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ABSTRACT

This study analyzes the impact of tax complexity on the location of tax employees and tax risk. Using a hand-collected dataset of more than 7,500 tax employees from 348 European-listed multinationals, we identify two types of firm-level costs associated with tax complexity—tax employees, and tax risk. We find that firms locate more tax employees in countries with greater tax complexity. This association is particularly pronounced for complexity in tax procedures. We also find that multinationals operating in countries with high tax complexity are associated with higher tax risk. The incremental tax risk vanishes for firms that locate more tax employees in countries with highly complex tax procedures, while we find no risk reduction from additional tax employees in countries with complex tax rules. Our results reveal that multinationals eliminate 25 percent of overall tax complexity-related tax risk through targeted location of tax employees.

Keywords: tax complexity; tax complexity cost; tax department; tax employees; tax risk

JEL Classifications: H25, H26, M12

1. Introduction

We investigate to what extent the location of tax employees of multinationals relates to tax complexity and the potential implications for firms' tax risk. Tax complexity has increased over recent years (Devereux, 2016; Hoppe et al., 2023) and is likely to continue to do so after the implementation of the global minimum tax and related reforms (Hanlon and Nessa, 2023). Surveys suggest that most senior tax professionals in large businesses and professional firms consider tax complexity and uncertainty to crucially determine business investment and location decisions (Devereux, 2016). However, researchers know little about how multinationals with subsidiaries in countries with high tax complexity staff their tax departments and to what extent this helps them mitigate negative consequences, such as tax risk, or implement tax planning more accurately. While a few studies examine the impact of tax complexity on the location of foreign direct investment (Mueller and Voget, 2012; Lawless, 2013; Hoppe et al., 2020; Esteller-Moré et al., 2021; Amberger et al., 2024), neither investments in tax departments' human capital, depending on tax complexity, nor how these investments might mitigate tax risk have been studied. We fill this gap. Studying the relation between tax complexity and local tax employees is important because it advances understanding of whether and to what extent navigating tax complexity and managing tax risk require country-specific expertise.

Theory suggests that firms will invest in tax uncertainty shields if the cost remains below a critical threshold that depends on the degree of uncertainty (Diller et al., 2017). We use this rationale to investigate how locating tax employees in more tax-complex countries helps multinationals navigate the complexity and manage tax risk. We proceed in two steps. First, we investigate whether and which elements of a complex tax system are associated with multinationals locating tax employees in foreign subsidiaries. Second, we investigate the association between tax complexity and tax risk and to what extent locating tax employees in more complex countries helps

multinationals manage incremental tax risk. We assume that tax employees in these countries are crucial for (a) dealing with complex local tax regulations, (b) better informing the central tax department of the multinational, and (c) achieving better settlements with the foreign tax authorities. We focus on the complexity of profit taxation and disregard payroll and value-added taxes, although the complexity of these taxes may also be high. However, we assume that profit taxes are particularly relevant for corporate location choices (see Hines 1999 for an overview) and therefore focus on their implications.

We hand-collect a unique cross-sectional dataset of tax employees from large, publicly traded European firms listed on the STOXX600 from the employees' résumés on LinkedIn. These data allow us to explore the role of tax department staffing based on a large sample of firms and individuals. We combine these data with country-level information on tax complexity from the Global Tax Complexity Surveys by Hoppe et al. (2023)[1] and the Paying Taxes measures of PwC et al. (2018). We use Compustat information on firm tax risk, measured by the three-year standard deviation of cash or GAAP effective tax rates (ETRs) or by the restatement of prior-year taxes. We include a comprehensive set of country and firm controls.

We document two main findings. First, we find that how multinationals staff their tax function at the subsidiary level depends on the complexity of the local tax system. We find that the likelihood of having a tax department employee in a foreign country increases significantly with the level of tax complexity in that country. In our baseline regression, a one standard deviation increase in tax complexity increases the probability of having a tax employee in a country by more than five percentage points. This increase in tax complexity corresponds, for example, to the change in tax complexity after the implementation of the Tax Cuts and Jobs Act in 2017. Analyzing

[1] Data can be retrieved from ww.taxcomplexity.org. We thank Schanz and Sureth-Sloane and their team for sharing data from their Global MNC Tax Complexity Project with us. For further information on the survey and index construction, see Hoppe et al. (2023).

complexity in the tax code and the tax framework separately reveals that the complexity of the framework drives the association between tax complexity and tax staff allocation.

Second, we show that the tax risk of a multinational is positively associated with the average tax complexity of its locations[2] and that multinationals can compensate for this additional tax risk by increasing tax staff in high-complexity countries. However, differences arise with regard to the dimensions of tax complexity. While 2.5 additional tax employees in countries with particularly complex tax procedures offset tax complexity-induced tax risk completely, we observe no significant tax risk-reducing effect for locating tax employees in countries with complex tax rules. Overall, multinationals in our sample therefore effectively eliminate 25 percent of the incremental tax risk related to high tax complexity.

Our study contributes to three streams of literature. First, we demonstrate that tax complexity helps determine investments in tax employees. We extend a nascent literature on the *real effects of tax complexity* that so far focuses on investment and location choices. According to survey results by Devereux (2016), tax uncertainty is among the top three most important influences on business investment and location decisions—even ahead of the expected tax rate. These survey results identify the complexity of the tax code as one of the main drivers of tax uncertainty. The association between tax complexity and the location choices of multinationals has also been shown in several archival-based studies. Edmiston et al. (2003) document the negative effect of tax complexity and uncertainty on inward FDI flows of Central and Eastern European countries. Mueller and Voget (2012) analyze the impact of tax complexity on the location of German outbound FDI and find a

[2] In contrast to measures that rely on a single or facet of tax complexity, like the costs associated with tax compliance or tax administration or the understandability (e.g., Pau et al., 2007; Richardson and Sawyer, 1998; Saw and Sawyer, 2010) and length of the tax regulations (e.g., Clotfelter, 1983; Karlinsky, 1981), we use the more differentiated and cross-country measurement approach of Hoppe et al. (2023). Their Tax Complexity Index captures and aggregates experienced tax consultants' perception of tax complexity of corporate income tax systems faced by multinational corporations.

repressive effect of complexity. Similarly, Lawless (2013) finds that tax complexity significantly inhibits the presence of FDI for a country pair. She observes that a 10 percent reduction in tax complexity is as effective as a one percentage point reduction in effective corporate tax rates. Hoppe et al. (2020) analyze the association between FDI location decisions and tax complexity and find that greater tax code complexity is associated with a higher likelihood of FDI, whereas high tax framework complexity has the opposite effect. These findings indicate that the direction of the real effects of tax complexity seems to depend on the kind of complexity. We extend this literature and document the cost of tax complexity by highlighting the relevance of specific dimensions of tax complexity for the local staffing of tax departments.

Second, we add to the literature on the *implications and determinants of tax risk*. While earlier studies demonstrate that a firm's tax risk depends on the tax strategy, our analysis reveals that it also relates to factors outside the firm's control, namely the complexity of the country's tax code and framework. In this sense, we adopt a broad definition of tax risk in line with that of Neuman et al. (2020), who consider economic risk, tax law uncertainty, and inaccuracies in information processing. Understanding the determinants of tax risk seems essential for several reasons. First, in contrast to the level of effective tax rates (Dyreng et al., 2017), the tax risk of multinationals has increased over the past 25 years (Jacob and Schuett, 2020) and has thus become increasingly relevant to business decisions. Second, the empirical literature has found that tax risk has important economic implications for firms. It may affect overall risk (Guenther et al., 2017; Hutchens and Rego, 2015), cost of equity (Hutchens and Rego, 2015), and firm values (Drake et al., 2017; Jacob and Schuett, 2020). Third, tax risk may affect firm decisions and thus has real effects. Theoretical studies show that tax uncertainty may hinder investments under specific conditions (Sialm, 2006; Niemann, 2011). Jacob et al. (2022) show empirically that tax uncertainty may affect the timing of a firm's capital investment. Saavedra (2019) highlights that lenders

consider tax volatility in pricing syndicated loans. And Osswald and Sureth-Sloane (2024) demonstrate that country-level tax risk attenuates risk-taking.

Third, we contribute to the research on the *internal structure of tax departments and the management of tax risk*. Firms might invest in their tax department to address tax complexity, deal with tax disputes (KPMG, 2023; EY, 2021), meet increased compliance requirements (Collier et al., 2018), exploit tax planning opportunities (Budak and James, 2018), or a combination of these. Both increased compliance requirements and new planning opportunities are associated with higher tax complexity and higher tax risk. By investigating how much multinationals can manage tax risk associated with complexity through tax staffing, we directly address the call for further research on the internal working of tax departments (Hanlon and Heitzman, 2010). While the role of top-level executives in tax planning and tax management is well analyzed,[3] little is known about the role of other tax employees and tax department structure and organization. Given the development in the organization of tax departments "from a compliance-focused activity to a profit-enhancing endeavor to a risk management center" (Donohoe et al., 2014), it remains an empirical question how this development translates into numbers and location of tax employees. Relatedly, Robinson et al. (2010) show that firms considering their tax department as profit centers report significantly lower ETRs than other firms. Barrios and Gallemore (2024) analyze the internal working of the tax department by using innovative online data sources and extracting employment histories from résumés posted on a professional networking site to study the effect of tax employee movement on ETRs. They demonstrate that a firm's ETR decreases once an employee from a more tax-aggressive

[3] The literature on the personal dimension of tax avoidance relies primarily on the central role of top executives in structuring a firm's tax planning (the so-called tone at the top) and thus focuses on the characteristics and experiences of CEOs, CFOs, or other top-level tax executives (e.g., Chyz, 2013; Dyreng et al., 2010; Francis et al., 2014; Law and Mills, 2017; Olsen and Stekelberg, 2016). Other studies have shown that after-tax compensation for these executives may help overcome agency issues and incentivize them to pursue tax avoidance (Armstrong et al., 2012; Phillips, 2003; Rego and Wilson, 2012).

firm joins its tax department, which suggests knowledge diffusion across such firms. Chen et al. (2021) use LinkedIn data to analyze the effect of investment in tax department human capital on ETR and tax risk. They find that multinationals with larger tax departments have lower ETRs and less tax risk. However, they do not study whether or to what extent these effects are attenuated or strengthened by tax complexity and where tax employees are located. Bruehne and Schanz (2022), for their part, provide interview-based evidence that tax risk management in multinationals is usually not integrated into general enterprise-wide risk management. Hence, we conjecture that increases in tax risk are likely to materialize in the tax department rather than in a general risk management department within a multinational.

Our findings have important implications both for decision-makers in multinationals and policymakers. From a business perspective, we inform decision-makers about the effectiveness of investment in tax departments. Our findings suggest that staffing tax employees in countries with complex tax procedures may help to manage tax risks in these countries. We inform tax policymakers about the costs of tax complexity by revealing the need for additional corporate tax employees to manage tax risk. Given the international trend toward more complex tax regulations, these costs may be an undesirable byproduct of new regulations and procedural requirements and might undermine the goal of better compliance. We also quantify the share of incremental tax complexity that translates into a higher tax risk for firms. Finally, our results also inform researchers about the associations among tax complexity, tax department structure, and tax risk, thus combining three streams of empirical tax research and contributing to a better understanding of the black box of tax planning (Dyreng and Maydew, 2018).

2. Hypotheses

The location of tax employees is, in the first instance, a choice on the mix between a central tax department in the home country of the multinational and a decentralized tax department with

employees (also) in the foreign host countries. The literature has documented that this choice involves a trade-off between the total cost of knowledge transfer and foreign employee control (e.g., Nagar, 2002). While centralized decisions tend to be better aligned with a multinational's strategy and goals, these decisions are, ceteris paribus, less informed (Deller and Sandino, 2020).[4] For tax departments, being familiar with the peculiarities of the local regulations and procedures might be particularly important (for transfer pricing, see Kohlhase and Wielhouwer, 2023). Transferring this convoluted information is costly (Jensen and Meckling, 1990; Demsetz, 1988), and these costs increase with the complexity of regulations and procedures.

Choosing a tax strategy and its implementation can benefit from country-specific knowledge, as being familiar with the local tax regulations and procedures helps ensure compliance and develop tax planning strategies. Local tax employees have better information on local tax legislation, regulation, and procedures, and can therefore better communicate with the local tax authorities. As tax legislation changes rapidly (Ward, 2020), following all relevant changes in all operating countries is challenging for a central tax department and may require installing tax employees in subsidiaries (Hayek, 1945).

We assume that the benefits associated with local tax employees increase with the complexity of the local tax code and framework and that the costs associated with these employees are independent of the complexity. We therefore regard hiring local tax employees as one way for multinationals to cope with a complex tax system. We formulate our first hypothesis as follows.

H1: *Companies locate more tax employees in more tax-complex countries.*

Our second hypothesis focuses on the relationship between the location of tax employees in countries with high tax complexity and the firm's tax risk. We assume that tax complexity may

[4] Deller and Sandino (2005) show, with regard to the hiring of new personnel for retail shops, that centralized hires are more aligned with the firm values but that this sort of hiring neglects local knowledge.

affect the firms' tax risk through two channels. Tax complexity may result in confusion and overload and thus higher tax uncertainty. Tax uncertainty can emerge from tax authorities, taxpayers, and courts interpreting the law differently (Mills et al., 2010; Lisowsky et al., 2013; Jacob and Schuett, 2020; Neuman et al., 2020). A complex tax code may exacerbate this situation. Tax complexity may also affect tax risk through another, indirect channel, i.e., the effect on tax avoidance practices. The literature has demonstrated that (aggressive) tax avoidance is, ceteris paribus, associated with higher tax risk (e.g., Blouin, 2014; Dyreng et al., 2019). However, the direction of how tax complexity affects tax risk through this channel is unclear. On the one hand, the ambiguity resulting from tax code complexity may offer multinationals additional leeway for tax avoidance (Hoppe et al., 2020; Krause, 2000; Laplante et al., 2019), which in turn might increase tax risk. On the other hand, firms may associate high tax complexity with greater fairness, which may improve tax morale and enhance compliance and thus reduce tax risk (Hoppe et al., 2023). Further, if high tax complexity results from comprehensive and restrictive anti-tax avoidance legislation, it may reduce opportunities for tax planning and reduce tax risk.

The relationship between the number of tax employees in countries with highly complex tax systems and tax risk should thus depend on these employees' tasks, responsibilities, and competencies. Installing local tax employees may ensure compliance with complex regulations and foster favorable settlements in complex tax procedures, so we expect additional local tax employees to be associated with lower tax risk. We expect that having tax employees in countries with high tax complexity may also support the central tax department in implementing an appropriate tax planning strategy. Having more local tax employees may result in better-informed decisions and thus lower tax risk. Chen et al. (2021) document that, in general, incremental investment in the tax department is associated with lower effective tax rates and lower tax risk. We therefore expect that

this relation even strengthens when tax complexity is high. We thus formulate our second hypothesis as follows.

H2: *Multinationals with more tax employees in tax-complex countries have a lower overall tax risk.*

However, whether firms behave in accordance with our two hypotheses is not straightforward and requires an empirical investigation. First, compliance with a complex tax code may also be maintained via other channels, for example, by a sophisticated digital infrastructure, like an advanced Tax Compliance Management System or automated tax bots that accomplish routine activities in tax compliance. Routine tasks may also be delegated to shared services centers in low-wage countries. Furthermore, multinationals may outsource specific tax activities to external advisers, as documented for example by Bustos et al. (2023). What's more, the effectiveness of having more local tax employees might depend on the country's policies and the particular kind of tax complexity. If complex transfer pricing regulations, for example, create the risk of uncoordinated treatment by tax authorities and thus double taxation, additional tax staff will not necessarily improve the outcome. Theory suggests cost also may play a role: firms are willing to invest in tax uncertainty shields only if the cost remains below a critical threshold that depends on the degree of uncertainty (Diller et al. 2017).

3. Research Design

According to Hypothesis 1, we expect that the location of tax employees in foreign subsidiaries of a multinational is positively associated with the level of tax complexity in that country. We use regressions described by Equation (1) based on multinational-country level data to test this

hypothesis. We consider all foreign countries[5] c, in which multinational i operates at least one subsidiary, as separate observations.

$$TaxEmp_{ic} = \beta_0 + \beta_1 TaxComplexity_c + \gamma\ Controls_{ic} + \mu\ MNE_i + \varepsilon_{ic}. \quad (1)$$

$TaxEmp_{ic}$ is our dependent variable, which captures the use of tax employees by multinational i in country c. We define $TaxEmp_{ic}$ either as an indicator variable ($TaxEmp\_d_{ic}$), indicating whether multinational i employs at least one tax department employee in country c, or as a count variable ($TaxEmp\_c_{ic}$), representing the number of tax employees in that country. Using the two variables allows us to investigate not only the general need for tax employees in a country ($TaxEmp\_d_{ic}$) but also the intensity of employment ($TaxEmp\_c_{ic}$). We use a probit model, a logit model, and a linear probability model to test the influence of tax complexity on $TaxEmp\_d_{ic}$ and a Poisson pseudo-maximum likelihood model, a negative binomial model, and a linear model for $TaxEmp\_c_{ic}$.[6]

$TaxComplexity_c$ is our primary independent variable and measures the complexity of a country's corporate income tax system. We use the Tax Complexity Index developed by Hoppe et al. (2023) and its sub-components—tax code complexity and tax framework complexity for 2018—as our primary measures. In robustness tests, we also consider the PwC Paying Taxes 2018 scores as alternative proxies for complexity. We primarily rely on the Tax Complexity Index since it focuses on the tax complexity faced by multinationals, is exclusively dedicated to tax complexity and based on a well-grounded approach, while the PwC data also reflects other influences on the country-level tax burden.[7] For the convenience of our readers, we transform all

[5] In untabulated regressions, we use home country subsidiaries instead of foreign subsidiaries. We find similar but smaller inferences.

[6] Due to the nature of our date, the main estimation methods are the probit and the Poisson model. To account for overdispersion in the count variable, we use heteroskedasticity robust standard errors when using the Poisson model (Wooldrigde, 2002, p. 657; see also Blackburn, 2014 for an evaluation of the Poisson and negative binomial estimator and Gould, 2011 for the advantages of Poisson estimation over log-linear regression).

[7] The TMF Group and OECD ISORA data for tax complexity are less suited for our analysis since they also reflect other aspects of financial complexity (TMF) or are restricted to one specific aspect (OECD ISORA).

considered tax complexity proxies in a way that high values reflect greater tax complexity. Even though these measures capture different facets of complexity, we expect a positive coefficient estimate for β_1 for all tax complexity measures.

We control for several multinational- and country-level influences to capture, in particular, the overall relevance of a location for the respective multinational as well as country characteristics that may drive employee recruitment decisions. We include GDP_c and $GDPgrowth_c$ to control for the size and growth of the economy. $Education_c$ is included to cover a potential preference for employees in countries with a higher standard of education, given the demanding requirements regarding the abilities and skills of tax employees. Additionally, we control for labor laws and environmental regulations in the respective country using data from the OECD ($LaborLaw_c$, $EnvironmentLaw_c$). Since stricter labor laws reduce a firm's flexibility to reduce the workforce, firms may abstain from hiring employees and instead rely on external service providers. We control for $Corruption_c$ and the country's statutory tax rate $STAXR_c$ as additional determinants of the location choice. The multinational-specific number of subsidiaries in country *c* divided by the overall number of subsidiaries of the multinational ($ShareSubsidiaries_{ic}$) indicates the general relevance of a location for the respective multinational.[8] To control for coordination costs and the costs of knowledge transfer between a foreign subsidiary and the head office, our regression model also includes the indicator variable $Language_{ic}$, taking one if the head office country and the subsidiary country share a common language, and the variable $Distance_{ic}$, measuring the distance between the head office and the subsidiary country. We also include the World Governance Indicators from the World Bank to control for the country's governance quality. Lastly, we use

[8] In untabulated robustness tests, we use the multinational's share of total assets in the respective country as a proxy for relevance. Since the information on total assets is not provided for all subsidiaries in ORBIS, we decided not to consider this definition for our baseline regressions.

multinational fixed effects (MNE_i) to account for general multinational-specific influences and preferences, such as size or the general preference of the multinational to organize its tax department in a centralized or decentralized manner. We provide definitions for all variables in Table 2. Descriptive statistics for all variables included in Equation 1 are reported in Table 3.

We use a second set of regressions based on multinational-level data to analyze the relationship between tax risk and tax personnel in high-complexity countries. We test Hypothesis 2, i.e., whether having more tax employees in countries with highly complex tax systems is associated with less tax risk. Again, the cross-sectional nature of our data allows us only to exploit between-variation for the purposes of identification.

$$TaxRisk_i = \beta_0 + \beta_1 EmpCompl_i + \beta_2 AvgTaxComplexity_i + \beta_3 CTD_i + \beta_4 TaxEmp_i + \gamma\ Controls_i + \eta\ HomeCountry_i + \delta\ Industry_i + \varepsilon_i. \quad (2)$$

Following the literature (Guenther et al., 2017; McGuire et al., 2013), we use the three-year standard deviation of Cash ETR ($SD\_CashETR3_i$) as the primary measure of tax risk. The descriptive statistics for this variable (Table 4) reveal that the average level of tax risk in our sample (12.8 percent) resembles the level of tax rate volatility observed in prior studies based on US data (13 percent reported by Gallemore and Labro, 2015 and 14.3 percent reported by Guenther et al., 2017).

We assume that tax risk is driven by the level of tax complexity at the different locations of the multinational, either through complex tax regulations or from complex tax administration procedures. The variable $AvgTaxComplexity_i$ captures this effect. It is defined as the average Tax Complexity Score weighted with the number of subsidiaries of a multinational at a specific location.

We expect in Hypothesis 2 that multinationals can reduce their tax risk by locating tax employees in high tax complexity countries. Hence, we include $EmpCompl_i$ as the main

independent variable in Equation (2). $EmpCompl_i$ captures the number of tax employees in high complexity countries. We use four different definitions of this count variable to ensure that the findings are not driven by the specific definition. As the primary specification, we use the count of tax employees located in the top decile of the tax complexity index ($EmpCompl\_10\%_i$), while $EmpCompl\_25\%_i$ follows the same definition but refers to the top quartile. Since the use of cutoffs involves subjectivity, we use two additional proxies that weight the number of tax employees per country with the local tax complexity score. They are calculated as the sum of the number of tax employees located in a country multiplied by its tax complexity index score, scaled by the worldwide average tax complexity level ($EmpCompl\_weight1_i$) or the average tax complexity score of the multinational ($EmpCompl\_weight2_i$).

The literature has documented the effects of overall investment in tax department personnel (Chen et al., 2021) on tax risk. Following Chen et al. (2021), we include the total number of multinational *i*'s tax employees divided by the total number of employees ($TaxEmp_i$) to control for the overall investment in tax department personnel. Our sample average of 0.00819 for $TaxEmp_i$ implies that 0.82 percent of the total workforce of multinationals in our sample work for the tax department. Our dataset is comparable in this respect to the data used by Chen et al. (2021), who observed a sample average of 0.85 percent of firms' employees working in the tax department. Additionally, we control for the tax department centrality by including the share of tax employees working in the home country of the multinational (CTD_i). On average, 36.7 percent of the tax employees in our sample are located in the home country, which is comparable to the 37 percent reported by KMPG (2016).

Following Chen et al. (2021), we control for size ($SIZE_i$), return on assets (ROA_i), market-to-book ratio (MTB_i), leverage (LEV_i), property, plant, and equipment (PPE_i), R&D expenditures ($R\&D_i$), intangible assets (INT_i), inventory (INV_i), the number of segments reported in the annual

report of 2018 (SEG_i), and auditor provided tax services ($APTS_i$). Auditor-provided tax services can be substitutes or complements for firm-internal members of the tax department.[9] Auditors can use the gathered knowledge to advise tax avoidance strategies (Cook and Omer, 2013; Hogan and Noga, 2015; Klassen et al., 2016), which may increase tax risk (Francis et al., 2019) or reduce it (Neumann, 2016; Watrin et al., 2019). Following Gallemore and Labro (2015), we control for internal information quality (IIQ_i) using earnings announcement speed, calculated as the days between the end of the fiscal year and the firm's earnings announcement divided by 365 and multiplied by minus one. Motivated by De Simone et al. (2015) and Guenther et al. (2017), we also include the level of tax avoidance ($CashETR3_i$ and $GaapETR3_i$, respectively) and the volatility of return on assets (SD_ROA3_i).[10] In addition to the level of tax avoidance, we control for the intensity of tax haven establishments ($TaxHavens_i$) using the number of tax haven subsidiaries scaled by the overall number of subsidiaries.[11] Lastly, we include the ratio of operating countries and the number of subsidiaries ($International_i$) to control for the degree of internationalization.

Since the dependent variable *TaxRisk* is measured over three years (2016 to 2018), we include all controls in terms of their three-year average. Following Chen et al. (2021), we winsorize all control variables at the first and 99th percentiles. We use home country fixed effects ($HomeCountry_c$) to control for home country-specific characteristics, especially the home country's tax rate.[12] Besides, we include industry fixed effects ($Industry_j$), using two-digit SIC Classification. We provide definitions (descriptive statistics) for all variables in Table 2 (Table 4).

[9] The correlation between size-adjusted $APTS_i$ and $TaxEmp_i$ in our sample is close to zero (-0.0699), indicating that no substitution effect between internal tax employees and external services seems to exist.
[10] In addition to the study variables, Chen et al. (2021) include an indicator for loss carryforward, change in loss carryforward, foreign operations, income from foreign operations, and internal control weakness. These variables are unavailable for European companies; thus, we exclude them from our regression design.
[11] To identify tax haven subsidiaries, we use the combination of tax haven lists of Bennedsen and Zeume (2018).
[12] In robustness tests, we use home country and industry fixed effects. We employ two-digit SIC Industry Classification when using industry fixed effects to control for business model diversity across segments.

4. Data

Our sample comprises European firms listed in the Stoxx600 index. We focus on Stoxx600 firms because they represent the largest and most important players in Europe; the index covers approximately 90% of the overall market capitalization of European stock markets. Moreover, Stoxx600 members are usually multinationals operating in complex and uncertain tax environments and sufficiently large to have an internal tax department.

We exclude firms operating in the real estate, oil, and financial industries, as industry-specific tax regulations may apply here. To qualify for inclusion in the final sample, multinationals need to have at least one direct tax department employee on the professional networking site LinkedIn, which leads to the exclusion of 26 firms. We further drop one firm with a dual listing, one advisory firm that provides tax services, and firms that are majority-owned by other Stoxx600 firms. Moreover, we exclude firms with a negative three-year pre-tax income over the sample period 2016 to 2018. These restrictions reduce our sample to 348 firms.

For each firm in our sample, we search LinkedIn[13] for employees working in a tax position.[14] As we are interested in the worldwide structure of the tax department, we screen for tax employees of the head office and all worldwide subsidiaries listed in the 2018 annual reports.[15] To identify tax employees, we perform a keyword search for "tax" in the job title both in English and the local language for each of these affiliates. We exclude tax employees with temporary jobs (e.g., interns) and employees whose job titles indicate a function unrelated to corporate income tax, such as payroll tax, property tax, or VAT. These employees account for approximately 10 percent of the overall tax employees. For each tax department employee, we collect information on the country

[13] LinkedIn is the best known professional online networking website. It has more than 800 million users in over 200 countries (Statista, 2022; Osman, 2022).
[14] The search took place at the end of 2019.
[15] The information quality of shareholding disclosure in annual reports has been questioned by prior research. However, Dyreng et al. (2020) find, for a US-sample, that "the overall incidence of nondisclosure is low."

of employment, the hierarchy level, and the academic background. Overall we identify 7,872 direct tax employees for the 348 multinationals included in our sample, i.e., on average, 22.3 tax employees per multinational. The majority of foreign tax employees are local tax experts, as we learn from the educational information from their LinkedIn profiles: 87.7 % of them have at least one degree from the country they are working in, whereas only 1.2 % of employees obtained a degree in the multinational's head office country.

Using data from public networking sites raises two concerns. First, the information in résumés is not subject to plausibility checks by the platform provider, which may raise concerns regarding data accuracy. We admit that job title manipulation or overestimating qualifications may occur; this, however, would not influence our results. We regard false statements on current (and past) employers to be unlikely, as detection risk is high.[16]

Second, it is unclear whether networking sites provide a representative sample of the overall workforce. We test the representativeness of our tax employee data with regard to the overall size of the tax department.[17] To validate the average tax department size observed in our data (22.3), we compare it to prior surveys and studies of tax departments. Studies by Klassen et al. (2017), Chen et al. (2021), and TEI (2012) all assess the size of tax departments. These studies employ different sources of information and refer to different countries and firms of varying size and are thus a valid benchmark to verify our hand-collected data.

Considering economies of scale, we assume that the tax department size increases in the balance sheet total.[18] Therefore, we extrapolate the number of tax employees observed in the

[16] Chen et al. (2021) validate their LinkedIn dataset by interviewing sample firms, finding the collected data to be slightly smaller but close to an accurate image of reality, which accords with findings in this section.
[17] In untabulated results, we also check for potential regional biases by assessing the correlation between continent sales and the distribution of tax employees.
[18] Accordingly, Chen et al. (2021) show that the number of tax employees increases with firm size but below linear growth. Dharmapala (2014) states that tax-planning expenditures decrease proportionally with firm size.

benchmark studies with total assets to ensure comparability to our own firm sample and report the results in Table 1. Altogether, the number of tax employees in our sample (22.3) approximates the extrapolated values in the benchmark studies [See Table 1].

We complement this data with financial and country information. We use financial statement information from Compustat Global and Thomson Reuters as well as two-digit SIC Industry Classification to identify a multinational's industry. As the collection of tax department employee data was accomplished in 2019, we refer correspondingly to the last three reports available at this point (2016 to 2018) for collecting financial statement data. We complement these data with hand-collected information on auditor-provided tax services (APTS) for 2016 to 2018 and segment reporting information from the 2018 annual reports. Further, we use country information from CEPII, IMF, OECD, KPMG, the World Bank, Transparency International, and the United Nations. Finally, we use two sources for complexity measures. We use the Tax Complexity Index by Hoppe et al. (2023) for the year 2018 as our main proxy to measure the countries' tax complexity. Additionally, we use the PwC paying taxes 2018 measures in robustness tests. All country controls are used in terms of their three-year average. Tables 2 to 4 provide detailed definitions as well as descriptive statistics on all considered variables.

5. Empirical Results

5.1 Tax complexity and the location of tax employees

We start our empirical analysis with the baseline regressions testing Hypothesis 1. We report regression results for six specifications based on multinational-country-level data, as outlined in Section 3. We include all countries in which the respective multinational has at least one foreign subsidiary and explain the probability of having a tax department employee (Specification (1) to (3), extensive margin) or the number of tax employees in this country (Specification (4) to (6),

intensive margin). Our main explanatory variable is the Tax Complexity Index of Hoppe et al. (2023).

Our results in Table 5 clearly show that the location of tax employees is associated significantly with the complexity of the local tax system. Irrespective of the model design, $TaxComplexity_c$ is positively associated with a significantly higher probability of at least one tax department employee in the respective country, as demonstrated in Specifications (1) to (3). The coefficient estimate for $TaxComplexity_c$ turns out to be statistically significant at conventional levels in all specifications. We evaluate the economic magnitude of the observed effects based on the linear probability model with an estimated semi-elasticity of 0.7715. According to this specification, a one standard deviation increase in tax complexity (0.074)[19] translates into an increase in the probability of having a tax department employee in the country of 5.7 percentage points or 24.4 percent of the sample average for $TaxEmpl\_d_{ic}$ (0.233).

Similarly, we find positive and statistically significant coefficient estimates in all three specifications using the intensive margin measure $TaxEmpl\_c_{ic}$, i.e., the count of tax employees. On average, firms in our sample have 0.23 more tax employees in countries with one standard deviation higher tax complexity. This corresponds to 1.1 percent of the average total number of tax employees in our sample (22.3).

The coefficients estimated for the control variables illuminate the nontax determinants of locating a tax department employee in a foreign country. The probability and number of tax employees increase with the economy's size (GDP_c) and decrease with economic growth ($GDPgrowth_c$). Surprisingly, a high level of education leads to a smaller probability and number

[19] Such an increase in tax complexity was experienced, for example, by the United States after the implementation of the TCJA (plus 7.7 percentage points).

of tax employees in the respective country.[20] Consistent with cost arguments, more tax employees can also be observed in countries that share a common language with the head office country (positive coefficient estimate for $Language_{ic}$), and stricter labor laws reduce the number as well as the likelihood of tax employees. More tax employees are found if the presence in the foreign country is substantial in terms of the number of subsidiaries (positive coefficient estimate for $ShareSubsidiaries_{ic}$) [See Table 5].

In Table 6 Panel A, we repeat the analysis from Table 5 but replace the Tax Complexity Index with its two sub-components—tax code complexity and tax framework complexity. According to Hoppe et al. (2023), tax code complexity describes the complexity of 15 regulations "that cover a major part of the tax code and are suitable for an international comparison." The complexity of these regulations is valued separately in five different dimensions. Tax framework complexity captures the complexity that arises from the legislative and administrative procedures inherent to taxation. Again, tax framework complexity is quantified based on five different dimensions, each of which is evaluated based on dimension-specific drivers of complexity. Control variables are included, as before, but not reported [See Table 6].

Our findings in Table 6 Panel A indicate that tax employees are allocated internationally in accordance with tax framework complexity rather than tax code complexity. Tax framework complexity shows a significant and positive effect in all six specifications, whereas tax code complexity turns out to be insignificant in all of them. Also, the coefficient size for tax framework complexity is considerably larger than for tax code complexity throughout all specifications. The difference between the coefficient estimates for the two dimensions of tax complexity is statistically significant at conventional levels in five out of six specifications, as indicated by an

[20] One possible explanation for this finding is that multinationals trust external service providers more than internal tax employees in countries with lower levels of education.

F-Test. We thus conclude that these employees are dealing with tax procedures, such as compliance tasks, rather than the interpretation of tax regulations.[21]

In Table 6 Panel B, we further compare the relevance of the tax framework complexity dimensions. Due to the multicollinearity of these different dimensions, we cluster them into two categories along the workflow of a firm's tax process to reduce dimensions. The first component ($PrefilingFiling_c$) comprises enactment, guidance, and payment and filing. It measures the complexity of procedures that arise before and while filing a tax return. The second component ($Postfiling_c$) represents the complexity of procedures that arise after the return is filed (audits and appeals). The results reported in Table 6 Panel B indicate that only complexity in the prefiling and filing procedures is significantly positively associated with the location of tax employees, both in terms of the extensive and intensive margins. A possible explanation is that more internal capacity allows firms to better follow complex legislative processes and deal with more complex filings and tax payments, whereas post-filing procedures, such as tax audits and appeals, can be influenced less by the firm itself. Additionally, these cases might be happening less regularly, leading firms to rely more on external service providers.

Table 7 reports the results of a heterogeneity analysis. For each sample split, we compare the lowest to the highest quartile of multinationals. We use the following dimensions: level of the ETR, size, internationalization, and business complexity. While the positive effect of tax complexity on the number of tax employees is observed for all subgroups, the effect strengthens for larger multinationals, more internationalized ones, and those with more complex business models. We do not find any significant effect of different levels of ETRs. The latter result indicates that these employees seem not to be used for tax planning purposes [See Table 7].

[21] This also aligns with descriptive evidence from the tax employees' job descriptions. We find a statistically significant higher share of tax employees with compliance-oriented job descriptions in foreign countries than tax planning-oriented ones.

Our results are robust to several modifications. In Table 8, we replace the Tax Complexity Index with an alternative measure, the PwC Paying Taxes Index (2018). The results support our baseline findings, both when using the overall rank or sub-categories of the index. Analyzing the separate components of the index, we find the strongest results for the $EasePayingTaxes_c$, $TimetoComply_c$, and $PostFilingIndex_c$, which seem most comparable to the Tax Complexity Index. Contrastingly, we find no effects for $TaxandContributions_c$ (which captures the level of the tax rate, not tax complexity) and negative but only partly significant results for $NumberPayments_c$ (which reflects the method and the frequency of payments) [See Table 8].

We also test whether our results are driven by the observations from a specific country. We disregard the observations of one country at a time and display the resulting coefficient estimates for $TaxComplexity_c$ from the baseline regressions in Figure 1. No single country affects our findings to any significant extent [See Figure 1].

We test the robustness of our findings to alternative definitions of the dependent variable, the tax complexity measure, and the inclusion of further control variables in several additional untabulated tests. With regard to the dependent variable, we consider (1) $TaxEmpl\_c_{ic}$ in terms of its natural logarithm,[22] (2) a definition that adjusts the number of tax employees observed for a specific country by the coverage of this country on LinkedIn, and (3) a definition that weights each tax department employee by his or her respective position (i.e., head of tax, tax manager, or tax employee), assigning greater weight to higher-level employees. With regard to the tax complexity measure, we use the countries' ranks and indicator variables for the top quintile and quartile instead of referring to the index values directly. None of these changes affect our inferences.

[22] We increase $TaxEmpl\_c_{ic}$ by one before taking the logarithm to avoid losing meaningful zero values.

In terms of additional control variables, we include two variables that reflect the degree of digitization and automatization of a country's tax processes. We consider a proxy for the digital offers of tax administrations and the degree of pre-filling in tax returns, both of which are derived from country-level tax technology data provided by the OECD. We regard these variables as potential drivers of the need for local tax employees but disregard them in the baseline regressions since tax framework complexity may also reflect these aspects. Like Eichfelder and Hechtner (2016), we find more tax employees in countries with a more digitalized tax administration (positive coefficient estimates for $DigitalInteraction_c$ and $Prefilled_c$), while the coefficients for tax complexity change only marginally.

We test the relevance of two further modifications of our control variables (untabulated) that result in a reduction of the sample size and were therefore disregarded for the baseline specification. First, we use aggregated total assets of a multinational's subsidiaries per country to proxy for the economic importance of the respective country, instead of relying on the share of subsidiaries located in that country. The association between tax complexity and having at least one tax department employee in the respective country ($TaxEmpl\_d_{ic}$) remains positive and statistically significant, though the effect size is now approximately 20% smaller. Second, we consider that multinationals could also rely on external tax advisers. Since tax advisory fees on a micro-level are not directly observable, we use country-level data on non-audit fees published by Big Four companies scaled by GDP. We find a positive and statistically significant coefficient estimate for the non-audit fees, indicating a complementary relation rather than a substitution effect. The coefficient estimate of tax complexity increases by almost 20 %.

5.2 Tax risk and tax employees in high-complexity countries

The results of the previous section show that multinationals consider tax complexity when locating their tax employees and do so in particular to overcome problems associated with high tax

framework complexity. Since hiring additional tax employees does not come free, this effect may constitute a first source of costs associated with tax complexity.

In this section, we turn to a second potential cost of tax complexity, i.e., tax risk. To this end, we estimate Equation (2) described in Section 3 based on multinational-level data, following a model consistent with Chen et al. (2021). However, we include two additional variables, $AvgTaxComplexity_i$ and $EmpCompl_i$, which allow us to test whether multinationals subject to a higher average tax complexity face a higher tax risk and to what extent this effect can be mitigated via in-country tax employees (Hypothesis 2).[23]

We employ four different definitions of $EmpCompl_i$ in the four specifications reported in Table 9. In specifications (1) and (2), we use the count of tax employees that multinational *i* has in countries that range in the top decile (Specification (1)) or top quartile of tax complexity (Specification (2)).[24] In specifications (3) and (4), we weight a country's tax complexity with the number of tax employees of multinational *i* and scale it by the worldwide average of tax complexity (Specification (3)) or the multinational-specific average of tax complexity (Specification (4)).

Our findings in Table 9 show that tax risk is positively associated with the existence of subsidiaries in high-complexity countries. $AvgTaxComplexity_i$ has a positive and statistically significant effect of similar effect size in all four specifications. A coefficient of 1.04 (Specification (1)) implies that a one standard deviation increase in $AvgTaxComplexity_i$ (0.02) is associated with an increase in tax risk of 0.02, which is equivalent to 15 percent of the sample average.

At the same time, our results in Table 9 also strongly support our second hypothesis. Tax risk is significantly negatively related to all four proxies for $EmpCompl_i$. An additional tax department

[23] Besides these two variables, we also deviate from Chen et al. (2021) by additionally controlling for the general structure of the tax department (*CTD*).

[24] The countries in the top decile of tax complex countries are Brazil, Columbia, Indonesia, Italy, and Romania, whereas, for the top quartile of tax complex countries, the following countries are additionally added: Belgium, Cyprus, Peru, Philippines, Poland, Portugal, Ukraine, and the United States.

employee in a country from the top decile (*EmpCompl_10%$_i$*) or top quartile(*EmpCompl_25%$_i$*) of tax complexity comes along with 0.36 or 0.20 percentage points less tax risk. This also reveals that the effect on incremental tax risk is smaller if the additional tax employees are located in countries with less tax complexity. A one standard deviation increase of *EmpCompl_10%$_i$* (6.508) is associated with a decrease in tax risk by 0.023 or 18 percent of the sample average. Additionally, we find similar magnitudes when we use the tax complexity weighted measures in columns 3 and 4 [See Table 9].

We perform the same heterogeneity tests as for Hypothesis 1 (untabulated). In contrast to the results reported in Table 7, the relationship between tax personnel in high complexity countries and tax risk does not depend significantly on the analyzed firm characteristics.

Given our findings in Table 6 Panel A that firms' tax department staffing differs with its association with tax code complexity and tax framework complexity, we assess in Table 10 whether there are corresponding differences with respect to their relationship with tax risk. Specifications (2) and (4) in Table 10 show the results of estimating equation (2) for tax framework complexity and tax code complexity separately. *EmpFrameCompl_10%$_i$* and *EmpCodeCompl_10%$_i$* are defined as the number of tax employees in countries in the top decile of tax framework and tax code complexity. Our results suggest that having more tax employees in countries with high tax framework complexity is associated with significantly lower tax risk. The corresponding coefficient for *EmpCodeCompl_10%$_i$* is also negative but smaller and statistically insignificant.

However, the findings in columns (2) and (4) of Table 10 do not reveal to what extent firms in our sample actually use tax employees to mitigate the effects of high tax framework complexity or high tax code complexity on tax risk. We therefore also estimate a reduced model in columns (1) and (3), in which we do not separately control for *EmpFrameCompl_10%$_i$* and *EmpCodeCompl_10%$_i$*. In this case, the coefficients for *AvgTaxFrameComplexity$_i$* and

AvgTaxCodeComplexity$_i$ reflect the residual effect of the two dimensions of tax complexity. The coefficient for *AvgTaxFrameComplexity*$_i$ in column (1) is insignificant and close to zero, indicating that firms in our sample effectively eliminate the incremental risk related to a high tax framework complexity. In contrast, the coefficient for *AvgTaxCodeComplexity*$_i$ remains positive and statistically significant in column (3) and is only 14 percent smaller (0.787 compared to 0.912) than in column (4) [See Table 10].

We test the robustness of our baseline findings from Table 9 in various additional tests. In Table 11, we test four alternative definitions of our dependent variable and two modifications of *EmpCompl_10%*$_i$. We find statistically significant effects for *EmpCompl_10%*$_i$ for two of the alternative tax risk measures (winsorized three-year standard deviation of cash ETR and taxes for previous years obtained from the annual reports of 2016 to 2018). The results for the five-year standard deviation of cash ETR and the three-year standard deviation of GAAP ETR approach statistical significance at conventional levels. With regard to our primary independent variable, *EmpCompl_10%*$_i$, we use an adjusted definition that accounts for country-level differences in the coverage of employees on LinkedIn (column (5)) and define it with reference to the overall PwC Paying Taxes Score (column (6)). Our results are robust to both of these modifications.

We also perform a structural equation model (SEM)[25] to account for potential multi-dependency relationships (Table 12). We include factors that potentially affect the use of tax employees in tax complex countries, such as the multinational's average tax complexity, the amount of auditor-provided tax services, the number of tax employees, and the tax department centrality as well as the size of the multinational and its business complexity. All of these variables have been controls in Equation (2). The analysis reveals that the size of the multinational, the

[25] SEM have been used in a number of accounting areas before (e.g., financial accounting (Gillet and Uddin, 2005), managerial accounting (Cadez and Guilding, 2008), and auditing (Deumes et al., 2012)). In tax research, Henderson and Kaplan (2005) and Blanthorne and Kaplan (2008) also use SEM.

average tax complexity, the number of tax employees, and the organizational form of the tax department affect the use of tax employees in tax complex countries, whereas the business complexity and auditor-provided tax services show no effect. Conditional on this analysis, we again find a negative and statistically significant effect of $EmpCompl\_10\%_i$ on tax risk. The effect size is comparable to the baseline finding in Table 9 (91% of the effect), and the statistical significance remains unchanged [See Table 12].

We argue that multinationals locate additional tax employees in high-complexity countries to improve compliance with the complex regulations. This assumption is supported by the finding that foreign tax employees of multinationals more often refer to compliance activities in their LinkedIn job descriptions than do tax department personnel for the head office.[26] Besides, the vast majority of foreign tax employees have experience in the local tax law from an educational program in the foreign country. Nevertheless, we cannot rule out the possibility that multinationals also appoint foreign tax employees to avoid taxes, which may bias our findings. To address this concern, we use a regression design similar to Equation 2 but replace our risk proxy with proxies for tax avoidance (three-year cash and GAAP ETR). In untabulated results, we find that neither the average level of tax complexity nor the number of tax employees in tax-complex countries is associated with more tax avoidance.[27]

[26] We compare the share of a multinational's home country and foreign employees engaged in tax planning and tax compliance. The share of tax compliance employees is almost twice as high in foreign entities as in the home country. This difference is statistically significant at the 5 percent level. In contrast, we find no significant difference for the location of tax avoidance employees.

[27] The current level of complexity in a country could also be induced by the prior year's profit shifting of companies, which requires local staff. In this case, these employees would rather indicate (past) tax avoidance than the need for more expertise due to high tax complexity. To mitigate this reversed causality concern, we also test the relevance of one-, two-, and three-year lagged tax avoidance. Again we do not find evidence of an association between the number of tax employees in highly tax-complex countries and earlier-period tax avoidance.

5.3 Costs of a complex tax system

The literature documents that higher tax risk is associated with higher overall firm risk (Guenther et al., 2017; Hutchens and Rego, 2015), higher cost of equity (Hutchens and Rego, 2015), and lower firm value (Drake et al., 2017; Jacob and Schuett, 2020). Drake et al. (2017) show that, for the United States, ceteris paribus, a one standard deviation increase in tax risk leads to a reduction in Tobin's q of about 2 percent. Second, firms may respond to high tax complexity by hiring additional tax staff. While this practice may compensate for the additional tax risk, it comes at the cost of additional employee compensation.

We now assess these costs associated with a high tax code or tax framework complexity more closely. Our results suggest that the economic effects associated with the two types of tax complexity differ. According to the results in Table 10, a one standard deviation increase in the average tax framework complexity leads, on average, to a 0.65 percentage point higher tax risk. Two and a half more employees in countries in the top decile of tax framework complexity are sufficient to offset this effect. The costs associated with this investment in tax personnel are comparatively low. Using the average salary of tax employees for countries in the top decile of tax complexity ($ 23,848),[28] the additional wage costs of these 2.5 employees are only approximately $ 60,000. It is therefore unsurprising that firms in our sample apply this strategy and locate their tax personnel accordingly.

The economic implications of tax code complexity differ. According to the results reported in Table 10 specification (4), firms in our sample cannot significantly reduce tax risk by increasing

[28] Chen et al. (2021) report an average salary of tax employees in the United States of $ 114,933 in 2016. Using this value and the average wage level of each sample country, we calculate the average salary of a tax department employee for each country. We use this information and the number of tax employees in each country to calculate the average cost per tax department employee in the top decile of tax complex countries Since these values only reflect net wages without any additional employee-related firm costs, our estimates are the lower bound of costs associated with tax complexity.

tax department staff in countries in the top decile of tax code complexity. Instead they seem not to locate tax personnel depending on countries' tax code complexity. A high average tax code complexity is thus associated with a significantly higher tax risk for the multinational, regardless of whether we control for tax employees in high-complexity countries (Table 10 specifications (3) and (4)). A multinational with a one standard deviation higher average tax code complexity is, on average, subject to 2.1 percentage points or 8 percent of the sample average higher tax risk. If a one standard deviation increase in tax risk reduces the market capitalization of affected firms by 2 percent, as predicted by Drake et al. (2017), then a reduction in average market capitalization of 0.16 percent can be expected. Using the year-end closing market capitalization of the STOXX600 as of 2018 of $ 7.42 trillion, this effect translates into a reduction in market capitalization of $ 11.88 billion or, on average, $ 19.8 million per firm.

One possible explanation is that high tax code complexity, as opposed to high tax framework complexity, increases tax risk for reasons that cannot be mitigated by careful tax planning or closer communication with the tax authorities. Transfer pricing, for example, carries the risk of double taxation if mutual agreement procedures fail, which is beyond the taxpayer's control. Interest expense limitation rules carry the risk of nondeductibility of interest expense if companies have insufficient EBITDA, which is also typically beyond the control of the tax department. Thus, hiring more tax employees may be less effective at attenuating tax risk from complex tax regulations.

A second possible explanation is that firms consider the required investment costs needed to reduce tax risk related to tax code complexity to be too high (Diller et al., 2017). We test this presumption using a nonlinear regression by adding a quadratic term[29] to Equation (2). Figure 2 displays the marginal effect of an additional tax employee in countries with the most complex tax

[29] Modeling compliance costs using a quadratic cost function is common in the literature (e.g., Baldenius and Michaeli, 2017).

framework (Panel A) and the most complex tax code (Panel B) on tax risk. Again we find adverse effects for the two dimensions of tax complexity. For tax framework complexity, the marginal effect of an additional employee on tax risk diminishes with the existing number of tax employees. In contrast, firms require a substantial minimum number of employees in countries with a very complex tax code to manage the inherent tax risk. It may be that firms consider the required investment in the tax department to be too high and therefore decide not to minimize their tax risk in this way [See Figure 2].

6. Conclusion

We analyze the influence of tax complexity on tax risk and the location of tax employees. We combine hand-collected data on more than 7,500 tax employees from 348 European multinationals with a novel and innovative measure of tax complexity, the Tax Complexity Index. We examine (1) whether greater tax complexity is associated with more tax employees in a country, (2) whether firms with a higher average tax complexity face a higher tax risk, and (3) to what extent having more tax employees in countries helps reduce tax risk.

Our analysis leads to three main findings. First, we find that a high level of tax complexity is associated with a higher probability of having a tax department employee and more tax employees at multinationals' foreign locations. A 10 percent increase in tax complexity increases the probability for a tax department employee by 2.1 percentage points. Our results suggest that the demand for additional tax employees is driven by highly complex administrative procedures rather than complex tax rules. Second, our findings provide the first evidence that the level of tax complexity is associated with greater tax risk. Third, multinationals with more tax employees in high-complexity countries have less tax risk, even though possible alternative solutions are available, such as using automated tax bots or external advisers. A one standard deviation increase in this variable is associated with a reduction in tax risk equivalent to almost 20 percent of the

average tax risk in our sample. However, having more tax staff seems only to help manage tax risks from complex administrative processes and not from complex tax rules.

Our findings have significant implications for policymakers, business decision-makers, and researchers. We inform policymakers about the costs of a complex tax system—additional tax employees or higher tax risk. This finding is particularly relevant, given the current trend toward higher complexity in international tax systems. We inform decision-makers in multinationals about the extent and conditions under which local tax experts help reduce tax risk. Finally, we illuminate the black box of tax risk management and contribute to the novel and growing empirical literature on efficient tax department structuring.

References

Amberger, H., Gallemore, J., Wilde, J. H., 2024. Corporate Tax System Complexity and Investment. WU International Taxation Research Paper Series No. 2023-11, Kenan Institute of Private Enterprise Research Paper No. 4607146. https://ssrn.com/abstract_id=4607146.

Armstrong, C. S., Blouin, J. L., Larcker, D. F., 2012. The incentives for tax planning. Journal of Accounting and Economics 53 (1–2), 391–411. https://doi.org/10.1016/j.jacceco.2011.04.001.

Baldenius, T., Michaeli, B., 2017. Investments and Risk Transfers. The Accounting Review 92 (6), 1–23. https://doi.org/10.2308/accr-51720.

Barrios, J. M., Gallemore, J., 2024. Tax Planning Knowledge Diffusion via the Labor Market. Management Science 70 (2), 1194–1215. https://doi.org/10.1287/mnsc.2023.4741.

Bennedsen, M., Zeume, S., 2017. Corporate Tax Havens and Transparency. The Review of Financial Studies 31 (4), 1221–1264. https://doi.org/10.1093/rfs/hhx122.

Blackburn, M. L., 2014. The Relative Performance of Poisson and Negative Binomial Regression Estimators. Oxford Bulletin of Economics & Statistics 77 (4), 605–616. https://doi.org/10.1111/obes.12074.

Blanthorne, C., Kaplan, S., 2008. An egocentric model of the relations among the opportunity to underreport, social norms, ethical beliefs, and underreporting behavior. Accounting, Organizations and Society 33 (7–8), 684–703. https://doi.org/10.1016/j.aos.2008.02.001.

Blouin, J., 2014. Defining and Measuring Tax Planning Aggressiveness. National Tax Journal 67 (4), 875-900. http://dx.doi.org/10.17310/ntj.2014.4.06.

Bruehne A. I., Schanz, D., 2022. Defining and Managing Corporate Tax Risk: Perceptions of Tax Risk Experts. Contemporary Accounting Review 39 (4), 2861–2902. https://doi.org/10.1111/1911-3846.12785.

Budak, T., James, S., 2018. The level of tax complexity: A comparative analysis between the U.K. and Turkey based on the OTS index. International Tax Journal 44 (1), 23–36.

Busto, S., Pomeranz, D., Serrato, J. C. S., Vila-Belda, J., Zucman, G., 2023. The race between tax enforcement and tax planning: Evidence from a natural experiment in Chile. NBER Working Paper Series 30114. http://www.nber.org/papers/w30114.

Cadez, S., Guilding, C., 2008. An Exploratory Investigation of an Integrated Contingency Model of Strategic Management Accounting. Accounting, Organizations and Society 33 (7–8): 836–863. https://doi.org/10.1016/j.aos.2008.01.003.

Chen, X, Cheng, Q., Chow, T., Liu, Y., 2021. Corporate in-house tax departments. Contemporary Accounting Review 38 (1), 443–482. https://doi.org/10.1111/1911-3846.12637.

Chyz, J. A., 2013. Personally tax aggressive executives and corporate tax sheltering. Journal of Accounting and Economics 56 (2), 311–328. https://doi.org/10.1016/j.jacceco.2013.09.003.

Clotfelter, C. T., 1983. Tax Evasion and Tax Rates: An Analysis of Individual Returns. The Review of Economics and Statistics 65 (3), 363–373. https://doi.org/10.2307/1924181.

Collier, R., Kari, S., Ropponen, O., Simmler, M., Todtenhaupt, M., 2018. Dissecting the EU's recent anti-tax avoidance measures: Merits and problems. EconPol Policy Report No. 08/2018.

Cook, K. A., Omer, T. C., Kim, K., 2020. The cost of independence: Evidence from companies' decisions to dismiss audit firms as tax-service providers. Accounting Horizons 34 (2), 83–107. http://dx.doi.org/10.2308/horizons-18-009.

Deller, C., Sandino, T., 2020. Effects of a tournament incentive plan incorporating managerial discretion in a geographically dispersed organization. Management Science 66 (2), 911–931. https://doi.org/10.1287/mnsc.2018.3214.

Demsetz, H., 1998. The theory of the firm revisited. Journal of Law, Economics, & Organization 4 (1), 141–161. https://doi.org/10.1093/oxfordjournals.jleo.a036941.

De Simone, L., Ege, M., Stomberg, B., 2015. Internal control quality: The role of auditor-provided tax services. The Accounting Review 90 (4), 1469–96. https://doi.org/10.2308/accr-50975.

Deumes, R., Schelleman, C., Bauwhede, H. V., Vanstraelen, A., 2012. Audit Firm Governance: Do Transparency Reports Reveal Audit Quality? AUDITING: A Journal of Practice & Theory 31 (4), 193–214. http://dx.doi.org/10.2139/ssrn.1847924.

Devereux, M., 2016. Measuring Corporation Tax Uncertainty across Countries: Evidence from a Cross-Country Survey. Oxford University Centre for Business Taxation Working Paper No. 16/13. https://oxfordtax.sbs.ox.ac.uk/files/wp16-13pdf.

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. https://doi.org/10.1111/j.1475-5890.2014.12037.x.

Diller, M., Kortebusch, P., Schneider, G., Sureth-Sloane, C., 2017. Boon or Bane? Advance Tax Rulings as a Measure to Mitigate Tax Uncertainty and Foster Investment. European Accounting Review 26 (3), 441–468. https://doi.org/10.1080/09638180.2016.1169939.

Donohoe, M. P., McGill, G. A, Outslay, E., 2014. Risky business: The prosopography of corporate tax planning. National Tax Journal 67 (4), 851–874. http://dx.doi.org/10.17310/ntj.2014.4.05.

Drake, K. D., Lusch, S. J., , Stekelberg, J., 2017. Does Tax Risk Affect Investor Valuation of Tax Avoidance? Journal of Accounting, Auditing & Finance 34 (1), 151–176. https://doi.org/10.1177/0148558X17692674.

Dyreng, S. D., Hanlon, M., Maydew, E. L., 2010. The effects of executives on corporate tax avoidance. The Accounting Review 85 (4), 1163–1189. https://doi.org/10.2308/accr.2010.85.4.1163.

Dyreng, S. D., Hanlon, M., Maydew, E. L., Thornock, J. R., 2017. Changes in corporate effective tax rates over the past 25 years. Journal of Financial Economics 124 (3), 441–463. https://doi.org/10.1016/j.jfineco.2017.04.001.

Dyreng, S. D., Hanlon, M., Maydew, E. L., 2019. When Does Tax Avoidance Result in Tax Uncertainty? The Accounting Review 94 (2), 179–203. https://doi.org/10.2308/accr-52198.

Dyreng, S. D., Hoopes, J. F., Langetieg, P., Wilde, J. H., 2020. Strategic Subsidiary Disclosure. Journal of Accounting Research 58 (3), 643–692. https://doi.org/10.1111/1475-679X.12308.

Dyreng, S. D., Maydew, E. L., 2018. Virtual Issue on Tax Research. Journal of Accounting Research 56 (2), 311–311. https://doi.org/10.1111/1475-679X.12213.

Edmiston, K., Mudd, S., Valev, N., 2003. Tax structures and FDI: The deterrent effects of complexity and uncertainty. Fiscal Studies 24 (3), 341–359. https://doi.org/10.1111/j.1475-5890.2003.tb00087.x.

Eichfelder, S., Hechtner, F., 2017. Tax Compliance Costs: Cost Burden and Cost Reliability. Public Finance Review 46 (5), 764–792. https://doi.org/10.1177/1091142117691603.

Esteller-Moré, A., Rizzo, L., Secomandi, R., 2021. The role of tax system complexity on foreign direct investment. Applied Economics 53 (45), 5208–5220. http://dx.doi.org/10.1080/00036846.2021.1922587.

EY., 2021. The Tax Leader Imperative: How do you adapt to the changing tax risk landscape? https://www.ey.com/content/dam/ey-unified-site/ey-com/en-gl/campaigns/tax-leader/documents/ey-the-tax-leader-imperative-adapt-to-the-changing-tax-risk-landscape.pdf?download.

Francis, B. B., Hasan, I., Wu, Q., Yan, M., 2014. Are female CFOs less tax aggressive? Evidence from tax aggressiveness. The Journal of the American Taxation Association 36 (2), 171–202. http://dx.doi.org/10.2139/ssrn.2428541.

Francis, J., Neuman, S., Newton, N., 2019. Does Tax Planning Affect Analysts' Forecast Accuracy? Contemporary Accounting Research 36 (4), 2663–2694. https://doi.org/10.1111/1911-3846.12515.

Gallemore, J., Labro, E., 2015. The importance of the internal information environment for tax avoidance. Journal of Accounting and Economics 60 (1), 149–167. https://doi.org/10.1016/j.jacceco.2014.09.005.

Gillet, P. R., Udding, N., 2005. CFO Intentions of Fraudulent Financial Reporting. AUDITING: A Journal of Practice & Theory 24 (1), 55–75. https://doi.org/10.2308/aud.2005.24.1.55.

Gould, W., 2011. Use Poisson rather than regress; tell a friend. The STATA Blog. https://blog.stata.com/2011/08/22/use-poisson-rather-than-regress-tell-a-friend/.

Guenther, D., Matsunaga, S., Williams, B., 2017. Is tax avoidance related to firm risk? The Accounting Review 92 (1), 115–136. https://doi.org/10.2308/accr-51408.

Hanlon, M., Heitzman, S., 2010. A review of tax research. Journal of Accounting and Economics 50 (2-3), 127–178. https://doi.org/10.1016/j.jacceco.2010.09.002.

Hanlon, M., Nessa, M., 2023. The use of financial accounting information in the OECD BEPS 2.0 project: A discussion of the rules and concerns. National Tax Journal, 76 (1), 193–232. http://dx.doi.org/10.1086/723199.

Hayek, F. A., 1945. The use of knowledge in society. The American Economic Review 35 (4), 519–530.

Henderson, R., Kaplan, S., 2005. Inertia and Incentives: Bridging Organizational Economics and Organizational Theory. Organization Science 16 (5), 509–521. http://dx.doi.org/10.1287/orsc.1050.0154.

Hines, J. R., 1999. Lessons from Behavioral Responses to International Taxation. National Tax Journal 52 (2), 305–322.

Hogan, B., Noga, T., 2015. Auditor-provided tax services and long-term tax avoidance. Review of Accounting Studies 14 (3), 285–305. http://dx.doi.org/10.1108/RAF-10-2013-0116.

Hoppe, T., Schanz, D., Sturm, S., Sureth-Sloane, C., Voget, J., 2020. The Relation between Tax Complexity and Foreign Direct Investments: Evidence Across Countries. TRR 266

Accounting for Transparency Working Paper Series No. 13. https://ssrn.com/abstract=3526177.

Hoppe, T., Schanz, D., Sturm, S., Sureth-Sloane, C., 2023. The Tax Complexity Index – A Survey-Based Country Measure of Tax Code and Framework Complexity. European Accounting Review 32 (2), 239–273. http://dx.doi.org/10.1080/09638180.2021.1951316.

Hutchens, M., Rego, S. O., 2015. Does Greater Tax Risk Lead to Increased Firm Risk? Working Paper. https://ssrn.com/abstract_id=2186564.

Jacob, M., Schuett, H. H., 2020. Firm Valuation and the Uncertainty of Future Tax Avoidance. European Accounting Review 29 (3), 409–435. http://dx.doi.org/10.1080/09638180.2019.1642775.

Jacob, M., Wentland, K., Wentland, S., 2022. Real Effects of Tax Uncertainty: Evidence from Firm Capital Investments. Management Science 68 (6), 3975–4753. http://dx.doi.org/10.1287/mnsc.2021.4072.

Jensen, M. C., Meckling, W. H., 1990. Specific and general knowledge, and organizational structure. Contract Economics, 251–274. https://doi.org/10.1111/j.1745-6622.1995.tb00283.x.

Karlinsky, S. S., 1981. Complexity in the Federal Income Tax Law Attributable to the Capital Gain and Loss Preference: A Measurement Model. Washington: University of Washington.

Klassen, J. K., Lisowski, P., Mescall, D., 2016. The role of auditors, non-auditors, and internal tax departments in corporate tax aggressiveness. The Accounting Review 91 (1), 179–205. https://doi.org/10.2308/accr-51137.

Klassen, K., Lisowsky, P., Mescall, D., 2017. Transfer pricing: Strategies, practices, and tax minimization. Contemporary Accounting Research 34 (1), 455–93. https://doi.org/10.1111/1911-3846.12239.

Kohlhase, S., Wielhouwer, J. L., 2023. Tax and tariff planning through transfer prices: The role of the head office and business unit, Journal of Accounting and Economics 75 (2–3), 101568. https://doi.org/10.1016/j.jacceco.2022.101568.

KPMG., 2023. Inside global tax functions: Managing today and transforming for tomorrow. https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2023/08/2023-global-tax-function-benchmarking-survey-web.pdf.

Krause, K., 2000. Tax Complexity: Problem or Opportunity? Public Finance Review 28 (5), 395–414. http://dx.doi.org/10.1177/109114210002800501.

Laplante, S. K., Skaife, H. A., Swenson, L. A., Wangerin, D., 2019. Limits of Tax Regulation: Evidence from the R&D Tax Credit. Journal of Accounting and Public Policy 38 (2), 89–105. https://doi.org/10.1016/j.jaccpubpol.2019.02.003.

Law, K. K. F., Mills, L. F., 2017. Military experience and corporate tax avoidance. Review of Accounting Studies 22 (1), 141–184. https://link.springer.com/article/10.1007/s11142-016-9373-z.

Lawless, M., 2013. Do Complicated Tax Systems Prevent Foreign Direct Investments? Economica 80 (317), 1–22. https://doi.org/10.1111/j.1468-0335.2012.00934.x.

Lisowsky P., Robinson, L., Schmidt, A., 2013. Do Publicly Disclosed Tax Reserves Tell Us About Privately Disclosed Tax Shelter Activity? Journal of Accounting Research 51 (3), 583–629. https://doi.org/10.1111/joar.12003.

McGuire, S. T., Rane, S. G., Weaver, C. D., 2018. Internal information quality and tax-motivated income shifting. The Journal of the American Taxation Association 40 (2), 25–44. http://dx.doi.org/10.2308/atax-51959.

Mills, L., Robinson, L., Sansing, R., 2010. FIN 48 and Tax Compliance. The Accounting Review 85(5), 1721–1743. http://dx.doi.org/10.2308/accr.2010.85.5.1721.

Mueller, C., Voget, J., 2012. Tax Complexity and Foreign Direct Investment. Working Paper. https://ssrn.com/abstract_id=3051912.

Nagar, V., 2002. Delegation and incentive compensation. The Accounting Review 77 (2), 379–395. https://doi.org/10.2308/accr.2002.77.2.379.

Niemann, R., 2011. The impact of tax uncertainty on irreversible investment. Review of Managerial Science 5 (1), 1–17. http://dx.doi.org/10.1007/s11846-010-0042-5.

Neuman, S., 2016. Tax strategies: It's not just about minimization. Working Paper. University of Missouri-Columbia. https://ssrn.com/abstract_id=2496994.

Neuman, S., Omer, T. C., Schmidt, A. P., 2020. Assessing Tax Risk: Practitioner Perspectives. Contemporary Accounting Research 37 (3), 1788–1827. https://doi.org/10.1111/1911-3846.12556.

Olsen, K. J., Stekelberg, J., 2016. CEO narcissism and corporate tax sheltering. The Journal of the American Taxation Association 38 (1), 1–22. https://doi.org/10.2308/atax-51251.

Osman, M., 2022. Mind-Blowing LinkedIn Statistics and Facts (2022). https://kinsta.com/blog/linkedin-statistics/.

Osswald, B., Sureth-Sloane, C., 2024. Do Country Risk Factors Attenuate the Effect of Tax Loss Incentives on Corporate Risk-Taking? TRR 266 Accounting for Transparency Working Paper Series No. 28. https://ssrn.com/abstract=3297418.

Pau, C., Sawyer, A., Maples, A., 2007. Complexity of New Zealand's tax laws: An empirical study. Australian Tax Forum 22 (1), 59–92.

Phillips, J. D., 2003. Corporate Tax-Planning Effectiveness: The Role of Compensation-Based Incentives. The Accounting Review 78 (3), 847–874. https://doi.org/10.2308/accr.2003.78.3.847.

PricewaterhouseCoopers (PwC), World Bank, and International Finance Corporation (IFC)., 2018. Paying taxes 2018. https://www.pwc.com/m1/en/tax/30847-middle-east-launch.pdf.

Rego, S. O., Wilson, R., 2012. Equity risk incentives and corporate tax aggressiveness. Journal of Accounting Research 50 (3), 775–810. https://doi.org/10.1111/j.1475-679X.2012.00438.x.

Richardson, M., Sawyer, A., 2001. A taxonomy of the tax compliance literature: Further findings, problems and prospects. Australian Tax Forum 16 (2), 137–32.

Robinson, J. R., Sikes, S. A., Weaver, C. D., 2010. Performance measurement of corporate tax departments. The Accounting Review 85 (3), 1035–1064. https://doi.org/10.2308/accr.2010.85.3.1035.

Saavedra, D., 2019. Is Tax Volatility Priced by Lenders in the Syndicated Loan Market? European Accounting Review 28 (4), 767–789. http://dx.doi.org/10.1080/09638180.2018.1520641.

Saw, K., Sawyer, A., 2010. Complexity of New Zealand's income tax legislation. Australian Tax Forum 25, 213–244.

Sialm, C., 2006. Stochastic Taxation and Asset Pricing in Dynamic General Equilibrium. Journal of Economic Dynamics and Control 30(3), 511–540. https://doi.org/10.1016/j.jedc.2005.02.004.

Statista., 2022. Anzahl der registrierten Nutzer von LinkedIn nach Weltregionen Jahr 2022. https://de.statista.com/statistik/daten/studie/192879/umfrage/vergleich-der-besucherzahlen-von-linkendin-nach-weltregionen/.

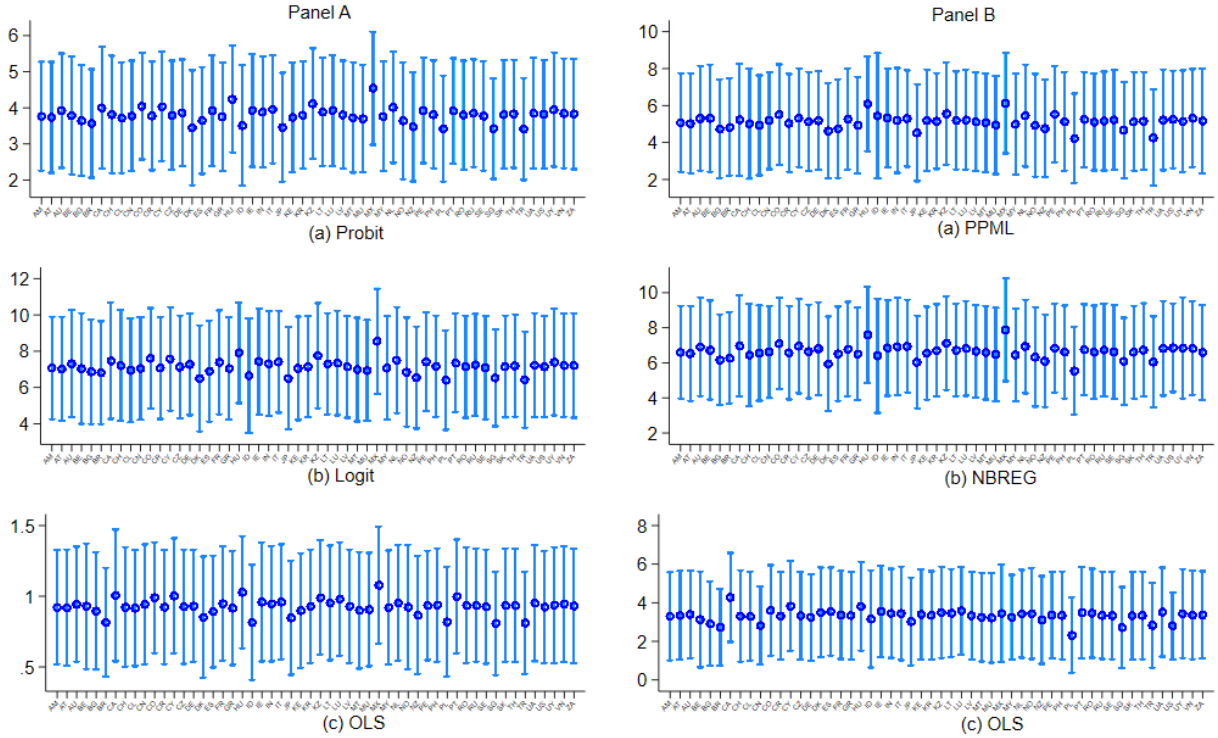
TEI., 2012. 2011-2012 Corporate Tax Department Survey. Tax Executives Institute, Inc.

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/.

Watrin, C., Burggraef, S.,Weiss, F., 2019. Auditor-Provided Tax Services and Accounting for Tax Uncertainty. The International Journal of Accounting 54 (3), 1–52. http://dx.doi.org/10.1142/S1094406019500112.

Wooldrigde, J. M., 2002. Econometric Analysis of Cross Section and Panel Data. MIT Press.

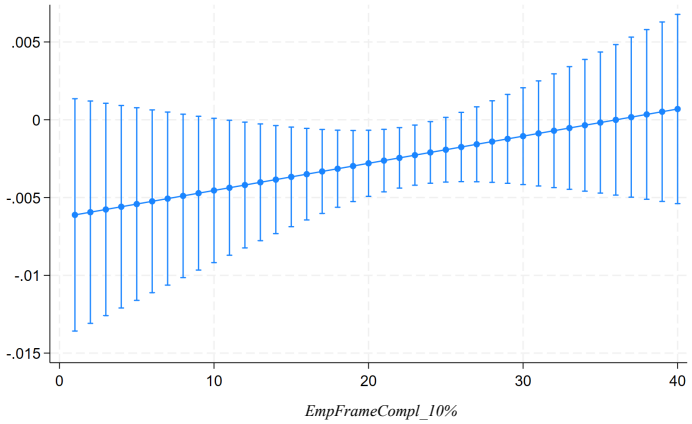
Figure 1
Cohort Exclusion Sample H1



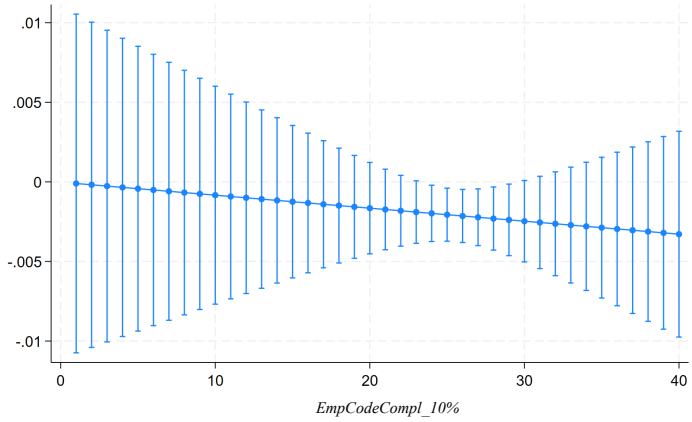
This figure displays the coefficient estimates for *TaxEmpl_dic* (Panel A) and *TaxEmpl_cic* (Panel B) for estimating Equation 1. Each coefficient estimate displays the result of a regression where all observations of the respective country were disregarded from the estimation.

Figure 2
Optimal level of tax employees in tax complex countries

Panel A



Panel B



This figure displays the predicted coefficient estimates for a non-linear relationship between *EmpFrameCompl_10%*$_i$ (Panel A) and *EmpCodeCompl_10%*$_i$ (Panel B) and tax risk (*SD_CashETR3*$_i$). Each predicted coefficient estimate displays the effect of an additional tax department employee in tax (code or framework) complex countries.

Table 1
Comparison of Bandwidth of Tax employees

Study	Lower bound	Upper bound
Chen et al. (2021)	23.2	
Klassen et al. (2017)	22.44	
TEI (2012)	21.11	

This table presents the extrapolated numbers of tax employees in previous studies using total assets. Lower and upper bounds are calculated using mean and median values of tax employees for the respective studies. The average number of tax employees in this study is 22.3.

Table 2
Definition of Variables

Variables	Definition
Equation 1	
$TaxEmpl\_d_{ic}$	Indicator variable taking the value of one if at least one tax employee is present in the respective foreign country and zero otherwise.
$TaxEmpl\_c_{ic}$	Total number of tax employees in foreign country c.
$TaxComplexity_c$	Overall tax complexity score for 2018 as defined by Hoppe et al. (2023).
$TaxFrameworkComplexity_c$	Tax framework complexity score for 2018 as defined by Hoppe et al. (2023).
$TaxCodeComplexity_c$	Tax code complexity score for 2018 as defined by Hoppe et al. (2023).
$PrefilingFiling_c$	Average score of the Tax Complexity Index sub-components Guidance, Enactment, and Filing for 2018 as defined by Hoppe et al. (2023).
$Postfiling_c$	Average score of the Tax Complexity Index sub-components Appeals and Audits for 2018 as defined by Hoppe et al. (2023).
$OverallRanking_c$	Country's rank in the 2018 PwC Paying Taxes Index.
$EasePayingTaxes_c$	Country's rank in the PwC et al. (2018) ease of paying taxes score.
$TaxandContributions_c$	Country's total tax and contribution rate for 2018 as defined by PwC et al. (2018).
$TimetoComply_c$	Number of hours needed to comply with the respective country's profit, labor, and consumption taxes as defined by PwC et al. (2018).
$NumberPayments_c$	Number of payments indicator as defined by PwC et al. (2018).
$PostFilingsIndex_c$	Post filing rank of the respective country as defined by PwC et al. (2018).
GDP_c	Gross domestic product of the respective country for 2018.
$GDPgrowth_c$	Percentage change between GDP_{2017} and GDP_{2018}.
$Education_c$	Country's level of education in 2018 as assessed by the World Bank.
$Corruption_c$	Transparency International Corruption Index for 2018.
$GovernmentEffectiveness_c$	The Worldwide Governance Indicator Government Effectiveness captures the perceived quality of public services, civil service and the degree of independence from political pressures. Furthermore, it captures the quality of policy formulation and implementation, and the credibility of the government's commitment for 2018.
$RegulatoryQuality_c$	The Worldwide Governance Indicator Regulatory Quality captures the perceived ability of the government to formulate and implement policies as well as regulations that promote private sector development for 2018.

$VoiceAccountability_c$	The Worldwide Governance Indicator Voice and Accountability captures the perceived ability to participate in elections, and free media for 2018.
$PoliticalStability_c$	The Worldwide Governance Indicator Political Stability and Absence of Violence/Terrorism measures the perceived political instability and political violence, including terrorism for 2018.
$Ruleoflaw_c$	The Worldwide Governance Indicator Rule of Law captures perceived confidence in the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence for 2018.
$LaborLaw_c$	Labor law strictness of the respective country for 2018. Data from the OECD.
$EnvironmentLaw_c$	Environmental law stringency of the respective country for 2018. Data from the OECD.
$STAXR_c$	Corporate statutory tax rate for 2018 taken from KPMG.
$ShareSubsidiaries_{ic}$	Number of subsidiaries owned by the multinational in the respective country divided by the overall number of subsidiaries of the multinational.
$Distance_{ic}$	Capturing the distance between the head office country's capital and the subsidiary country's capital.
$Language_{ic}$	Indicator variable taking one if the head office and subsidiary country share a common language and zero otherwise.
Equation 2	
$SD\_CashETR3_i$	Standard deviation of annual Cash ETR over three years.
$SD\_CashETR5_i$	Standard deviation of annual Cash ETR over five years.
$SD\_GaapETR3_i$	Standard deviation of annual GAAP ETR over three years.
$PriorYearTaxes_i$	Three-year average value of taxes paid for previous years, scaled by total assets.
$EmpCompl\_10\%_i$	Number of tax employees in countries in the top decile of the Tax Complexity Index.
$EmpCompl\_25\%_i$	Number of tax employees in countries in the top quartile of the Tax Complexity.
$EmpCompl\_weight1_i$	Overall tax complexity score multiplied by the number of tax employees in the respective country divided by average tax complexity.
$EmpCompl\_weight2_i$	Overall tax complexity score multiplied by the number of tax employees in the respective country divided by multinational's average tax complexity.
$EmpFrameCompl\_10\%_i$	Number of tax employees in countries in the top decile of the Tax Framework Complexity Index.
$EmpCodeCompl\_10\%_i$	Number of tax employees in countries in the top decile of the Tax Code Complexity Index.
$EmpCompl\_10\%\_adj_i$	Number of tax employees in countries in the top decile of the Tax Complexity Index adjusted by the LinkedIn coverage rate in the respective countries, scaled by the number of direct tax employees.
$EmpCompl\_10\%\_OR$	Number of tax employees in countries in the top decile of the PwC Paying Taxes Score ($OverallRanking_c$).
$AvgTaxComplexity_i$	Average Tax Complexity calculated as the sum of Tax Complexity Scores of each country a multinational owns a subsidiary weighted by the number of subsidiaries divided by the overall number of countries a multinational is operating in.
$AvgTaxFrameComplexity_i$	Average Tax Framework Complexity calculated as the sum of Tax Complexity Scores of each country a multinational owns a subsidiary

	weighted by the number of subsidiaries divided by the overall number of countries a multinational is operating in.
$AvgTaxCodeComplexity_i$	Average Tax Code Complexity calculated as the sum of Tax Complexity Scores of each country a multinational owns a subsidiary weighted by the number of subsidiaries divided by the overall number of countries a multinational is operating in.
$TaxEmp_i$	Total number of tax employees of a multinational, scaled by the total number of employees as reported in the financial statement multiplied by 1,000 as suggested by Chen et al. (2021).
CTD_i	Total number of local tax employees, divided by the total number of tax employees.
$SIZE_i$	Natural logarithm of average total assets over three years.
ROA_i	Average pre-tax income over three years divided by average lagged total assets over the same period, winsorized at the 1 percent level.
MTB_i	Average market value of equity over three years divided by the average book value of common equity over the same period, winsorized at the 1 percent level.
RD_i	Average research and development expenditures over three years divided by average assets over the same period, winsorized at the 1 percent level.
LEV_i	Average long-term debt over three years divided by average total assets over the same period, winsorized at the 1 percent level.
PPE_i	Capital intensity, calculated as the average net property, plant, and equipment over three years divided by average assets over the same period, winsorized at the 1 percent level.
INT_i	Average intangible assets over three years divided by average assets over the same period, winsorized at the 1 percent level.
INV_i	Average inventory over three years divided by average assets over the same period, winsorized at the 1 percent level.
$APTS_i$	Average expense for auditor-provided tax services over three years.
SEG_i	Natural logarithm of the number of segments reported in the annual report of 2018.
IIQ_i	Number of days between the end of the fiscal year and the firm's earnings announcement, divided by 365 and multiplied by minus one.
$TaxHavens_i$	Number of tax haven subsidiaries scaled by the overall number of subsidiaries.
$International_i$	Ratio of operating countries and number of subsidiaries.
$CashETR3_i$	Three-year average cash effective tax rate, calculated as the sum of a firm's cash taxes 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.
SD_ROA_i	Standard deviation of pre-tax return on assets over three years.

Table 3
Descriptive Statistics: Equation (1)

Variables	(1) N	(2) mean	(3) sd	(4) p5	(5) p95
$TaxEmpl\_d_{ic}$	6,670	0.233	0.422	0	1
$TaxEmpl\_c_{ic}$	6,670	0.754	2.569	0	4
$TaxComplexity_c$	6,670	0.382	0.0737	0.222	0.492
$TaxFrameworkComplexity_c$	6,670	0.289	0.0758	0.160	0.425
$TaxCodeComplexity_c$	6,670	0.474	0.0886	0.272	0.589
$PrefilingFiling_c$	6,670	0.269	0.0745	0.151	0.398
$Postfiling_c$	6,670	0.318	0.0893	0.185	0.463
$OverallRanking_c$	6,670	58.62	41.42	7	128
$EasePayingTaxes_c$	6,670	79.36	10.91	64	91.60
$TaxandContributions_c$	6,670	41.94	12.36	21	60.70
$TimetoComply_c$	6,670	212.4	228.6	64	334
$NumberPayments_c$	6,670	10.46	4.488	5	21
$PostFilingIndex_c$	6,670	75.47	21.74	40.50	98.10
GDP_c	6,670	2,097	4,300	65.20	13,368
$GDPgrowth_c$	6,670	0.0682	0.0516	0.00176	0.142
$Education_c$	6,670	0.808	0.101	0.626	0.923
$Corruption_c$	6,670	59.48	19.13	28	85
$GovermentEffectiveness_c$	6,670	0.933	0.753	-0.247	2.039
$RegulatoryQuality_c$	6,670	0.939	0.778	-0.327	2.020
$VoiceAccountability_c$	6,670	0.674	0.834	-1.075	1.580
$PoliticalStability_c$	6,670	0.341	0.760	-1.092	1.363
$Ruleoflaw_c$	6,670	0.820	0.881	-0.637	1.896
$LaborLaw_c$	6,670	1.426	1.153	0	3.258
$EnvironmentLaw_c$	6,670	2.054	1.514	0	4.417
$STAXR_c$	6,670	24.48	5.878	12.50	34
$ShareSubsidiaries_{ic}$	6,670	0.0257	0.0409	0.00299	0.0845
$Distance_{ic}$	6,670	5,059	4,696	360.3	11,994
$Language_{ic}$	6,670	0.0712	0.257	0	1

Table 4
Descriptive Statistics: Equation (2)

Variables	(1) N	(2) mean	(3) sd	(4) p5	(5) p95
$SD\_CashETR3_i$	348	0.128	0.256	0.0120	0.470
$SD\_CashETR5_i$	348	0.210	0.524	0.018	0.783
$SD\_GaapETR3_i$	348	0.104	0.226	0.00469	0.426
$PriorYearTaxes_i$	229	7.612	164.29	-48.508	35.333
$EmpCompl\_10\%_i$	348	2.991	6.508	0	15
$EmpCompl\_25\%_i$	348	8.523	13.93	0	38
$EmpCompl\_weight1_i$	348	17.022	28.723	0	71.821
$EmpCompl\_weight2_i$	348	15.933	26.401	0	66.397
$EmpFrameCompl\_10\%_i$	348	2.695	6.422	0	14
$EmpCodeCompl\_10\%_i$	348	5.390	8.738	0	23
$EmpCompl\_10\%\_adj_i$	348	5.888	9.096	0	24.340
$EmpCompl\_10\%\_OR$	338	12.422	24.613	0	61.232
$AvgTaxComplexity_i$	348	0.391	0.0217	0.357	0.429
$AvgTaxFrameComplexity_i$	348	0.290	0.0229	0.248	0.327
$AvgTaxCodeComplexity_i$	348	0.492	0.0263	0.456	0.540
$TaxEmp_i$	348	0.0008	0.0009	0	0.0027
CTD_i	348	0.367	0.325	0	1
$SIZE_i$	348	9.315	1.421	7.219	11.77
ROA_i	348	0.0716	0.0537	0.00815	0.187
MTB_i	348	3.564	2.896	0.420	9.603
RD_i	348	0.0196	0.0323	0	0.0923
LEV_i	348	0.203	0.133	0.000554	0.461
PPE_i	348	0.234	0.194	0.0204	0.659
INT_i	348	0.298	0.210	0.0184	0.666
INV_i	348	0.0934	0.0885	0	0.273
$APTS_i$	348	0.278	0.561	0	1.380
SEG_i	348	0.985	0.646	0	1.946
IIQ_i	348	-0.137	0.0382	-0.200	-0.0740
$TaxHavens_i$	348	0.0638	0.0711	0	0.179
$International_i$	348	0.324	0.202	0.0645	0.731
$CashETR3_i$	348	0.245	0.117	0.0795	0.485
SD_ROA_i	348	0.0203	0.0209	0.00281	0.0715

Table 5: Baseline Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	TaxEmpl_d$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_c*$_{ic}$	*TaxEmpl_c*$_{ic}$	*TaxEmpl_c*$_{ic}$
	Probit	Logit	OLS	Poisson	NBREG	OLS
TaxComplexity$_c$	**3.0505*****	**5.6422*****	**0.7715*****	**3.8398*****	**5.4600*****	**3.0672****
	(3.47)	**(3.49)**	**(3.08)**	**(2.81)**	**(3.27)**	**(2.10)**
GDP$_c$	0.0000***	0.0001***	0.0000***	0.0001***	0.0001***	0.0002***
	(3.28)	(3.03)	(3.83)	(4.03)	(3.17)	(6.91)
GDPgrowth$_c$	-4.1068***	-7.6823***	-1.1356**	-5.6810***	-6.7097***	-9.4478***
	(-3.30)	(-3.45)	(-2.47)	(-3.23)	(-3.59)	(-3.59)
Education$_c$	-1.3756	-2.2223	-0.4078*	-0.8748	-2.2512	-0.6639
	(-1.61)	(-1.32)	(-1.79)	(-0.61)	(-1.50)	(-0.64)
Corruption$_c$	-0.0145	-0.0310	-0.0034	-0.0275	-0.0269	-0.0468**
	(-1.28)	(-1.34)	(-1.15)	(-1.04)	(-1.32)	(-2.25)
GovermentEffectiveness$_c$	0.0832	0.1678	0.0208	-0.3754	-0.0714	-0.2031
	(0.32)	(0.35)	(0.26)	(-0.78)	(-0.17)	(-0.42)
RegulatoryQuality$_c$	0.5184*	0.8906	0.1218	0.3816	0.8026	0.5598
	(1.70)	(1.45)	(1.50)	(0.69)	(1.29)	(1.52)
VoiceAccountability$_c$	0.0740	0.1818	0.0243	0.3707	0.2421	0.5163**
	(0.52)	(0.63)	(0.63)	(1.49)	(0.89)	(2.59)
PoliticalStability$_c$	0.0448	0.0432	0.0126	0.0300	0.1852	-0.0403
	(0.35)	(0.18)	(0.33)	(0.17)	(0.87)	(-0.21)
Ruleoflaw$_c$	-0.2219	-0.3229	-0.0518	0.0822	-0.3183	0.5874
	(-0.75)	(-0.57)	(-0.57)	(0.16)	(-0.60)	(1.19)
LaborLaw$_c$	-0.1489**	-0.2696**	-0.0384**	-0.2325*	-0.2804**	-0.2286**
	(-2.37)	(-2.18)	(-2.20)	(-1.95)	(-2.37)	(-2.41)
EnvironmentLaw$_c$	0.0861*	0.1583*	0.0196*	0.2190**	0.1907**	-0.0928
	(1.92)	(1.77)	(1.79)	(2.40)	(2.42)	(-1.50)
STAXR$_c$	0.0005	-0.0021	0.0002	-0.0030	-0.0015	-0.0274*
	(0.04)	(-0.10)	(0.06)	(-0.15)	(-0.08)	(-1.71)
ShareSubsidiaries$_{ic}$	11.8360***	24.5420***	2.5675***	8.0385***	14.3264***	17.3568***
	(6.49)	(5.94)	(4.20)	(8.10)	(2.87)	(6.23)
Distance$_{ic}$	-0.0000	-0.0000	-0.0000	0.0000	-0.0000	-0.0000*
	(-0.45)	(-0.30)	(-0.55)	(0.39)	(-0.41)	(-1.74)
Language$_{ic}$	0.1590	0.2772	0.0453	0.4309**	0.3725**	-0.0092
	(1.42)	(1.23)	(1.41)	(2.33)	(2.04)	(-0.07)
ln dispersion parameter(alpha)					0.3546	
					(1.58)	
MNE FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,670	6,670	6,670	6,670	6,670	6,670
Adj. R-sq			0.2162			0.2709
Pseudo R-sq	0.7030	0.5890		0.4949	0.2129	

This table presents the estimates of Equation (1) for the dependent variables *TaxEmpl_d*$_{ic}$ and *TaxEmpl_c*$_{ic}$. *TaxEmpl_d*$_{ic}$ is an indicator variable taking the value of one if multinational *i* has at least one tax department employee in country *c*; zero otherwise. *TaxEmpl_c*$_{ic}$ is the total number of tax employees of multinational *i* in a specific country c. *TaxComplexity*$_c$ represents the tax complexity score of country *c* as described by Hoppe et al. (2023). See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust and clustered at the country level. Pseudo R-sq represent Efron's R-sq for Probit and Logit and McFadden's pseudo R-sq for Poisson and NBREG.

Table 6: Components of Tax Complexity

	(1) $TaxEmpl\_d_{ic}$	(2) $TaxEmpl\_d_{ic}$	(3) $TaxEmpl\_d_{ic}$	(4) $TaxEmpl\_c_{ic}$	(5) $TaxEmpl\_c_{ic}$	(6) $TaxEmpl\_c_{ic}$
Panel A	Probit	Logit	OLS	Poisson	NBREG	OLS
$TaxFrameworkComplexity_c$	2.4805**	4.7788**	0.6975**	3.6185**	4.2892**	4.2553***
	(2.29)	(2.41)	(2.28)	(1.99)	(2.39)	(2.77)
$TaxCodeComplexity_c$	0.8182	1.3536	0.1651	0.6234	1.5628	-0.3921
	(0.98)	(0.87)	(0.76)	(0.44)	(1.07)	(-0.41)
ln dispersion parameter (alpha)					0.3117	
					(0.22)	
TFC minus TCC	1.6623*	3.4252*	0.5324*	2.9951	2.7264*	4.6474**
MNE FE	Yes	Yes	Yes	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,670	6,670	6,670	6,670	6,670	6,670
Adj. R-sq			0.2173			0.2730
Pseudo R-sq	0.7040	0.5900		0.4955	0.2132	

	(1) $TaxEmpl\_d_{ic}$	(2) $TaxEmpl\_c_{ic}$
Panel B	Probit	Poisson
$PrefilingFiling_c$	4.3524***	7.1781***
	(3.29)	(3.08)
$Postfiling_c$	-0.7799	-2.0059
	(-0.89)	(-1.45)
$PrefilingFiling_c$ *minus* $Postfiling_c$	5.1323**	9.184***
MNE FE	Yes	Yes
Controls	Yes	Yes
Observations	6,670	6,670
Pseudo R-sq	0.7060	0.4987

s table presents the estimates of Equation (1) for the dependent variables $TaxEmpl\_d_{ic}$ and $TaxEmpl\_c_{ic}$. $TaxEmpl\_d_{ic}$ is an indicator variable taking the value of one if multinational as at least one tax department employee in country c; zero otherwise. $TaxEmpl\_c_{ic}$ is the total number of tax employees of multinational i in country c. $TaxCodeComplexity_c$ $xFrameworkComplexity_c$) represents the tax code (framework) complexity score of country c, as described by Hoppe et al. (2023). $PrefilingFiling_c$ and $Postfiling_c$ represent dimensions Tax Framework Complexity as described by Hoppe et al. (2023). Accordingly, the five dimensions, Appeal, Audits, Enactment, Payment and Filing, and Guidance, are clustered into categories based on the workflow of a firm's tax process to reduce dimensions. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust and clustered at the country el. Pseudo R-sq represent Efron's R-sq for Probit and Logit and McFadden's pseudo R-sq for Poisson and NBREG.

Table 7: Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TaxEmpl_d$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$	*TaxEmpl_d*$_{ic}$
TaxComplexity$_c$	3.6574***	3.1110***	2.5800***	2.5499*	3.9372***	2.4619**	2.7856***	2.6645***
	(3.09)	(3.47)	(3.00)	(1.71)	(2.86)	(2.58)	(3.98)	(2.60)
Diff		-0.5464		-0.0301***		-1.4753***		-0.1211***
Sample	Low ETR	High ETR	Large MNEs	Small MNEs	Highly International	Low International	Many Segments	Few Segments
MNE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,376	1,699	1,987	1,423	1,420	1,527	1,637	2,222
Adj. R-sq	0.5402	0.4740	0.4831	0.4831	0.4398	0.5505	0.5371	0.4793

This table presents heterogeneity analyzes for Equation (1) for the dependent variables *TaxEmpl_d*$_{ic}$. *TaxEmpl_d*$_{ic}$ is an indicator variable taking the value of one if multinational *i* has at least one tax department employee in country *c*; zero otherwise. *TaxComplexity*$_c$ represents the tax complexity score of country *c* as described by Hoppe et al. (2023). The sample is split using a median split based on the presented variable. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust and clustered at the country level.

Table 8: Robustness: PwC Paying Taxes 2018

	(1) *TaxEmpl* d_{ic}	(2) *TaxEmpl* c_{ic}	(3) *TaxEmpl* d_{ic}	(4) *TaxEmpl* c_{ic}	(5) *TaxEmpl* d_{ic}	(6) *TaxEmpl* c_{ic}	(7) *TaxEmpl* d_{ic}	(8) *TaxEmpl* c_{ic}	(9) *TaxEmpl* d_{ic}	(10) *TaxEmpl* c_{ic}	(11) *TaxEmpl* d_{ic}	(12) *TaxEmpl* c_{ic}
	Probit	Poisson	Probit	Poisson	Probit	Poisson	Probit	Poisson	Probit	Poisson	Probit	Poisson
OverallRanking$_c$	0.0047**	0.0088***										
	(2.43)	(3.23)										
EasePayingTaxes$_c$			0.0217***	0.0347***								
			(3.22)	(3.99)								
TaxandContribution$_c$					0.0079	0.0164						
					(1.14)	(1.55)						
TimetoComply$_c$							0.0010***	0.0016***				
							(5.17)	(4.57)				
NumberPayments$_c$									-0.0248*	-0.0367		
									(-1.68)	(-1.48)		
PostFilingIndex$_c$											0.0081**	0.0139**
											(1.97)	(2.52)
MNE FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670
Pseudo R-sq	0.7020	0.4958	0.7030	0.4978	0.7000	0.4930	0.7040	0.5014	0.7250	0.4973	0.7020	0.4954

This table presents robustness tests of Equation (1) for the dependent variables *TaxEmpl_d*$_{ic}$ and *TaxEmpl_c*$_{ic}$ using alternative measures of Tax Complexity. *TaxEmpl_d*$_{ic}$ is an indicator variable taking the value of one if multinational *i* has at least one tax department employee in country *c*; zero otherwise. *TaxEmpl_c*$_{ic}$ is the total number of tax employees of multinational *i* in country c. *OverallRanking*$_c$ is the country's overall rank in the PwC Paying Taxes 2018 Index. *EasePayingTaxes*$_c$ is the ease of paying taxes index, multiplied by -1. *TaxandContribution*$_c$ is the total tax and contribution rate assessed by PwC Paying Taxes 2018 Index. *TimetoComply*$_c$ is the hours needed to comply as assessed by the PwC Paying Taxes 2018 Index. *NumberPayments*$_c$ is the number of payments identified in the PwC Paying Taxes 2018 Index. *PostFilingIndex*$_c$ is the post-filing index of the PWC Paying Taxes 2018 Index, multiplied by -1. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust and clustered at the country level.

Table 9: Tax risk Baseline

	(1) $SD\_CashETR3_i$	(2) $SD\_CashETR3_i$	(3) $SD\_CashETR3_i$	(4) $SD\_CashETR3_i$	(5) $SD\_CashETR3_i$
	OLS	OLS	OLS	OLS	OLS
EmpCompl_10%$_i$	**-0.0036****				
	(-2.43)				
EmpCompl_25%$_i$		**-0.0020****			
		(-2.05)			
EmpCompl_weight1$_i$			**-0.0009****		
			(-2.31)		
EmpCompl_weight2$_i$				**-0.0010****	
				(-2.25)	
$AvgTaxComplexity_i$	1.0412*	1.0879*	0.9819*	0.9661*	0.7710
	(1.81)	(1.90)	(1.76)	(1.74)	(1.37)
$TaxEmp_i$	5.1854	7.0568	7.7829	8.0300	2.7891
	(0.35)	(0.48)	(0.52)	(0.54)	(0.19)
CTD_i	-0.1166**	-0.1234**	-0.1230**	-0.1233**	-0.1145**
	(-2.02)	(-2.15)	(-2.14)	(-2.15)	(-1.98)
$SIZE_i$	-0.0068	-0.0032	-0.0032	-0.0030	-0.0157
	(-0.49)	(-0.20)	(-0.20)	(-0.19)	(-1.25)
ROA_i	-1.4026***	-1.3870***	-1.3929***	-1.3936***	-1.4745***
	(-3.68)	(-3.55)	(-3.59)	(-3.58)	(-3.88)
MTB_i	0.0013	0.0013	0.0016	0.0016	0.0006
	(0.21)	(0.21)	(0.27)	(0.28)	(0.09)
RD_i	0.0932	0.1295	0.1212	0.1218	0.1318
	(0.19)	(0.26)	(0.25)	(0.25)	(0.27)
LEV_i	-0.1206	-0.1181	-0.1233	-0.1236	-0.1113
	(-0.58)	(-0.57)	(-0.60)	(-0.60)	(-0.54)
PPE_i	0.0295	0.0190	0.0169	0.0161	0.0252
	(0.19)	(0.12)	(0.11)	(0.10)	(0.16)
INT_i	-0.0660	-0.0609	-0.0643	-0.0650	-0.0682
	(-0.58)	(-0.53)	(-0.56)	(-0.57)	(-0.59)
INV_i	-0.2286	-0.2124	-0.2221	-0.2221	-0.1906
	(-1.06)	(-0.99)	(-1.03)	(-1.03)	(-0.88)
$APTS_i$	0.0250	0.0221	0.0225	0.0224	0.0215
	(0.60)	(0.52)	(0.53)	(0.53)	(0.51)
SEG_i	-0.0044	-0.0017	-0.0039	-0.0041	-0.0081
	(-0.25)	(-0.10)	(-0.22)	(-0.23)	(-0.45)
IIQ_i	0.1791	0.2034	0.1980	0.1995	0.1905
	(1.43)	(1.60)	(1.59)	(1.60)	(1.53)
$TaxHavens_i$	0.2554	0.2656	0.2602	0.2601	0.2373
	(1.14)	(1.18)	(1.16)	(1.16)	(1.06)
$International_i$	0.0635	0.0590	0.0620	0.0616	0.0134
	(0.14)	(0.14)	(0.14)	(0.14)	(0.03)
$CashETR3_i$	0.7353***	0.7254***	0.7313***	0.7315***	0.7127***
	(5.18)	(5.09)	(5.12)	(5.12)	(5.00)
SD_ROA_i	3.1373***	3.0710***	3.1062***	3.1045***	3.0859***
	(4.23)	(4.14)	(4.20)	(4.20)	(4.14)
Industry FE	Yes	Yes	Yes	Yes	Yes
Home Country FE	Yes	Yes	Yes	Yes	Yes
Observations	348	348	348	348	348
Adj. R-sq	0.3484	0.3484	0.3479	0.3478	0.3458

This table presents the estimates of Equation (2) for the dependent variables $SD\_CashETR3_i$. $SD\_CashETR3_i$ is the standard deviation of the cash ETR over a three-year period. $AvgTaxComplexity_i$ is the weighted sum of Tax Complexity Scores of each country a multinational owns a subsidiary by the number of subsidiaries divided by the overall number of countries a multinational is operating in. $EmpCompl\_10\%_i$ ($EmpCompl\_25\%_i$) is the number of tax employees in countries in the top decile (quartile) of the Tax Complexity Index. $EmpCompl\_weight1_i$ ($EmpCompl\_weight2_i$) is the sum of worldwide tax employees weighted by the country's tax complexity index value scaled by the worldwide average tax complexity (the multinational's worldwide tax complexity). *TaxEmp* is the number of tax employees scaled by the number of employees as defined by Chen et al. (2021). *CTD* is the ratio of home country tax employees to the total number of tax employees. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust.

Table 10: Framework and Code Complexity

	(1)	(2)	(3)	(4)
	SD_CashETR3$_i$	*SD_CashETR3*$_i$	*SD_CashETR3*$_i$	*SD_CashETR3*$_i$
	OLS	OLS	OLS	OLS
EmpFrameCompl_10%$_i$		-0.0026*		
		(-1.76)		
EmpCodeCompl_10%$_i$				-0.0017
				(-0.89)
AvgTaxFrameComplexity$_i$	0.0530	0.2833		
	(0.10)	(0.49)		
AvgTaxCodeComplexity$_i$			0.7865*	0.9142*
			(1.70)	(1.85)
Industry FE	Yes	Yes	Yes	Yes
Home Country FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	348	348	348	348
Adj. R-sq	0.3410	0.3411	0.3470	0.3462

This table presents the estimates of Equation (2) for the dependent variables *SD_CashETR3*$_i$. *SD_CashETR3*$_i$ is the standard deviation of the cash ETR over a three-year period. *AvgTaxCodeComplexity*$_i$ *(AvgTaxFrameComplexity*$_i$*)* is the weighted sum of Tax Code (Framework) Complexity Scores of each country a multinational owns a subsidiary by the number of subsidiaries divided by the overall number of countries a multinational is operating in. *EmpCodeCompl_10%*$_i$ (*EmpFrameCompl_10%*$_i$) is the share of tax employees in countries in the top decile of the Tax Code (Framework) Complexity Index divided by the number of overall tax employees. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust.

Table 11: Robustness Tax risk measures and Tax Employees

	(1) $SD\_CashETR3_i$	(2) $SD\_CashETR5_i$	(3) $SD\_GaapETR3_i$	(4) $PriorYearTaxes_i$	(5) $SD\_CashETR3_i$	(6) $SD\_CashETR3_i$
$EmpCompl\_10\%_i$	-0.0038***	-0.0046	-0.0026	-2.1129*		
	(-2.91)	(-1.46)	(-1.42)	(-1.68)		
$EmpCompl\_10\%\_adj_i$					-0.0146**	
					(-2.02)	
$EmpCompl\_10\%\_OR_i$						-0.0010**
						(-2.44)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Home Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Full	Full	Full
Observations	348	343	348	229	348	338
Adj. R-sq	0.4374	0.1003	0.0937	0.1763	0.3619	0.3209

This table presents the estimates of Equation (2) for the alternative dependent variables. $SD\_CashETR3_i$ in column (1) is the $SD\_CashETR3_i$ winsorized at the 5 percent level to account for outliers. $SD\_GaapETR3_i$ is the standard deviation of the GAAP ETR over three years. $PriorYearTaxes_i$ is the three-year average of taxes paid for previous years, scaled by total assets. $EmpCompl\_10\%\_adj_i$ is the number of tax employees in countries in the top decile of the Tax Complexity Index adjusted by the LinkedIn coverage rate of the respective country c as indicated by Statista. $EmpCompl\_10\%\_OR_i$ is the number of tax employees in countries in the top decile of the 2018 PwC Paying Taxes Index. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust.

Table 12: Structural Equation Model

Pathway	
$EmpCompl\_10\%_i$ ← $AvgTaxComplexity_i$	81.5745***
	(4.99)
$EmpCompl\_10\%_i$ ← $TaxEmp_i$	1.1028***
	(2.98)
$EmpCompl\_10\%_i$ ← CTD_i	-2.7740***
	(-4.51)
$EmpCompl\_10\%_i$ ← $SIZE_i$	1.3585***
	(4.72)
$EmpCompl\_10\%_i$ ← SEG_i	0.6114
	(1.08)
$EmpCompl\_10\%_i$ ← $APTS_i$	0.7905
	(1.10)
Industry FE	No
Home Country FE	No
Controls	No
Sample	Full
Observations	348
$SD\_CashETR3_i$ ← $EmpCompl\_10\%_i$	**-0.0033****
	(-2.36)
Industry FE	Yes
Home Country FE	Yes
Controls	Yes
Sample	Full
Observations	348
SRMR	0.017
CD	0.486

This table presents the estimates of the structural equation model. See Table 2 for the definitions of control variables. ***, ** and * label statistical significance at 1%, 5% and 10% level, respectively. A constant is included but not reported. *t* statistics are given in parentheses and standard errors are heteroscedasticity-robust.