assets and off-balance sheet items (in logs), as it is a potentially important factor in lending decisions. During the crisis, large banks were particularly affected by their lower deposit funding ratio. According to Brei, Gambacorta and von Peter (2013) recapitalized banks were on average twice the size as non-rescued banks. Therefore, we can expect a positive relationship between recapitalization status and bank size. We also add the variable *ROA* which is measured by adjusting net income with interest expenses divided by total assets as a proxy for profitability. High profits could lead banks to retain earnings and lower the leverage ratio. As a higher equity ratio could reduce the demand for external lending, we expect a negative correlation. In addition, we consider the variable *LEVERAGE*, which is the quotient between total liabilities and total assets, as the leverage ratio should have a positive influence on the recapitalization of a bank. *LIQUIDITY*, which is defined as liquid assets (including cash, trading securities and interbank lending with a

maturity of less than three months) divided by total assets, is also an important characteristic of rescued banks as their reliance on market funding before and during the crisis was generally higher (Brei, Gambacorta and von Peter, 2013). Liquidity should have a negative impact on the recapitalization status of a bank. Moreover, we add the variable *COLLATERAL*, which is a tangibility measure including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets (Gropp and Heider, 2010), in order to capture for banks' specific asset structure. As a high level of tangibility makes external lending more attractive (easier access and lower costs), we expect a positive correlation with a bank's recapitalization status, since lending conditions changed dramatically during the financial crisis. Finally, we take the variable *LLP* into consideration, which captures a bank's accrual of loan loss provisions (in logs). Since banks with a high level of LLPs can be assumed to have a higher amount of defaulting credits, we expect a positive correlation with recapitalization status.

The computation of the propensity score should also include determinants of the outcome variable ETR in addition to the drivers of the selection decision (Heckman, Ichimura and Todd, 1998). In our study, there is some overlap of both groups of determinants. For example, prior studies find a significant influence of size and profitability (Zimmermann, 1983; Gupta and Newberry, 1997; Plesko, 2003; Rego, 2003; Chen et al., 2010) on tax planning activities. In addition, leverage is associated with tax aggressiveness. Banks with a high level of debt can use the deductibility of interest expenses to reduce tax burden. However, the effect of leverage on the ETR is ambiguous since interest payments do not only reduce taxable profits, and thus, tax

expenditures, but also pre-tax earnings (Hanlon and Heitzman, 2010). Loan loss provisions' tax deductibility varies by country, however the accrual of bad loans in high-tax countries can be seen as a proxy for future deductions in case of credit default and therefore as a tax planning tool.

Table 2 shows the means of the observable characteristics before matching. The comparison shows with the exception of *ROA* and *COLLATERAL*, both groups of banks are significantly different. These results underline the necessity to establish an adequate control group via propensity score matching.

TABLE 2: Means of the Selected Observable Characteristics before Matching

Characteristics	RECAP = 1	RECAP = 0	t-stat	p-value
SIZE	11.4112	9.1208	-9.1402	0.0000
ROA	0.0420	0.0804	0.5459	0.5853
LEVERAGE	0.9194	0.8673	-2.9189	0.0036
LIQUIDITY	0.1433	0.2435	3.7466	0.0002
COLLATERAL	0.2890	0.2701	-0.7474	0.4550
LLP	4.8272	3.2204	-6.4369	0.0000

Notes: Table 2 compares the mean of selected characteristics between rescued banks (RECAP = 1) and non-rescued banks (RECAP = 0) before matching in 2007.With the exception of ROE and COLLATERAL, the differences between both groups are highly significant.

3.4.3. Estimating the Propensity Score

We use the observable characteristics we derived in Section 3.4.2 to calculate the probability of receiving government support (propensity score). In accordance with Heckman, Ichimura and Todd (1998), we estimate the propensity score by taking the determinants of a bank's recapitalization and of the outcome, in our case tax aggressiveness (ETR), as explanatory variables [cf. Equation (1)]. In addition, as

Mariathasan and Merrouche (2012) find an influence of different banks' specializations, we ensure that only banks belonging to the same specialty are matched.

$$\Pr(RECAP) = \beta_0 + \beta_1 \log(SIZE) + \beta_2 ROA + \beta_3 LEVERAGE + \beta_4 LIQUIDITY + \beta_5 COLLATERAL + \beta_6 \log(LLP) + \varepsilon \quad (6)$$

Table 3 shows the coefficients of the probit regression. All determinants have the expected sign. The size of the coefficients cannot be directly interpreted as there are no marginal effects of the explaining variables on the dependent variable. However, this is not relevant here as the coefficients are exclusively used to calculate the propensity score.

TABLE 3: Estimating the Propensity Score

	Coefficient	**S.E.**	**z**	**P>|z|**
SIZE	0.2106	0.0809	2.60	0.009
ROA	-0.0530	0.6241	-0.08	0.932
LEVERAGE	0.8909	1.6700	0.53	0.594
LIQUIDITY	-2.4570	0.6685	-3.68	0.000
COLLATERAL	0.7076	0.5818	1.22	0.224
LLP	0.0628	0.0616	1.02	0.308
CONSTANT	-4.1394	1.4610	-2.83	0.005

Notes: Table 3 shows the coefficients of the probit regression.

As the propensity score is a probability of receiving treatment given observed characteristics X_i, it has to be in the interval [0;1] [cf. Equation (2)]. In our sample, the average probability to participate in the treatment for all banks is 0.14. Based on the propensity score, we use for the matching in our study *five to one nearest neighbor algorithm* (with replacement) which assigns five of the closest non-treated observations to match the treated one. We choose this matching method as it is more reliable especially in small samples of treated units. It reduces the variability of the nearest

neighbor estimator in comparison to a one to one neighbor matching (Blundell and Dias, 2008). To ensure matching quality we set the maximum caliper at 0.01. Due to the caliper, the propensity scores between treated and matched control banks do not deviate in absolute terms by more than 0.01.

However, to show that the results are not driven by the applied matching algorithm, we also apply kernel matching and one to one nearest neighbor matching in Section 3.5. *One to one nearest neighbor matching* matches to each treated unit the control unit with the closest propensity score. *Kernel matching* uses weighted averages of all controls in order to match treated and control units. The shorter the distance between the treated and the control observation, the greater is the weight. Thus, this method can use more information as it reduces the variance of the estimation.

3.4.4. Assessing Matching Quality

Before we report the results with respect to our research question, we first provide information on the matching quality concerning the two main assumptions of propensity score matching – Conditional Independence Assumption and Common Support Condition [cf. Section 3.4.1]. The Conditional Independence Assumption cannot be directly tested, but several guidelines for model specification should be considered. Since we do not condition on all covariates but on the propensity score, we have to check if the matching procedure is able to adequately balance the distribution of these characteristics. For the validity of results it is important that the treated and control group are sufficiently similar after the matching. This prerequisite can be assessed in a balancing test by the standardized bias (SB_x) for each variable. The SB_x is calculated by dividing the difference between the mean characteristic of the treatment ($\bar{x}_{tr}$) and

matched control group ($\bar{x}_{co}$) by the square root of the mean variance in each group (Rosenbaum and Rubin, 1985) and expressed as a percentage:

$$SB_x = 100 * \frac{\bar{x}_{tr} - \bar{x}_{co}}{\sqrt{\frac{\sigma^2_{\bar{x}_{tr}} + \sigma^2_{\bar{x}_{co}}}{2}}} \% \quad (7)$$

Table 4 compares the means of all relevant characteristics between rescued banks and a control group which was determined via propensity score matching (five to one nearest neighbor caliper matching) before and after matching and displays the standardized bias for all observable variables.

The results show that the propensity score matching succeeds at balancing the covariates and reducing the bias between banks with and without recapitalization. With the exception of *ROA* and *LEVERAGE,* all variables are significant before matching, i.e., the unmatched treatment and control group differ substantially. After matching the standardized bias should be about 5 % for the key variables as this indicates good matching quality. Otherwise the mean difference is considered quite large and may indicate a lack of balancing (Caliendo and Kopeinig, 2008). The standardized biases are acceptable for all variables. By the matching, the differences between treatment group and non-treatment group are reduced considerably. An exception is the variable *COLLATERAL*. For this variable, the standardized bias is about 9 %. However, the two columns on the right hand side show that the difference in the variable *COLLATERAL* is not significant after matching which confirms that the variable is no longer an explanation for the recapitalization status of a bank.

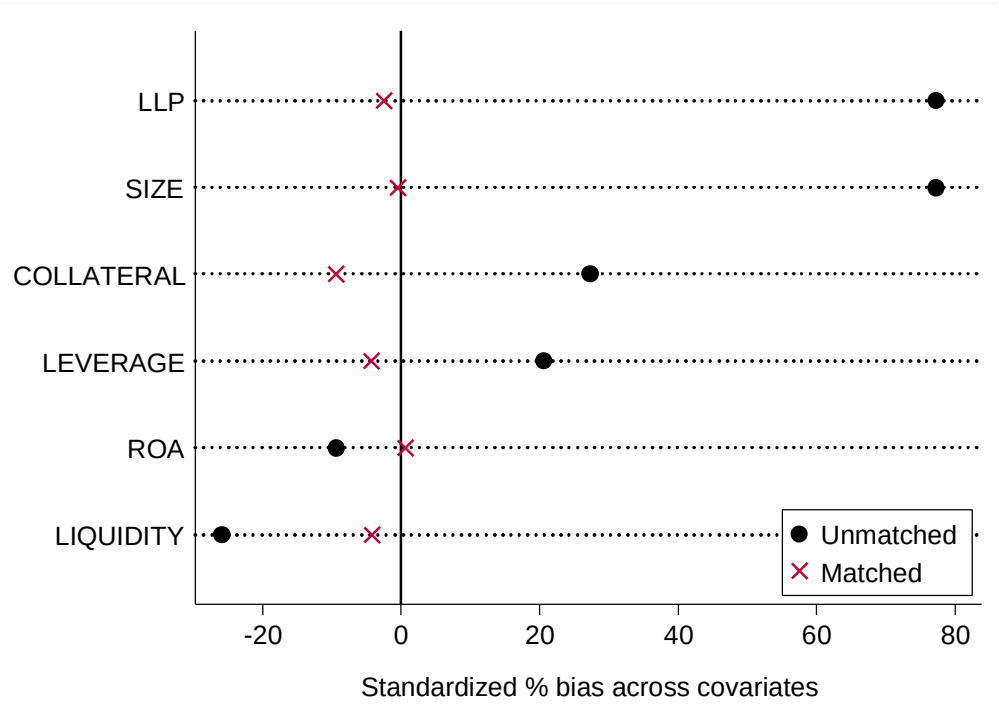
TABLE 4: Assessment of Matching Quality

Variable		Mean		%	%		
		Treated	Control	Bias	Reduction (Bias)	T	p>|t|
SIZE	Unmatched	11.283	9.790	77.3		6.42	0.000
	Matched	11.050	11.059	-0.5	99.4	-0.03	0.977
ROA	Unmatched	0.408	0.094	-9.3		-0.58	0.565
	Matched	0.040	0.037	0.6	93.5	1.67	0.096
LEVERAGE	Unmatched	0.918	0.904	20.7		1.36	0.174
	Matched	0.914	0.917	-4.3	79.2	-0.47	0.643
LIQUIDITY	Unmatched	0.135	0.178	-25.9		-1.97	0.049
	Matched	0.122	0.129	-4.2	83.7	-0.29	0.773
COLLATERAL	Unmatched	0.267	0.227	27.3		2.01	0.045
	Matched	0.253	0.267	-9.4	65.5	-0.63	0.533
LLP	Unmatched	4.827	3.226	77.3		6.42	0.000
	Matched	4.648	4.699	-2.5	96.8	-0.14	0.891

Notes: Table 4 compares the means of all relevant characteristics between rescued banks and a control group of non-rescued banks which was determined by propensity score in 2007. The results are based on five to one nearest neighbor caliper matching.

The bias reduction can also be illustrated graphically. Figure 1 compares the standardized bias before matching (indicated with points) to the standardized bias after matching (indicated with small crosses). The figure illustrates again the successful reduction in standardized bias due to the matching procedure.

FIGURE 1: Bias Reduction for Characteristics



Notes: Figure 1 compares the standardized bias before matching to the standardized bias after matching for all selected characteristics.

A further possibility to assess the quality of the matching consists in re-estimating the probit regression based on the matched sample. Table 5 illustrates again that the observable characteristics do not longer explain the recapitalization status of a bank. The explanatory power in terms of pseudo-R^2 is reduced from 0.134 to 0.022 and the observables are not only separately insignificant as shown in Table 4 but also jointly insignificant ($\rho > x^2 = 0.675$). Moreover, the table shows that the mean bias between the two groups before and after matching and across all characteristics is reduced from 39.6 % to 3.6 %. As the mean standardized bias over all variables is below 5 %, we can again confirm a good matching quality.

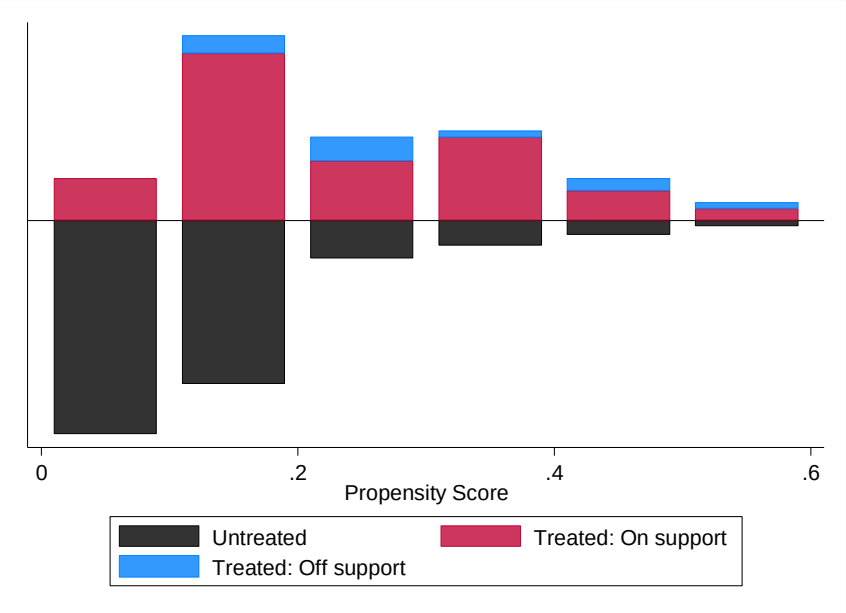
TABLE 5: Joint Insignificance of Observables after Matching

	Pseudo-R^2	$p > \chi^2$	Bias	
			Mean	Median
Raw	0.1340	0.000	39.6	26.6
Matched	0.0220	0.675	3.6	3.4

Notes: Table 5 shows that after matching observable characteristics do no longer provide joint explanatory power for recapitalization status. The results are based on five to one nearest neighbor caliper matching.

In addition, the Common Support Condition should be tested which ensures that there is a sufficient overlap of the propensity scores of the treated and non-treated group in order to find adequate matches. This can be done by visual inspection. Figure 2 shows that we can assume that the common support is given as there is a certain number of treated and non-treated banks between the interval [0;1] in each class of the propensity score. In addition, imposing the Common Support Condition only leads to the exclusion of a few treatment observations.

FIGURE 2: Common Support Condition



Notes: Figure 2 illustrates that the propensity score as a probability lies between zeroand one for both groups (treated and untreated).

To conclude all information on the matching quality, we can show that through the propensity-score five to one nearest neighbor caliper matching, it was possible to generate a control group which is similar enough to the treatment group to be used to calculate the ATT using difference-in-differences method.

3.5. Empirical Analysis

3.5.1. Main Results

As we want to examine whether the tax aggressiveness of treated banks has changed in the years after they received governmental support, we use a DID-PSM approach (Heckman, Ichimura and Todd, 1998) to compare tax aggressiveness of recapitalized banks and banks not receiving government support. We take the outcome variable ETR as measure of banks' tax avoidance in 2007, which is the year before the recapitalization occurred and compare it with the ETR in 2011. We choose 2011 instead of 2010 to allow for some time to successfully implement or change existing tax planning strategies after the financial crisis.[35] Moreover, we assume that crisis-related balance sheet distortions have faded out until then.

In particular, we calculate not only the ATT on the outcome variable ETR in 2007 and 2011 but also the effect on the change in the outcome variable before and after the treatment. As derived in Section 3.4.1 the difference-in-differences matching relies on the assumption that the change in the outcome variable ETR between 2007 and 2011 would be the same for the treatment and the control group in the absence of the recapitalization. This allows us to control for the notion that there may be unobserved differences between treated and untreated units. Thus, an advantage of the combination

[35] An estimation using 2010 instead of 2011 can be found in our robustness tests [cf. Section 3.5.2].

of propensity score matching and difference-in-differences method is not only the potential selection of observables but also the elimination of time constant unobservables.

The main result of the difference-in-differences analysis is presented in the last column of Table 6 and significant at 5 % level. It indicates a change in rescued banks' tax aggressiveness, namely higher reported ETRs, caused by capital injections in 2008/09. The effect is robust concerning time-invariant unobserved heterogeneity.

TABLE 6: Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			**FOLLOW UP (2011)**			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.251	-0.031*	0.252	0.274	0.022	0.053**
Std. E	(0.011)	(0.013)	(0.017)	(0.011)	(0.017)	(0.020)	(0.026)

Notes: Table 6 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 219, observations in the treatment group 133. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

The BASELINE columns contain the mean outcome for each group (control and treated) before recapitalization in 2007 and its difference. The mean ETR of the treated group is smaller (3.1 percentage points) which is an indicator for more tax planning activities. The difference between the means is significant at 10 % level and suggests that banks receiving public funds were on average more tax aggressive in 2007. The FOLLOW UP columns show the same information after the recapitalization. The results indicate that the ETRs of the treated and control group converge in 2011. The difference between the mean outcomes is now positive, but not statistically significant anymore.

This supports our assumption that increasing influence and supervision by governments and public attention lead to a reduction in banks' tax aggressiveness.

3.5.2. Robustness Checks

To test the robustness of our results, we carry out several additional analyses. To show that the results are not driven by the applied matching algorithm, we also test samples matched with *one to one nearest neighbor* and *kernel* matching. The results are shown in Tables 7 and 8 and confirm the results obtained with *five to one nearest neighbor* matching.

TABLE 7: Difference-in-Differences Method – 1to1 NN-Matching

	BASELINE (2007)			**FOLLOW UP (2011)**			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.299	0.251	-0.048*	0.252	0.274	0.022	0.070**
Std. E	(0.022)	(0.013)	(0.026)	(0.017)	(0.017)	(0.024)	(0.035)

Notes: Table 7 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on one to one nearest neighbor caliper matching. Observations in the control group 90, observations in the treatment group 133. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

TABLE 8: Difference-in-Differences Method – Kernel Matching

	BASELINE (2007)			**FOLLOW UP (2011)**			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.274	0.251	-0.023*	0.256	0.274	0.018	0.041**
Std. E	(0.010)	(0.010)	(0.013)	(0.012)	(0.011)	(0.016)	(0.021)

Notes: Table 8 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on kernel matching. Observations in the control group 435, observations in the treatment group 133. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

Again, we find a significant impact of the recapitalization status on the tax aggressiveness in 2007. The treated group has, on average, smaller ETRs. For the year 2011, the difference of the mean ETRs is not significant. Additionally, we find again a significant effect in the difference-in-differences approach.

We examine subsamples with respect to different regions to account for heterogeneity in our sample. Table 9 shows a difference-in-differences analysis when only recapitalized European banks are taken into account. We obtain highly significant positive effects at 1 % level for the year 2007, i.e., the mean ETR of treated group is 9 percentage points smaller than the ETR of the respective control group. Again, we cannot find a significant effect of the recapitalization status on the tax aggressiveness in 2011. Our results suggest that for European rescued banks tax aggressiveness was not only more pronounced than for non-rescued banks before the crisis, but that the effect is also time-constant.

TABLE 9: European Sample – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			**FOLLOW UP (2011)**			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.192	-0.090***	0.252	0.296	0.044	0.134**
Std. E	(0.011)	(0.023)	(0.025)	(0.011)	(0.051)	(0.052)	(0.058)

Notes: Table 9 considers a subsample of only European banks in the treated group. It shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 219, observations in the treatment group 40. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

When limiting our sample to U.S. based banks only, we are not able to identify any effect of capital injections on tax aggressiveness. Treatment and control group are very similar in respect to their tax aggressiveness before and after the financial crisis. This can be attributed to a number of causes. First, there was no condition concerning taxation implemented into recapitalization contracts. Second, although public attention and governments' interest in supervision in the U.S. might have been of equal power; the total number of more than 700 capital injections complicated tight supervision and lowered public attention to the single bank. With being one among many banks behavioral incentive might be much lower. Third, whereas in most European countries only few banks with a supposedly risk prone management style were bailed out, in the U.S. the sample includes a bigger variety of business models.

Table 10: U.S. Sample – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			**FOLLOW UP (2011)**			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.260	0.283	0.022	0.269	0.267	-0.003	-0.025
Std. E	(0.013)	(0.013)	(0.019)	(0.013)	(0.015)	(0.020)	(0.027)

Notes: Table 10 considers a subsample of only U.S. banks in the treated group. It shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 171, observations in the treatment group 93. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

Choosing our event window has great impact on our analysis. Capital injection programs allowed banks to pay back injected capital when possible on specific terms. Most banks were eager to pay back governments as soon as possible, not only to avoid government influence on their business decisions but also as a signal to their other

shareholders. Therefore, one could argue that 2011 is already too late to measure effects of government influence. To avoid this complication, we repeat our analysis choosing 2010 instead of 2011 as our relevant after-crisis year.

As shown in Table 11 our results are robust and indicate the same behavior of tax aggressiveness as we measured for 2011.

TABLE 11: Robustness Test Year 2010 – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2010)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.251	-0.031*	0.241	0.274	0.033	0.064*
Std. E	(0.011)	(0.013)	(0.017)	(0.014)	(0.028)	(0.031)	(0.036)

Notes: Table 11 shows the mean outcome for the treated and control group in 2007 and 2010 and its difference for the entire sample. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 222, observations in the treatment group 132. Robust standard errors are shown in parentheses. ***, ** and * indicate significance at 1 %, 5 % and 10 % level, respectively.

3.6. Conclusion

Our study investigates tax aggressiveness of banks which received public funds during the recent financial crisis.

For the empirical analysis we use a unique hand-collected data sample of 93 multinational banks headquartered in 10 OECD countries that received support in form of capital from public funds in 2008 and/or 2009. Our control group, which did not receive government support, consists of 763 banks in the respective countries.

Using a DID-PSM approach we are able to compare tax aggressiveness of recapitalized banks with banks that did not receive support. Our main result indicates a

significant change in tax aggressiveness caused by capital injections that is robust concerning time-invariant unobserved effects.

In addition, we explore the tax aggressiveness of both groups before (2007) and after the capital injections were received (2011). Our results show that banks receiving public funds in 2008 and/or 2009 had significantly lower ETRs measured one year before the financial crisis. However, after the recapitalization we cannot find significant different mean ETRs between the treated and control group anymore. We associate this result with increased government influence after strengthening its shareholder position by capital injections.

Our findings are supported by a series of consistent robustness tests, applying a different event window and additional matching methods. Lastly, a closer look at our sample suggests that effects differ among countries. Whereas the effect is very pronounced in Europe, we do not find significant results for the U.S. subsample.

Our study contributes to the recent discussions on possible ways to regulate banks' behavior. Interestingly, we find that banks changed their tax aggressiveness even without contractual enforcement. However, this does not hold for the U.S., where the majority of recapitalized banks are located. We attribute this to the enormous size of the recapitalization program, taking attention away from the single bank.

Several policy implications can be taken from our study. First, rescue measures offer an opportunity to address banks' existent tax aggressiveness. Second, negative behavioral patterns such as excessive risk taking and tax avoidance might be highly correlated. Future regulatory approaches could therefore attempt to address both issues simultaneously.

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Chapter 4

Public Disclosure of Foreign Subsidiaries and Aggressive International Tax Avoidance

Public Disclosure of Foreign Subsidiaries and Aggressive International Tax Avoidance

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Abstract:

Our study analyzes the influence of public disclosure of group structures in Exhibit 21 on the tax aggressiveness of U.S. multinational firms. Several U.S. multinational enterprises (MNEs) have removed a substantial number of subsidiaries from their Exhibit 21 since 2008. 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. Moreover, our study reveals that international tax avoidance by U.S. firms is associated with tax haven operations and profit-shifting opportunities. Our results suggest that publicly disclosed country-by-country information could influence MNEs' tax avoidance behavior.

Keywords: Effective Tax Rate, Tax Accounting, Tax Aggressiveness, International Tax Planning

We thank Lorenz Schwittmann for his valuable technical support regarding the collection of our Exhibit 21 data set. We appreciate comments from participants at the EAA Annual Congress in Glasgow, at the Vienna University of Economics and Business conference, at the annual meeting of the Accounting Section of the German Economic Association (VfS), at the Tagung der Kommission Betriebswirtschaftliche Steuerlehre der VHB and at the Doctoral Research Seminar in Berlin.

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4.1. Introduction

It is well-known that multinational enterprises (MNEs) use different mechanisms to avoid taxes. Recent public discussion proposes the establishment of a country-by-country reporting of key economic figures and tax payments to hinder tax avoidance. We analyze the relationship between public disclosure of group structures of U.S. MNEs and tax avoidance. Moreover, we investigate the influence of well-known determinants of international tax avoidance such as tax haven operations and profit-shifting opportunities.

Aggressive tax avoidance of MNEs has received considerable attention recently. The debate has been stimulated by very low effective tax rates (ETRs) disclosed in consolidated financial statements of well-known firms. For example, Google Inc. paid only $0.36 billion foreign taxes on $8.1 billion of non-U.S. profits in 2012, resulting in a foreign tax rate lower than 5 %.[36] As statutory tax rates on corporate income are significantly higher than 5 % in most industrialized countries, Google's ETR does not reflect common expectations about the tax level imposed. 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). In particular, a publicly disclosed country-by-country reporting might increase public pressure from customers or the general public, thereby limiting international tax avoidance. 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

[36] Cf. Google U.K. paid £11.2m in corporate tax, The Financial Times, 30/09/2013; http://www.ft.com/cms/s/0/c6ff0ebc-29c4-11e3-bbb8-00144feab7de.html#axzz3O9jEfFE6.

locations especially in Luxembourg, the company has changed the way it books revenue from sales in Europe, a move that could lead to higher tax payments.[37]

However, as U.S. MNEs are currently not obliged to disclose an entire country-by-country reporting, empirical evidence on the effect of public disclosure of tax planning details on the scope of tax avoidance is still scarce. Only a small strand of previous research analyzes this relationship. The results of existing studies indicate that less public pressure concerning different types of country-by-country reporting leads to more aggressive tax behavior (e.g., Hope, Ma and Thomas, 2013; Dyreng, Hoopes and Wilde, 2014).

Our paper contributes to this literature. U.S. listed firms are obliged to disclose a simplified country-by-country reporting that consists of a list of their significant subsidiaries in Exhibit 21 of Form 10-k to the U.S. Securities and Exchange Commission (SEC).[38] Interestingly, several companies removed a substantial number of foreign subsidiaries from their Exhibit 21 between 2007 and 2012. 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 two are based in foreign countries.[39] As their 10-k filings mention an extensive expansion and acquisition program and do not reveal any reasons for this extensive reduction, there is no obvious reason for this despite the broad interpretation of the SEC regulation.[40] For the cases of

[37] Cf. http://fortune.com/2015/05/26/amazon-is-going-to-pay-more-tax-in-europe/.
[38] The disclosure rule Item 601 of SEC Regulation S-K (§229.601) requires the disclosure of all significant subsidiaries in Exhibit 21 to Form 10-k.
[39] Cf. The Incredible Vanishing Subsidiary – From Google to FedEx, Wall Street Journal, 5/22/2013; http://www.wsj.com/articles/SB10001424127887323463704578497290099032374. Note that U.S. subsidiaries are also included here, whereas our following analysis considers only foreign subsidiaries [cf. Section 4.3.1].
[40] Cf. https://www.sec.gov/cgibin/browseedgar?CIK=1341439&Find=Search&owner=exclude&action=getcompany.

Google and Oracle, Gramlich and Whiteaker-Poe (2013) searched public company registers after they significantly reduced their number of subsidiaries reported in Exhibit 21. Their investigation detects that in these cases, at least 65 % of the disappearing subsidiaries still existed in 2012.

In addition to this change in disclosure policy, their ETR measures suggest that this change in disclosure policy is followed by a change in tax avoidance behavior. For example, Oracle reported a Foreign ETR of 22 % in 2007. In 2012, they reported a Foreign ETR of 15 %. We use the phenomenon of diminishing foreign subsidiaries in our empirical analysis to test whether international tax avoidance is affected. We combine information disclosed in Exhibit 21 with financial information for 2007 and 2012. These years can be considered the beginning and end of the period of significant changes in reporting of foreign subsidiaries. During this period, more than 30 firms that are required to file Exhibit 21 significantly reduced the number of foreign subsidiaries disclosed in Exhibit 21. We contacted each of these firms in order to evaluate their reasons for this change in disclosure behavior. Most of the firms refer to M&A activities as the main reason for their changes in disclosure. None of the firms that answered specified tax planning as reason of specific interest.

We analyze whether these diminishing firms became more tax aggressive after changing their public disclosure attitude compared to firms that did not change their public disclosure. As most of the firms referred to M&A activities as the main reason for their change in disclosure, we do control for M&A activities in our analysis. As ETRs are well accepted measures for tax avoidance, we consider *Foreign ETR*, *Foreign Current ETR* and *GAAP ETR* in our analysis. In addition, we also take the new measure

ETRDIFF (Herbert and Overesch, 2015) into consideration which identifies the aggressive part of international tax avoidance.

The empirical results suggest 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. The effect of public disclosure on international tax avoidance is robust across different specifications and different measures of international tax avoidance. Moreover, our results confirm that international tax avoidance of U.S. multinational firms is determined by tax haven operations and profit-shifting opportunities.

Our results contribute to the recent debate on base erosion and profit-shifting. In particular, our results suggest that publicly disclosed country-by-country information might influence MNEs' tax avoidance behavior.

The remainder of the paper is organized as follows. In Section 4.2, we discuss the impact of public disclosure on international tax avoidance. Section 4.3 describes our research design. Empirical results are presented in Section 4.4. Section 4.5 concludes.

4.2. Prior Literature and Research Question

4.2.1. Determinants of International Tax Avoidance

Several U.S. based MNEs have recently been at the center of public discussion due to their aggressive tax planning activities. The public discussion has focused primarily on strategies affecting foreign tax payments. For example, the coffeehouse chain Starbucks paid only £8.6 million in U.K. corporate taxes on sales of £3 billion from

1998 to 2012.[41] Nevertheless, Starbucks' top-level functionaries stressed that the company's tax rate was 32 % on U.S. profits.[42] This case suggests that U.S. MNEs reach their low ETRs through foreign activities.

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 multinational subsidiaries are inversely related to the local tax level, suggesting intra-firm shifting of taxable profits (cf. Hines and Rice, 1994; Huizinga and Laeven, 2008; Blouin, Robinson and Seidman, 2015; Klassen and LaPlante, 2012a, 2012b).

A broad literature has already analyzed different tax planning strategies used by MNEs to reduce the overall foreign tax bill. 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)[43] 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).

Referring to these prior empirical findings, we revisit potential determinants of international tax avoidance in our analysis. In particular, we analyze how certain strategies of international tax avoidance affect the ETRs of multinational firms. Our

[41] Cf. Starbucks suffers first U.K. sales after tax row, The Independent, 24/04/2014; http://www.independent.co.uk/news/business/news/starbucks-suffers-first-uk-sales-fall-after-tax-row-9284988.html.
[42] Cf. Starbucks Asks Congress For Expanded Tax Breaks, The Huffington Post, 24/04/2013; http://www.huffingtonpost.com/2013/04/24/starbucks-tax-breaks_n_3150050.html.
[43] 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.

analysis is related to studies by Dyreng and Lindsey (2009) and Markle and Shackelford (2012a, 2012b) that consider tax haven operations and proxies for profit-shifting channels as determinants of ETR measures.

4.2.2. Influence of Public Disclosure on International Tax Avoidance

Although it is well-known that MNEs engage in all types of tax avoidance (for an overview cf. Hanlon and Heitzman, 2010) and that the empirical evidence shows that some firms use tax planning strategies while others do not (Dyreng, Hanlon and Maydew, 2008), it is still not well understood what differentiates these firms from other firms that do not engage in tax planning or even tax sheltering.

One potential explanation is that the extent to which a firm engages in international tax avoidance is associated with costs. The prior literature shows that lower ETRs result in significantly higher tax uncertainty (Dyreng, Hanlon and Maydew, 2014). Therefore, engagement in tax avoiding strategies or tax shelter schemes results not only in the benefit of paying less tax but also in the risk of being detected or suffering a bad reputation for the firm and its top management. In this case, tax avoidance is limited by costs of tax planning and incentivizing managers as well as by substitution effects due to limited management capacity (Jacob, Rohlfing-Bastian and Sandner, 2014). Therefore, a firm should only engage in tax avoidance if benefits outweigh costs.

The prior literature finds ambiguous evidence for this relationship. While some studies assert that some firms do not engage in tax avoidance due to the costs involved, other studies do not confirm this relationship (for an overview cf. Gallemore, Maydew and Thornock, 2014; Jacob, Rohlfing-Bastian and Sandner, 2014).

Most of these studies do not take into consideration the fact that costs depend on information available for assessment of a firm's tax strategy by tax authorities, customers or the general public. Access to proprietary information is often a requirement for a tax audit of complex international tax avoidance strategies such as holding structures or transfer pricing schemes. While the information requests of fiscal authorities might be satisfied by reporting requirements that are exclusively submitted to the tax authorities, a rating of the scope of tax avoidance by customers or the general public requires publicly available information. In particular, 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.

A recent survey among tax executives of U.S. firms confirms the concern of reputational costs associated with corporate tax planning (Graham et al., 2014). Therefore, managers should be less tax aggressive if they perceive significant reputational costs associated with public disclosure regulations revealing their tax avoidance strategies.

Nevertheless, managers might be able to reduce transparency concerning their international firm structure or tax planning strategies. In this case, customers cannot observe the details of the tax strategy used and reputational costs are avoided.

Non-tax literature finds evidence that poor transparency is often associated with cost for firms. For example, Leuz and Verrecchia (2000) show that the cost of capital decreases if the level of disclosure increases. Biddle and Hilary (2006) show that an increase in accounting quality involves an increase in investment efficiency. If a firm uses tax planning strategies, these results may not be confirmed, as this firm benefits from less transparency due to the decreasing risk of being detected or suffering bad reputation.

Empirical evidence of the effect that accounting transparency has on tax aggressiveness is scarce in the tax literature. 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 in their financial reports. They find that opting to discontinue geographic earnings disclosure was associated with significantly lower ETRs. However, their results suggest 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. Recently, Dyreng, Hoopes and Wilde (2014) analyzed public pressure on MNEs in the United Kingdom to carefully report a complete list of all foreign subsidiaries. They find increasing ETRs for U.K. firms after they had to reveal their list of foreign subsidiaries.

We consider Exhibit 21as a simplified country-by-country reporting. 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 some firms have removed a substantial number of foreign subsidiaries from their Exhibit 21 between 2007 and 2012. As mentioned above, there is no obvious reason for the decrease in subsidiaries despite a broad interpretation of the disclosure rule and the respective firm's decision to opt for a lower level of transparency concerning their international activities.[44] As executives are partially responsible for a firm's tax avoidance level (Dyreng, Hanlon and Maydew, 2010), we expect executives of diminishing firms to deliberately make the decision to become more tax aggressive. Therefore, we use the fact that some firms significantly diminished the number of foreign subsidiaries in Exhibit 21 and derive our research question that a diminishing of foreign subsidiaries disclosed in Exhibit 21 of Form 10-k is associated with additional international tax avoidance.

4.3. Empirical Design

4.3.1. Diminishing Subsidiaries in Firms' Exhibit 21

Exhibit 21 of Form 10-k reveals information about a firm's 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. Even though the disclosure rule was not changed during this period, starting in 2008, a substantial number of subsidiaries

[44] While the SEC's definition can give some room for interpretation 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.

vanished from some Exhibit 21 disclosures.[45] Therefore, we assume that the phenomenon of diminishing subsidiaries derives from a different interpretation of Item 601 of SEC Regulation S-K (§229.601). Considering Exhibit 21 disclosures of various firms in a time period between 2007 and 2012, we conclude that most firms completed their diminishing process by the end of the fiscal year 2012. Therefore, we compare Exhibit 21 data of fiscal years 2007 and 2012 to identify firms that have significantly diminished their list of foreign subsidiaries disclosed in Exhibit 21.

We assume a substantial decline in significant subsidiaries if the number of foreign subsidiaries in Exhibit 21 declined by more than 50 % between 2007 and 2012. We do not consider the U.S. subsidiaries disclosed in Exhibit 21, as we only analyze the influence of public disclosure on international tax avoidance. Moreover, we consider a firm only as diminishing if at least 10 significant foreign subsidiaries vanished from Exhibit 21.

To further investigate disclosure behavior, we contacted the investor relations departments of our diminishing firms. We asked them via letters and email about the reasons for their decreasing number of subsidiaries disclosed in Exhibit 21.[46] Only four 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

[45] According to SEC Regulation (17 CFR 210.1-02(w)), (1) the parent company's and its other subsidiaries' investments in the subsidiary do not exceed 10 % 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 10 % of the consolidated firm's total assets; and (3) the parent company's and its other subsidiaries' investments proportionate share of the subsidiary's pre-tax income from continuing operations does not exceed 10 % of the consolidated income from continuing operations.

[46] The complete request can be found in Appendix 2.

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 is partly a reason in some cases, we account for changes in Exhibit 21 due to M&A activities. We assume that a firm's sales should significantly decline if it sells parts of its business and therefore reports fewer subsidiaries in Exhibit 21. Therefore, we reclassify diminishing as non-diminishing if the firm belongs to the top 5 % decreasing total sales.

Imposing this definition on our research sample identifies 31 firms that significantly diminished their public disclosure of foreign subsidiaries. *DIMINISHING* is defined as a dummy variable being 1 for these 31 firms. We expect *DIMINISHING* to have a positive effect on international tax aggressiveness in the aftermath of changing the public disclosure about foreign subsidiaries.

Table 1 provides an overview of these firms and their share of diminishing subsidiaries, which is the percentage change between the number of foreign subsidiaries in 2007 and 2012.

Figure 1 depicts the mean values of *Foreign ETRs* for diminishing (*DIMINISHING* = 1) and non-diminishing (*DIMINISHING* = 0) firms in 2007 and 2012. The mean *Foreign ETR* for the diminishing companies decreases from 0.34 in 2007 to 0.22 in 2012, which constitutes a decrease by 35 %, whereas it remains almost unchanged for the non-diminishing firms. In 2012, the *Foreign ETR* mean of the diminishing firms is 0.22 compared to 0.26 of the non-diminishing companies. These descriptive statistics confirm our expectation that firms that substantially reduced public disclosure of foreign subsidiaries in their Exhibit 21 avoided additional taxes in 2012. In

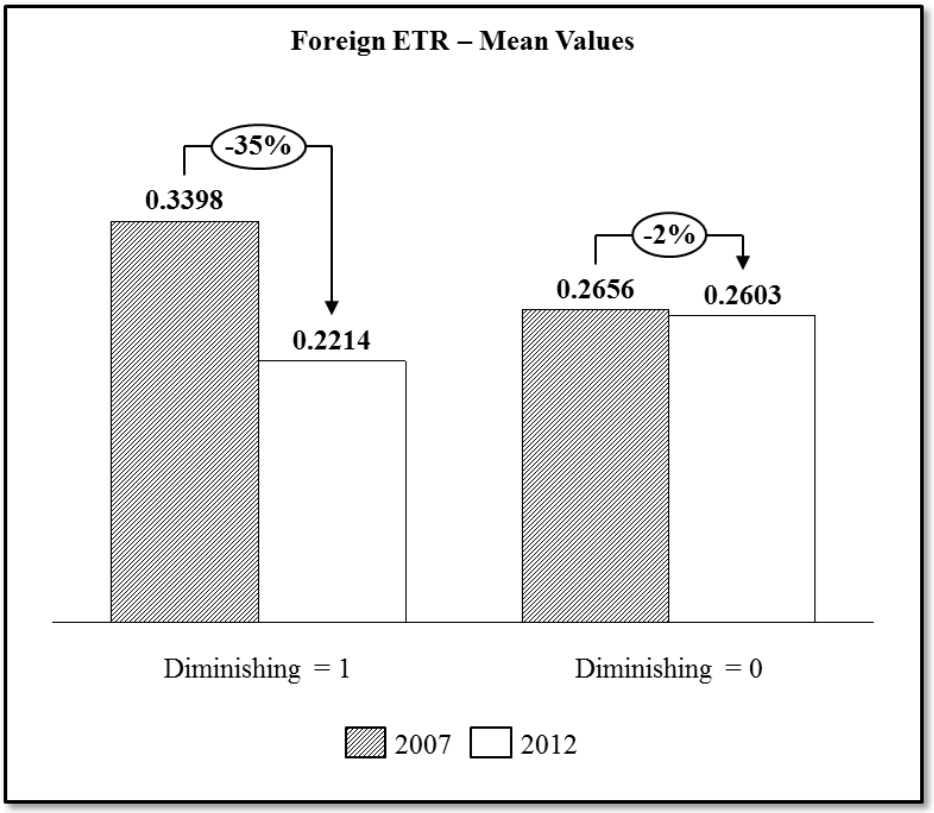
Section 4.4, we will use regression analysis to further identify the impact of public disclosure on the scope of international tax avoidance.

TABLE 1: Overview Diminishing Firms

	Company Name	Share of Diminishing Foreign Subsidiaries
1	HILLSHIRE BRANDS CO	0.9887
2	FEDEX CORP	0.9792
3	ORACLE CORP	0.9759
4	ALTRIA GROUP INC	0.9752
5	GOOGLE INC	0.9683
6	URS CORP	0.9624
7	TRIMAS CORP	0.9583
8	BOEING CO	0.9151
9	ALLY FINANCIAL INC	0.9091
10	MRV COMMUNICATIONS INC	0.8667
11	FREEPORT-MCMORAN INC	0.8571
12	AEP INDUSTRIES INC	0.8462
13	CARDINAL HEALTH INC	0.7669
14	WEBSENSE INC	0.7667
15	NYSE EURONEXT	0.7632
16	ACTIVISION BLIZZARD INC	0.7368
17	CALPINE CORP	0.7000
18	ITT CORP	0.6964
19	CYPRESS SEMICONDUCTOR CORP	0.6774
20	FEDERAL SIGNAL CORP	0.6538
21	DANAHER CORP	0.6381
22	ARMSTRONG WORLD INDUSTRIES	0.6190
23	ACI WORLDWIDE INC	0.6170
24	YRC WORLDWIDE INC	0.6047
25	INVESTMENT TECHNOLOGY GP INC	0.5909
26	IAC/INTERACTIVECORP	0.5688
27	DANA HOLDING CORP	0.5679
28	CONOCOPHILLIPS	0.5372
29	HARTFORD FINANCIAL SERVICES	0.5333
30	CONVERGYS CORP	0.5167
31	E TRADE FINANCIAL CORP	0.5000

Notes: Table 1 shows the diminishing firms (*DIMINISHING* = 1) of our main analysis and the percentage decrease of foreign subsidiaries in Exhibit 21. *DIMINISHING* is defined in the Appendix.

FIGURE 1: Foreign ETR – Mean Values



Notes: Figure 1 shows the mean values for the dependent variable *Foreign ETR* in 2007 and 2012 for diminishing (*DIMINISHING* = 1) and non-diminishing firms (*DIMINISHING* = 0) and the percentage change. *DIMINISHING* is defined in the Appendix.

4.3.2. Research Design

We test the effect of diminishing subsidiaries disclosed in Exhibit 21 on tax aggressiveness by a standard difference-in-differences approach (Meyer, 1995). We estimate the following Equation (1) to analyze the determinants of (international) tax avoidance of firm *i* in year *t*.

$$Tax\ Measure_{i,t} = \beta_0 + \beta_1 DIMINISHING_i + \beta_2 (DIMINISHING_i \times D2012_t) + \beta_3 D2012_t + X_{i,t}\delta + u_{i,t} \quad (1)$$

In our main analysis, we use a firm's *Foreign ETR* as a Tax Measure, which is the quotient between the sum of foreign current taxes plus foreign deferred income taxes and foreign pre-tax income.[47] ETRs are well-accepted proxies for tax avoidance, as a lower ETR suggests that a firm is more effectively avoiding income taxes compared to firms with higher ETRs. In further robustness checks, we also consider the *Foreign Current ETR* and *GAAP ETR* as dependent variables.

As described in Section 4.3.1, *DIMINISHING* is an indicator variable for firms that have significantly reduced their number of foreign subsidiaries reported in Exhibit 21. *D2012* is an indicator variable for the year 2012, i.e., the period after the diminishing. Therefore, β_1 captures potential differences in tax avoidance between diminishing and non-diminishing firms. β_3 controls for a general time trend in tax avoidance between 2007 and 2012.

The variable of interest is the interaction term between *DIMINISHING* and *D2012*. The coefficient β_2 captures a difference in the change of Tax Measure for diminishing firms between 2007 and 2012 compared to the general time trend in tax avoidance for non-diminishing firms. In accordance with our research question, we expect a negative significant effect for β_2, indicating an increase in international tax avoidance of firms that have sharply reduced public disclosure of foreign subsidiaries.

4.3.3. Control Variables

Vector *X* of Equation (1) controls for several determinants of international tax avoidance. Financial statement information is mainly taken from Compustat. A list of all variable definitions can be found in Appendix 1.

[47] To limit the influence of outliers, we delete ETRs < 0 and ETRs > 1.

In vector *X*, we consider two different groups of explanatory variables. The first group consists of tax avoidance determinants in terms of more general firm characteristics that have been used in the previous literature, whereas the second group includes particular variables that reflect certain international tax planning strategies.

We consider *SIZE*, which is the natural logarithm of groups' total assets as a control for the impact of general tax planning determinants. Considering the influence of *SIZE* on the ETR, prior research has found inconsistent results. Some studies reveal a positive correlation between size and ETR (Wang, 1991; Plesko, 2003; Rego, 2003), while other studies find the opposite (Chen et al., 2010). Therefore, we have no clear prediction concerning international tax avoidance.

PROFITABILITY is measured as pre-tax income divided by total assets. Most studies find a negative correlation between tax avoidance and profitability (Gupta and Newberry, 1997; Plesko, 2003; Chen et al., 2010). However, some papers detect the opposite (Rego, 2003). Profitability and tax avoidance may be positively correlated, as more profitable firms have more opportunities and incentives to reduce tax expenses by engaging in tax avoidance.

The variable capital intensity (*CAPINT*) is the quotient between property, plant and equipment and total assets. The association between ETR and *CAPINT* is also ambiguous. The most widely obtained result is a negative correlation with tax avoidance (Gupta and Newberry, 1997), which leads to the assumption that a high level of property, plant and equipment causes a tax reduction in ETR due to the deductibility of

high depreciations.[48] Regarding international tax planning strategies, higher capital intensity might also indicate less mobility of taxable income.

The variable *LEV* is defined as liabilities divided by total assets. Firms with a high level of debt can use the deductibility of interest expenses to reduce tax burden. However, the effect of leverage on the effective tax rate measures is ambiguous because interest payments do not only reduce taxable profits, and thus, tax expenditures, but also pre-tax earnings (Hanlon and Heitzman, 2010). While some previous studies have found an inverse relation with the ETR (Plesko, 2003; Markle and Shackelford, 2012b), others found the opposite (Chen et al., 2010). Therefore, we have no clear prediction.

Utilization of prior operating tax loss carryforwards should reduce current period tax payments. *NOL* is a dummy variable that equals one if there has been a decrease in tax loss carry forwards and zero otherwise.[49] Prior studies have predicted that firms utilizing *NOLs* should have lower ETRs (Mackie, 1999; Cooper and Knittel, 2010).

The second group of variables considered in the vector *X* includes determinants of international tax avoidance. In line with previous evidence from subsidiary level data, we focus on tax planning via the use of tax havens and profit-shifting opportunities depending on the characteristics of a firm's business.

Profit-shifting opportunities vary across firms and industries. 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). We include the variable *R&D*, which is defined as R&D expenses scaled by total assets in

[48] Note that pre-tax profit, which is the denominator of the ETR, is also affected by depreciation and amortization. Therefore, not all studies have reached the same conclusion (Plesko, 2003).

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

our analysis. A strong positive association with the scope of international tax avoidance is expected. [50]

HAVEN captures the number of tax haven countries in which a firm has subsidiaries scaled by the total number of countries in which the company operates according to the information disclosed in Exhibit 21 of Form 10-k in 2007 and 2012. The definition of tax haven countries follows Dyreng and Lindsey (2009).

In particular, firms in high-tech and pharmaceutical industries ("income mobile industries") are best positioned to implement long-term tax avoidance strategies, as they possess significant intellectual property and products with global demand, which allow them to shift profits to low-tax jurisdictions via transfer pricing. According to De Simone, Mills and Stomberg (2014), we use three-digit SIC codes to compute the dummy variable *INCOME MOBILE*, which equals one if the industry membership of the parent is supposed to be income mobile.[51]

Tax avoidance opportunities differ across industries due to the different business models (Balakrishnan, Blouin and Guay, 2012). We therefore consider industry-fixed effects in accordance with the Fama and French classification of 17 different industry groups.[52]

[50] We require companies to have non-missing values for all components of the dependent and independent 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.
[51] We classify the following three-digit SIC codes as income mobile industries: 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services).
[52] Updated industry-classification can be downloaded from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/changes_ind.html.

4.3.4. Sample Selection

We derive our data from two data sets: financial statement information from Compustat[53] and subsidiary information disclosed in Exhibit 21 of Form 10-k available at the SEC's database EDGAR.[54] For both data sets, we use data of the fiscal years 2007 and 2012. Moreover, we require a non-missing CIK number, as these two data sets can only be combined by CIK.

Our starting point for data sampling is the financial statement data we derive from Compustat. Financial statement information is used to compute the tax avoidance measures and most of the explanatory variables described in Section 4.3.3. As we analyze the 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. Our analysis focuses on *Foreign ETR* as a tax measure. Hence, we require non-missing values for foreign pre-tax income and foreign current income taxes. 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 foreign income.[55] Imposing these requirements, we remain with 2,967 observations.

In a next step, we add the Exhibit 21 data set.[56] We have collected company structures from Exhibit 21 for all of these 2,967 firms for the fiscal years 2007 and

[53] Further data used only for some variables are described in Sections 4.3.2 and 4.3.3.
[54] https://www.sec.gov/edgar/searchedgar/companysearch.html.
[55] In additional analysis, we use the *GAAP ETR* as tax avoidance measure. In these cases, we also require a positive pre-tax income.
[56] We thank Scott D. Dyreng for offering his Exhibit 21 data set for download on https://spreadsheets.google.com/viewform?formkey=dElURjI1eUJvWDhHSmMwMmFPVmdvVnc6MQ. Further description of the data set can be found in Dyreng and Lindsey (2009). However, all data used in this paper were collected by us, as Dyreng's data set only includes fiscal years until 2009 and we could not guarantee the comparability of his data to our data, which is essential for the variable *DIMINISHIING*.

2012.[57] As a non-missing Exhibit 21 for the fiscal years 2007 and 2012 is required to construct the variable *DIMINISHING*, only those companies having an Exhibit 21 for both years are included in our analysis. In addition to being U.S. based, we require the firms to be multinational. A firm is defined as multinational if it conducts business in at least two countries besides the U.S. in accordance with their Exhibit 21 for the fiscal year 2007. Imposing these prerequisites on the data set creates a sample of 1,552 observations from 2007 and 2012.

The pooled data are used for regression analysis in Section 4.4. As we delete ETRs < 0 and ETRs > 1 to limit the influence of outliers and due to missing values in the control variables, we derive 1,309 observations for our analysis. Table 2 provides summary statistics of all variables used.

TABLE 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Foreign ETR	1,309	0.2633	0.1597	0.0008	0.9946
SIZE (ln)	1,309	7.7331	1.7213	2.9432	13.9287
PROFITABILITY	1,309	0.0877	0.0956	-0.4978	0.6513
CAPINT	1,309	0.4240	0.3213	0	1.6646
LEV	1,309	0.0316	0.0586	0	0.4554
NOL	1,309	0.2811	0.4497	0	1
HAVEN	1,309	0.2122	0.1531	0	1
INCOME MOBILE	1,309	0.2552	0.4361	0	1
R&D	1,309	0.0363	0.0567	0	0.6999
DIMINISHING	1,309	0.0382	0.1917	0	1

Notes: Table 2 shows descriptive statistics for all variables included in our main regression analysis. Variables are defined in the Appendix.

[57] Starting with an automatically created data set, we also manually checked the collected data. As the country Georgia cannot be distinguished from the U.S. state Georgia in our data set, we deleted Georgia from our sample.

4.4. Empirical Results

In our empirical analysis, we test our research question derived in Section 4.2 and investigate the influence of diminishing subsidiaries from publicly disclosed financial filings in addition to other well-known determinants of tax planning channels on MNEs' international tax avoidance. We expect diminishing firms to avoid more taxes and become more tax aggressive than non-diminishing firms. We test this relation in regression analysis in accordance with the approach described in Section 4.3.2 and based on pooled data from the fiscal years 2007 and 2012.

4.4.1. Main Findings

Table 3 presents OLS regression results for the *Foreign ETR* as dependent variable. Specifications (1) and (2) show the plain diminishing effect with and without industry-fixed effects. In column (3), we add variables concerning firm characteristics and general tax planning activities. In column (4), we consider additional variables for international tax planning activities. Specifications (5) and (6) repeat the analysis without *DIMINISHING* and the interaction term. Starting with column (2), all specifications are augmented with industry fixed effects.

In specifications (1) – (4), we test whether the diminishing coverage of foreign subsidiaries disclosed in Exhibit 21 of Form 10-k is associated with more aggressive tax avoidance. The specifications contain the dummy variable *DIMINISHING* and an interaction term between the indicator variable for diminishing firms and the time dummy for 2012 (*DIMINISHING x D2012*). In columns (3) and (4), we additionally include variables for general and international tax planning activities, whereas columns (1) and (2) show the diminishing effect without any control variables. The coefficient for

the interaction is always negative and statistically significant in all four difference-in-differences estimations that include *DIMINISHING*. This result suggests that the *Foreign ETR* of the diminishing firms declined significantly after diminishing the number of publicly disclosed foreign subsidiaries. The point estimates for the interaction *DIMINISHING x D2012* are of a magnitude of approximately 0.11. Considering the sample mean *Foreign ETR* of approximately 0.263, this magnitude is remarkable.

With the exception of column (1), we find no statistically significant difference between diminishing and non-diminishing firms in 2007. The plain time indicator *D2012* is not significant at the conventional level throughout all specifications. Thus, we cannot confirm a general downward trend in the *Foreign ETR* between 2007 and 2012.

In the following, the results for the control variables in specifications (3) – (6) are briefly discussed. Columns (5) and (6) do not include the *DIMINISHING* variable and the interaction term in order to confirm the robustness of the results. Across specifications (3) – (6), *PROFITABILITY* exerts a strong negative effect on the *Foreign ETR*. This finding is very reasonable. Because a cross-border offsetting of subsidiary losses and profits is hardly ever allowed, it is very likely that firms with lower profitability pay taxes on gross profits in some countries while suffering from loss carryforwards in other locations. Simultaneously, the denominator of the *Foreign ETR* might be small because pre-tax foreign income is balanced across all foreign subsidiaries. Moreover, widely used transfer pricing methods such as the cost plus method, the resale pricing method or the transactional net margin method are associated with particular profit-shifting opportunities if profitability is abnormally high.

In addition, all specifications depict a strong negative association between *SIZE* and *Foreign ETR*, indicating that larger firms are more engaged in tax planning activities. The variable *NOL* is negative and significant at the conventional level as well, which confirms that the use of prior operating tax loss carryforwards reduces firms' tax payments.

With the exception of specification (4), *LEV* has a positive and significant influence on the *Foreign ETR*. This finding shows that the foreign pre-tax profits are more reduced by the deductibility of the interest payments than the tax expenses.

The variable *CAPINT* exerts a positive and significant influence on *Foreign ETR* if we do not control for international tax planning activities. The positive effect suggests less aggressive tax avoidance if the firm employs more property, plant and equipment. This result is in line with the expectations that profit-shifting is predominantly associated with intangibles and intra-firm sales.

In specifications (4) and (6) of Table 3, we add variables for international tax planning activities. We include the variables *INCOME MOBILE* and *R&D* to investigate the influence of profit-shifting opportunities and to analyze whether the *Foreign ETR* is smaller if income is supposed to be highly mobile. Indeed, we find a negative and significant effect for the dummy variable *INCOME MOBILE* with a coefficient of approximately 0.03. We can also confirm a strong negative and significant influence of the variable *R&D*. Taking into consideration the coefficient of 0.28, we receive an additional effect of approximately 1.6 percentage points on the *Foreign ETR* for a firm with an R&D intensity that is one standard deviation higher. By adding the variable *HAVEN*, our analysis refers to the ongoing debate on aggressive tax planning via tax

havens. Our results support the expectation that *Foreign ETR* is smaller if a firm has more subsidiaries in tax haven countries. Evaluated at sample means, tax havens are responsible for a decrease in *Foreign ETR* of almost 2 percentage points.

TABLE 3: Foreign ETR

Foreign ETR	**1**	**2**	**3**	**4**	**5**	**6**
DIMINISHING x 2012	-0.1130***	-0.1150***	-0.1100***	-0.1040**		
	(0.0399)	(0.0401)	(0.0394)	(0.0405)		
DIMINISHING	0.0742*	0.0650	0.0680	0.0692		
	(0.0428)	(0.0424)	(0.0420)	(0.0423)		
D2012	-0.0053	-0.0048	-0.0033	-0.0036	-0.0073	-0.0074
	(0.0079)	(0.0078)	(0.0078)	(0.0079)	(0.0077)	(0.0077)
SIZE			-0.0090***	-0.0090***	-0.0086***	-0.0088***
			(0.0032)	(0.0032)	(0.0031)	(0.0032)
PROFITABILITY			-0.1590***	-0.2020***	-0.1600***	-0.2040***
			(0.0543)	(0.0560)	(0.0544)	(0.0560)
CAPINT			0.0358**	0.0236	0.0350**	0.0228
			(0.0173)	(0.0168)	(0.0174)	(0.0169)
LEV			0.1650**	0.1150	0.1760**	0.1260*
			(0.0745)	(0.0725)	(0.0739)	(0.0719)
NOL			-0.0153*	-0.0151*	-0.0157*	-0.0154*
			(0.0090)	(0.0088)	(0.0090)	(0.0088)
HAVEN				-0.0894***		-0.0912***
				(0.0345)		(0.0344)
INCOME MOBILE				-0.0328**		-0.0323**
				(0.0135)		(0.0135)
R&D				-0.2800***		-0.2830***
				(0.1050)		(0.1050)
CONSTANT	0.2660***	0.2660***	0.3300***	0.3800***	0.3310***	0.3820***
	(0.0061)	(0.0060)	(0.0272)	(0.0275)	(0.0267)	(0.0271)
Hausman test	0.47	0.65	0.34	0.46		
[p - value]	[0.6280]	[0.5226]	[0.7141]	[0.6325]		
Industry-FE		✓	✓	✓	✓	✓
N	1,309	1,309	1,309	1,309	1,309	1,309
R^2	0.006	0.041	0.068	0.096	0.064	0.092

Notes: Table 3 presents the results of our main OLS regressions with the *Foreign ETR* as dependent variable. Numbers in parentheses are robust standard errors clustered by firms. Numbers in brackets for the Hausman test are p-values. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

One restriction to our results is the potential endogeneity of the variable *DIMINISHING*. While we expect *DIMINISHING* to influence a firm's international tax

avoidance, some firms might diminish the number of subsidiaries disclosed in their Exhibit 21 because they are already tax aggressive. As none of the diminishing firms we contacted cited tax planning as reason of particular interest, we do not expect to have the problem of endogeneity. Specifications (5) and (6) of Table 3 show that the effects of our control variables hold if we do not consider the variables *DIMINISHING* and *DIMINISHING x D2012*. This robustness of our results is another indicator that the potential endogeneity is not of further interest. To corroborate this idea, we use the regression-based form of the Hausman test for endogeneity (Hausman 1978, 1983).

The Hausman test for endogeneity requires an instrument variable that is uncorrelated with our dependent variable – in our case the *Foreign ETR* as measures of tax avoidance – and correlated with the endogenous variable – in our case *DIMINISHING* and *DIMINISHING x D2012* – conditional on the explanatory variables of the outcome regression. As an instrument, we use the percentage change in the word count of Form 10-k between 2007 and 2012. Changes in the length of Form 10-k are a good proxy for the general preference for the disclosure of proprietary information, which also significantly affects the disclosure of foreign subsidiaries in Exhibit 21. However, the general preference for disclosure quality is not directly correlated with tax avoidance.

We regress *DIMINISHING* and *DIMINISHING x D2012* on all variables, including our instrument for change in the word count of 10-k and the interaction term of this instrument variable and D2012. In a second stage, we include the residuals from these regressions in Equation (1) and perform a joint F-test. In columns (1) – (4) of

Table 3, we report the results for the joint F-tests that clearly reject the endogeneity of *DIMINISHING* and *DIMINISHING x D2012*.

4.4.2. Alternative Measures for Diminishing

In additional analysis, we focus on two different measures for *DIMINISHING* in order to show the robustness of our main results in Table 3. We keep the *Foreign ETR* as the dependent variable and test two alternative diminishing definitions in two specifications. Table 4 depicts the respective regression results.

In specifications (1) and (2), we consider change in total assets as a proxy for firms' M&A activities and reclassify diminishing firms that belong to the top 5 % diminishing firms in decreasing total assets as non-diminishing. The other prerequisites remain unchanged compared to our main definition of *DIMINISHING*. The number of foreign subsidiaries has to decline by more than 50 % between 2007 and 2012, and at least 10 significant foreign subsidiaries have to vanish from Exhibit 21. Imposing this definition on our sample identifies 32 firms that significantly diminished their public disclosure of foreign subsidiaries. The coefficient for the interaction term *DIMINISHING x D2012* is again negative and significant in both specifications. Moreover, we find a statistically significant difference between diminishing and non-diminishing firms in 2007. This confirms our descriptive findings that firms avoid additional taxes in 2012 if they disclose fewer foreign subsidiaries in their Exhibit 21 (Figure 1). Again, the plain time dummy *D2012* is not significant at the conventional level.

In specifications (3) and (4) of Table 4, we define *DIMINISHING* as one if the number of subsidiaries declined between 2007 and 2012, but sales increased by more

than 50 % during this time period. We identify 54 firms as diminishing. The analysis confirms our results from Table 3. The point estimates for the interaction *DIMINISHING x D2012* is lower (approximately 0.07) but still negative and significant in both specifications. *DIMINISHING* and the time dummy *D2012* are both not significant at the conventional level. Thus, with each *DIMINISHING* definition, the difference-in-differences estimations suggest a significant rise in tax avoidance as a response to less public disclosure of foreign subsidiaries. In addition, our results for the influence of (international) tax planning strategies on the *Foreign ETR* remain robust.

TABLE 4: Alternative Measures for Diminishing

Foreign ETR	**1**	**2**	**3**	**4**
DIMINISHING x 2012	-0.0931**	-0.0911**	-0.0699**	-0.0725**
	(0.0405)	(0.0411)	(0.0350)	(0.0355)
DIMINISHING	0.0756*	0.0754*	0.0191	0.0336
	(0.0394)	(0.0400)	(0.0371)	(0.0363)
D2012	-0.0037	-0.0038	-0.0030	-0.0032
	(0.0079)	(0.0079)	(0.0079)	(0.0080)
SIZE	-0.0091***	-0.0093***	-0.0086***	-0.0088***
	(0.0032)	(0.0033)	(0.0031)	(0.0032)
PROFITABILITY	-0.1560***	-0.1990***	-0.1600***	-0.2030***
	(0.0542)	(0.0559)	(0.0544)	(0.0560)
CAPINT	0.0357**	0.0235	0.0329*	0.0215
	(0.0173)	(0.0168)	(0.0175)	(0.0169)
LEV	0.1740**	0.1230*	0.1710**	0.1200*
	(0.0738)	(0.0719)	(0.0742)	(0.0723)
NOL	-0.0156*	-0.0153*	-0.0147	-0.0149*
	(0.0090)	(0.0086)	(0.0090)	(0.0088)
HAVEN		-0.0898***		-0.0893**
		(0.0345)		(0.0348)
INCOME MOBILE		-0.0326**		-0.0326**
		(0.0135)		(0.0133)
R&D		-0.2830***		-0.2820***
		(0.1050)		(0.1050)
CONSTANT	0.3320***	0.3820***	0.3310***	0.3800***
	(0.0271)	(0.0275)	(0.0263)	(0.0266)
Industry-FE	✓	✓	✓	✓
N	1,309	1,309	1,309	1,309
R^2	0.068	0.096	0.067	0.095

Notes: Table 4 presents the results of OLS regressions with the *Foreign ETR* as dependent variable and different *DIMINISHING* definitions. Specifications (1) and (2) define *DIMINISHING* as one if the number of subsidiaries has declined by > 50 % between 2007 and 2012 and (i) ≥ 10 subsidiaries are diminished and (ii) firm does not belong to the top 5% firms in decreasing total assets (at). Specifications (3) and (4) define *DIMINISING* as one if (i) number of subsidiaries has declined between 2007 and 2012 and (ii) sales (sale) have increased by > 50 %. Robust standard errors clustered by firms are shown in parentheses. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

4.4.3. Alternative Measures of Tax Avoidance

The previous literature has employed different definitions of ETRs to measure tax avoidance (cf. for example Plesko 2003; Dyreng, Hanlon and Maydew, 2008).

Therefore, we also consider *Foreign Current ETR* and *GAAP ETR* according to ASC 740-20 as alternative measures of tax avoidance in additional analysis. We use the sample described in Section 4.3.4. The only difference is that we do not consider firms having a negative pre-tax income when we use the *GAAP ETR* as a dependent variable. The additional results are reported in Table 5. We consider the same control variables for general and international tax planning activities as in Table 4. All specifications are augmented with industry-fixed effects.

First, we take into account the *Foreign Current ETR*, which includes only foreign current tax expenses in the numerator as dependent variable in order to avoid possible bias due to deferred taxes.

Across both specifications, the interaction terms between *DIMINISHING* and *D2012* for the post-diminishing period are highly significant and show the expected negative signs. Neither the dummy variable *DIMINISHING* nor the time indicator exerts any statistical effect at the conventional level. Regarding the influence of general firm characteristics and international tax planning activities, we observe similar results compared to the findings for the *Foreign ETR* in Table 3.

In specifications (3) and (4) of Table 5, we present additional tests using the *GAAP ETR* which is the quotient between total taxes and pre-tax profit as dependent variable. According to ASC 740-20, we do not consider the influence of extraordinary items on the pre-tax profit and subtract them in the denominator. This measure does not exclusively consider foreign activities. Therefore, these additional tests answer the question whether the change in disclosure about foreign firm structures affects a firm's overall tax avoidance behavior.

The results suggest that the diminishing of publicly disclosed foreign subsidiaries does not affect the *GAAP ETR*. The dummy variable *DIMINISHING* and the interaction term *DIMINISHING x D2012* again have the expected sign but are no longer significant at the conventional level. However, we find a negative and significant impact of the plain time dummy *D2012*, which indicates a significant downward trend in the *GAAP ETR*. As the *GAAP ETR* is also influenced by a general time trend, the *Foreign ETR* can be regarded as more suitable for our analysis, which mainly considers foreign activities. Interestingly, except of *SIZE*, all general firm characteristics have no significant influence on the *GAAP ETR*, whereas the proxies for international tax planning activities exert significant effects.

TABLE 5: Alternative Measures of Tax Avoidance

	Foreign Current ETR		*GAAP ETR*	
	1	**2**	**3**	**4**
DIMINISHING x 2012	-0.1090**	-0.0995**	-0.0388	-0.0393
	(0.0442)	(0.0445)	(0.0302)	(0.0330)
DIMINISHING	0.0609	0.0618	0.0383	0.0391
	(0.0390)	(0.0385)	(0.0313)	(0.0316)
D2012	0.0022	0.0021	-0.0143**	-0.0150**
	(0.0086)	(0.0086)	(0.0061)	(0.0060)
SIZE	-0.0071**	-0.0065*	-0.0042	-0.0028
	(0.0034)	(0.0034)	(0.0029)	(0.0026)
PROFITABILITY	-0.2040***	-0.2430***	0.0527	0.0611
	(0.0569)	(0.0599)	(0.0462)	(0.0445)
CAPINT	0.0291	0.0159	0.0004	-0.0138
	(0.0192)	(0.0190)	(0.0134)	(0.0130)
LEV	0.0607	0.0072	0.0331	-0.0313
	(0.0795)	(0.0784)	(0.0697)	(0.0696)
NOL	-0.0208**	-0.0210**	-0.0066	-0.0045
	(0.0102)	(0.0101)	(0.0074)	(0.0070)
HAVEN		-0.1340***		-0.1210***
		(0.0342)		(0.0339)
INCOME MOBILE		-0.0399***		-0.0216**
		(0.0139)		(0.0102)
R&D		-0.2150*		-0.4000***
		(0.1200)		(0.0944)
CONSTANT	0.3420***	0.3940***	0.3360***	0.3720***
	(0.0281)	(0.0285)	(0.0244)	(0.0242)
Industry-FE	✓	✓	✓	✓
N	1,285	1,285	1,104	1,104
R^2	0.059	0.092	0.083	0.139

Notes: Table 5 presents results of OLS regressions with the *Foreign Current ETR* in columns (1) – (2) and the *GAAP ETR* in columns (3) – (4) as dependent variables. Robust standard errors clustered by firms are shown in parentheses. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

4.4.4. ETRDIFF as Measure of Aggressive International Tax Avoidance

We also use the new measure ETRDIFF that isolates the additional or even aggressive part in international tax avoidance from well-known determinants of effective tax rates in order to evaluate the influence of public disclosure on tax planning behavior.

The measure ETRDIFF considers the difference between a firm's average of the statutory corporate tax rates imposed by its host countries taken from Exhibit 21 of Form 10-k ($\overline{STR}$) and its ETR.[58] Since $\overline{STR}$ is used as a proxy for the expected tax level according to the distribution of real economic activities, we do not consider tax havens. Thus, we classify a firm as more tax aggressive if the gap between its ETR and its expected benchmark tax level increases (Herbert and Overesch, 2015).

In accordance with Sections 4.4.1 and 4.4.3, we use the *Foreign ETRDIFF*, *Foreign Current ETRDIFF* and *GAAP ETRDIFF* as corresponding ETRDIFF measures. Table 6 shows the regression results considering the same variables as in Tables 4 and 5. Please note that the expected signs for each effect reverse due to the construction of the ETRDIFF.

Across all columns (1) – (6), we can confirm a significant effect of diminishing the list of foreign subsidiaries in Exhibit 21 on the three respective ETRDIFF measures for aggressive international tax avoidance. The interaction terms between *DIMINISHING* and the time dummy *D2012* for the post-diminishing period are always highly significant and show the expected positive signs. In contrast to the *GAAP ETR*, the *GAAP ETRDIFF* suggests that the diminishing coverage of foreign subsidiaries in Exhibit 21 is higher for tax aggressive firms.

[58] Due to the exclusion of tax havens, we lose a few observations for the *Foreign ETRDIFF* and *Foreign Current ETRDIFF*.

Interestingly, the plain time dummy is significant at 1 % level for all three ETRDIFF measures. Accordingly, we now identify a time effect, i.e., the general level of the *Foreign ETRDIFF* and *Foreign Current ETRDIFF* declined while the *Foreign ETR* and *Foreign Current ETR* did not change between 2007 and 2012 (cf. Tables 3 and 5). In addition, we also find a weak significant difference between diminishing and non-diminishing firms in 2007 across all specifications.

Regarding the influence of international tax planning activities, we receive robust results similar to the findings for the *Foreign ETR, Foreign Current ETR* and *GAAP ETR* in Tables 3 and 5.

TABLE 6: ETRDIFF as Measure of Aggressive International Tax Avoidance

	Foreign ETRDIFF		***Foreign Current ETRDIFF***		***GAAP ETRDIFF***	
	1	**2**	**3**	**4**	**5**	**6**
DIMINISHING x 2012	0.1090***	0.1120***	0.1100**	0.1100**	0.0764***	0.0769**
	(0.0415)	(0.0412)	(0.0472)	(0.0459)	(0.0309)	(0.0324)
DIMINISHING	-0.0699*	-0.0718*	-0.0635*	-0.0651*	-0.0399*	-0.0412*
	(0.0414)	(0.0418)	(0.0383)	(0.0379)	(0.0240)	(0.0248)
D2012	-0.0339***	-0.0342***	-0.0393***	-0.0398***	-0.0166***	-0.0159***
	(0.0079)	(0.0079)	(0.0087)	(0.0087)	(0.0062)	(0.0061)
SIZE	0.0055*	0.0062*	0.0039	0.0038	-0.0011	-0.0010
	(0.0032)	(0.0033)	(0.0035)	(0.0035)	(0.0026)	(0.0025)
PROFITABILITY	0.1440***	0.1890***	0.1890***	0.2310***	-0.0810*	-0.0884**
	(0.0545)	(0.0564)	(0.0574)	(0.0603)	(0.0465)	(0.0440)
CAPINT	-0.0339**	-0.0236	-0.0268	-0.0162	-0.0016	0.0142
	(0.0172)	(0.0166)	(0.0193)	(0.0190)	(0.0137)	(0.0132)
LEV	-0.1610**	-0.1160	-0.0552	-0.0074	-0.0260	0.0455
	(0.0741)	(0.0713)	(0.0798)	(0.0779)	(0.0650)	(0.0636)
NOL	0.0135	0.0145	0.0206**	0.0210**	0.0057	0.0036
	(0.0092)	(0.0090)	(0.0104)	(0.0102)	(0.0073)	(0.0069)
HAVEN		0.0987**		0.1520***		0.1660***
		(0.0438)		(0.0431)		(0.0320)
INCOME MOBILE		0.0313**		0.0383***		0.0265***
		(0.0137)		(0.0142)		(0.0102)
R&D		0.3120***		0.2500*		0.4010***
		(0.1050)		(0.1290)		(0.0953)
CONSTANT	0.0056	-0.0489*	-0.0071	-0.0655**	0.0285	-0.0203
	(0.0271)	(0.0279)	(0.0284)	(0.0292)	(0.0249)	(0.0242)
Industry-FE	✓	✓	✓	✓	✓	✓
N	1,299	1,299	1,275	1,275	1,104	1,104
R^2	0.070	0.097	0.065	0.097	0.071	0.152

Notes: Table 6 presents results of OLS regressions with the *Foreign ETRDIFF* in columns (1) – (2), the *Foreign Current ETRDIFF* in columns (3) – (4) and the *GAAP ETRDIFF* in columns (5) – (6) as dependent variables. Robust standard errors clustered by firms are shown in parentheses. Variables are defined in the Appendix. *, ** and *** show significance at the level of 10 %, 5 % and 1 %, respectively.

4.5. 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 insights into the relationship between public disclosure of group structures of U.S. MNEs and tax aggressiveness. Hereby, we also consider the influence of other well-established determinants of (international) tax planning.

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 2007 and 2012. Our study identifies more than 30 U.S. MNEs that reduced more than 50 % of their significant foreign subsidiaries from publicly disclosed financial filings. In an empirical analysis, we 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 significant effect of reduced public disclosure on international tax avoidance. 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. In addition, our results confirm the influence of well-known strategies of tax avoidance of MNEs, such as the use of tax havens and other profit-shifting opportunities. Our findings are supported by a series of robustness tests, applying different diminishing definitions and tax avoidance measures.

Our study contributes to the recent debate on base erosion and profit-shifting. 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

Appendix 1: Variable Definitions

Foreign ETR	(*txfo* + *txdfo*) / *pifo*
Foreign Current ETR	*txfo* / *pifo*
GAAP ETR	*txt* / (*pi* – *xi* – *esub*)
SIZE	log (*at*)
PROFITABILITY	*pi* / *at*
CAPINT	*ppeveb* / *at*
LEV	*dlc* / *at*
NOL	Dummy variable, which equals one if there was a decrease in *tlcf* from fiscal year t-1 to fiscal year t
HAVEN	Number of tax havens in which the group has subsidiaries scaled by total number of countries in which the company operates
INCOME MOBILE	Dummy which is one if the SIC Codes of the parent is: 283, 357, 367, 737, or 738
R&D	*xrd* / *at*
DIMINISHING	Dummy, which is one if the number of subsidiaries has declined by > 50 % between 2007 and 2012 and (i) ≥ 10 subsidiaries are diminished and (ii) firm does not belong to the top 5 % firms in decreasing sales
D2012	Dummy variable which equals one for year 2012

Appendix 2: Investor Relations Letter

Information Request

Dear Sir or Madam:

I am an accounting student at the University [redacted]. My thesis focuses on the disclosure of significant foreign subsidiaries in Exhibit 21 of SEC Form 10-k. I have recognized that [*company name*] has significantly reduced the number of foreign subsidiaries disclosed in Exhibit 21 in year 20XX.

I hope that you might be able to answer several questions regarding this reduction:

1. Why was there a decrease in the number of foreign subsidiaries from 20XX to 20XX? For example, has [*company name*] voluntarily disclosed more subsidiaries in Exhibit 21 than required by Item 601 of SEC Regulation S-K (§229.601) or has [*company name*] been involved in M&A activities?

2. If [*company name*] changed its disclosure policy, what factors did the company consider in making this change?

Thank you very much in advance for your help!

Your support in this matter would be greatly appreciated. If you have any further questions or prefer to send your answer via email, you can contact [redacted].

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