Arbeitskreis Quantitative Steuerlehre
Quantitative Research in Taxation – Discussion Papers

Henning Giese, Reinald Koch, Markus Gamm

Tax Avoidance and Vertical Interlocks within Multinational Enterprises

arqus Discussion Paper No. 270
June 2022

www.arqus.info
ISSN 1861-8944

Tax Avoidance and Vertical Interlocks within Multinational Enterprises

Henning Giese
Paderborn University
KU Research Institute for Taxation

Reinald Koch
Catholic University of Eichstaett-Ingolstadt
KU Research Institute for Taxation

Markus Gamm
Catholic University of Eichstaett-Ingolstadt

ABSTRACT

This study investigates to what extent multinational enterprises appoint managers jointly at the headquarter and a foreign subsidiary (vertical manager interlocks, VMIs) in order to facilitate tax planning. We use a cross-section data set taken from the AMADEUS database to show that VMIs are observed more frequently in MNEs with a higher potential for tax-induced profit shifting. We also provide evidence indicating that the implementation of VMIs is motivated by an internal principal-agent conflict arising from conflicting interests between the MNE and high-tax subsidiary managers. Finally, we show that the use of VMI structures is associated, ceteris paribus, with a lower effective tax rate.

Keywords: management structure, profit shifting, principal-agent-theory

JEL Classifications: H25, H26, M12

Data Availability: Data are available from the public sources cited in the text.

The authors thank Irem Guceri (Discussant), Dominika Langenmayr, Lillian Mills, Benjamin Osswald, Caren Sureth-Sloane, Ann-Catherin Werner (Discussant), Jacco Wielhouwer (Discussant), and participants at the 41st Annual Congress of the European Accounting Association, the 8th EIASM Conference on Current Research in Taxation, the Oxford Centre for Business Taxation Doctoral Meeting 2018, and the 4th Vienna Doctoral Consortium in Taxation for their helpful comments and suggestions. Henning Giese gratefully acknowledges financial support by the German Research Foundation (DFG) - Collaborative Research Center (SFB/TRR) Project-ID 403041268 - TRR 266 Accounting for Transparency.

I. INTRODUCTION

We analyze to what extent European multinational enterprises (MNEs) organize their internal management structure as to solve an internal principal-agent conflict with regard to the application of tax-induced profit shifting and, thus, foster tax avoidance.

According to the principal-agent theory, firm managers may act contrary to the interests of firm owners if the individual preferences of these different stakeholders are not aligned, e.g., by way of a proper manager incentivization (see, e.g., Grossman and Hart, 1983; Holmström, 1979; Hurwicz and Shapiro, 1978). Prior literature has documented the existence and implications of this principal-agent conflict in various management fields (Armstrong et al., 2010; Chen et al., 2012; Ferrell et al., 2016), including the organization of the tax department. If MNE managers are compensated based on the firm's pre-tax performance, then the MNE reports – on average – a higher effective tax rate (Robinson et al., 2010; Gaertner, 2014).

These studies, however, usually focus on the top-level management of the MNE (e.g., Chyz, 2013; Olsen and Stekelberg, 2016; Armstrong et al., 2012; see section II for a more detailed review). In doing so, they implicitly assume that tax planning falls in the responsibility of a centralized department at the MNE's headquarter or that, at least, such a department decides on the general strategies and offers only a small decision leeway to subsidiary managers for operationalizing them. This assumption may be valid for complex tax planning schemes, such as creating untaxed income or a double-deduction of expenses. Ordinary profit shifting (e.g., via transfer pricing), however, frequently involves negotiations at subsidiary level. Therefore, we expect the existence of an internal principal-agent conflict within the MNE, i.e., between the headquarter and subsidiary managers.[1] Profit shifting from a high-tax to a low-tax subsidiary,

[1] Scharfstein and Stein (2000) characterize this type of structure as a two-tiered agency conflict in their seminal paper on inefficiency of internal capital markets. In the following we will refer to this structure when we speak of an internal principal-agent conflict.

which maximizes after-tax profits of the MNE, may not necessarily correspond to the personal preferences of the high-tax subsidiary managers. If compensation or other personal benefits of these managers are linked to the performance of the individual subsidiary, these managers may not be willing to accept any tax-motivated shifting that reduces the profitability of their unit.[2]

Thus far, the influence of such internal principal-agent conflict has been widely neglected in the tax avoidance literature. However, it can be solved in various ways. On the one hand, MNEs can incentivize subsidiary managers based on the MNE's overall performance, which is, however, not free of cost. On the other hand, MNEs may organize their management structure as to mitigate this internal principal-agent conflict. Based on a sample taken from AMADEUS, we focus on this latter solution and investigate whether European MNEs use Vertical Manager Interlocks (VMIs), that is, managers with concurrent positions at the MNE's headquarter and a foreign subsidiary.[3] The use of VMIs has been documented in other areas, e.g., with respect to cash holdings (Chen and Yang, 2021). The use of VMIs may help foster tax avoidance for at least three reasons. First, these managers can be incentivized by the overall MNE performance without referring to the success of units not being under their immediate control. Second, these managers may control compliance with group standards and guidelines by other managers. Third, these managers may foster profit shifting activities through an improved sharing of tax knowledge within the group (see, e.g., Brown and Drake, 2013[4]).

Our study is one of the first to provide evidence indicating that MNEs use VMIs for tax planning reasons and that the application of this management structure may, in fact, help reduce the MNE's effective tax rate. VMIs may also be used for non-tax reasons (e.g., cost efficiency in

[2] While compensation may be the most obvious reason for non-aligned interests, personal aspects, such as future career effects of a well performing subsidiary should not be underestimated (Fama, 1980; Gibbsons and Murphy, 1992).
[3] See Chen and Yang (2021) for an overview of applications of VMI in non-tax contexts.
[4] Bizjak et al. (2009) provide evidence for knowledge sharing with regard to non-tax knowledge.

the case of subsidiaries without real activity or knowledge sharing within the group). However, we are able to show that VMIs can be observed more frequently in MNEs with a higher potential for tax-efficient profit shifting. We also provide evidence indicating that these structures are motivated by tax planning considerations and the above described internal principal-agent conflict since VMIs are installed significantly more frequently in subsidiaries with tax rates above the group average. Finally, we are able to show that the use of VMIs explains some of the cross-sectional heterogeneity in corporate tax avoidance. MNEs that use VMI structures to a larger extent report, on average, a significantly lower effective tax rate.

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

II. RELATED LITERATURE AND CONTRIBUTION

Our study informs the literature strands analyzing the relationship between manager person, agency conflicts, management structure, and corporate tax avoidance. It is widely accepted in the general management literature that explaining corporate behavior (e.g., Bertrand and Schoar, 2003) and performance (e.g., Chatterjee and Hambrick, 2007; Hribar and Yang, 2016) should consider the personal abilities, attitudes, and characteristics of the involved managers. In tax research, the manager person has been identified as an important determinant of tax avoidance. Feller and Schanz (2017) provide evidence that the implementation of tax planning methods varies with respect to the tax manager's level of influence within the company. Dyreng et al. (2010) evaluate the effects of executives that move across firms over time and find the existence of a general manager fixed effect on a company's tax avoidance. Other studies investigate the relationship

between specific manager characteristics and corporate tax avoidance (see, e.g., Chyz, 2013; Francis et al., 2014; Olsen and Stekelberg, 2016; Law and Mills, 2016; Koester et al., 2017; and Chyz et al., 2019).

A number of studies have investigated the tax implications within the agency framework, with the majority of them following Jensen and Meckling (1976) and focusing on a potential agency conflict between shareholder and top-level management. Chen and Chu (2005) use a standard principal-agent model and show that the separation of ownership and control results in inefficiencies with regard to tax. This efficiency loss occurs if the manager is not properly compensated for personal tax evasion penalties and therefore reduces effort to minimize the firm's tax burden. Using a contractual setting between a shareholder and a tax manager, Crocker and Slemrod (2005) analyze the optimal design of a compensation contract and the impact of penalties for tax evasion. They find that personal penalties for managers are more effective than penalties imposed on shareholders. Desai and Dharmapala (2006) analyze the effect of high-powered incentives and find that the use of stock options fosters corporate tax avoidance. Other studies examine whether managers that are compensated based on after-tax earnings of the firm engage to a larger extent in tax avoidance. Phillips (2003) is the first to show that compensating managers based on the after-tax accounting-based performance help firms lower their effective tax rate. He observes this effect for business unit managers but finds no similar effect for the compensation of CEOs. Gaertner (2014) and Armstrong et al. (2012) complement this research and document similar influences for CEOs (Gaertner, 2014) and tax directors (Armstrong et al., 2012).[5]

Only very few recent studies consider internal agency conflicts within MNEs with regard to taxation. Using a two-tier agency model described by Scharfstein and Stein (2000),

[5] For an additional review of the so far analyzed effects of the principal-agent problem on tax we refer to Bauer et al. (2018).

Amberger et al. (2021) analyze to what extent non-repatriated earnings are invested inefficiently due to an internal agency conflict between headquarter and subsidiary managers. They find that repatriation taxes exacerbate the agency conflict between head office and subsidiary management. Klassen and Valle Ruiz (2022) show that a conflict of interest within an MNE can also arise if incentives do not properly reflect internal transfer prices. They show that managers tend to inflate profits of their own unit after a change within the MNE's transfer pricing policies due to incongruences between the new transfer price and their personal incentives. In this vain, Ortmann and Schindler (2019) provide analytical evidence that debt shifting does not directly affect management incentives, whereas profit shifting via royalty payments has a negative incentive effect.

The implications of manager interlocks, i.e., managers with positions at different firms, have so far been addressed particularly in non-tax fields of business research (see Chen and Yang, 2021 for an overview). Existing literature differentiates between horizontal manager interlocks, i.e., managers with concurrent positions at different MNEs, and vertical interlocks, i.e., managers with concurrent positions at the headquarter and a subsidiary of the same MNE. Only very few studies investigate the consequences of horizontal and vertical interlocks for tax avoidance. Brown and Drake (2014) use the existence of horizontal interlocks as a proxy for tax avoidance knowledge sharing between firms and find that firms with stronger board ties to low-tax firms also show a lower Cash ETR. Wang et al. (2022) consider the impact of vertical interlocks on tax avoidance. Using a dataset of Chinese firms, they investigate the effect of appointing an MNE's top manager (chairman or CEO) as a subsidiary manager on the MNE's ETR. They find a negative effect and relate this to a better internal knowledge of the parent-subsidiary joint managers, which leads to a more efficient implementation of tax avoidance strategies. By focusing on the knowledge-sharing advantage of VMIs, they disregard that VMIs may also be used to overcome the above described

internal principal-agent conflict and should, thus, be more efficient for tax avoidance purposes in relation to high-tax subsidiaries. Furthermore, their analysis is limited to Chinese firms. Since governance practices and regulations are not necessarily the same in other countries, it is not clear to what extent the effects identified in their study hold also for other regions of the world.

Our study contributes to these different strands of tax literature in various ways. First, we address the call for further research on the relation between agency issues and taxation (Hanlon and Heitzman, 2010) and underline the relevance of a new dimension, the dimension of internal agency conflicts within MNEs. In this respect, our research can be linked to the recent papers by Amberger et al. (2021) and Klassen and Valle Ruiz (2022), which follow a similar line of thinking. Second, we propose and test a different solution to this internal principal-agent problem by considering the strategic use of VMIs. In contrast, previous literature primarily relied on the adjustment of compensation contracts. Third, our results shed some light on the relevance and role of subsidiary managers for the efficient implementation of profit shifting schemes. It underlines the usefulness of considering lower-level managers when analyzing the role of manager persons and characteristics for tax avoidance.

III. HYPOTHESES

The implementation of profit shifting strategies at the optimum level requires that responsible managers act in accordance with the overall MNE goals. Agency issues as well as a lack of knowledge and information may, however, prevent MNE-optimal profit shifting, particularly if we consider tax planning strategies that are implemented at the subsidiary level. Tax avoidance and profit shifting not necessarily require complex tax planning schemes developed by tax specialists at the headquarter level. It may also involve operative decisions within the regular business of the firm, e.g., when it comes to the pricing of internal transactions or financing

decisions. We, therefore, assume that profit shifting involves, to a certain extent, decentralized decision-making at the subsidiary level[6], which may result in these internal agency conflicts. Elizur and Mintz (1996), for example, consider for their theoretical transfer pricing model a parent company setting the transfer price and the subsidiary manager choosing the quantity depending on his personal compensation scheme.

Compensation and other personal benefits of subsidiary managers may relate to the performance of the individual subsidiary.[7] If MNEs apply a one-book system for tax accounting as well as (internal and external) financial accounting, then subsidiary managers located in high-tax countries may not be willing to accept that taxable income is shifted out of the unit under their control and, thus, are incentivized to act contrary to the MNE interest of minimizing the overall effective tax rate.[8]

It is, therefore, the task of the MNE's headquarter to design organizational control systems which help to align the subsidiary manager's goals with 'the goals headquarters [have] for that particular subsidiary' (O'Donnell, 1999, 154). There are different ways how the MNE can incentivize its subsidiary managers to act in accordance with the group interest. One obvious solution is to use a variable component of the subsidiary manager's salary. Roth and O'Donnell (1996) state that the interests of a subsidiary manager can be aligned with the MNE's

[6] In the industrial organization literature, different scenarios for the delegation of decision-making are evaluated using analytical models (see, e.g., Saha and Stiglitz, 1986). Empirical findings suggest that the delegation of decision-making is influenced by the complexity of production or ownership status (Colombo and Delmastro, 2004).

[7] Likewise, Gut and MacMillan (1986), e.g., provide evidence that middle managers are not motivated to act according to a corporate strategy that conflicts with their own self-interest.

[8] Survey as well as analytical results on one-set and two-sets of books are mixed. While an early survey by Springsteel (1999) reports 77 percent of the interviewed companies use two-sets of books. Czechowicz et al. (1982) report for a set of US MNEs that 89 percent use an one-set of book system and a more recent survey by E&Y (2003) reports over 80 percent of MNEs using a one-set of book system. Baldenius et al. (2004) show that decoupling tax and managerial transfer prices is optimal if using one transfer price does not reflect tax and managerial objectives. However, Dürr and Göx (2011) show in case of low competition that using one-set of book can be optimal. A number of studies emphasize higher costs and suspicious tax authorities (e.g. Baldenius et al., 2004; Nielsen and Raimondos-Møller, 2012) as reasons for keeping one-set of book. In addition, Nielsen et al. (2008) highlight that using two-sets of books is an illegal practice in some countries. Which all in all makes us confident to make this assumption.

parent company's interests by increasing the proportion of subsidiary management payments that is based on the overall MNE's performance. This, however, may involve additional costs and the inherent disadvantage that the variable salary component is not directly related to the performance of the unit controlled by the manager. In line with this cost argument, Fey and Furu (2008) provide evidence that the subsidiary management is often compensated by a salary and a variable component based on the subsidiary's short-term performance.

Hence, we consider a different solution in this paper, the use of VMIs. VMI names an organizational structure where the same manager person is in charge of the parent company and a (foreign) subsidiary. We argue that VMIs may help to overcome the above described internal agency conflict by assuming that these managers act in the MNE interest. In the following, we call this effect the "internal agency motive" for the use of VMI.

Prior literature (Wang et al., 2022) has pointed to a second advantage associated with this type of structure, which we refer to as the "better knowledge motive" and which may also alleviate tax avoidance. According to this argument, headquarter managers are assumed to have a better knowledge of the MNE, which helps them implement more efficient tax avoidance strategies at the subsidiary level.

If VMIs are installed for tax reasons, as predicted both by the "internal agency motive" and the "better knowledge motive", then we expect to observe these structures more frequently in MNEs with a larger potential for profit shifting. This assumption is also in line with Nielsen et al. (2008), who investigate analytically the effect of tax rate differences on the coordination of decision-making. Their model suggests that profit-maximizing MNEs should decide on profit shifting in a more centralized fashion, the larger the tax rate differentials are within the group. These considerations lead us to formulate our first hypothesis.

***H1**: Vertical manager interlocks should be observed more frequently in MNEs with a larger potential for profit shifting, i.e., MNEs with higher tax rate differentials within the group.*

We now take a closer look at the motives that drive the tax-related implementation of VMIs. Considering the two arguments for the use of VMIs described above leads us to assume that the heterogeneity in the use of VMIs within MNEs should depend on the applicable tax rate of the (foreign) subsidiaries. Whereas the "internal agency motive" relates only to high-tax subsidiaries, the "better knowledge motive" may also be valid for subsidiaries that face particularly low tax rates and are therefore of particular relevance for tax planning within the MNE. Assessing these two benefits of VMIs, we expect to observe VMIs more frequently in high-tax subsidiaries if the internal agency motive explains at least partly the use of VMIs. We, therefore, formulate our second hypothesis.

***H2a**: Vertical manager interlocks should be observed more frequently in foreign subsidiaries with a statutory tax rate above the group average (high-taxed subsidiaries).*

Implementing a VMI structure in a foreign subsidiary should not come free of cost (e.g., travel costs depending on the distance between headquarter and subsidiary location as well efficiency losses related to language and cultural differences if compared to a local manager). We, therefore, expect that this type of management structure is used in cases where the expected tax savings are particularly pronounced, i.e., the more the subsidiary's tax rate is above the tax rate of the profit shifting targets within the MNE.

***H2b**: The frequency of vertical manager interlocks in foreign subsidiaries should increase the more the statutory tax rate of the subsidiary is above the MNE average.*

The use of VMIs in high-tax subsidiaries alleviates the implementation of tax-efficient profit shifting by solving the above-described misincentivization of subsidiary managers and improving the knowledge of relevant tax planning-related information. Efficient profit shifting

depends not only on differences in statutory tax rates but should also consider the tax status of all other subsidiaries, e.g., the existence of loss-carry forwards. Appointing parent company managers on the subsidiary's management board could also help to inform the subsidiary management in this respect. We, therefore, hypothesize that MNEs with a higher share of vertical interlocks are more successful in avoiding taxes and formulate our third hypothesis. According to hypotheses 2a and 2b, this should hold in particular if these VMIs are installed in high-tax subsidiaries.

> ***H3****: MNEs with a high share of vertical manager interlocks have, all else being equal, a lower effective tax rate, particularly if the vertical manager interlocks are implemented in high-tax subsidiaries.*

IV. EMPIRICAL IDENTIFICATION

We start our empirical analysis by examining whether MNEs use VMIs for tax reasons. According to our Hypothesis 1, we expect this to be the case if VMIs can be observed more frequently in MNEs with a larger potential for tax-efficient profit shifting. To this end, we use the following cross-sectional OLS regression model, based on financial and management data aggregated at MNE level, with MNEs indexed as *j*.

$$Average\ VMI_j = \beta_0 + \beta_1\ tr\_diff_j + \beta_2\ \Phi_j + Industry\ Fixed\ Effects + \varepsilon_j \qquad (1)$$

Our dependent variable *Average VMI* is determined as the MNE-wide average share of VMIs per subsidiary. In line with Hypothesis 1, we expect MNEs with larger intra-group tax-rate differentials to use VMI structures more frequently. To measure the tax rate differential within MNEs (*tr_diff*) we use, in particular, the standard deviation of the statutory tax rate as well as the difference between the lowest and the highest tax rate within the MNE. We apply a comprehensive set of group-specific controls (Φ_j), including *Debt ratio* (calculated as total assets minus equity divided by total assets) and intensity of intangible assets (*Intangibles/Total assets*). We also include

MNE's *Number of employees, Sales,* and *Fixed assets* in order to control for the scale of economic activity. We further include *Number of countries* and the *Number of subsidiaries* to control for the (international) diversity of the MNE.[9] MNE industry fixed effects are included to control for industry-specific influences.

We now turn to the intra-group heterogeneity in the use of VMIs in order to investigate more closely the motives behind the use of VMIs. We investigate whether MNEs appoint managers in high-tax subsidiaries strategically in order to facilitate profit shifting by solving the internal principal-agent conflict. More specifically, we test whether VMIs are observed in particular in the case of high-tax subsidiaries (Hypothesis 2a). We employ the following cross-sectional OLS regression model as our baseline equation[10], based on affiliate-level data, with subsidiaries indexed as *i*, the subsidiary location as *c,* and the MNE as *j*.

$$VMI_i = \beta_0 + \beta_1 \, hightax_i + \beta_2 \, \Psi_{i,} + \beta_3 \, x_c + \alpha_j + \varepsilon_i \qquad (2)$$

Our dependent variable VMI_i is the share of managers of subsidiary *i*, that have co-positions at the headquarter of MNE *j*. Equation (3) defines the calculation of this variable.

$$VMI_i = \frac{Number\ of\ managers\ of\ sub_i\ with\ co\text{-}position\ at\ the\ headquarter}{Number\ of\ managers\ of\ sub_i} \qquad (3)$$

According to Hypothesis 2a, VMIs are expected to occur more frequently if the subsidiary's tax rate is above the group average. To test this relation, we include an indicator variable $hightax_i$, as our main independent variable. It takes the value of one if the subsidiary's statutory tax rate is above the assets-weighted group average, and zero otherwise.

[9] All of these MNE specific variables are included in terms of their natural logarithm.

[10] We use count data and probit specifications as robustness tests. For the count data specifications, the numerator of VMI_i enters the regression on the left-hand side, whereas the denominator is used as an offset variable. The probit model uses a binary dependent variable that takes the value of 1 if VMI_i is greater than zero, indicating that at least one subsidiary manager works for the head office.

We control comprehensively for subsidiary-, country-, and MNE-level influences in our regression.[11] *Fixed assets* and *Number of employees* control for the size of the subsidiary and the intensity of the production factors employed. We have ambiguous expectations for their coefficient estimates. On the one hand, large subsidiaries offer a higher potential for tax avoidance. On the other hand, they can, on average, also be expected to act more autonomous from the headquarter. We further control for the intensity of intangible assets (*Intangibles/Total assets*) and the *Debt ratio* to control for tax planning opportunities. *Firm age* is included in order to consider that more mature firms may be better established than new entrants and is calculated as the difference between our sample year 2014 and the year of incorporation. Since all of these variables are highly skewed, we include them in terms of the natural logarithm. *Language* controls for language differences between the headquarter and the foreign subsidiary and takes the value of one if headquarter country and subsidiary country have a common official language or a common non-official language spoken by at least 9 percent of the population. *Distance* captures the distance between the capital cities of the two countries. Both of these variables are included in order to capture potential efficiency costs associated with the VMI. We, thus, expect a positive effect for *Language* and a negative effect for *Distance*.

X_c is a vector of country-level variables and controls in the baseline specification for macroeconomic conditions prevailing in the subsidiary country *c*. *Corruption* is assessed by the Transparency International Corruption Index for 2014. *GDP* and *GDP per capita* are captured in log of US $, *GDP growth* is determined as the percentage change between GDP_{2013} and $GDP_{2014,}$ and *Unemployment* is assessed as the percentage of total labor force.[12] We expect VMIs rather in

[11] Hereby, we need to consider that our main variable of interest, $hightax_i$, is determined by the subsidiary-level statutory tax rate and the MNE-level average tax rate. Including subsidiary-country or MNE fixed effects, thus filters out parts of the variation in $hightax_i$. Ψ_i is a vector of subsidiary-specific control variables.
[12] All of this information is taken from the IMF database.

relation to subsidiaries from larger and faster-growing economies. In alternative specifications, country fixed effects are included instead of country-level controls.

Additionally, we control for the number of subsidiaries owned by an MNE within a respective country (*Number of country subsidiaries*). We expect it to be negatively associated with our dependent variable since vertical interlocks of other subsidiaries within the same country may prevent further use of such appointments.

We filter out group-level heterogeneity by including a vector of MNE-specific controls Θ_j in our baseline specification or MNE fixed effects in alternative specifications.[13] Θ_j comprises the intensity of intangibles, defined as *Intangibles* scaled by *Total assets*, the number of foreign locations (N*umber of countries*), the *Number of subsidiaries,* and the *Debt ratio* to control for the availability of tax planning potential. We also include *Fixed assets* and *Number of Employees* to control for MNE size.[14]

Testing Hypothesis 2b allows us to further differentiate whether the tax-motivated use of VMIs follows the internal agency motive or the better knowledge motive. To this end, we split the sample into high-tax and low-tax subsidiaries using the *hightax* variable from Equation (1). We then include *taxdiff* on the right-hand side, capturing the difference between the subsidiary's statutory tax rate ($staxr_i$) and the asset-weighted average statutory tax rate of the MNE (*Group* ATR_j).[15] The resulting regression for testing Hypothesis 2b is reported in Equation (4).

$$VMI_i = \beta_0 + \beta_1\, taxdiff_i + \beta_2\, \Psi_{i,} + \beta_3\, x_c + \alpha_j + \varepsilon_i \qquad (4)$$

For subsidiaries that belong to the high-tax subsample, higher values for *taxdiff* are associated with a higher potential for tax avoidance, meaning that we expect a positive effect on

[13] If MNE controls are used instead of MNE fixed effects, we also include MNE industry fixed effects.
[14] Again, the variables are included in terms of their natural logarithm.
[15] In alternative specifications, we define *taxdiff* also with reference to the unweighted average statutory tax rate of the MNE (robustness test) or the minimum statutory tax rate within the MNE (Hypothesis 2b).

VMI. If the appointment of VMIs would follow the better knowledge argument, we would expect a corresponding effect for subsidiaries with more negative values for *taxdiff* since these subsidiaries are also more relevant for tax avoidance strategies. A significantly higher coefficient estimate for *taxdiff* in the high-tax sample can thus be seen as a further confirmation of the internal agency motive.

We use another OLS regression model based on financial data aggregated at MNE level to test whether using VMI structures actually helps to optimize tax planning and therefore results in a lower *GAAP ETR* (Hypothesis 3). The cross-section OLS model is specified as follows.

$$ETR_j = \beta_0 + \beta_1 \, Average\ VMI_j + \beta_2 \, \Phi_j + Industry\ Fixed\ Effects + \varepsilon_j \quad (5)$$

Following prior literature, we use the *GAAP ETR* to capture corporate tax avoidance. It is calculated as the MNE's tax expense divided by EBIT. The independent variable *Average VMI* is determined as described above. Large values for *Average VMI* indicate a highly concentrated composition of the MNE's management, which should, according to Hypothesis 3, be associated with more tax avoidance and, therefore, lower ETRs. We, therefore, expect negative coefficient estimates for this variable.

Again, we apply a comprehensive set of group-specific controls (Φ_j), including *Debt ratio* (calculated as total assets minus equity divided by total assets) and intensity of intangible assets (*Intangibles/Total assets*). In accordance with prior literature, we expect a negative coefficient estimate due to the tax shield of debt (see MacKie-Mason, 1990). Likewise in (1), we also include MNE's *Number of employees, Sales,* and *Fixed assets* in order to control for the scale of economic activity. We further include earnings before interest and taxes (*EBIT*) and the *Number of subsidiaries* to control for the diversity of the MNE.[16] Since the *GAAP ETR* is highly driven by the

[16] Again, all of these MNE specific variables are included in terms of their natural logarithm.

group's statutory tax rate, we include MNE's *Average STAXR* in our main specification. MNE industry fixed effects are included to control for industry-specific influences.

V. DATA AND SAMPLE SELECTION

Sample Selection

We employ two distinct sets of company data for testing our three hypotheses. Both samples are taken from the AMADEUS database, which is compiled by Bureau van Dijk and contain detailed information on accounting data, ownership structure, and management composition of European firms.[17] Using AMADEUS allows us to link accounting and ownership information for headquarter and subsidiaries with detailed management information, which is inevitable for our purposes. We employ the following manager-specific information provided in AMADEUS for each manager working in a considered headquarter or subsidiary: a unique manager identifier and the job title. The unique identifier allows us to tag managers with positions in the headquarter as well as a subsidiary. For both analyses, we incorporate cross-section data referring to the year 2014 since the management information is available only for that single year.

Sample 1, used to test Hypotheses 2a and 2b, considers all European subsidiaries of an MNE held (directly or indirectly) to at least 50 percent by a foreign corporation. With regard to legal form and firm status, we restrict our sample to active firms in the legal form of a private or public limited company. Financial and insurance companies as well as companies with an unknown industry are removed from our sample for reasons of industry-specific tax regulations. We also eliminate firms for which the required unconsolidated balance sheet and income statement information is not available for 2014. Lastly, we require management information for both the

[17] We use the release 259 of the Amadeus Database for this study.

subsidiary and the majority shareholder (ultimate parent company). Table 1 below summarizes the selection process. Summary statistics for the resulting sample can be found in the Appendix.

TABLE 1
Sample selection process Hypothesis 2a and 2b

Total number of available companies (MNE and domestic)	3,146,375
Public or private limited	2,789,807
Only active companies	2,555,569
Unconsolidated data	2,274,709
No financial and insurance companies	2,145,524
Parent company control of at least 50 %	1,155,188
Available control variables and management information	21,365

This table presents the sample selection process for the sample used to test Hypothesis 2a and 2b. The population is all available companies in the AMADEUS database.

Sample 2, used to test Hypotheses 1 and 3, results from a similar selection process, subject to the difference that we here analyze data aggregated at the MNE level. To this end, we select all (domestic and foreign) subsidiaries with the required balance sheet, income statement, industry, and management information. We then aggregate accounting information group-wise at the level of the ultimate parent company. Finally, we drop MNEs with a negative tax payment or EBIT. Again, summary statistics for the resulting sample can be found in the Appendix.

Construction of the VMI variable

The generation of our dependent variable *VMI* follows a four-step procedure. In the first step, we identify the headquarter managers. In a second step, we identify the set of managers with positions related to any kind of tax issue for each foreign subsidiary. To this end, we exclude all management positions with no broader association to tax decisions, such as marketing, human resources, or IT. The managers remaining in the sample have positions like, Financial Executive, Chief Branch Officer, and Member of the Board of Directors. We require relevant managers further to have a position with a reasonable decision-making power, which we assume for C-level

employees as well as employees with a higher management position in the respective subsidiary.[18] In step 3, we match the two sets of managers to obtain those having a position at the headquarter as well as the foreign subsidiary, which are hereafter called VMIs. Lastly, we determine *VMI* for each foreign subsidiary and *Average VMI* for each MNE as described above.

VI. EMPIRICAL RESULTS

The tax-motivated use of VMIs

VMIs can alleviate the realization of the MNE goals in foreign subsidiaries by better sharing MNE knowledge in the management of foreign subsidiaries and by solving internal agency issues in situations where the preferences of the MNE management and the subsidiary management do not perfectly align. Both mechanisms may explain why VMIs facilitate tax optimization within MNEs, but may also hold for other areas of business decisions.

We, therefore, start our empirical analysis by investigating to what extent the use of VMIs is driven by tax considerations. To this end, we test whether MNEs with more potential for tax planning, i.e., with larger tax rate differentials, have on average more VMIs (Hypothesis 1).[19] Regression results are presented in Table 2. To measure the potential for profit shifting within MNEs, we use the standard deviation of the statutory tax rate (*sd_staxr*, Column 2), the difference between the lowest and the highest tax rate (*minmax_staxr*) within the MNE (Column 3), and lastly,

[18] Bureau van Dijk uses a four dimensional scale to identify the decision making power of an employee. Level 1 refers to C-level employees, level 2 indicates executives and higher management, level 3 represents managers and level 4 corresponds to employees of the respective department. Hence we are using level 1 and level 2 managers for our analysis. Due to national regulations the number of board members varies extensively within Europe. Some countries enact a mandatory two-tier board structure, e.g. Austria, while others such as Spain oblige to adopt a single-tier board and lastly in countries like France and Italy companies may generally adopt either structure (Gerner-Beuerle and Schuster, 2014). We, therefore, exclude managers whose job description indicates working as a Member of the Board or as Supervisory Board Members of the subsidiary.

[19] Similarly, Nielsen et al. (2008) advise MNEs facing larger tax rate differentials to use more centralized decision making.

an indicator variable taking the value of 1 if *minmax_staxr* is above the sample average, zero otherwise (Column 4).

TABLE 2
Tax motivated use of VMIs

Dependent variable: *Average VMI*	(1) OLS	(2) OLS	(3) OLS	(4) OLS
Debt ratio	-0.0009	-0.0011	0.0006	0.0016
	(-0.33)	(-0.39)	(0.20)	(0.58)
Intangible /Total assets	-0.0481	-0.0460	-0.0370	-0.0358
	(-1.30)	(-1.24)	(-1.00)	(-0.99)
Number of employees	-0.0006	-0.0009	-0.0006	-0.0005
	(-0.33)	(-0.49)	(-0.30)	(-0.28)
Fixed assets	-0.0022**	-0.0022*	-0.0019*	-0.0017
	(-1.96)	(-1.92)	(-1.67)	(-1.52)
Number of subsidiaries	0.0725***	0.0732***	0.0418***	0.0263***
	(12.66)	(12.80)	(7.68)	(4.81)
Number of countries	-0.1186***	-0.1339***	-0.1706***	-0.1184***
	(-12.41)	(-13.12)	(-14.77)	(-13.04)
SD_staxr		**0.0056*** **		
		(4.27)		
minmax_staxr			**0.0107*** **	
			(10.72)	
minmax_dummy				**0.1278*** **
				(13.69)
Industry FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Group FE	No	No	No	No
Sample	Full	Full	Full	Full
Observations	6,567	6,567	6,567	6,567
Adj. R-sq	0.0435	0.0452	0.0772	0.0945

This table presents the estimates of Equation (1) for the dependent variable *Average VMI*. *SD_staxr* represents the standard deviation of the MNE's statutory tax rate. *minimax_staxr* is the maximum statutory tax rate less the minimum statutory tax rate of the respective MNE. *minmax_dummy* represents an indicator variable taking the value of 1 if the MNEs *minmax_staxr* is above the average, 0 otherwise. We control for MNE specifics by using *Debt ratio* representing the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* representing the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of the MNE's total number of employees. *Fixed assets* is the natural logarithm of fixed assets, *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

In Column 1 of Table 2, we analyze the group-level non-tax determinants on the application of VMI structures. We find that VMIs are used more frequently if MNEs are split into a higher number of separate subsidiaries (positive coefficient estimate for *Number of subsidiaries*) and if subsidiaries are located in fewer different countries (negative coefficient estimate for *Number of*

countries). Our analysis of the tax determinants strongly confirms Hypothesis 1. The coefficients estimated for all three tax rate differential variables in Columns 2 to 4 are positive and statistically significant at the one percent confidence level. Besides, the overall explanatory power of the model increases substantially if the tax rate differential is included (Columns 2 to 4, compared to Column 1). Tax planning considerations thus seem to be a relevant driver for the use of VMIs.

Mechanisms behind the tax-motivated use of VMIs

The results in the previous section provide evidence that tax planning considerations are a relevant driver for the use of VMIs. In this section, we take a closer look at the motives and mechanisms behind this influence. As discussed in Section 2, the tax-related use of VMIs may be particularly motivated by a "better knowledge effect" and an "internal agency effect". Whereas the "better knowledge effect", i.e., the advantage that MNEs can pass down the knowledge about tax planning opportunities to foreign subsidiary managers, should be valid for both high-tax and low-tax subsidiaries, the "internal agency effect" is effective only in relation to high-tax subsidiaries (see Hypothesis 2a). We, therefore, test whether VMIs are found more frequently in foreign high-tax subsidiaries in order to validate the relevance of the "internal agency effect". To this end, we estimate the OLS regression model as described by Equation (2) and report the respective results in Table 3. Since the described internal agency conflict is assumed only in relation to foreign high-tax subsidiaries, we expect that our main independent variable, *hightax*, has a positive effect on the dependent variable VMI, i.e., that VMIs are used more frequently in relation to subsidiaries that face a tax rate that is above the group average. We estimate three different specifications of Equation (2) in terms of the considered controls and fixed effects. In defining our regression model, we must consider that the choice of management structure may well be influenced by country-level governance regulations or standards and, particularly, unobservable group preferences. Incorporating (MNE and/or country) fixed effects, however, involves the disadvantage that it

partially filters out the variation in the *hightax* variable. In Columns 1 and 2, we, therefore, report regression results for a specification considering MNE fixed effects as well as subsidiary-level and country-level controls. In additional specifications, we incorporate country fixed effects (Column 3 of Table 3) and neither MNE nor country fixed effects (Column 4 of Table 3) in order to test the robustness of our findings.

In Column 1, we analyze the non-tax determinants of VMIs at the subsidiary level. The coefficient estimates for the two size measures, *Fixed assets* and *Number of employees*, are negative and significant at the one percent level, indicating that VMIs are less common in large subsidiaries. This may indicate that large-scale subsidiaries are, ceteris paribus, more independent from the headquarter. As expected, VMIs are negatively associated with a longer distance between headquarter and subsidiary, while a common language fosters the implementation of these structures.

In Columns 2 to 4, we test whether VMI structures are used more often in high-tax subsidiaries, which may indicate that MNEs implement this instrument in order to solve the internal principal-agent conflict with regard to profit shifting decisions (Hypothesis 2a). In Column 2, the coefficient estimate for *hightax* is positive and significant at the ten percent level. A subsidiary located in a high-tax country has on average 0.012 more VMIs compared to a subsidiary located in a low-tax country. Compared to the VMIs mean of 0.042, this represents an increase of almost 30 percent. The use of VMIs thus seems to be driven largely by this tax-related internal agency motive. Using country fixed effects (Column 3) or MNE- and country-level controls (Column 4) leads to even larger and stronger effects.

TABLE 3
The use of VMIs in High-tax Subsidiaries (Hypothesis 2a)

Dependent variable:	(1)	(2)	(3)	(4)
VMI	OLS	OLS	OLS	OLS
hightax		**0.0119***	**0.0436*****	**0.0439*****
		(1.82)	**(10.40)**	**(10.98)**
Debt ratio (sub)	0.0008	0.0006	0.0009	0.0007
	(0.33)	(0.23)	(0.38)	(0.41)
Intangibles/Total assets (sub)	-0.0023	-0.0039	-0.0264	-0.0264
	(-0.08)	(-0.13)	(-1.13)	(-1.13)
Number of employees (sub)	-0.0028*	-0.0027	-0.0052***	-0.0052***
	(-1.67)	(-1.59)	(-3.63)	(-3.63)
Fixed assets (sub)	0.0023***	0.0022**	-0.0021***	-0.0020***
	(2.69)	(2.62)	(-2.89)	(-2.72)
Firm age (sub)	0.0013	0.0013	-0.0008	-0.0008
	(0.57)	(0.58)	(-0.53)	(-0.57)
Language (sub)	0.0164*	0.0168*	0.0259**	0.0265***
	(1.80)	(1.84)	(4.59)	(4.92)
Distance (sub)	-0.0116**	-0.0109*	-0.0257***	-0.0254***
	(-2.09)	(-1.95)	(-23.31)	(-22.99)
Debt ratio (MNE)			-0.0010	-0.0008
			(-0.49)	(-0.40)
Intangibles/Total assets (MNE)			0.0338	0.0370
			(1.04)	(1.14)
Number of employees (MNE)			0.0055***	0.0053***
			(3.46)	(3.37)
Fixed assets (MNE)			0.0034***	0.0035***
			(4.11)	(4.26)
Number of countries (MNE)			-0.0067	-0.0060
			(-1.40)	(-1.30)
Number of subsidiaries (MNE)			-0.0191***	-0.0199***
			(-4.93)	(-5.28)
GDPgrowth	0.4460***	0.2369***		0.3926***
	(11.06)	(2.77)		(9.77)
GDP	0.0033***	0.0020		0.0052***
	(4.19)	(1.59)		(6.40)
GDP per capita	0.0157***	-0.0036		0.0003
	(3.19)	(-0.42)		(0.07)
Unemployment rate	-0.0007***	-0.0009*		-0.0010***
	(-2.62)	(-1.71)		(-3.98)
Corruption	-0.0077***	-0.0038		-0.0059***
	(-4.41)	(-1.43)		(-3.42)
Number of subsidiaries per country	-0.0106***	-0.0047	-0.0126***	-0.0122***
	(-4.42)	(-1.71)	(-5.03)	(-5.06)
Industry FE	No	No	Yes	Yes
Group FE	Yes	Yes	No	No
Country FE	No	No	Yes	No
Observations	21,365	21,365	21,365	21,365
Adj. R-sq	0.0106	0.0117	0.0555	0.0793

This table presents the estimates of Equation (2) for the dependent variable *VMI*. *hightax* is an indicator variable taking the value 1 if the subsidiary's statutory tax rate is above the asset-weighted average statutory tax rate of the MNE. For the subsidiary-level controls, *Debt ratio* represents the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of subsidiary's number of employees. *Fixed assets* is the natural logarithm of fixed assets and *Firm age* is the natural logarithm of years between 2014 and the year of incorporation. The binary variable *Language* takes the value of one if the common official language in the parent and subsidiary country is identical or a commonly spoken language, with at least 9 % of the population speaking such language, is present in both countries; zero otherwise. *Distance* captures the distance between the parent and the subsidiary countries' capitals. Both are taken from the CEPII Database. *Debt ratio, Intangibles/total assets, Employee costs,* and *Fixed assets* are calculated likewise for the group-level controls with respect to the MNE. *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. *GDPgrowth* is the percentage change between GDP_{2013} and GDP_{2014}. *GDP* is the natural logarithm of the gross domestic product of the subsidiary's country, *GDP per capita* represents the natural logarithm of the country's GDP per capita, *Unemployment rate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *Number of subsidiaries per country* is the natural logarithm of the MNE's total number of subsidiaries in the subsidiary's country. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

The relevance of subsidiaries for an MNE's tax planning increases with the subsidiary's tax rate being more above (profit shifting origin) or more below (profit shifting target) the group average. The use of structures that facilitate and foster tax avoidance, like the VMI structure, should, thus, be particularly attractive in these subsidiaries. In order to test whether this hypothesis holds for the use of VMIs, we split our sample into a subsample of high-tax and a subsample of low-tax subsidiaries and test whether the investment in VMIs increases with the deviation from the group average tax rate in both subsamples. Hereby, using VMIs in low-tax subsidiaries may foster tax avoidance only according to the "better knowledge motive", whereas for high-tax subsidiaries the tax-related "internal agency motive" also applies. In line with Hypothesis 2b, we, therefore, expect the effect observed for the low-tax subsample – if any – to be smaller and weaker.

Table 4 displays the regression results. Column 1 reports the results for the high-tax subsample, whereas Column 2 refers to the low-tax sample. We, again, estimate the model with MNE fixed effects and country-level controls since this is our primary specification.

As expected, the estimated coefficient for *taxdiff* is positive and statistically significant for the high-tax sample. In Column 1, the coefficient estimate of 0.003 is equivalent to an increase of 5.5 percent compared to the sample average of the VMI variable (0.058) if the tax rate differential is one percentage point higher. We find no similar effect for the low-tax subsidiaries. The coefficient estimate is positive and statistically insignificant. If the appointment of VMIs would also occur more frequently for subsidiaries with very low tax rates, we would have expected a negative and statistically significant coefficient estimate.

TABLE 4
The use of VMIs in High-tax Subsidiaries II (Hypothesis 2b)

Dependent variable:	(1)	(2)
VMI	OLS	OLS
Taxdiff	**0.0032****	**0.0015**
	(2.32)	**(0.87)**
Debt ratio (sub)	-0.0016	-0.0007
	(-0.43)	(-0.23)
Intangibles/Total assets (sub)	0.0146	-0.0094
	(0.38)	(-0.20)
Number of employees (sub)	-0.0043*	-0.0012
	(-1.79)	(-0.47)
Fixed assets (sub)	0.0027**	0.0012
	(2.41)	(0.89)
Firm age (sub)	0.0012	0.0030
	(0.44)	(0.72)
Language (sub)	0.0286**	0.0288
	(2.44)	(1.34)
Distance (sub)	-0.0030	-0.0050
	(-0.40)	(-0.54)
Sample	High-taxed Subsidiaries	Low-taxed Subsidiaries
Industry FE	No	No
Group FE	Yes	Yes
Country FE	No	No
Country-level controls	Yes	Yes
Observations	6,131	15,234
Adj. R-sq	0.0203	0.0116

This table presents the estimates of Equation (4) for the dependent variable *VMI*. *Taxdiff* is the subsidiary's statutory tax rate less the asset-weighted average statutory tax rate of the MNE. For the subsidiary-level controls, *Debt ratio* represents the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of subsidiary's number of employees. *Fixed assets* is the natural logarithm of fixed assets and *Firm age* is the natural logarithm of years between 2014 and the year of incorporation. The binary variable *Language* takes the value of one if the common official language in the parent and subsidiary country is identical or a commonly spoken language, with at least 9 % of the population speaking such language, is present in both countries; zero otherwise. *Distance* captures the distance between the parent and the subsidiary countries' capitals. Both are taken from the CEPII Database. The not reported control variables are the following. *Debt ratio, Intangibles/Total assets, Number of employees,* and *Fixed assets* are calculated likewise for the Group-level controls with respect to the MNE. *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. *GDPgrowth* is the percentage change between GDP_{2013} and GDP_{2014}. *GDP* is the natural logarithm of the gross domestic product of the subsidiary's country, *GDP per capita* represents the natural logarithm of the country's GDP per capita, *Unemployment rate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *Number of subsidiaries per country* is the natural logarithm of the MNE's total number of subsidiaries in the subsidiary's country. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

In Table 4, we have used the MNE average tax rate in order to assess the potential for profit shifting. Some prior literature points, in the context of profit shifting via capital structure choice, to the relevance of the minimum tax rate within the MNE for intra-group profit shifting (see Moen et al., 2011). We test the relevance of the minimum tax rate for our setting and replace *Taxdiff*

with *Taxdiff_2*, defined with reference to the minimum tax rate, in Table 5 (Columns 3 and 4).[20] For reason of comparability, we report the results for the respective specifications using the average tax rate (*Taxdiff*) in Columns 1 and 2 of Table 5.

TABLE 5
The use of VMIs in High-tax Subsidiaries III (Hypothesis 2b)

Dependent variable:	(1)	(2)	(3)	(4)
VMI	OLS	OLS	OLS	OLS
Taxdiff	**0.0019***	**0.0023****		
	(1.95)	**(2.52)**		
Taxdiff_2			**-0.0002**	**0.0007**
			(-0.27)	**(1.13)**
Debt ratio (sub)	-0.0003	0.0004	-0.0004	0.0006
	(-0.10)	(0.13)	(-0.12)	(0.19)
Intangibles/Total assets (sub)	-0.0038	-0.0070	-0.0028	-0.0172
	(-0.11)	(-0.20)	(-0.08)	(-0.50)
Number of employees (sub)	-0.0057**	-0.0054**	-0.0059**	-0.0061***
	(-2.41)	(-2.27)	(-2.46)	(-2.67)
Fixed assets (sub)	0.0018	0.0016	0.0014	0.0012
	(1.56)	(1.36)	(1.21)	(1.05)
Firm age (sub)	-0.0017	-0.0021	-0.0017	-0.0025
	(-0.56)	(-0.70)	(-0.55)	(-0.84)
Language (sub)	0.0025	0.0010	-0.0340***	-0.0336***
	(0.27)	(0.11)	(-16.31)	(-16.09)
Distance (sub)	-0.0339***	-0.0351***	0.0008	0.0033
	(-16.43)	(-16.75)	(0.09)	(0.37)
Sample	High-taxed Subsidiaries	High-taxed Subsidiaries	High-taxed Subsidiaries	High-taxed Subsidiaries
Industry FE	Yes	Yes	Yes	Yes
Group FE	No	No	No	No
Country FE	Yes	No	Yes	No
Observations	6,131	6,131	6,131	6,131
Adj. R-sq.	0.1005	0.1227	0.0998	0.0501

This table presents additional estimates of Equation (4) for an alternative definition of *Taxdiff*. The dependent variable is *VMI*. *Taxdiff_2* represents the difference between the subsidiary's statutory tax rate and the MNE's lowest statutory tax rate. The control variables are the following. For the subsidiary-level controls, *Debt ratio* represents the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of subsidiary's number of employees. *Fixed assets* is the natural logarithm of fixed assets and *Firm age* is the natural logarithm of years between 2014 and the year of incorporation. The binary variable *Language* takes the value of one if the common official language in the parent and subsidiary country is identical or a commonly spoken language, with at least 9 % of the population speaking such language, is present in both countries; zero otherwise. *Distance* captures the distance between the parent and the subsidiary countries' capitals. Both are taken from the CEPII Database. Not-reported controls are *Debt ratio, Intangibles/Total assets, Number of employees*, and *Fixed assets* calculated likewise for the Group-level. *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. *GDPgrowth* is the percentage change between GDP_{2013} and GDP_{2014}. *GDP* is the natural logarithm of the gross domestic product of the subsidiary's country, *GDP per capita* represents the natural logarithm of the country's GDP per capita, *Unemployment rate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *Number of subsidiaries per country* is the natural logarithm of the MNE's total number of subsidiaries in the subsidiary's country. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

[20] Note that we do not report a specification with MNE fixed effects, since this would filter out the minimum tax rate. Results would thus be the same as in Table 5, Specification (1).

The coefficient estimate for *Taxdiff_2* is insignificant in both specifications, meaning that the use of VMI structures responds to the average tax rate rather than to the minimum tax rate of the MNE. Following the arguments used in Moen et al. (2011), this finding may indicate that VMIs are relevant for the optimal allocation of profits across operative subsidiaries but less significant when it comes to the application of more sophisticated tax planning structures involving financing units or tax haven affiliates.

Robustness

We test the robustness of our regression results by changing several regression parameters.[21] In all analyses presented so far, we use a tax differential variable weighted by the subsidiary's total assets. In a first robustness test, we conduct the same regression as presented in Tables 3 (Column 2) and 4 (Column 1) but use a non-weighted tax differential (Table 6). The estimated coefficients are statistically significant and slightly larger than in the baseline regressions.

TABLE 6
The use of VMIs in High-tax Subsidiaries (Robustness I)

Specification	*Unweighted Taxdiff*	*Unweighted Taxdiff*
Model	OLS	OLS
hightax	**0.0149****	
	(2.26)	
Taxdiff		**0.0024***
		(1.97)
Sample	Full	High-taxed Subsidiaries
Industry FE	No	No
Group FE	Yes	Yes
Country FE	No	No
Observations	21,365	6,520
Adj. R-sq	0.0121	0.0176

This table presents the estimates of the robustness analyses for the independent variable *hightax*. The dependent variable is *VMI*. *hightax* is an indicator variable taking the value 1 if the subsidiary's statutory tax rate is above the average statutory tax rate of the MNE. The not reported control variables are the following. For the subsidiary-level controls, *Debt ratio* represents the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of subsidiary's number of employees. *Fixed assets* is the natural logarithm of fixed assets and *Firm age* is the natural logarithm of years between 2014 and the year of incorporation. The binary variable *Language* takes the value of one if the common official language in the parent and subsidiary country is identical or a commonly spoken language, with at least 9 % of the population speaking such language, is present in both countries; zero otherwise. *Distance* captures the distance between the parent and the subsidiary countries' capitals. Both are taken from the CEPII Database. *Debt ratio, Intangibles/Total assets, Number of employees*, and *Fixed assets* are calculated likewise for the Group-level controls with respect to the MNE. *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. *GDPgrowth* is the percentage change between GDP_{2013} and GDP_{2014}. *GDP* is the natural logarithm of the gross domestic product of the subsidiary's country, *GDP per capita* represents the natural logarithm of the country's GDP per capita, *Unemployment rate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *Number of subsidiaries per country* is the natural logarithm of the MNE's total number of subsidiaries in the subsidiary's country.***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

[21] We focus on our main specification for all robustness tests.

A second set of robustness tests (Table 7) relates to the distribution of the dependent variable. Whereas for the baseline specifications, the dependent variable *VMI* captures the ratio of VMIs to the total number of subsidiary managers, we translate this variable into a binary as well as a count data variable.

TABLE 7
The use of VMIs in High-tax Subsidiaries (Robustness II)

Specification	Binary Variable	Count Data Model
Model	Probit	NBREG
hightax	**0.4166*****	**1.0695*****
	(12.36)	**(8.55)**
Sample	Full	Full
Industry FE	No	Yes
Group FE	Yes	No
Country FE	No	No
Subsidiary-level controls	Yes	Yes
Group-level controls	No	Yes
Country-level controls	Yes	Yes
Observations	21,365	21,365
Pseudo R-sq.	0.516	0.0843

This table presents the estimates of the robustness analyses for the dependent variable *VMI*. In Column 1, the dependent variable takes the value of 1 if *VMI* is greater than zero, indicating at least one subsidiary manager working for the subsidiary as well as the head office, and 0 otherwise. In Column 2, the numerator of the VMI variable, the number of managers of the respective subsidiary with co-position in the foreign parent company, is used as the dependent variable, while the denominator is used as an offset variable. *hightax* is an indicator variable taking the value 1 if the subsidiary's statutory tax rate is above the asset-weighted average statutory tax rate of the MNE. The not reported control variables are the following. For the subsidiary-level controls, *Debt ratio* represents the natural logarithm of the ratio of company's debt to total assets. *Intangibles/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of subsidiary's number of employees. *Fixed assets* is the natural logarithm of fixed assets and Firm Age is the natural logarithm of years between 2014 and the year of incorporation. The binary variable *Language* takes the value of one if the common official language in the parent and subsidiary country is identical or a commonly spoken language, with at least 9 % of the population speaking such language, is present in both countries; zero otherwise. *Distance* captures the distance between the parent and the subsidiary countries' capitals. Both are taken from the CEPII Database. *Debt ratio, Intangibles/Total assets, Number of employees*, and *Fixed assets* are calculated likewise for the Group-level controls with respect to the MNE. Group ATR is the MNE's asset-weighted average statutory tax rate. *Number of countries* represents the number of countries an MNE is working in and *Number of subsidiaries* is the natural logarithm of the number of subsidiaries of an MNE. *GDPgrowth* is the percentage change between GDP_{2013} and GDP_{2014}. *GDP* is the natural logarithm of the gross domestic product of the subsidiary's country, *GDP per capita* represents the natural logarithm of the country's GDP per capita, *Unemployment rate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *Number of subsidiaries per country* is the natural logarithm of the MNE's total number of subsidiaries in the subsidiary's country.***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity-robust and clustered at country and MNE level.

In Table 7, Column 1, we translate *VMI* into an indicator variable which indicates whether a subsidiary has at least one manager who is also employed at the headquarter. We use a probit regression with the same explanatory variables as in our main OLS specification (Table 3) and add the number of manager positions per subsidiary as an additional control. We again find similar

results compared to our main specification. The *hightax* indicator variable is positive and statistically significant.

In Column 2 of Table 7, we conduct a count data analysis to further validate the OLS regression results. To this end, we use the number of VMIs at subsidiary level as dependent variable. For reasons of overdispersion in our dependent variable, we apply a negative binomial model.[22] Again, the coefficient estimate for *hightax* is positive and statistically significant at the one percent confidence level. The coefficient estimate of 1.0695 translates into an incidence rate ratio of approximately 2.9[23]. Therefore high-taxed subsidiaries show almost three times as many VMIs as the low-taxed ones.

Effect of VMIs on tax avoidance outcomes

Altogether, the results so far provide evidence that (a) MNEs with more potential for tax planning use VMI structures more frequently, and (b) VMIs are used in particular in relation to high-tax subsidiaries, for which a potential internal agency conflict may arise if profit shifting strategies are applied. We complete our analysis on the relevance of VMI structures for corporate tax avoidance and investigate in this section whether and to what extent MNEs with VMI structures report ceteris paribus lower effective tax rates.

According to Hypothesis 3, we expect a negative coefficient estimate for our variable of interest, the average VMI variable (Table 8), particularly if the VMI occurs in relation to high-tax subsidiaries (Table 9). To test this prediction, we employ financial data aggregated at the MNE-level.

[22] Using a Lagrange multiplier test (LM-value>0, p-value 0.000) we can reject the hypothesis of no overdispersion and confirm using the negative binomial model.
[23] $e^{1,0695}=2.9139$

TABLE 8
The effect of VMI structures on ETR I

	(1) *GAAP ETR*	(2) *GAAP ETR*	(3) *3year GAAP ETR*	(4) *GAAP ETR/Avg STAXR*
Average VMI	**-0.0381****	**-0.0446*****	**-0.0442*****	**-0.1760*****
	(-2.52)	**(-3.06)**	**(-2.95)**	**(-2.99)**
Debt ratio	-0.0437***	-0.0474***	-0.0398***	-0.2189***
	(-8.38)	(-9.37)	(-7.55)	(-10.14)
Intangible/Total assets	0.2539***	0.0682	0.1283*	0.5508**
	(3.74)	(0.99)	(1.85)	(2.00)
Number of employees	-0.0096***	0.0091***	0.0121***	0.0242**
	(3.51)	(3.19)	(4.01)	(2.07)
Fixed assets	0.0030	0.0041*	0.0018	0.0135
	(1.34)	(1.89)	(0.77)	(1.51)
EBIT	-0.0629***	-0.0641***	-0.0700***	-0.2632***
	(-11.99)	(-12.37)	(-11.94)	(-11.58)
Number of subsidiaries	0.0356***	0.0296***	0.0372***	0.1320***
	(7.69)	(6.57)	(8.41)	(7.42)
Sales	0.0541***	0.0355***	0.0372***	0.1648***
	(13.58)	(9.07)	(8.64)	(10.64)
Average STAXR		1.2113***	1.2597***	
		(22.37)	(20.86)	
Industry FE	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Full
Observations	6,592	6,592	5,583	6,592
Adj. R-sq	0.1015	0.1707	0.1959	0.1057

This table presents the estimates of Equation (5) for variable *Average VMI*, where the dependent variables are the *GAAP ETR*, a *3 year GAAP ETR* and the ratio of GAAP ETR and the MNE's average statutory tax rate. The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by EBIT, winsorized at the 1 % level. *Average VMI* is calculated as the total of *VMI* divided by the MNE's overall number of subsidiaries. *Debt ratio* is the natural logarithm of MNE's debt to total assets. *Intangible/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of MNE's Number of employees. *Fixed assets* is the natural logarithm of MNE's fixed assets. *EBIT* represents the logarithm of MNE's earnings before interest and tax and *Sales* represents the logarithm of MNE's sales. *Average STAXR* represents the group's average statutory tax rate. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. *t* statistics are given in the parentheses and standard errors are heteroscedasticity robust.

The results reported in Table 8 confirm our Hypothesis 3. The coefficient estimated for *Average VMI* in specification (1) is statistically significant and negative (marginal effect: -0.0381). Based on these regression results, we predict that an MNE with the sample average value for *Average VMI* reports a *GAAP ETR* which is 0.18 percentage points smaller compared to an MNE without any VMIs, all else being equal. This difference is equivalent to approximately 0.7 percent of the average GAAP ETR. Using the average statutory tax rate of the MNE as an additional control variable leads to slightly larger effects. The coefficient estimate of -.0446 represents an average tax burden reduction of 0.22 percentage points which translates into approximately 0.9 percent of the average GAAP ETR. Since the one-year *GAAP ETR* can be driven by year-specific events, we also

use a three-year *GAAP ETR* as dependent variable (Column 3).[24] The result confirms our findings using the one-year measure (-0.21 percentage points). The *GAAP ETR* is also largely driven by the location of subsidiaries and the applicable statutory tax rates. Given that the location choice is not necessarily based on tax considerations, we use a second independent variable (Table 8, Column 4) that scales the *GAAP ETR* by the average statutory tax rate. The resulting coefficient estimate for *Average VMI* is again negative, statistically significant, and economically substantial. Comparing an average MNE (in terms of *Average VMI*) with one using no VMI structure leads to an approximately 0.86 percentage point lower adjusted *GAAP ETR*.

In the previous subsection, we have documented that VMI structures are used significantly more frequently in subsidiaries with an above-average statutory tax rate. For these subsidiaries, implementing a VMI offers not only the advantages of the "better knowledge effect", but also the advantages of the "internal agency effect". Since the managers of high-tax subsidiaries are thus more relevant for an efficient application of profit shifting strategies, we expect that VMIs in high-tax subsidiaries are also associated with a stronger reduction of effective tax rates. We, therefore, repeat our analysis from Table 8 but consider only the managers from high-tax subsidiaries in order to determine *Average VMI.*[25] The regression results are reported in Table 9. The results support our expectations. The size of the tax-reducing effect of VMIs is larger in all four specifications, compared to the results reported in Table 8.

[24] The use of a three-year GAAP ETR is very common in the tax avoidance literature due to the proposed reason (see e.g., Armstrong et al., 2015). Since we are using the years 2014 to 2012 to calculate the ETR and only use management information for the year 2014 (because of data availability) using this measure indirectly assumes the described management structure has been implemented within the whole period, an assumption which we, unfortunately, cannot verify. Since the coefficient for the three-year *GAAP ETR* does not deviate much from the one representing 2014 we are confident that the assumption holds and one-year events are not driving our results.

[25] As a consequence, MNEs are only included in the resulting sample, if the required information is available for at least one high-tax subsidiary.

TABLE 9
The effect of VMI structures on ETR II

	(1) *GAAP ETR*	(2) *GAAP ETR*	(3) *3 year GAAP ETR*	(4) *GAAP ETR/Avg STAXR*
Average VMI (hightax)	**-0.0662*****	**-0.0575****	**-0.0953*****	**-0.2384****
	(-2.77)	**(-2.51)**	**(-4.62)**	**(-2.50)**
Debt ratio	-0.0421***	-0.0464***	-0.0316**	-0.1815***
	(-3.26)	(-3.68)	(-2.49)	(-3.55)
Intangible Assets/Total Assets	0.1502	0.0297	0.1318	0.1288
	(1.46)	(0.29)	(1.28)	(0.34)
Number of Employees	0.0032	0.0131**	0.0184***	0.0577**
	(0.62)	(2.58)	(3.31)	(2.34)
Fixed Assets	0.0200***	0.0205***	0.0175***	0.0867***
	(4.46)	(4.61)	(3.82)	(4.72)
EBIT	-0.0918***	-0.0906***	-0.0988***	-0.3724***
	(-9.55)	(-9.41)	(-9.90)	(-8.34)
Number of subsidiaries	0.0325***	0.0323***	0.0376***	0.1269***
	(3.93)	(3.95)	(5.11)	(3.96)
Sales	0.0401***	0.0284***	0.0340***	0.1134***
	(7.43)	(5.27)	(5.84)	(5.65)
Average STAXR		1.1307***	1.1848***	
		(9.53)	(9.83)	
Industry FE	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Full
Observations	2,283	2,283	2,157	2,283
Adj. R-sq	0.1628	0.1957	0.2228	0.1692

This table presents the estimates of Equation (5) for the variable *Average VMI (hightax)* where the dependent variables are the *GAAP ETR*, a *3-year GAAP ETR* and the ratio of *GAAP ETR* and the MNE's average statutory tax rate. The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by EBIT, winsorized at the 1 % level. *Average VMI (hightax)* is calculated as the total of *VMI* in high-tax countries divided by the MNE's overall number of subsidiaries. *Debt ratio* is the natural logarithm of MNE's debt to total assets. *Intangible/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of MNE's Number of employees. *Fixed assets* is the natural logarithm of MNE's fixed assets. *EBIT* represents the logarithm of MNE's earnings before interest and tax and *Sales* represents the logarithm of MNE's sales. *Average STAXR* represents the group's average statutory tax rate. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. t statistics are given in the parentheses and standard errors are heteroscedasticity robust.

Robustness

Our results for the implications of VMIs for the effective tax rate may be affected by differences with regard to the general potential for profit shifting between MNEs with VMI structures and MNEs without any such interlocks. In order to further validate the robustness of our findings, we, therefore, report additional regression results that are based on a matched sample of MNEs. We match MNEs from these two groups with regard to their profit shifting potential. To this end, we use a propensity score matching and a covariate nearest neighbor matching based on *Total assets*, *EBIT* scaled by *Total assets*, *Leverage, R&D expenses* scaled by *Total assets,* and *Intangibles* scaled by *Total assets*, which all represent variables which capture shifting potential

(Overesch et al., 2018) and therefore should result in appropriate comparables. By using multiple matching techniques and parameters as well as unmatched regression results, we follow Leamer (1983) who expressed the general concern that findings could be driven by a specific research design. We again run the regressions from Table 8 for the matched sample and report the results in Table 10.

TABLE 10
The effect of VMI structures on ETR (Robustness)

Coefficient estimates: *Average VMI*	(1) *GAAP ETR*	(2) *GAAP ETR with Avg STAXR*	(3) *3 year GAAP ETR*	(4) *GAAP ETR/Avg STAXR*
Matching Characteristics				
Size/ROA/Leverage/R&D/Intangibles	**-0.0588*****	**-0.0482*****	**-0.0639*****	**-0.1947*****
(One-to-one Propensity Score Matching, Caliper)	**(-3.32)**	**(-2.84)**	**(-3.70)**	**(-3.01)**
Size/ROA/Leverage/R&D/Intangibles	**-0.0553*****	**-0.0495*****	**-0.0574*****	**-0.1962*****
(One-to-three Propensity Score Matching)	**(-3.41)**	**(-3.18)**	**(-3.75)**	**(-3.26)**
Size/ROA/Leverage/R&D/Intangibles	**-0.0557*****	**-0.0511*****	**-0.0630*****	**-0.199*****
(One-to-five Propensity Score Matching)	**(-3.53)**	**(-3.38)**	**(-4.15)**	**(-3.44)**
Size/ROA/Leverage/R&D/Intangibles	**-0.0385****	**-0.0315***	**-0.0326****	**-0.1331****
(Covariate Matching One-to-one Nearest Neighbor with replacement)	**(-2.22)**	**(-1.87)**	**(-2.04)**	**(-2.05)**
Size/ROA/Leverage/R&D/Intangibles/Industry	**-0.0553*****	**-0.0495*****	**-0.0574*****	**-0.1962*****
(Covariate Matching One-to-one Nearest Neighbor with replacement)	**(-3.41)**	**(-3.18)**	**(-3.75)**	**(-3.26)**

This table presents double robust estimates for Equation (5) for the variable *Average VMI* where the dependent variables are the *GAAP ETR*, a *3-year GAAP ETR* and the ratio of *GAAP ETR* and the MNE's average statutory tax rate. The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by EBIT, winsorized at the 1 % level. *Average VMI* is calculated as the total of *VMI* divided by the MNE's overall number of subsidiaries. Non-displayed controls are the following. *Debt ratio* is the natural logarithm of MNE's debt to total assets. *Intangible/Total assets* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Number of employees* is the natural logarithm of MNE's Number of employees. *Fixed assets* is the natural logarithm of MNE's fixed assets. *EBIT* represents the logarithm of MNE's earnings before interest and tax and *Sales* represents the logarithm of MNE's sales. The MNE's are matched on the indicated characteristics. *Average STAXR* represents the group's average statutory tax rate. ***, ** and * label statistical significance at 1 %, 5 % and 10 % level, respectively. A constant is included but not reported. t statistics are given in the parentheses and standard errors are heteroscedasticity robust.

Line 1 of Table 10 presents the results for a one-to-one Propensity Score Matching without replacement using a caliper set to .2*pooled standard deviation of the logit of the propensity score, as it is common in the accounting literature (Shipman et al., 2017). The reported coefficient estimates are negative and statistically significant but uniformly larger in size and significance than the ones presented in Table 8. Lines 2 and 3 show results of similar Propensity Score Matchings but with the difference of using a one-to-three and one-to-five matching with replacement,

respectively.[26] Line 4 reports the results for covariate matching using one-to-one nearest neighbor. In Line 5 these matches are within the same industry. Again, all coefficient estimates are negative and statistically significant, showing that our results are also robust to these model adjustments.

VIII. CONCLUSION

This study provides new evidence that the management structure of MNEs is driven by tax considerations. In particular, we show that MNEs appoint managers that work for the parent company on the management board of subsidiaries for tax reasons. We argue that MNEs apply this VMI strategy in order to solve a principal-agent conflict between the MNE's interest and the subsidiary manager's motives. Hence, we show that VMIs are more frequently installed in high-tax subsidiaries than in low-tax subsidiaries. This effect is even more pronounced the larger the tax rate differential between the subsidiary's statutory tax rate and the MNE's average statutory tax rate is. Moreover, we demonstrate that these VMIs are more frequently used in MNEs with more tax avoidance potential and that a larger implementation of this structure is associated with a lower ETR.

In doing so, we extend the existing literature that explains the heterogeneity in profit shifting with the characteristics and incentives of the MNE's top-level management persons and add a new dimension by focusing on the overall management structure within the group. We also offer new evidence for the internal workings of multinational firms, which helps to understand the profit shifting practice of MNEs.

[26] We adjust standard errors due to repeated matches according to Armstrong et al. (2010) and Stuart (2010).

REFERENCES

Amberger, H., K. Markle, and D. M. P. Samuel. 2021. Repatriation Taxes, Internal Agency Conflicts, and Subsidiary-level Investment Efficiency. *The Accounting Review:* 96 (4): 1-25.

Armstrong, C. S., J. L. Blouin, and D. F. Larcker. 2012. The incentives for tax planning. *Journal of Accounting and Economics* 53 (1): 391-411.

Armstrong, C. S., J. L. Blouin, A. D. Jagolinzer, and D. F. Larcker. 2015. Corporate governance, incentives, and tax avoidance. *Journal of Accounting and Economics* 60 (1): 1-17.

Armstrong, C. S., A. D. Jagolinzer, and D. F. Larcker. 2010. Chief Executive Officer Equity Incentives and Accounting Irregularities. *Journal of Accounting Research* 48 (2): 225-271.

Baldenius, T., N. D. Melumad, and S. Reichelstein. 2004. Integrating Managerial and Tax Objectives in Transfer Pricing. *The Accounting Review* 79 (3): 591-615.

Bauer, T., T. Kourouxous, and P. Krenn. 2018. Taxation and agency conflicts between firm owners and managers: A review. *Business Research* 11 (1): 33-76.

Bertrand, M., and A. Schoar. 2003. Managing with style. The effect of managers on firm policies. *The Quarterly Journal of Economics* 118 (4): 1169-1208.

Bizjak, J., M. Lemmon, and R. Whitby. 2009. Option Backdating and Board Interlocks. *Review of Financial Studies* 22 (11): 4821-4847.

Brown J. L., and K. D. Drake. 2014. Network Ties Among Low-Tax Firms. *The Accounting Review* 89 (2): 483-510.

Chatterjee, A., and D. Hambrick. 2007. It's all about me: Narcissistic CEOs and their effects on company strategy and performance. *Administrative Science Quarterly* 52 (3): 351-386.

Chen, K.-P., and C. Y. C. Chu. 2005. Internal Control versus External Manipulation: A Model of Corporate Income Tax Evasion. *The RAND Journal of Economics* 36 (1): 151-164.

Chen, C. X., H. Lu, and T. Sougiannis. 2012. The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research* 29 (1): 252-282.

Chen X., and C. Yang. 2021. Vertical interlock and the value of cash holdings. *Accounting & Finance* 61 (1): 561-593.

Chyz, J. A. 2013. Personally tax aggressive executives and corporate tax sheltering. *Journal of Accounting and Economics* 56 (2): 311-328.

Chyz, J. A., F. B. Gaertner, A. Kausar, and L. Watson. 2019. Overconfidence and corporate tax policy. *Review of Accounting Studies* 24 (3): 1114-1145.

Colombo, M. G., and M. Delmastro. 2004. Delegation of Autority in Business Organizations: An Empirical Test. *The Journal of Industrial Economics* 52 (1): 53-80.

Crocker, K. J., and J. Slemrod. 2005. Corporate tax evasion with agency costs. *Journal of Public Economics* 89 (9-10): 1593-1610.

Czechowicz, I. J., F. D. S. Choi, and V. B. Bavishi. 1982. *Assessing Foreign Subsidiary Performance Systems and Practices of Leading Multinational Companies*. New York Business International Corporation.

Desai, M. A., and D. Dharmapala. 2006. Corporate tax avoidance and high-powered incentives. *Journal of Financial Economics* 79 (1): 145-179.

Dürr, O. M., and R. F. Göx. 2011. Strategic Incentives for Keeping One Set of Books in International Transfer Pricing. *Journal of Economics & Management Strategy* 20 (1): 269-298.

Dyreng, S. D., M. Hanlon, and E. L. Maydew. 2010. The effects of executives on corporate tax avoidance. *The Accounting Review* 85 (4): 1163-1189.

Elizur, R., and J. Mintz. 1996. Transfer pricing rules and corporate tax competition. *Journal of Public Economics* 60 (3): 401-422.

E. F. Fama. 1980. Agency Problems and the Theory of the Firm. *Journal of Political Economy* 88 (2): 288-307.

Feller, A., and D. Schanz. 2017. The Three Hurdles of Tax Planning: How Business Context, Aims of Tax Planning, and Tax Manager Power Affect Tax Expense. *Contemporary Accounting Review* 34 (1): 494-524.

Ferrell, A., H. Liang, and L. Renneboog. 2016. Socially responsible firms. *Journal of Financial Economics* 122 (3): 585-606.

Fey, C. F., and P. Furu. 2008. Top management incentive compensation and knowledge sharing in multinational corporations. *Strategic Management Journal* 29 (12): 1301-1323.

Francis, B. B., and I. Hasan, Q. Wu, and M. Yan. 2014. Are female CFOs less tax aggressive? Evidence from tax aggressiveness. The *Journal of the American Taxation Association* 36 (2):171-202.

Gaertner, F. B. 2014. CEO after-tax compensation incentives and corporate tax avoidance. *Contemporary Accounting Research* 31 (4): 1077-1102.

Gerner-Beuerle, C., and E.-P. Schuster. 2014. The Evolving Structure of Directors' Duties in Europe. *European Business Organization Law Review 15: 191-233*.

Gibbsons, R., and K. J. Murphy. 1992. Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence. *Journal of Political Economy* 100 (3): 468-505.

Grossman, S. J., and O. D. Hart. 1983. An Analysis of the Principal-Agent Problem. *Econometrica* 51 (1): 7-45.

Hanlon, M. and S. Heitzman. 2010. A review of tax reseach. J*ournal of Accounting and Economics* 50 (2-3): 127-178.

Hribar, P., and H. Yang. 2016. CEO overconfidence and management forecasting. *Contemporary Accounting Research* 33 (1): 204-227.

Hurwicz L., and L. Shapiro. 1978. Incentive Structures Maximizing Residual Gain under Incomplete Information. *The Bell Journal of Economics* 9 (1): 180-191.

Jensen, M. C. and W. H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3 (4): 305-360.

Klassen, K. J. and C. Valle Ruiz. 2022. The Effect of Changes in Income Shifting on Affiliate Managers' Internal Reporting Decisions. *Contemporary Accounting Research,* forthcoming.

Koester, A., T. Shevlin, and D. Wangerin. 2017. The role of managerial ability in corporate tax avoidance. *Management Science* 63 (10): 3285-3310.

Law, K. K. F., and L. F. Mills. 2017. Military experience and corporate tax avoidance. *Review of Accounting Studies* 22 (1): 141-184.

Leamer, E. E. 1983. Let's take the con out of econometrics. *American Economics Review* 73 (1): 31-43.

MacKie-Mason, J. K. 1990. Do taxes affect corporate financing decisions? *Journal of Finance* 45 (5): 1471-1493.

Moen, J., D. Schindler, G. Schjelderup, and J. Tropina. 2011. *International Debt Shifting: Do Multinationals Shift Internal or External Debt?* CESifo Working Paper No. 3519.

Nielsen, S. B., and P. Raimondos-Møller. 2012. Multiple Roles of Transfer Prices: One vs. Two Books . In W. Schön, & K. A. Konrad (Eds.), *Fundamentals of International Transfer Pricing in Law and Economics*.

Nielsen, S. B., P. Raimondos-Møller and G. Schjelderup. 2008. Taxes and Decision Rights in Multinationals. *Journal of Public Economic Theory* 10 (2): 245-258.

O'Donnell, S. 1999. Compensation design as a tool for implementing foreign subsidiary strategy. *Management International Review* 39 (2): 149-165.

Olsen, K. J., and J. Stekelberg. 2016. CEO narcissism and corporate tax sheltering. *The Journal of the American Taxation Association* 38 (1): 1-22.

Ortmann, R., and D. Schindler. 2019. *Income Shifting and Management Incentives*. Working Paper.

Overesch, M., S. Schenkelberg, and G. Wamser. 2018. *Do US Firms Pay Less Tax than their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legsilation as Determinants of Tax Differentials.* CESifo Working Paper No. 6960.

Phillips, J. D. 2003. Corporate tax-planning effectiveness: the role of compensation-based incentives. *The Accounting Review* 78 (3): 847-874.

Robinson, J. R., S. A. Sikes, and C. D. Weaver. 2010. Performance measurement of corporate tax departments. *The Accounting Review* 85 (3): 1035-1064.

Roth, K., and S. O'Donnell. 1996. Foreign subsidiary compensation strategy: An agency theory perspective. *Academy of Management Journal* 39 (3): 678-703.

Saha, R., and J. Stiglitz. 1986. The Architecture of Economic Systems: Hierarchies and Polyarchies. *American Economic Review* 76 (4): 716-727.

Scharfstein, D. S. and J. C. Stein. 2000. The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment. *The Journal of Finance* 55 (6): 2537-2564.

Shipman, J. E., Q. T. Swanquist, and R. L. Whited. 2017. Propensity Score Matching in Accounting. *The Accounting Review* 92 (1): 213-244.

Springsteel, I. 1999. Separate But Unequal. *CFO Magazine* Available at: https://www.cfo.com/accounting-tax/1999/08/separate-but-unequal/ (last revisited 09/03/20).

Stuart, E. A. 2010. Matching Methods for Causal Inference: A Review and a Look Forward. *Statistical Science* 25 (1): 1-21.

Wang, X., Xu, Y., Zhang, L., and Zheng, G. 2022. Subsidiary Governance and Corporate Tax Planning: The Effect of Parent-Subsidiary Common Directors and Officers. *Journal of Management Accounting Research,* forthcoming.

Appendix

Table 11: Descriptive Statistics, Sample 1

VARIABLES	(1) N	(2) mean	(3) sd	(4) p5	(5) p95
hightax	21,365	0.2870	0.4524	0	1
Taxdiff (weighted)	21,365	0.0403	4.083	-7.605	7.512
Taxdiff (unweighted)	21,365	0.224	3.622	-6.464	6.887
Taxdiff_2	21,365	4.473	6.187	0	17.33
VMI (OLS Regression)	21,365	0.0419	0.170	0	0.333
VMI count (counts)	21,365	0.100	0.392	0	5
Subsidiary-level controls					
Debt ratio [percent]	21,365	-0.702	0.992	-2.317	0.134
Intangibles/Total Assets [percent]	21,365	0.0200	0.0647	0	0.124
Number of Employees [count]	21,365	3.711	1.592	1.099	6.323
Fixed Assets [thousand €]	21,365	6.589	2.809	1.792	11.14
Firm age [years]	21,365	2.507	0.902	0.693	3.892
Distance [in thousand km]	21,365	7.390	1.145	5.570	9.138
Language [binary values]	21,365	0.126	0.332	0	1
Group-level controls					
Debt ratio [percent]	21,365	-0.672	0.785	-1.993	0.0706
Intangibles/Total Assets [percent]	21,365	0.0202	0.0506	0	0.103
Number of Employees [count]	21,365	5.461	2.510	1.609	9.740
Fixed Assets [thousand €]	21,365	9.519	4.218	2.708	16.29
Number of subsidiaries [count]	21,365	1.408	1.551	0	4.277
Number of countries [count]	21,365	1.416	0.887	0.693	3.091
Country controls					
GDP growth [percent]	21,365	-0.00633	0.0474	-0.0895	0.0408

GDP [thousand $]	21,365	9.918	2.465	7.616	13.69
GDP per capita [thousand $]	21,365	10.23	0.615	9.210	10.98
Corruption Index	21,365	8.811	5.010	5.008	24.44
Unemployment rate [percent]	21,365	5.635	2.081	2.700	8.600
Number of Subs per Country	21,365	0.489	0.845	0	2.303

Table 12: Descriptive Statistics, Sample 2

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	p5	p95
SD_staxr	6,567	0.859	1.998	0	5.826
minmax_staxr	6,567	4.654	6.307	0	17.33
minmax_dummy	6,567	0.389	0.488	0	1
Average VMI	6,592	0.0486	0.164	0	0.333
Average VMI (hightax)	2,283	0.067	0.184	0	0.5
GAAP ETR [percent]	6,592	0.249	0.247	0	0.611
3Y GAAP ETR [percent]	5,583	0.256	0.240	0	0.608
GAAP ETR/Av STAXR [percent]	6,592	0.985	0.962	0	2.230
Debt Ratio [percent]	6,592	-0.648	0.633	-1.863	-0.00983
Intangible Assets/Total Assets [percent]	6,592	0.0212	0.0535	0	0.117
Number of Employees [count]	6,592	4.299	2.007	1.099	7.867
Assets Fixed [thousand €]	6,592	7.823	3.173	2.773	13.35
EBIT [thousand €]	6,592	6.806	2.316	3.258	10.93
Number of Subsidiaries [count]	6,592	0.842	1.066	0	2.996
Average STAXR [percent]	6,592	0.250	0.0589	0.160	0.333
Sales [thousand €]	6,592	9.582	2.099	6.733	13.38

Impressum:
Arbeitskreis Quantitative Steuerlehre, arqus, e.V.
Vorstand: Prof. Dr. Ralf Maiterth (Vorsitzender),
Prof. Dr. Kay Blaufus, Prof. Dr. Dr. Andreas Löffler
Sitz des Vereins: Berlin

Herausgeber: Kay Blaufus, Jochen Hundsdoerfer, Martin Jacob, Dirk Kiesewetter, Rolf J. König, Lutz Kruschwitz, Andreas Löffler, Ralf Maiterth, Heiko Müller, Jens Müller, Rainer Niemann, Deborah Schanz, Sebastian Schanz, Caren Sureth-Sloane, Corinna Treisch

Kontaktadresse:
Prof. Dr. Dr. h.c. Dr. h.c. Caren Sureth-Sloane,
Universität Paderborn, Fakultät für Wirtschaftswissenschaften,
Warburger Str. 100, 33098 Paderborn,
www.arqus.info, Email: info@arqus.info

ISSN 1861-8944