

# Tax department structure and tax avoidance

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**ABSTRACT:** Using a hand-collected data set for large European listed MNEs obtained from a major professional networking website, we investigate whether a centralized tax department leads to a more efficient tax management in terms of reducing tax liability and tax risk minimization. We report three key findings: (1) more centralized tax departments lead to an overall lower ETR but not to a lower tax risk; (2) employees working outside the home country are more frequently found in more tax complex countries; (3) the location of tax employees in tax complex countries reduces the overall tax risk. Our findings shed light on the internal working of the tax department and help explain variation in tax avoidance and tax risk behavior.

**Keywords:** management structure, location choice, profit-shifting, tax avoidance

**JEL Classifications:** H25, H26, M12

## I. INTRODUCTION

Starting with Hines and Rice (1994) many studies of the empirical tax literature have tried to analyze the firm-level and country-level determinants of differences in MNEs' tax burden. Since these determinants could only partly explain corporate tax avoidance behavior, employees with decision making power, such as CEOs and CFOs, were added to the equation. The literature has thereby focused mostly on characteristics and experiences of top-level executives (see section II for a review of this literature strand), but has mostly neglected the influence of the tax department core personnel itself.<sup>1</sup> This is even more surprising as Slemrod and Venkatehs (2002) show that tax department employees represent the MNE's largest investment in tax planning. One of the few studies analyzing the effect of the tax department on profit shifting is a study conducted by Robinson et al. 2010. Employing data from a confidential survey of CFOs, they investigate whether the organization of the tax function affects tax effectiveness. They find that MNEs organizing their tax function as profit centers exhibit significantly lower ETRs than MNEs organizing their department as cost centers. This is in line with results presented by Donohoe et al. (2014), who show that in the mid-1990s the tax function of public corporations evolved from a compliance-focused activity to a profit-enhancing endeavor. Two additional studies focusing on tax departments and tax personnel are those by Barrios and Gallemore (2019) and Chen et al. (2020). The former use the employment history posted on a professional networking site to study the effect of tax employee movement on the company's effective tax rate. They find that companies' ETR decreases once an employee from a more tax aggressive firm joins the tax department and relate this to a knowledge spread across these firms by employee movement. A concurrent study by Chen et al. (2020) focuses on the effect of investment in tax department,

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<sup>1</sup> Ege et al. 2020 is one of the few studies investigation the effect of the tax department and its personnel on profit shifting. They analyze the effect of the rank of the title of the highest tax executive within the MNE's hierarchy on corporate behavior and find a positive effect on MNE's tax planning.

measured as size of the department (headcount), on tax avoidance and tax risk.<sup>2</sup> They find larger tax departments to be negatively associated with the magnitude of the ETR as well as their tax risk proxy. While they analyze the effect of overall department size on tax avoidance, they leave aside further department characteristics.

Since the general investment in the tax department can be heterogeneous, we analyze the effect of tax department organization choice on their performance. Ege et al. (2020) argue that there is a wide variation in how corporations structure their tax departments.<sup>3</sup> We use this variation to identify the effect of (de)centralization on tax department performance. Prior literature has pointed to the twofold tasks of corporate tax departments (Feller and Schanz 2016), tax planning and tax compliance. Taking this into account, we test whether the (de)centralization decision affects both, tax planning and tax compliance. We evaluate the influence of the organization's tax department by examining the MNEs' ETR, the traditional tax department performance metric. According to the Manufacturers Alliance for Productivity and Innovation, 82 percent of the top 200 manufacturing firms in the US evaluate tax function performance using ETRs (Day 2018). Besides, we also use the standard deviation of the MNEs ETR to measure tax risk and, thus, tax department performance in terms of accurate compliance.

Our empirical investigation is particularly relevant because, ex-ante, there are no clear predictions on the relation between a firm's effective tax rate or its tax compliance and its tax department's organization choice (central vs. decentral). In general, the knowledge should be made available to the employee with decision making power (centralized) or the decision should be delegated to those having the knowledge (decentralized). The optimal level of (de)centralization is

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<sup>2</sup> A complementary action to an increase in the number of employees would be to quantify expenses for outsourcing, which could be measured by fees paid to tax service providers, however these numbers for MNEs are rarely available (see Dunbar and Philipps (2001) for a study on outsourcing of tax department activities).

<sup>3</sup> In this line, Feller and Schanz (2016) state that the tax department is mostly located in the home country of the MNE but with employees "spread all over the world" (p. 4).

reached by minimizing the total cost of knowledge transfer and the costs of foreign employee control (Nagar 2002). In the extreme case of having tax department employees only located in the home country, communication between employees and coordination of subsidiaries to act according to the MNE's tax strategy is inexpensive. However, gathering information about each MNE's subsidiary and every foreign jurisdiction's tax legislation as well as monitoring each subsidiary's actions is costly. On the contrary, having tax department employees spread across the MNE's subsidiaries increases coordination costs which arise from operational costs such as language differences but even more from implementation and monitoring of the overall tax strategy which can, in extreme cases, lead to missed opportunities. Since today's tax avoidance schemes are complex (Sikka and Hampton 2005) and require the interplay of different subsidiaries across multiple jurisdictions centralized coordination may be favorable when it comes to tax planning. However, the contrary is true for tax compliance. Due to the rapid change in tax legislation and the larger number of subsidiaries MNEs' using decentralized tax departments could experience lower tax risk.

To answer these questions, we construct a unique dataset of tax department employees at large, publicly-traded EU companies that have posted their résumés on a major professional networking website. In contrast to survey data with limited sample sizes, this data allows us to explore the role of tax department organization for an extensive sample of firms and individuals. We begin our analysis by replicating the results presented by Chen et al. (2020) for the S&P 1500 companies using our European sample. We find the size of the tax department, measured as number of tax department employees scaled by overall number of employees as indicated in the financial statement (multiplied by 1,000), to be negatively associated with the three-year GAAP ETR. A one standard deviation increase in the number of employees leads to a 1.61 percentage point's lower ETR. This is approximately twice the value reported by Chen et al. (2020) (0.71). The effect on the

risk measure (SD\_GAAP\_ETR) is also negative but insignificant in our setting. Next, we test the effect of (de)centralization on the two measures. A one standard deviation increase in our primary proxy for centralization (CTD I) decreases an MNE's ETR by 2.3 percentage points. This is equivalent to 10 percent of the average ETR (23 %) of our sample. However, we do not find a significant effect on our tax risk measure (SD\_ETR). Analyzing heterogeneity within the centralization decision, we find the effect on ETR to be more pronounced for larger tax departments. Lastly, we analyze where MNEs locate tax personnel outside their home country and how such investment influences tax risk. Conditional on the establishment of a subsidiary in the country, we find employees more frequently in jurisdictions with complex tax systems (using the Tax Complexity Index developed by Hoppe et al.<sup>4</sup>). Placing tax personnel in countries with a complex tax system, improves the tax department's performance in terms of lower tax risk.

This research provides the first analysis on the effects of location and organization choices for tax departments. Our findings contribute to the ongoing debate on heterogeneity in tax avoidance behavior and tax risk management. The findings are of primary interest to researchers and investors who seek to understand the internal working of tax departments and its effect on tax planning outcome as well as tax risk reduction. MNEs in general as well as CEOs and CFOs in particular should be interested that the degree of centralization of the tax department has predictable effects on the tax departments performance which affects results presented in the financial statements.

This paper proceeds as follows. Section 2 summarizes prior research and highlights the main contribution of our analysis. Section 3 develops our main hypotheses, section 4 presents the econometric design. Section 5 describes the employed data set. In section 6, the empirical results are presented. Section 7 concludes.

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<sup>4</sup> Data can be retrieved from [www.taxcomplexity.org](http://www.taxcomplexity.org).

## II. LITERATURE AND CONTRIBUTION

Our study contributes to the literature on tax avoidance and tax risk management in several ways. First, we address the call for further research on heterogeneity in tax avoidance (Dharmapala 2014) and the internal working of a company's tax department (Hanlon and Heitzman 2010). The heterogeneity of effective tax rates of MNEs is a puzzling phenomenon that has been first linked to firm characteristics (for extensive reviews of the literature on the effect of firm characteristics on tax avoidance we refer to Dharmapala (2014) and Hanlon and Heitzman (2010)). Since a large proportion of the variation remained unexplained, MNEs' human capital, such as managing directors and CEOs were included to the scope of analyses to shed light on the differences in tax avoidance behavior.

Several studies have documented a manager effect on tax avoidance. Dyreng et al. (2010) study manager movement over time and find a manager fixed effect on company's tax avoidance. Other studies analyze the effect of manager characteristics and prior experience. On the one hand, studies document moderating characteristics that lead to less tax avoidance. Francis et al. (2014) document a gender effect on company's effective tax rate. They find companies with female CFOs to be less tax aggressive. In addition, Law and Mills (2016) show that manager with a military background tend to be less tax aggressive. On the other hand, researchers have identified characteristics that foster tax avoidance. Chyz (2013) documents a positive relation between managers' private tax evasion and corporate tax avoidance. Furthermore, narcissistic CEOs are associated with increased tax avoidance (Olsen and Stekelberg 2016). Additionally, the compensation has been identified as an influential factor. Phillips (2003) shows that compensating business unit managers on after-tax basis reduces the company's effective tax rate. Equity compensation of CEOs and CFOs (Rego and Wilson 2012) and tax directors (Armstrong et al. 2012) is also attributed to lower tax liabilities. These studies focus mostly on the

top-level management of the company and do not directly measure the effect of tax departments on tax avoidance but rather the general climate set out by its directors, the so-called tone at the top. Furthermore, these studies neglect the tax department as a business unit.<sup>5</sup> One of the few exceptions in this regard is Robinson et al. (2010). They document two contradicting ways how companies consider tax departments. Depending on the way corporations evaluate tax departments, they group them into cost or profit center departments. Following this classification, they provide evidence that MNEs who manage their tax department as profit centers report significantly lower ETRs than those who view tax departments as cost centers. Feller and Schanz (2017) and Ege et al. (2020) add to this analysis, by providing evidence that the implementation of tax planning methods varies with respect to the tax manager's level of influence within the company. Besides, the management structure has been identified as a potential amplifier for tax avoidance. Gamm et al. (2020) show that MNEs tend to use vertical interlocks to foster profit shifting from high-taxed subsidiaries to low-taxed affiliates resulting in an overall lower effective tax rate. Lastly, two recent studies have tried to analyze the internal working of the tax department by using innovative online data sources. Barrios and Gallemore (2019) extract the employment history from résumés posted on a professional networking site to study the effect of tax employee movement on the company's effective tax rate. They find that a company's ETR decreases once an employee from a more tax aggressive firm joins the tax department and relate this to a knowledge diffusion across these firms by employee movement. Chen et al. (2020) use LinkedIn data to analyze the effect of investment in tax department human capital on the company's effective tax rate and tax risk. They find larger tax departments, measured by the number of tax department employees, to be negatively associated with the magnitude of the ETR as well as a tax risk proxy. While these studies document the

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<sup>5</sup> This is even more surprising, since Slemrod and Venkatehs (2002) show that tax department employees represent the largest investment in tax planning and should therefore draw larger attention when it comes to tax avoidance research.

importance of tax departments in tax planning outcome they lack to provide evidence on the effect of department organization on tax outcome. We fill this void by analyzing the effect of (de)centralization of tax departments on tax avoidance as well as tax risk management.

Second, we add to the literature on (de)centralization. Following this literature strand, knowledge should be made available to those with decision rights (centralized) or decision rights should be located where the knowledge resides (decentralized). In case of centralization, information should be collected across the organization and used appropriately at the highest level (Brickley et al. 2009). In the opposing case, the information transfer from subsidiaries to head office is too costly and therefore local employees should decide. The optimal level of (de)centralization is reached by minimizing the total cost of knowledge transfer and foreign employee control (Nagar 2002). In general, Deller and Sandino (2020) state that with regard to delegation of authority, there is an inherent trade-off in the decision to (de)centralize. While centralized decisions tend to be better aligned with the MNE's strategy and goals, they are less informed, with the opposite being true for decentralized decisions. In this line Deller and Sandino (2020) show in the context of hiring new personnel for retail shops that centralized hires are more aligned with the company value, while local knowledge is neglected, leading to a higher dropout rate of employees due to mismatched hirings. Jensen and Meckling (1990) classify information into two groups, specific and general knowledge.<sup>6</sup> General knowledge is inexpensive to transfer while specific knowledge is costly. Within their model knowledge of law and accounting practices is classified as specific knowledge, indicating a costly transfer. However, this classification does not indicate which degree of (de)centralization is optimal, since both information flows, from subsidiaries to head offices as well as from head office to subsidiaries is costly. Therefore, we add to this stream of literature by providing evidence on the optimal

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<sup>6</sup> Demsetz (1988) refers to these two types as specialized and nonspecialized knowledge.

(de)centralization choice when it comes to tax decisions. Helping understand more about (de)centralization decisions of MNEs.

Third, we contribute to the literature on internal information quality. Gallemore and Labro (2015) find that better internal information quality, characterized by accessible, useful, and reliable information, is associated with lower effective tax rates. In general, this strand of literature provides evidence, that higher internal information quality provides managers with more useful information which leads to better and more informed decisions (Cheng et al. 2018), indicating a centralized view of decision making. A sufficient level of information for tax-related decisions includes efficient information transfer across subsidiaries and jurisdictions. This information can be acquired from different (internal) sources. While information about product markets and costs throughout the supply chain can also be provided by a company's non-tax personnel, information on country or subsidiary specific tax issues may be best provided by trained tax employees, due to the specific nature of the information. McGuire et al. (2018) show that better internal information quality increases tax-motivated income shifting. They provide further evidence that these results are more pronounced for MNEs with uncertain foreign earnings and higher for geographically dispersed MNEs. We contribute to this stream of literature by adding the location of employees as an indicator of resource allocation. As prior literature documents income shifting is information demanding (McGuire et al. 2018) which makes fast, relevant, and informative knowledge transfer necessary. Our (de)centralization measures can therefore be interpreted as a proxy for information gathering and sharing within the MNE and thereby adding to this stream of literature to better understand internal information quality and flow.

Lastly, we add to the literature that uses innovative online data sources to conduct research on internal workings of corporations. The use of data obtained from online self-reporting platforms is contemporary. There is still some skepticism whether such data represents the corporations

accurately.<sup>7</sup> However, this type of data presents valuable insights since it is (mostly) presented without the oversight and ratification of the respective company. The data in hand can therefore be viewed as comparable to information from data breaches such as the Panama papers or data from the so-called LuxLeaks breach, which have been widely used in the accounting and economics literature (Hüsecken et al. 2018, Omartian 2017), as it provides unmonitored location information of the MNEs tax department. So far, a number of studies have used online data sources such as professional networking sites or work-related social media platforms. One strand of this literature focuses on employer reviews posted on websites. Hales et al. (2018) and Green et al. (2019) use such reviews to predict future stock performance of the company. Huang et al. (2020) show that outlooks posted by employees on review websites are informative and can be a reasonable predictor for a company's future performance. Also, product reviews of consumers have been used, too (Huang 2018). A second strand of literature uses résumés posted on professional networking sites. Tambe (2012) uses data gathered from LinkedIn to evaluate the effect of investment in data technic expertise of employees on investment returns. In this line, the study by Barrios and Gallemore (2019) mentioned above uses the employment history posted on a professional networking site to study the effect of tax employee movement on the company's effective tax rate. Also, Chen et al. (2020) use LinkedIn data to analyze the effect of investment in tax department human capital on the company's effective tax rate and tax risk and Ege et al. (2020) use title rank of top tax executives posted on LinkedIn to measure the weight of the tax department within the corporate hierarchy.

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<sup>7</sup> As shown below, this skepticism is an unfounded concern since many studies have shown the representativeness of these data sources. We do so in section V.

### III. HYPOTHESES

Chen et al. (2020) show that investment in tax department (measured as a larger number of tax employees) results in a lower ETR and less tax risk.<sup>8</sup> However, investment efficiency can vary and therefore not only the invested amount (in terms of number of tax employees) but also the way this investment is made should have an impact on the tax outcome (measured as ETR and tax risk). One type of such investment heterogeneity is the choice of organizational form. Ege et al (2020) report a large degree of variation in the tax department structure.<sup>9</sup> We use this heterogeneity to analyze the effect of MNE's organizational tax department choice on ETR and tax risk.

Prior literature has documented the dual tasks of corporate tax departments (Feller and Schanz 2016), tax planning and tax compliance. Therefore we test whether the (de)centralization decision of the tax department affects both, tax planning as well as tax compliance. We evaluate the influence of the organization's tax department by examining the MNE's ETR, the traditional tax department performance metric.<sup>10</sup> In addition, we use the standard deviation of the MNE's ETR to measure tax risk outcome.

From a theoretical point of view knowledge should be transferred to those with decision rights or decision rights should be transferred to those having the knowledge. To decide which is preferable a tradeoff of transfer costs and control costs is required. The optimal level of (de)centralization is reached by minimizing the total of transfer and control costs (Nagar 2002). Typical control costs result from incentive schemes (Christie et al. 2003) while transfer costs depend on the information shared. Jensen and Meckling (1995) identify two types of knowledge,

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<sup>8</sup> Using the size as well as the organization of the MNEs tax department may be influential since Slemrod and Venkatehs 2002 show that tax department employees represent the largest share of an MNE's investment in tax planning.

<sup>9</sup> In this line, Feller and Schanz (2016) state that with regard to location of the tax department, this is mostly located in the home country of the MNE but with employees "spread all over the world" (p. 4).

<sup>10</sup> Day (2018) reports that according to a survey of manufacturing firms 82 percent use the ETR as the preferred performance measure.

specific and general knowledge.<sup>11</sup> General knowledge is inexpensive to transfer while specific knowledge is costly. Within their model knowledge of law and accounting practices are classified as specific knowledge, indicating costly transfer. While one can easily imagine that the knowledge transfer of different tax systems from a subsidiary to the head office department or the overall transfer pricing strategy from the head office department to the subsidiary's tax employees is costly, it remains unclear which direction of the knowledge transfer is pricier. However within a centralized tax department structure, it is easier to align each subsidiary's tax avoidance behavior with the overall tax strategy of the MNE as well as its shared values with regard to the degree of aggressiveness and compliance since the head office employees have a general information advantage about the overall MNEs strategy (van den Steen 2010). In addition, local tax departments can better monitor and coordinate the interplay between different divisions within the MNE. Since they incorporate greater decision making power, they can more easily enforce a specific tax strategy when dealing with different departments as well as with subsidiaries across jurisdictions. Lastly, differences in ability and education of foreign tax personnel can lead to considerable variation in the performance when using a decentralized structure. The arguments presented above show, that a more centralized tax department structure increases efficiency since coordination and communication are less costly. On the contrary, choosing the right tax strategy as well as its implementation can benefit from country-specific knowledge. According to De Simone et al. (2017) income shifting is accomplished through operational and accounting decisions. Both require decision-makers to acquire and aggregate information from subsidiaries residing in different tax jurisdictions to design and implement the MNE's tax avoidance strategy (McGuire et al. 2018). For instance, developing an effective transfer pricing strategy requires information about product markets and costs throughout the supply chain. Similarly, allocating

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<sup>11</sup> Demsetz (1988) refers to these two types as specialized and nonspecialized knowledge.

income from intellectual property either developed domestically or through a cost-sharing agreement requires information about the jurisdiction specific value of and market for the intangibles (De Simone and Sansing 2018). In general, foreign tax employees have an information advantage with regard to local tax legislation and when dealing with foreign tax authorities. Since tax legislation changes rapidly (Ward 2020), following all relevant changes in every operating country as a head office tax department is extremely costly and may be even impossible. The information advantage of subsidiary employees could make delegation of tasks more desirable for the reasons described above. A second effect of such information advantage is that it makes it harder to control the actions of the local employees to ensure that they are acting in line with the headquarter tax department. Baiman et al. (1995) identify two reasons for this lack of control. First, it is difficult to know the behavior and outcome that should be exhibited in the foreign environment. Second, it is difficult to choose the right performance measures and therefore design an adequate incentive scheme. Hayek (1945) argues that the distribution of knowledge calls for decentralization. The flow of information between the home country tax department and the MNE's foreign subsidiaries is necessary to implement a successful tax avoidance strategy. This can be best achieved by a decentralized tax department structure. However, we believe that the coordination and communication advantage outweighs the information advantage of the foreign, local tax personnel when it comes to the implementation of complex tax planning strategies, which best reduce tax burden, leading to the following hypothesis.

*H1: A more centralized tax department is associated with an overall lower ETR.*

With the dual function of the tax department, the same arguments could also be true for tax compliance. A more centralized tax department structure could increase the overall efficiency, leading to more compliance and therefore fewer tax risks. On the contrary, the better knowledge of the specific tax code of a respective country could reduce tax risks. Making a more wide-spread tax department better suitable for reducing the company's tax risk. Since we expect the knowledge of the specific tax code to be a substantial factor when it comes to minimizing tax risks, we expect a tax department covering more jurisdictions to be more effective, leading to the following hypothesis.

*H2: A more decentralized tax department is associated with less tax risk.*

If a more centralized tax department is favorable with regard to lowering the ETR (H1) and in contrast a more decentralized department enhances tax compliance (H2), the question remains: Why and when do companies locate tax managers in countries, other than their home country? And, where do MNEs locate tax department personnel outside their home country? Besides general country characteristics, especially tax specific properties could explain such implementation. Prior literature has documented the wide use and the effectiveness of tax havens when it comes to tax planning (Clausing 2016, Desai et al. 2006, Laffitte and Toubal 2018, Langenmayr and Reiter 2007, Slemrod and Wilson 2006).<sup>12</sup> Even though these countries are crucial to MNE's tax avoidance strategy it remains unclear why tax employees are needed in these countries to foster tax avoidance through tax havens. In addition, the alignment of corporate actions with tax law is an issue (Feller and Schanz 2016). The more complex a country's tax code, the more costly it is to

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<sup>12</sup> Contrary, using country-by-country reporting data Fuest et al. 2020 show that German MNEs report only approximately 10 percent of total profits in tax havens. However, they report a very high profitability in these countries.

gather appropriate knowledge to fulfill compliance requirements. Hence, we expect more tax personnel in more complex countries.

*H3: MNEs' locate tax personnel more frequently in tax complex countries.*

If companies invest in tax managers in more tax complex countries these additional costs should result in a lower tax risk. We, therefore, expect the location of tax personnel in these countries to be associated with lower tax risk.

*H4: The location of tax employees in countries with complex tax systems is negatively associated with tax risk.*

It is worth noting that the two organizational forms discussed above could potentially attract different type of employees (Kacperczyk and Seru 2012). The incentives offered in centralized and decentralized organizations may differ and therefore induce sorting of managers if they are well informed about their abilities. Specifically, if higher-ability managers prefer discretion, they might sort into a company with a decentralized tax department structure, since monitoring is lower. In the empirical analysis, any differences in our performance measures (ETR and SD\_ETR) across centralized and decentralized tax departments could therefore be driven by differences in managerial quality. However, this self-selection of high-ability managers does not pose threat to our analysis for two reasons. First, our results indicate, at least for the ETR analysis, an advantage of a centralized structure. If however higher-ability managers prefer working within decentralized structures, we underestimate the genuine effect of centralization on ETR. Second and more important, the structure of a company's tax department is not at all easy to observe from outside the company, making it difficult to find a suitable MNE for self-selection. In addition, the locations

are wide-spread across borders all over the globe, making it, in our view, less likely that a manager would choose to move to a different location just for discretion. This makes it unlikely that sorting of high-ability managers into one specific tax department structure affects our results. However, there may still be other reasons for heterogeneity in managerial quality across the two organizational forms and we cannot entirely rule these out. Therefore, our empirical identification is devoted to providing evidence for the causal link between tax department centralization and tax performance after conditioning for managerial quality.

#### **IV. RESEARCH DESIGN**

We start our analysis with re-estimating the analysis by Chen et al. (2020) with our set of data. Following Chen et al. (2020) we define a company’s tax investment as the total number of tax employees divided by the company’s total number of employees (measured in thousand). According to Chen et al. (2020) “this measure captures whether the firm has a sufficient number of personnel with adequate tax knowledge and as the total number of tax employees is positively correlated with the overall firm size, it also controls for the size effect”.

$$\text{Tax Personnel} = \frac{\text{Number of Tax Employees}}{\text{Number of Employees as stated in the Balance Sheet}} \times 1,000 \quad (1)$$

Table 9 in Appendix A presents the descriptive statistics for the Number of Tax Employees as well as for the Number of Personnel variable. The average Number of Tax Employees is 75, the mean value of .811 for Number of Personnel is quite comparable to the value of .85 reported by Chen et al. (2020) and corresponds to .0811% of the total workforce working in the tax department (see Chapter V for a detailed discussion of these variables).

To replicate the findings by Chen et al. (2020) we estimate the following equation:

$$\text{GAAP\_ETR3 or SD\_ETR3} = \beta_0 + \beta_1 \text{ Tax Personnel} + \gamma \text{ Controls} + \text{Home Country Fixed Effects} + \varepsilon \quad (2)$$

We measure tax avoidance using GAAP ETR. To account for fluctuation of a single year measure, we use the three-year average GAAP ETR, calculated as the sum of firm's total tax expense over 2016 to 2018,<sup>13</sup> divided by the sum of total pre-tax income over the same period (Dyreng et al. 2008), as our proxy. Following prior literature, we use the standard deviation of annual GAAP ETR over three years as a proxy for tax risk (Guenther et al 2017, McGuire et al. 2013). Table 9 in Appendix A reports the descriptive statistics. Comparable to the values reported by earlier studies (Dyreng et al. 2008, Guenther et al. 2017), the sample average of the three-year GAAP ETR is 23 percent and the standard deviation is 10 percent. Following Chen et al. (2020) we control for size (SIZE), return on assets (ROA), market-to-book ratio (MTB), leverage (LEV), property, plant, and equipment (PPE), R&D expenditures (R&D), intangible assets (INT) and inventory (INV). For the tax risk regression, we also include the level of tax avoidance (GAAP\_ETR) and the volatility of return on assets (SD\_ROA) as they were identified as potential explanatory variables by De Simone et al. (2015) and Guenther et al. (2017).<sup>14</sup> Since both dependent variables are measured over a three year period, we include all controls averaged over this period. Table 8 in Appendix A describes the variables measures. Since our sample consists of companies from different countries all over Europe, we use home country fixed effects to control for home country-specific characteristics, especially the home country's tax rate.<sup>15</sup>

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<sup>13</sup> The tax employee search took place in 2019; therefore, our sample period ends in 2018.

<sup>14</sup> In addition to the included variables in our study, Chen et al. (2020) include an indicator for loss carry forward, change in loss carry forward, an indicator for foreign operations, income from foreign operations, the natural logarithm of the number of business segments, an indicator for internal control weakness, an indicator for the use of auditor-provided tax services as well as industry and year fixed effects. As these variables are not available for European companies, we exclude them from our regression design.

<sup>15</sup> Due to the small sample size, we currently cannot include industry fixed effects. After further data collection, we will include industry fixed effects, as well.

We then add the degree of centralization of the company's tax department (CTD) to the regression design shown in equation 2 in order to test hypotheses 1 and 2:

$$GAAP\_ETR3 \text{ or } SD\_ETR3 = \beta_0 + \beta_1 CTD + \beta_2 \text{Tax Personnel} + \gamma \text{Controls} + \text{Home Country Fixed Effects} + \varepsilon \quad (3)$$

We express the centralization of the tax department in four different ways. First, we use the ratio of the number of local tax personnel divided by the total number of tax personnel of the MNE (CTD I). This quantifies the degree of absolute centralization of tax personnel in the MNE's home country. Second, we use the total number of tax personnel divided by the total number of operating countries (CTD II) to measure the utilization of each tax department employee. The fewer the number of countries each tax personnel has to deal with, the more information can be gathered. Third, we use the total number of tax personnel divided by the total number of countries hosting a tax department (CTD III) to measure the spread of tax managers across departments. Fewer tax employees per department locations increase coordination costs. Finally, we use an indicator variable that takes the value of one if the value of CTD I is above the average of CDT I values (CTD IV), zero otherwise. For all four CTD measures, we expect a negative and statistically significant effect on *GAAP\_ETR3* whereas we expect a positive and statistically significant effect on *SD\_ETR3*. We use the same set of controls as in equation 2 and include the Number of Personnel by Chen et al. (2020) to control for the overall size of the tax department. Since they have documented a negative effect of the overall size of the tax department on the two dependent variables, we also expect a negative effect in our setting. We further assume that the coefficient of Tax Personnel may be biased due to omitted variable bias. Since the correlation between Tax Personnel and our CTD measures is negative we expect a larger coefficient for the Tax Personnel variable.

We expect the structure of the tax department to be more important in case of large tax departments. To test this hypothesis, we interact Tax Personnel and our CTD measures for the ETR analysis, resulting in the following equation:

$$GAAP\_ETR3 = \beta_0 + \beta_1 CTD + \beta_2 Tax\ Personnel + \beta_3 CTD \times Number\ Employees + \gamma Controls + Home\ Country\ Fixed\ Effects + \varepsilon \quad (4)$$

We expect a negative and statistically significant coefficient for  $\beta_3$ , indicating, that larger and more centralized tax departments lead to an overall lower ETR and less tax risk. Since we expect centralization as well as size alone also to be a significant factor when it comes to reduction of the ETR as well as tax compliance, we also expect negative and significant estimates for  $\beta_1$  and  $\beta_2$ .

After analyzing the effect of (de)centrality on tax avoidance and tax risk, we analyze which country characteristics determine the location of foreign tax personnel. We use country-level data to answer this question. Conditional on the presence of a subsidiary in a specific country we estimate the following probability model to test H3:

$$Tax\_Employee = \beta_0 + \beta_1 Tax\ Complexity\ Index + \gamma Controls + Home\ Country\ Fixed\ Effects + \varepsilon \quad (5)$$

Tax\_Employee is an indicator variable taking the value of one if at least one tax employee is present in the respective foreign country, zero otherwise.<sup>16</sup> Tax Complexity represents the complexity of a country's corporate income tax system as described in Hoppe et al. Besides, we include several country characteristics that potentially are primer for overall country significance to the respective MNE as well as relevant in terms of recruitment of suitable employees. We include GDP and GDP\_growth to control for the economic potential of the country. Education is included, to capture a potential preference for higher educated countries due to the better availability of trained

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<sup>16</sup> In a robustness test, we include the total number of tax employees in the respective country as the dependent variable and obtain similar inferences using count data models.

workforce. We build in corruption as well as the country's statutory tax rate to control for additional location choice reasons. Since the overall continent sales are highly correlated with the location of tax employees, as shown in section V, we add the continent sales measured in percent of the overall MNE's sales in the regression. The number of subsidiaries in a country is an indicator of the general relevance of its territory for the respective MNE and therefore included as a control variable. To measure coordination costs between the head office and its subsidiary our regression design also comprises of an indicator variable, taking the value of one if the head office as well as the subsidiary country share a common language, zero otherwise and a variable capturing the distance between the head office and the subsidiary country.

Lastly, we analyze how the location of tax personnel in countries with a complex tax system affects the MNE's tax risk. According to hypotheses 4, we expect a negative effect of personnel in tax complex countries on SD\_ETR3.

$$SD\_ETR3 = \beta_0 + \beta_1 CTD + \beta_2 Tax\ Personnel + \beta_3 Tax\ Personnel\ in\ Complex\ Tax\ Countries + \gamma Controls + Home\ Country\ Fixed\ Effects + \varepsilon \quad (6)$$

As indicated in equation 6, we add Tax Personnel in Complex Tax Countries to the regression design presented in equation 3. Tax Personnel in Complex Tax Countries is measured as the total number of tax personnel in countries in the top quintile of the Tax Complexity Index taken from Hoppe et al. Descriptive statistics of the included variables are displayed in table 9 in Appendix A.

## V. DATA

We include in our analysis non-financial EuroStoxx50 companies.<sup>17</sup> We focus on Eurostoxx50 firms for several reasons. First, these firms represent the largest and most important players in the European economy, leading to increased attention from academics as well as politicians and the media. Examining their actions is thus of broad public interest. Second, these MNEs operate in complex and uncertain tax environments, suggesting that the tax department is more likely to play an important role in understanding their tax planning and tax compliance outcomes. Third, the Eurostoxx50 index consists of companies from various industries and regions within the EU, allowing us to explore differences in the structural choices across fields. Finally, due to their size, these companies are highly likely to have a tax department and employees posting their profiles at professional networking websites.

For each sample company, we search the networking site for individuals who currently work in a tax position. Since we are interested in the worldwide structure of the tax department, we screen the parent company as well as all subsidiaries that are listed in the annual report of 2018. To identify employees working in a firm's tax department, we perform a keyword search for "tax" within each company. To avoid missing employees due to translation issues we use "tax" in English as well as in the local language. We exclude tax employees whose jobs are temporary, e.g. "interns". We further exclude personnel, whose job title indicates that they do work in a tax function unrelated to corporate income tax, including but not limited to payroll tax, property tax and VAT. For each employee that was identified by this process, we collect information on the current position (job title), the affiliation time, and the country of employment.

Using data from public networking sites is challenging for multiple reasons. First, it is unclear whether such networking sites provide a representative sample of overall workforce.

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<sup>17</sup> A list of the respective companies can be found in Appendix B.

Therefore, we test the representativeness with regard to overall size and potential within and across MNE biases. To validate our hand-collected dataset regarding the overall size of the tax department, we compare it to prior surveys of corporate tax departments. A number of studies have tried to evaluate the size of tax departments, including Klassen et al. (2017), Chen et al. (2020), TEI (2012), Barrios and Gallemore (2019), KPMG (2016), and Feller et al. (2017). These studies use different data sources as well as tax department data from companies' of different size and hence are a valid sample to verify our hand-collected dataset. Figure 1 shows the extrapolated values of these studies.<sup>18</sup> In general the number of tax employees for our sample firms (75) tend to be slightly lower than the extrapolated values of the other studies.<sup>19</sup>

**Table 1: Comparison of bandwidth of tax employees**

<b>Study</b>	<b>Lower bound</b>	<b>Upper bound</b>
Chen et al. (2020)	77.6	155.3
Barrios and Gallemore (2019)	490	490
Feller et al. (2017)	220	220
Klassen et al. (2017)	81.65	195.25
TEI (2012)	74.2	111

<sup>18</sup> A detailed description of the comparison of these studies can be found in Appendix B.

<sup>19</sup> Two outliers in this respect are the Studies by Barrios and Gallemore (2019) and Feller et al. (2017). Barrios and Gallemore (2019) report an average number of tax employees of 14 for S&P 1500 companies for the time period of 2011 and 2015. This value is almost twice the amount reported by Chen et al. (2020) for the same companies during the period of 2009-2014. Furthermore, the average size of their sample firm is 1.9 Million Dollar, which is five times smaller (and 35 times smaller than our average firm size value) than the average size reported by Chen et al. (2020), making their companies not a good comparison group. The study by Feller et al. (2017) focuses on German companies and reports an average of 29 tax employees for stock market-oriented companies. The extrapolated number of tax employees of 220 is twice the average number of tax employees for the German companies in our sample (108).

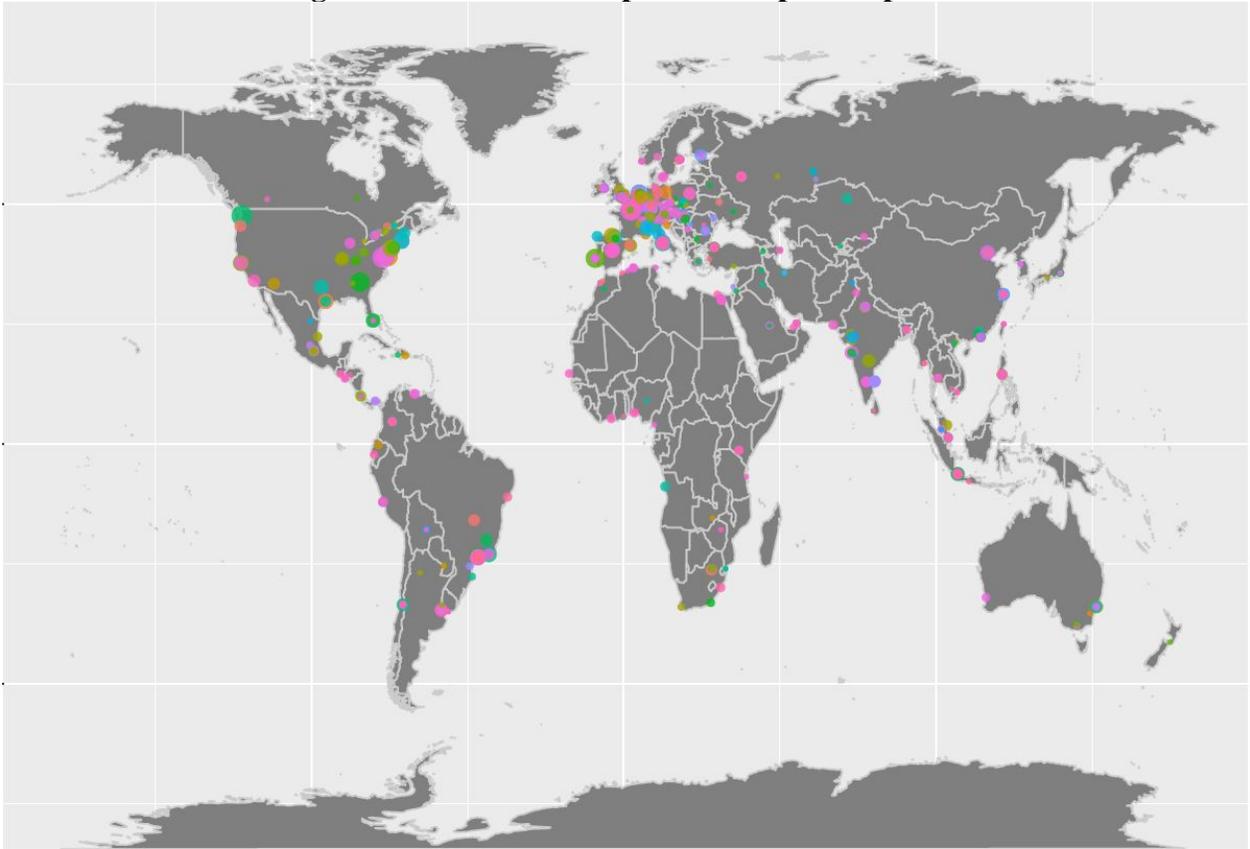
Taking economies of scale into account it is reasonable that the size of the tax departments in our sample are lower, since our MNEs tend to be much larger than the ones in the comparison group.<sup>20</sup>. Taking these findings together, the coverage seems quite plausible with potentially only a small underestimation of the real size of the tax departments of our sample MNEs.

To test the validity of our data with regard to a potential bias within an MNE, we test the location distribution of the tax personnel to clarify that we do not suffer from regional coverage differences. To test this, we analyze the correlation of employee location with the MNE's continent sales and find a statistically significant correlation of 0.35. Figure 1 shows the worldwide locations of tax employees. Most tax personnel is located in Europe which is non-surprising, given the use of European MNEs and the large revenue generation within Europe (44% of overall revenue). Next is North America, especially the USA and Africa being last, corresponding to the overall level of activity in our sample. This is reassuring as it suggests that our data collection does not suffer from regional biases.

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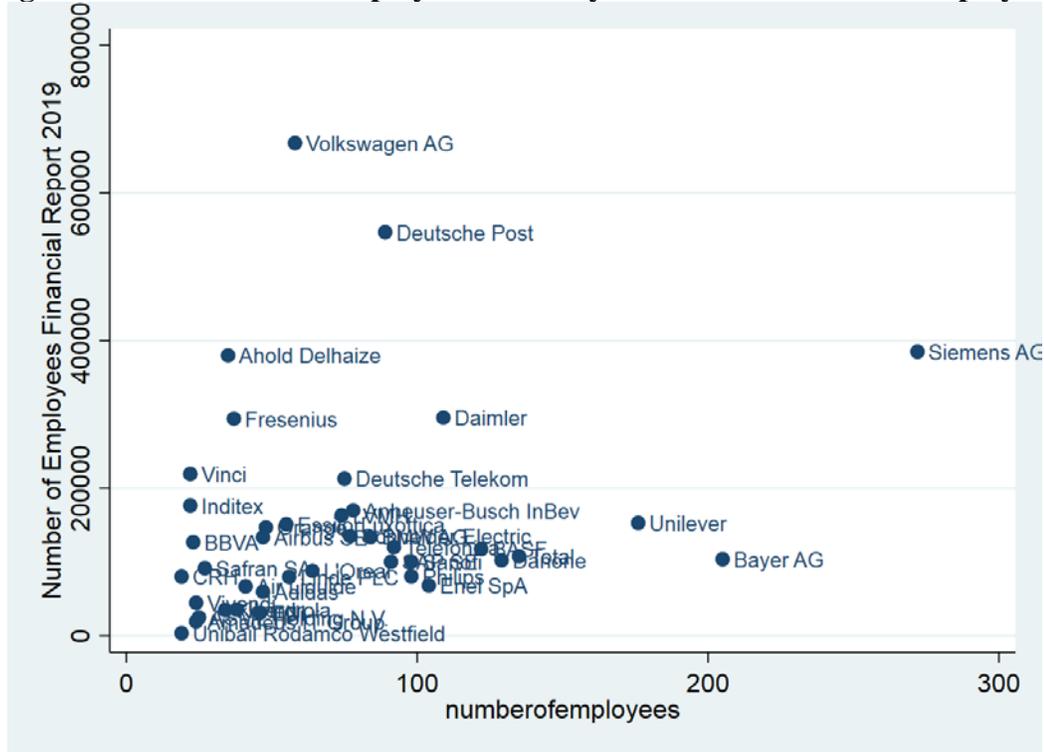
<sup>20</sup> This is in line with findings by Chen et al. (2020), that the number of tax employees increases with firm size, but below linear growth, due to potential economies of scale. Dharmapala (2014) also states that tax-planning expenditures decrease proportionally with firm size.

**Figure 1: Worldwide Map of all sample companies**



Lastly, we test the correlation between the number of tax employees and the number of overall personnel as reported in the MNE's financial statement to mitigate concerns of underrepresentation of MNEs at the professional networking site. We find a positive correlation of 0.22 which further strengthens our confidence in the data set. Figure 2 shows the number of tax employees relatively to the total number of employees of the company. Most sample companies are fairly close to each other in terms of the number of tax employees and the overall number of employees. However, non-surprisingly Siemens as well as Bayer and Unilever show a higher share of tax employees compared to other sample firms. The fewer number of tax employees at Deutsche Post and Ahold Delhaize can be explained by the large extend of blue-collar workers needed for their business concept.

**Figure 2: Number of tax employees relatively to the total number of employees**



Somewhat surprising is the value of Volkswagen. With over 600 thousand employees, it is by far the largest company in terms of employees in our sample. However, we only report 58 tax employees for Volkswagen. One reason for this could be that, like Deutsche Post and Ahold Delhaize, they heavily rely on blue-collar workers and thus, employees of the Volkswagen group are underrepresented at the professional networking website.<sup>21</sup>

Second, information presented in résumés are not subject to plausibility checks by the platform provider and therefore some skepticism whether this data represents the corporations accurately can occur. Such accuracy issues may be mostly due to deceitful (job) title manipulation

<sup>21</sup> An additional issue of our data set could be that the age of the workforce is negatively correlated with the usage of social media and professional networking sites. Clement (2020) shows a left-skewed age distribution for LinkedIn users indicating younger employees are overrepresented in the data. Same could be true for employees searching for (new) job opportunities. This could bias the measure of the number of tax employees, if MNEs' tax departments vary with respect to characteristics such as age or career ambition. Since age is not available via the chosen professional networking site we use average time of affiliation as a proxy. Using this measure assumes that time of affiliation correlates with age. The value of 0.36 (3.13/8.58) of the normalized standard deviation indicates a low variation of the affiliation time between the tax departments of MNEs.

or overestimation of own qualifications which won't influence our results. False statements regard current (and past) employer seem to be unlikely as such deception won't achieve much and detection risk is high.<sup>22</sup>

Overall, we believe that the data collection procedure as well as the described characteristics of our data set and the comparison to previous studies suggest that our sample is reasonably accurate in terms of capturing the size and structure of the tax departments of the non-financial Eurostoxx50 companies.

Analyzing the effect of tax department structure on tax avoidance as well as tax risk requires financial information. We collect financial statement information from the company's annual reports and use the industry classification by Thomson Reuters. Since the employee search took place in 2019 we use the corresponding last available reports from 2016 to 2018.<sup>23</sup> Further, we use country-specific information from CEPII, IMF, OECD, KPMG, Transparency International, and the UN. Lastly, we use the Tax Complexity Index by Hoppe et al. to measure the countries tax environment. Detailed definitions and descriptions of the respective variables can be found in Appendix A table 9 and 10.

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<sup>22</sup> Chen et al. (2020) validate their LinkedIn data set of tax employees by interviews of sample firms, finding the collected data a slightly smaller but close to an accurate image which is in line with findings presented in this section.

<sup>23</sup> For the calculation of the three-year ETR used in the cross sectional analysis we therefore use data from 2016 to 2018.

## V. EMPIRICAL RESULTS

### Effect of tax personnel invest on ETR and tax risk

Chen et al. (2020) show that investment in tax department, measured as a larger number of tax employees, results in a lower ETR and less tax risk. We start our analysis by re-estimation their study to observe whether their conclusion is also true for our sample of European MNEs (table 2).

**Table 2: Re-estimation of Chen et al. (2020)**

	(1)	(2)
	GAAP_ETR3	SD_ETR3
<b>Tax Personnel</b>	<b>-0.0189<sup>+</sup></b>	<b>-0.0014</b>
	<b>(-1.37)</b>	<b>(-0.04)</b>
SIZE	0.0337 <sup>#</sup>	-0.0570
	(1.60)	(-1.08)
ROA	0.1283	-0.7101 <sup>**</sup>
	(1.01)	(-2.17)
MTB	0.0097 <sup>+</sup>	0.0059
	(1.45)	(0.32)
LEV	0.0387	-0.1658
	(0.34)	(-0.69)
R&D	0.1891	0.4735
	(0.37)	(0.39)
PPE	-0.1009	0.3783
	(-0.88)	(1.13)
INT	-0.0085	-0.0269
	(-0.30)	(-0.32)
INV	0.2324 <sup>#</sup>	-0.2574
	(1.52)	(-0.62)
GAAP_ETR 3Y		0.1688
		(0.17)
SD_ROA		2.1132
		(1.01)
Home Country FE	Yes	Yes
Observations	40	40
Adj. R-sq	0.30	0.1807

This table presents the results for the reproduction of the analysis conducted by Chen et al. 2020 using our dataset of non-financial EUROSXXX50 companies. See Table 9 in Appendix A for variable definitions. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

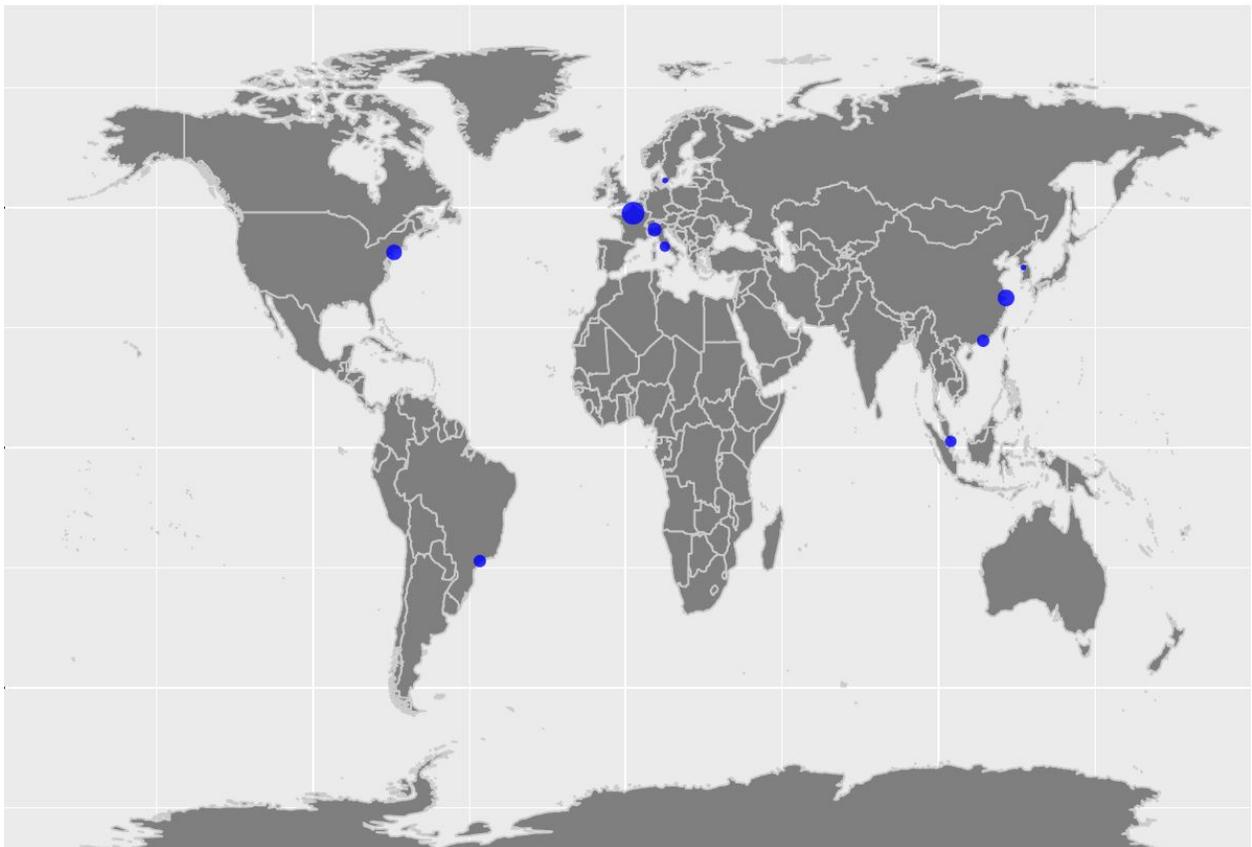
Following Chen et al. (2020), we use the three-year GAAP\_ETR (column 1) and the standard deviation of three-year GAAP\_ETR (column 2) as our dependent variables. In line with the findings by Chen et al. (2020), we expect a negative and significant effect of the total number of employees (Tax Personnel) working in the MNEs tax department on GAAP\_ETR3 as well as SD\_ETR3. Confirming their findings, the results in table 1 show a negative effect of Tax Personnel on GAAP\_ETR3 as well as SD\_ETR3. However, the effect on the tax compliance measure fails to

attain statistical significance at conventional levels. A one standard deviation change in the Tax Personnel variable leads to a reduction in the three-year GAAP ETR by 1.6 percentage points, which corresponds to approximately 7 percent of the average ETR. This effect is approximately twice the value reported by Chen et al. (2020) (0.7). Overall, the results mostly confirm the findings of Chen et al. (2020) for the S&P 1500 companies.

### **Tax department structure of large EU MNEs**

Since we hypothesize that the (de)centralization choice of the MNE's tax department affects tax planning as well as tax compliance, we further analyze the differences in the degree of (de)centralization choice within our sample. Figure 3 and 4 show two examples of MNE's organizational choice with regard to (de)centralization.

**Figure 3: Worldwide tax employee locations of MNE using centralized tax department structure**



Both displayed MNEs are comparable in terms of size of the tax department (74 and 77 tax employees respectively, which is close to the sample average of 75), overall company size, and number of operating countries. While the MNE's tax department in figure 4 (henceforth company A) operates through ten locations in eight countries the MNE's tax department in figure 5 (company B) operates in 27 jurisdictions.<sup>24</sup> The size of the dots represent the share of personnel located in the respective location indicating a mostly homogenous distribution of employees across jurisdictions outside the home country (France) for the more centralized company A, whereas the size (in terms of employees) varies for the decentralized MNE (company B). The average number (normalized standard deviation) of tax employees in each foreign country for the centralized tax department is 7 (0.46), whereas it is 2.4 (0.75) for the decentralized.<sup>25</sup> While the average number of tax personnel per country for company A is larger, due to the fewer locations, the deviation of tax personnel per location is much lower indicating that the locations outside the home country are more equally balanced. This is in line with the graphical display of company A. Furthermore, it is worth noting that the few locations of company A are spread across the globe. Besides Europe the company's tax department operates through one location in North America (USA), one location in South America (Brazil), and three countries in Asia (China, Indonesia and Japan). This design being a potential indicator for regional (continent) hubs that coordinate tax matters for the whole region (continent). In contrast, the tax department locations of company B are spread across many countries with multiple operations within one region (continent). The descriptive evidence as well as figure 3 and 4 so far indicate a variation between MNEs' tax department structures. We continue

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<sup>24</sup> The average number of countries with at least one tax employee for our sample is 24.7 with a standard deviation of 13.2.

<sup>25</sup> The average number of employees per foreign country in our sample is 11.7 with a normalized standard deviation of 1.07, indicating a deviation slightly above the mean.

analyzing the effect of these choices with regard to tax department performance measures such as the ETR and tax risk.

**Figure 4: Worldwide tax employee locations of MNE using decentralized tax department structure**



### **Tax department structure and ETR**

To test hypotheses 1, we observe in table 3 whether our four centralization measures reduce the overall tax expenses. We also include the Tax Personnel variable introduced in table 1 to account for the findings by Chen et al. (2020) that the size of the tax department is associated with a lower ETR. As posed in section IV we expect the coefficient for Tax Personnel to be larger in magnitude due to a potential omitted variable bias compared to the coefficient presented in the re-estimation (table 1). Conforming hypothesis 1 we find, that a more centralized tax department reduces the MNE's ETR, indicating that a more efficient implementation and monitoring of the tax

strategy outweighs more costly information gathering. A one standard deviation increase in CTD I reduces the ETR by 2.3 percentage points ( $-0.1312 \times 0.179 = 0.0235$ ), which corresponds to 10 percent of the average ETR. Using alternative centrality measures (CTD II to CTD IV) we find an ETR reduction by 2.5 to 3.8 percentage points. As in table 1, the coefficient for Tax Personnel is also negative and statistically significant, indicating that irrespective of the organizational choice the overall investment in the tax department, measured by the number of tax employees, still explains the tax avoidance behavior of the MNE. In fact, as expected due the omitted variable bias, the coefficient increases in magnitude from -0.0189 to -0.0293, indicating downward biased results for equation 2. This increase corresponds to an additional decrease in the ETR by 0.8 percentage points which represents 50 percent of the initial ETR reduction displayed in table 2.

**Table 3 (H1): The effect of centralized tax department on the MNEs ETR**

	(1)	(2)	(3)	(4)
	GAAP_ETR3	GAAP_ETR3	GAAP_ETR3	GAAP_ETR3
<b>CTD I</b>	<b>-0.1312<sup>+</sup></b> <b>(-1.35)</b>			
<b>CTD II</b>		<b>-0.0068</b> <b>(-1.16)</b>		
<b>CTD III</b>			<b>-0.0147</b> <b>(-1.19)</b>	
<b>CTD IV</b>				<b>-0.0795<sup>**</sup></b> <b>(-2.65)</b>
<b>Tax Personnel</b>	<b>-0.0293<sup>*</sup></b> <b>(-1.87)</b>	<b>-0.0246<sup>#</sup></b> <b>(-1.63)</b>	<b>-0.0236<sup>#</sup></b> <b>(-1.61)</b>	<b>-0.0351<sup>***</sup></b> <b>(-3.12)</b>
SIZE	0.0380 <sup>+</sup> (1.77)	0.0301 <sup>+</sup> (1.47)	0.0428 <sup>+</sup> (1.80)	0.0350 <sup>**</sup> (2.13)
ROA	0.1183 (0.86)	0.0842 (0.60)	0.1553 (1.08)	0.1539 <sup>+</sup> (1.47)
MTB	0.0089 <sup>+</sup> (1.36)	0.0128 <sup>+</sup> (1.48)	0.0044 (0.52)	0.0101 <sup>*</sup> (1.89)
LEV	0.0133 (0.11)	0.0805 (0.69)	0.0884 (0.77)	0.0428 (0.49)
R&D	0.2549 (0.53)	0.3423 (0.57)	-0.0719 (-0.12)	0.4066 (0.93)
PPE	-0.1475 (-1.21)	-0.0376 (-0.23)	-0.1291 (-1.02)	-0.1476 <sup>#</sup> (-1.58)
INT	-0.0343 (-0.91)	-0.0224 (-0.64)	0.0325 (0.79)	-0.0524 <sup>#</sup> (-1.58)
INV	0.2263 <sup>+</sup> (1.43)	0.1702 (0.92)	0.3992 <sup>*</sup> (1.86)	0.3037 <sup>**</sup> (2.09)
Home Country FE	Yes	Yes	Yes	Yes
Observations	40	40	40	40
Adj. R-sq	0.2971	0.3537	0.3105	0.3990

This table presents the estimates of Equation 2 for the dependent variable 3 year GAAP ETR (GAAP\_ETR3), to test the effect of tax department centralization on tax avoidance. See Table 9 in Appendix A for variable definitions. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

Since we expect the structure of the tax department to be more important in case of large tax departments we interact the Tax Personnel variable with our CTD measures to explore heterogeneous effects of size and centralization choice.<sup>26</sup> From theory, we expect size (Tax Personnel) as well as the degree of centralization (CTD's) to be associated with lower ETRs. The same should be true of the interaction term since we expect the degree of centralization to be more effective for MNEs with larger tax departments.

**Table 4: Heterogeneous effect of size and centrality**

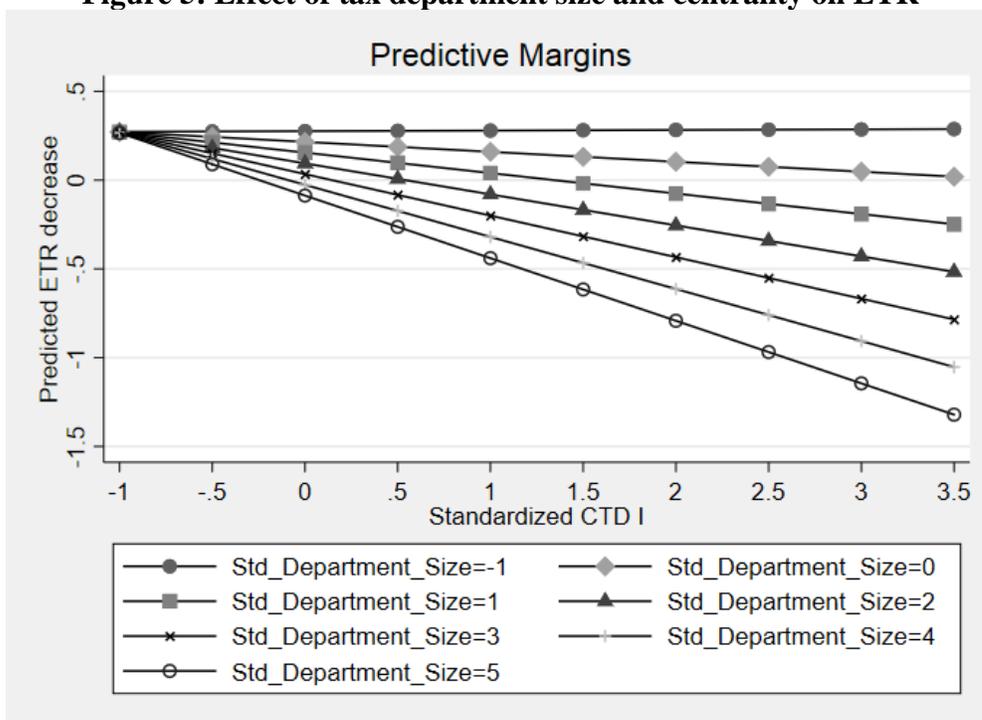
	(1)	(2)	(3)	(4)
	GAAP_ETR3	GAAP_ETR3	GAAP_ETR3	GAAP_ETR3
CTD I	-0.0559*** (-2.99)			
Tax Personnel	-0.0604*** (-3.21)	-0.0370*** (-2.97)	-0.0511* (-1.96)	-0.0324*** (-2.90)
<b>CTD I # Tax Personnel</b>	<b>-0.0593** (-2.21)</b>			
CTD II		-0.0327** (-2.75)		
<b>CTD II # Tax Personnel</b>		<b>-0.0776*** (-6.09)</b>		
CTD III			-0.0422* (-2.02)	
<b>CTD III # Tax Personnel</b>			<b>-0.0550* (-1.78)</b>	
CTD IV				-0.0516 (-1.25)
<b>CTD IV # Tax Personnel</b>				<b>-0.0505 (-0.91)</b>
Home Country FE	Yes	Yes	Yes	Yes
Observations	40	40	40	40
Adj. R-sq	0.3567	0.5664	0.4338	0.3839

This table presents the estimates of Equation 3 for the dependent variable 3 year GAAP ETR (GAAP\_ETR3), to test the effect of tax department centralization and department size on tax avoidance. See Table 9 in Appendix A for variable definitions. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

As expected the coefficients of the interaction terms are negative and statistically significant. This is also true for the coefficients of our centralization measure and the Tax Personnel variable. Figure 6 shows the additional combined effect of normalized CTD I and normalized department size on ETR. In addition to the standalone effect of department size and CTD I the ETR is reduced up to approximately 1.25 percentage points further.

<sup>26</sup> To account for multicollinearity, we standardize our CTD measures (except for the indicator variable CTD IV) as well as the Tax Personnel variable.

**Figure 5: Effect of tax department size and centrality on ETR**



### Tax department structure and tax risk

In hypothesis 2, we assume that a more decentralized tax department is associated with a lower tax risk. We relate this to foreign tax employees having a better knowledge of the respective tax code which in turn reduces potential tax risks. To test this hypothesis, we observe in table 5 whether our centralization measures are positively associated with our tax risk proxy (SD\_ETR3). The results presented in table 5 do not confirm hypothesis 2. All four centralization measures attain only weak or no statistical significance at conventional level, with the sign of the coefficient depending on the specification of the centralization measure. These results lead to the conclusion that not the overall distribution of the tax department personnel itself but potentially the actual locations within specific jurisdictions could explain the heterogeneity in MNEs' tax risk. This encloses the underlying assumption that as a head office tax department the more complex a tax code, the more costly it is to gather knowledge to fulfill compliance requirements which in turn

leads to a lower overall tax risk.<sup>27</sup> To test this assumption, we employ equation 6 to start our analysis by investigating whether country characteristics can explain the location of foreign tax employees.

**Table 5 (H2): The effect of decentralized tax department on tax risk**

	(1)	(2)	(3)	(4)
	SD_ETR3	SD_ETR3	SD_ETR3	SD_ETR3
<b>CTD I</b>	<b>0.0428</b> (0.16)			
<b>CTD II</b>		<b>-0.0141<sup>#</sup></b> (-1.54)		
<b>CTD III</b>			<b>-0.0237</b> (-1.05)	
<b>CTD IV</b>				<b>0.1745<sup>#</sup></b> (1.64)
Tax Personnel	0.0026 (0.05)	-0.0142 (-0.39)	-0.0088 (-0.23)	0.0412 (0.88)
SIZE	-0.0593 (-1.14)	-0.0590 (-1.12)	-0.0404 (-0.96)	-0.0733+ (-1.35)
ROA	-0.7089* (-2.07)	-0.7633** (-2.28)	-0.6496** (-2.21)	-0.8213** (-2.35)
MTB	0.0059 (0.31)	0.0137 (0.72)	-0.0023 (-0.11)	0.0012 (0.06)
LEV	-0.1591 (-0.63)	-0.0799 (-0.38)	-0.0877 (-0.40)	-0.1885 (-0.83)
R&D	0.4328 (0.37)	0.6378 (0.55)	-0.0375 (-0.03)	-0.0395 (-0.03)
PPE	0.3947 (0.92)	0.4751 (1.31)	0.3170 (0.91)	0.5249# (1.51)
INT	-0.0172 (-0.15)	-0.0435 (-0.47)	0.0461 (0.53)	0.0700 (0.74)
INV	-0.2547 (-0.59)	-0.2589 (-0.58)	0.0740 (0.19)	-0.5260 (-1.08)
GAAP_ETR3	0.1903 (0.17)	-0.0622 (-0.07)	0.0737 (0.07)	0.5824 (0.59)
SD_ROA	2.0429 (0.93)	1.1946 (0.58)	1.6086 (0.80)	2.3118 (1.10)
Home Country FE	Yes	Yes	Yes	Yes
Observations	40	40	40	40
Adj. R-sq	-0.0112	0.0904	0.0248	0.1542

This table presents the estimates of Equation 2 for the dependent variable standard deviation of 3 year GAAP ETR (SD\_ETR3), to test the effect of tax department centralization on tax risk. See Table 9 in Appendix A for variable definitions. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

More specifically we analyze if the foreign country having a complex tax system partly explains the employee location in the respective country. We use the Tax Complexity Index conducted by Hoppe et al. to measure Tax Complexity. We use Match as our main dependent variable taking the value of one if at least one tax employee is located in a country where the MNE is active; zero otherwise.<sup>28</sup> As a robustness check we use the total number of employees in the respective country

<sup>27</sup> As Feller and Schanz (2016) state the alignment of corporate actions with (foreign) tax law is an issue a tax department has to deal with.

<sup>28</sup> More precisely, Match takes the value of one if conditional on the MNE having a subsidiary in the respective country a tax employee is present; zero otherwise.

as our dependent variable (column 4 to 6). In addition to the Tax Complexity variable, we include country characteristics that potentially indicate the countries importance for the respective MNE (GPD, GDP\_growth, continent sales, and the number of subsidiaries in the country) as well as further country controls such as education, corruption and the statutory tax rate. Lastly, we include the distance between home country and subsidiary country as well as a language indicator taking the value of one if the home country and the subsidiary country share a common language and zero otherwise, to control for operational costs.

**Table 6 (H3): Location choice of tax employees**

	(1) Probit Match 0 1	(2) Logit Match 0 1	(3) OLS Match 0 1	(4) OLS Number of Employees per Country (count)	(5) Poisson Number of Employees per Country (count)	(6) NBREG Number of Employees per Country (count)
<b>Tax Complexity</b>	<b>6.1153***</b> (8.47)	<b>10.0244***</b> (7.85)	<b>1.7387***</b> (5.28)	<b>8.2395**</b> (2.44)	<b>10.1041***</b> (11.38)	<b>9.7864***</b> (10.95)
GDP	0.0002*** (4.26)	0.0003*** (3.62)	0.0000*** (7.84)	0.0006*** (4.49)	0.0002*** (20.19)	0.0001*** (5.38)
GDP_Growth	-1.0910# (-1.64)	-1.5643+ (-1.34)	-0.3081 (-0.88)	-4.8534* (-1.70)	-3.7465*** (-5.09)	-2.9360*** (-4.03)
Education	-0.5319 (-1.01)	-0.9606 (-1.06)	-0.1359 (-0.52)	-0.3534 (-0.30)	-0.7335 (-1.13)	-0.2217 (-0.33)
Corruption	0.0030 (0.84)	0.0018 (0.28)	0.0018 (0.89)	0.0058 (0.85)	0.0111** (2.40)	0.0067+ (1.42)
STAXR	-0.0002 (-0.03)	-0.0016 (-0.10)	0.0026 (0.57)	-0.0194 (-0.93)	0.0229** (1.99)	0.0102 (0.87)
Continent Sales in %	0.7048*** (2.66)	1.1166** (2.33)	0.2096*** (2.94)	1.0403# (1.49)	1.5410*** (4.67)	1.3199*** (3.97)
Subs per Country	0.0613*** (4.69)	0.1521*** (3.52)	0.0005 (1.13)	0.0137*** (2.84)	0.0025** (2.03)	0.0210 (1.14)
Distance	0.0000 (1.05)	0.0000 (1.02)	0.0000 (0.11)	0.0000 (0.50)	0.0000 (0.07)	0.0000 (0.36)
Same Language	0.1408 (0.86)	0.2181 (0.74)	0.0464 (0.54)	0.3083 (1.26)	0.2695 (1.17)	0.2522 (1.25)
Inalpha						0.3586*** (3.74)
Group FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,655	1,655	1,655	1,655	1,655	1,655
Adj. R-sq			0.2672	0.4181		

This table presents the estimates of Equation 5 for the dependent variable Match in column (1) to (3) and Number of employees per country in column (5) and (6), to test the effect of country characteristics on the MNEs decision to install a tax department employee in the respective country, conditional on having at least one subsidiary present. See Table 10 in Appendix A for summary statistics. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

Confirming hypothesis 3 we find that a more complex tax system increases the probability of a tax employee present in the jurisdiction. The marginal effect of the Tax Complexity variable on Match (in column 1) is 1.47. Using the results from the linear probability model (column 3), we find that moving from a country with a Tax Complexity at the 5 percentile to a country at the 95 percentile increases the probability of a tax employee located in the respective country

(conditional on the MNE having a subsidiary present) by 37 percent, all else being equal. In general, tax employees are more frequently located in greater economies and on continents with a larger share of overall sales as well as in countries with more subsidiaries, whereas faster growing economies are chosen less often as locations for tax personnel by MNEs. Surprisingly, coordination costs, measured by having the same language as well as the distance between head office and subsidiary, as well as the statutory tax rate do not foster the location of tax employees. Using robustness checks we obtain the same inferences.

**Table 7 (H4): The effect of foreign manager location on tax risk**

	(1)	(2)	(3)	(4)
	SD_ETR3	SD_ETR3	SD_ETR3	SD_ETR3
<b>Tax Personnel in Tax Complex Countries</b>	<b>-0.0045<sup>#</sup></b>	<b>-0.0036<sup>*</sup></b>	<b>-0.0042<sup>*</sup></b>	<b>-0.0030</b>
	<b>(-1.57)</b>	<b>(-1.86)</b>	<b>(-1.73)</b>	<b>(-1.03)</b>
Tax Personnel	0.0029	0.0009	0.0037	0.0270
	(0.07)	(0.03)	(0.12)	(0.96)
CTD I	-0.1590			
	(-0.65)			
CTD II		-0.0144 <sup>+</sup>		
		(-1.41)		
CTD III			-0.0348	
			(-1.25)	
CTD IV				0.0766
				(0.84)
Home Country FE	Yes	Yes	Yes	Yes
Observations	40	40	40	40
Adj. R-sq	0.1073	0.2196	0.1796	0.1254

This table presents the estimates of Equation 6 for the dependent variable standard deviation of 3 year GAAP ETR (SD\_ETR3), to test the effect of tax department centralization and department size on tax risk. See Table 9 in Appendix A for variable definitions. \*\*\*, \*\*, \*, # and + label statistical significance at 1%, 5%, 10%, 15% and 20% level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust.

In hypothesis 4 we assume that the investment in tax personnel in more tax complex countries reduces tax risk. We test this by adding a count variable to equation 3 which captures the number of tax employees located in countries in the top quintile of the Tax Complexity Index by Hoppe et al. (Tax Personnel in Complex Tax Countries). Table 7 reports results for this analysis. We find a negative and statistically significant effect of the Tax Personnel in Complex Tax Countries variable on SD\_ETR3 indicating a lower tax risk for MNEs with more tax personnel in tax complex jurisdictions. A one standard deviation increase in the number of employees in the top quintile of tax complex countries reduces the SD\_ETR3 by 0.07. This reduction corresponds to 6.3 percent of the overall value of the SD\_ETR3 variable (0.106). The coefficient for our CTD

measures is mostly negative but still not significant at conventional levels. Taking these results together, we find the location of tax personnel in tax complex countries to be more important than a general more decentralized tax department.

## VI. CONCLUSION

Our paper provides new evidence on the internal working of the tax department. We investigate the effect of centralization of the MNE's tax function on ETR as well as tax risk. Using a hand-collected data set of tax employees from a professional networking site for non-financial Eurostoxx50 companies, we find more centralized tax departments to be associated with lower ETRs, while we do not document such effect on our measure for tax risk (SD\_ETR3). We further report that the effect is more pronounced for larger tax departments. In addition, we analyze where MNEs locate tax personnel outside their home country. Conditional on the establishment of a subsidiary in the country, we find employees more frequently in countries with a more complex tax system. When testing whether such location decreases tax risk, we find a positive effect of the location of tax personnel in tax complex jurisdictions on the MNE's tax risk.

We contribute to the literature on the effect of tax employees and tax departments on MNEs' tax outcomes by providing comprehensive evidence on the effect of tax department centrality, tax department size, and foreign tax employee location on tax avoidance and tax risk. Our findings suggest that organizing the tax department more centralized is beneficial in terms of lower ETRs while locating tax personnel in complex tax jurisdictions reduces tax risk. By doing so, we extend the results presented by Chen et al. (2020) and document a downward biased estimate in their setting due to an omitted variable bias. We document an additional increase in the effect of investment in tax personnel on the ETR by 50 percent which corresponds to an additional reduction in the ETR by 0.8 percentage points.

The study is subject to a number of caveats. The (de)centralization decision as well as the size of the tax department are endogenous. We therefore, cannot predict the optimal level of (de)centrality nor the optimal size of the tax department. We use self-reported data from a professional networking website which potentially results in data issues, such as incomplete

coverage and false self-reports. Even though we validated our hand collected data set using multiple resources in section V potential data limitations should be kept in mind when interpreting our findings.

## REFERENCES

- Armstrong, C. S., J. L. Blouin, and D. F. Larcker. 2012. The incentives for tax planning. *Journal of Accounting and Economics* 53 (1): 391-411.
- Baiman, S., D. F. Larcker, and M. V. Rajan. 1995. Organizational design for business units. *Journal of Accounting Research* 21: 371-395.
- Barrios, J. M. and J. Gallemore. 2019. Tax-related Human Capital: Evidence from Employee Movements. *Working Paper*.
- Bennedsen, M. and S. Zeume. 2018. Corporate Tax Havens and Transparency. *The Review of Financial Studies* 31 (4): 1221-1264.
- Brickley, J. A., C. W. Smith, and J. L. Zimmermann. 2009. Managerial Economics and Organizational Architecture.
- Büttner, T., M. Overesch, U. Schreiber, and G. Wamser. 2012. The Impact of Thin-capitalization Rules on the Capital Structure of Multinational Firms. *Journal of Public Economics* 96 (11-12): 930-938.
- Chen, X, Q. Cheng, T. Chow, and Y. Liu. 2020. Corporate In-house Tax Departments. *Contemporary Accounting Review*, forthcoming.
- Cheng, Q., Y. J. Cho, and H. Yang. 2018. Financial reporting changes and the internal information environment: Evidence from SFAS 142. *Review of Accounting Studies* 23 (1): 347-383.
- Christie, A. A., M. P. Joye, and R. L. Watts. 2003. Decentralization of the Firm: Theory and Evidence. *Journal of Corporate Finance* 9 (1): 3-36.
- Chyz, J. A. 2013. Personally tax aggressive executives and corporate tax sheltering. *Journal of Accounting and Economics* 56 (2): 311-328.
- Clement, J. 2020. Distribution of LinkedIn users worldwide as of October 2020, by age group. *Statista* <https://www.statista.com/statistics/273505/global-linkedin-age-group/> (11/16/2020).
- Clausing, K. A. 2016. The effect of profit shifting on the corporate tax base in the United States and beyond. *National Tax Journal* 69 (4): 905-934.
- Day, S. 2018. An introduction to measure tax function value. *Taxconnections* <https://www.taxconnections.com/taxblog/if-unmeasured-is-it-really-success-an-introduction-to-measuring-tax-function-value/> (11/16/2020)
- Deller, C., and T. Sandino. 2020. Effects of a Tournament Incentive Plan Incorporating Managerial Discretion in a Geopgraphically Dispersed Organization. *Management Science* 66 (2): 911-931.
- Demsetz, H. 1998. The Theory of the Firm Revisited. *Journal of Law, Economics, & Organization* 4 (1): 141-161.

- Desai, M. A., C. F. Foley, and J. Hines. 2006. The demand for tax given operations. *Journal of Public Economics* 90 (3): 513-531.
- De Simone, L., M. Ege, and B. Stomberg. 2015. Tax internal control quality: The role of auditor-provided tax services. *The Accounting Review* 90 (4): 1469-1496.
- De Simone, L., K. J. Klassen, and J. K. Seidman. 2017. Unprofitable Affiliates and Income Shifting Behavior. *The Accounting Review* 92 (3): 113-136.
- De Simone, L. and R. C. Sansing. 2018. Income Shifting Using a Cost Sharing Arrangement. *Journal of the American Taxation Association* 41 (1): 123-136.
- Dharmapala, D. 2014. What Do We Know about Base Erosion and Profit Shifting? A Review of the Empirical Literature. *Fiscal Studies* 35 (4): 421-448.
- Dischinger, M., and N. Riedel. Corporate taxes and the location of intangible assets within multinational firms. *Journal of Public Economics* 95 (7-8): 691-707.
- Donohoe, M. P. G. A. McGill, and E. Outslay. 2014. Risky Business: The Prosopography of Corporate Tax Planning. *National Tax Journal* 67 (4): 851-874.
- Dunbar, A. E. and J. Phillips. 2001. The Outsourcing of Corporate Tax Function Activities. *The Journal of the American Taxation Association* 23 (2): 35-49.
- Dyreng, S. D., M. Hanlon, and E. L. Maydew. 2010. Long-Run Corporate Tax Avoidance. *The Accounting Review* 83 (1): 61-82.
- Dyreng, S. D., M. Hanlon, and E. L. Maydew. 2010. The effects of executives on corporate tax avoidance. *The Accounting Review* 85 (4): 1163-1189.
- Ege, M. S., B. F. Hepfer, and J. R. Robinson. 2020. Tax function influence: The case of power and status. *The Accounting Review*, forthcoming.
- Feller, A., S. Huber, and D. Schanz. 2017. Aufbau und Arbeitsweisen der Steuerabteilungen großer deutscher Kapitalgesellschaften (Teil I). *Deutsches Steuerrecht* 2017 (29): 1617-1622.
- Feller, A. and D. Schanz. 2017. The Three Hurdles of Tax Planning: How Business Context, Aims of Tax Planning, and Tax Manager Power Affect Tax Expense. *Contemporary Accounting Review* 34 (1): 494-524.
- Francis, B. B., I. Hasan, Q. Wu, and M. Yan. 2014. Are female CFOs less tax aggressive? Evidence from tax aggressiveness. *The Journal of the American Taxation Association* 36 (2):171-202.
- Fuest, C., F. Hugger, and F. Neumeier. 2020. Corporate profit shifting and the role of tax havens: Evidence from German country-by-country reporting data. *Working Paper*.
- Gallemore, J., and E. Labro. 2015. The importance of the internal information environment for tax avoidance. *Journal of Accounting and Economics* 60 (1): 149-167.
- Guenther, D., S. Matsunaga, and B. Williams. 2017. Is tax avoidance related to firm risk? *The Accounting Review* 92 (1): 115-136.

- Hales, J., J. R. Moon, and L. A. Swenson. 2018. A new era of voluntary disclosure? Empirical evidence on how employee postings on social media relate to future corporate disclosures. *Accounting, Organizations and Society* 68: 88-108.
- Hanlon, M. and S. Heitzman. 2010. A review of tax reseach. *Journal of Accounting and Economics* 50 (2-3): 127-178.
- Hayek, F. A. 1945. The use of Knowledge in Society. *The American Economic Review* 35 (4): 519-530.
- Hines, J. and E. M. Rice. 1994. Fiscal Paradise: Foreign Tax Havens and american Business. *The Quarterly Journal of Economics* 109 (1): 149-182.
- Hoppe, T., D. Schanz, S. Sturm, and C. Sureth-Sloane. Tax Complexity Index. Data available at [www.taxcomplexity.org](http://www.taxcomplexity.org)
- Hoppe, T., D. Schanz, S. Sturm, and C. Sureth-Sloane. 2018. What are the Drivers of Tax Complexity for MNCs? Global Evidence. *Intertax* 46 (8-9): 654-675.
- Huang, J. 2018. The customer knows best: The investment value of consumer opinions. *Journal of Financial Economics* 128 (1): 164-182.
- Huang, K., M. Li, and S. Markov. 2020. What do Employees know? Evidence from a Social Media Platform. *The Accounting Review* 95 (2): 199-226.
- Huesecken, B., M. Overesch, and A. Tassius. 2018. Effects of Disclosing Tax Avoidance: Capital Market Reaction to LuxLeaks. *Working Paper*.
- Kacperczyk, M., and A. Seru. 2007. Fund Manager use of Public Information: New Evidence on Managerial Skills. *The Journal of Finance* 62 (2): 485-528.
- Klassen, K., P. Lisowsky, and D. Mescall. 2017. Transfer pricing: strategies, practices, and tax minimization. *Contemporary Accounting Research* 34 (1): 455-93.
- KPMG. 2016. Global Tax Benchmarkgin Survey.
- Jensen, M. C., and W. H. Meckling. 1990. Specific and general Knowledge, and Organizational Structure. *Contract Economics*: 251-274.
- Laffitte, S., and F. Toubal. 2018. Firms, Trade and Profit Shifting: Evidence from aggregate Data. *CESifo Working Paper Series* No. 7171.
- Langenmayr, D., and F. Reiter. 2017. Trading Offshore: Evidence on Banks' Tax Avoidance. *CESifo Working Paper Series* No. 6664.
- Law, K. K. F., and L. F. Mills. 2017. Military experience and corporate tax avoidance. *Review of Accounting Studies* 22 (1): 141-184.
- McGuire, S., S. Neuman, and T. Omer. 2013. Sustainable tax strategies and earnings persistence. *Working paper*.

- McGuire, S. T., S. G. Rane, and C. D. Weaver. 2018. Internal Information Quality and Tax Motivated Income Shifting. *The Journal of the American Taxation Association* 40 (2): 25-44.
- Nagar, V. 2002. Delegation and incentive compensation. *The Accounting Review* 77 (2): 379-395.
- Norris, F. 2013 Apple's move keeps profit out of reach of taces. *New York Times* (May 2).
- Olsen, K. J., and J. Stekelberg. 2016. CEO narcissism and corporate tax sheltering. *The Journal of the American Taxation Association* 38 (1): 1-22.
- Omartian, J. 2017. Do banks aid and abet asset concealment: Evidence form the Panama Papers. *Working Paper* (unpublished).
- Phillips, J. D. 2003. Corporate tax-planning effectiveness: the role of compensation-based incentives. *The Accounting Review* 78 (3): 847-874.
- Rego, S. O., and R. Wilson. 2012. Equity Risk Incentives and Corporate Tax Aggressiveness. *Journal of Accounting Research* 50 (3): 775-810.
- Robinson, J. R., S. A. Sikes, and C. D. Weaver. 2010. Performance measurement of corporate tax departments. *The Accounting Review* 85 (3): 1035-1064.
- Sikka, P., and M. P. Hamton. 2005. The role of accountancy firms in tax avoidance: some evidence and issues. *Accounting Forum* 29 (3): 325-343.
- Slemrod, J. B., and V. Venkatesh. 2002. The Income Tax Compliance Cost of Large and Mid-Size Businesses. *Ross School of Business Paper No. 914*.
- Slemrod, J. B., and J. D. Wilson. 2006. Tax Competition with Parasitic Tax Havens. *NBER WORKING PAPER SERIES* No. 12225.
- Van den Steen, E. 2010. On the origin of shared beliefs (and corporate culture). *The RAND Journal of Economics* 41 (4): 617-648.
- Ward, C. J. 2020. CPA's track rapid-fire changes in tax law. Here's what you need to know. News Channel 3-12 (March 23). <https://keyt.com/news/top-stories/2020/03/23/cpas-track-rapid-fire-changes-in-tax-law-heres-what-you-need-to-know/>

## Appendix A

**Table 8: Definition of variables**

Variables	Definition
Number of Employees	Total number of tax employees of a company per professional networking website, scaled by total number of employees as reported in the financial statement multiplied by 1.000.
LOCAL_TAX	Total number of local tax personnel.
CM I	Total number of local tax employees (local_tax), divided by the total number of tax employees.
CM II	Total number of tax employees, divided by the total number of locations according to the financial statement.
CM III	Total number of tax employees, divided by the total number of locations with at least one tax employee.
CM IV	Total number of local tax employees (local_tax), divided by total number of employees as reported in the financial statement multiplied by 1.000.
CM V	Dummy variable, taking the value of 1 if the companies CM I is greater than the average CM I, zero otherwise.
GAAP_ETR3	Three-year average GAAP effective tax rate, calculated as the sum of the firm's tax paid over three years divided by the sum of its total pre-tax income over the same period. Observations with a negative denominator are dropped from the sample.
GAAP ETR	Annual GAAP effective tax rate, calculated as tax paid divided by total pre-tax income.

Observations with a negative denominator are dropped from the sample.

SD_ETR3	Standard deviation of annual GAAP ETR over three years.
SIZE	Natural logarithm of average total assets over three years.
ROA	Average pre-tax income over three years divided by average total assets over the same period.
MTB	Average market value of equity over three years divided by the average book value of common equity over the same period.
LEV	Average long-term debt over three years divided by average total assets over the same period.
R&D	Average research and development expenditures over three years divided by average assets over the same period.
PPE	Capital intensity, calculated as the average net property, plant, and equipment over three years divided by average assets over the same period.
INT	Average intangible assets over three years divided by average assets over the same period.
INV	Average inventory over three years divided by average assets over the same period.
SD_ROA	Standard deviation of pre-tax return on assets over three years.

**Table 9: Descriptive statistics**

VARIABLES	(1) N	(2) mean	(3) sd	(4) p5	(5) p95
GAAP_ETR3	40	0.230	0.0932	0.0635	0.314
SD_ETR3	40	0.106	0.178	0.00718	0.537
Number of Employees (non-scaled)	40	72.97	54.19	20.50	190.5
Tax Personnel	40	0.811	0.854	0.0962	1.749
CTD I	40	0.261	0.179	0.0745	0.678
CTD II	40	2.739	4.050	0.446	12.93
CTD III	40	4.430	1.676	2.583	8.304
CTD IV (indicator variable)	40	0.350	0.483	0	1
SIZE	40	11.10	0.939	9.763	12.72
ROA	40	0.230	0.140	0.0837	0.496
MTB	40	2.707	1.896	0.806	7.227
R&D	40	0.0177	0.0228	0	0.0688
LEV	40	0.588	0.191	0.315	0.851
PPE	40	0.212	0.158	0.0189	0.510
INT	40	0.351	0.278	0.0248	0.735
INV	40	0.0757	0.0696	0	0.217
SD_ROA	40	0.0158	0.0159	0.00228	0.0577

**Table 10: Descriptive statistics countries**

VARIABLES	(1) N	(2) mean	(3) sd	(4) p5	(5) p95
Match (indicator variable)	1,655	0.351	0.478	0	1
Tax Complexity	1,655	0.376	0.0617	0.271	0.483
GDP	1,655	1,447	3,444	28.12	4,972
GDP_Growth	1,655	0.0653	0.0683	-0.0901	0.145
Education	1,655	0.783	0.121	0.558	0.920
Corruption	1,655	55.26	19.81	27	85
STAXR	1,655	23.86	6.010	12.50	33
Continent Sales in %	1,655	0.301	0.209	0.0130	0.703
Subs per Country	1,655	8.542	42.34	1	26
Same Language as Headoffice	1,655	0.0532	0.224	0	1

## Appendix B

### Data validation

We assess the coverage of the professional networking website by comparison to prior studies that used tax department information. The below described comparison lead to the values displayed in figure 1. Klassen et al. (2017) in cooperation with the Tax Executives Institute (TEI) conducted a survey of multinational corporate tax directors to assess several issues regarding the taxation of multinationals, one of which being transfer prices. The survey contains 114 questions, one of which being a query about the size of the tax department. The average number of tax employees for firms with total assets in the range of 21 to 50 Million Dollar, which represents the largest well-represented company size in the survey, is 35.5. Extrapolating this number to the size of our sample MNEs leads to a range of 81.65 to 195.25 tax employees. Given that the number of tax employees increases with firm size, but below linear growth, due to potential economies of scale (Chen et al. 2020) the number of tax employees in our sample (75) seems quite reasonable compared to the possible range of tax employees.<sup>29</sup> Chen et al. (2020) report for their sample of S&P 1500 a value of 7.24 tax managers per company. This value is considerably lower than the reported number of tax employees in our sample (75). However, their average firm is much smaller compared to ours. The average size, in terms of total assets, of an S&P 1500 firm is 10,742 million and the median firm has total assets worth 2,585 million compared to 105,056 million € (approximately 115,098 US Dollar) and 55,450 million € (approximately 60,750 US Dollar) in our sample. Again, given that the number of tax employees increases with firm size, but below linear growth, the number of tax employees in our sample is quite reasonable compared the possible range of tax employees of 77.6 to 155.3. A much-cited study by the TEI reports for approximately 500 large companies operating in the US, Canada, Europe, and Asia an average number of 10.6 tax

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<sup>29</sup> Dharmapala (2014) also states that tax-planning expenditures decrease proportionally with firm size.

managers. According to the 2011/12 report, 70 percent of these companies had total assets greater than 1 billion US Dollar, whereas in our sample the smallest company has total assets worth 9.4 billion US Dollars (8.5 billion €). Since our sample consists of the 40 largest non-financial companies in the Euro-Zone, we are not surprised to have on average much larger corporations as well as a larger number of tax managers.<sup>30</sup> The same is true for a dataset of S&P 1500 companies used by Barrios and Gallemore (2019). They report on average 14 tax employees within their time period of 2011 to 2015 which is almost twice the amount reported by Chen et al. (2020) for the period 2009-2014. The average size of a sample firm (measured as natural logarithm of total assets) in their study is 7.555, which translates into total assets of 1.9 Million Dollar, which is five times smaller than the average size reported by Chen et al. (2020). Compared to our size (natural logarithm of total assets) of 11.10, which translates into an approximately 35 times larger average company, this would result in a calculated department size of 490 tax employees, which seems highly unlikely. While these studies do not differentiate between local (home country) and foreign tax employees, a tax benchmarking study by KPMG (2016) reports on average 16 local tax managers and 27 foreign tax managers. With an average number of 16.72 local tax managers, our sample firms match the number of home-country tax employees. The study is based on responses of 294 tax employees in 36 industrial countries with 60 percent operating in more than 10 countries. Our sample MNE reports on average operations in 52 different countries (60 percent of our sample operates in more than 38 countries), which in term can be a possible explanation for the by far larger number of foreign tax employees (58.28). While these studies mostly refer to tax department size of US corporations, Feller et al. (2017) report for 154 public listed German companies an average number of 16 tax employees. However, the average number of employees of stock market-

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<sup>30</sup> Assuming linear growth and an average total assets of 10 (15) billion US Dollar, this would result in 111 (74.2) tax managers. As mentioned above, due to economies of scale, strict linear growth is highly unlikely and with our average number of tax employees being on the lower edge of this range confirming our collected number of tax employees.

oriented companies is higher (29). The average total number of employees for stock market-oriented firms in their sample is only 35,000 compared to 265,232 for the German MNEs in our sample. Extrapolating the number of employees of the Feller et al. (2017) study to our average total employee size leads to 220 tax employees, which is twice our average number of 108 tax employees for the German companies in our study.

**Table 11: Descriptive statistics on tax department size by industry**

Sector	Average number of tax employees
<i>Automobiles &amp; Parts</i>	83,6
<i>Chemicals</i>	73
<i>Construction &amp; Materials</i>	20,5
<i>Food &amp; Beverage</i>	103,5
<i>Health Care</i>	99
<i>Industrial Goods &amp; Services</i>	100,3
<i>Media</i>	24
<i>Oil &amp; Gas</i>	63,6
<i>Personal &amp; Household Goods</i>	90,5
<i>Real Estate</i>	19
<i>Retail</i>	30,6
<i>Technology</i>	54
<i>Telecommunications</i>	72
<i>Utilities</i>	60

**Table 12: List of non-financial Eurostoxx50 Companies included in the analysis**

ADIDAS	IBERDROLA
AHOLD DELHAIZE	INDITEX
AIR LIQUIDE	KERING
AIRBUS	L'OREAL
AMADEUS IT GROUP	LINDE
ANHEUSER BUSCH	LVMH
ASML HOLDING	ORANGE
BASF	PHILIPS
BAYER	SAFRAN
BBVA	SANOFI
BMW	SAP
CRH	SCHNEIDER ELECTRIC
DAIMLER	SIEMENS
DANONE	TELEFONICA
DEUTSCHE POST	TOTAL
DEUTSCHE TELEKOM	UNIBAIL-RODAMCO-WESTFIELD
ENEL	UNILEVER
ENI	VINCI
ESSILORLUXOTTICA	VIVENDI
FRESENIUS	VOLKSWAGEN