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ABSTRACT

This study examines whether multinational corporations (MNCs) employ managers jointly at the headquarters and foreign subsidiaries (vertical manager interlocks) to facilitate tax planning by mitigating an internal principal-agent conflict. We utilize a cross-sectional dataset for European firms to demonstrate that vertical manager interlocks are more prevalent in multinational corporations with greater potential for tax-motivated profit shifting and implemented mainly in high-tax subsidiaries. A one standard deviation increase in the statutory tax rate volatility within an MNC is associated with 1.2 percent more vertical manager interlocks, representing over 25 percent of the sample average. We also reveal that applying vertical manager interlock structures results in a lower effective tax rate. Vertical manager interlocks are especially pertinent for profit shifting through transfer pricing rather than debt shifting. A one standard deviation increase in the usage of this structure is associated with a 1.2 percentage point reduction in the MNC's ETR, corresponding to almost 5 percent of the average ETRs.

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.

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I. INTRODUCTION

The "undersheltering puzzle" (Weisbach, 2002) refers to the phenomenon that tax avoidance by multinational corporations (MNCs) is, on average, lower than expected. The analytical literature suggests that internal agency conflicts within MNCs may partly explain this pattern (Smith, 2002; Baldenius et al., 2004; Ortmann & Schindler, 2022). To date, only a few recent studies (Gallamore & Labro, 2015; Klassen & Valle Ruiz, 2022; Kohlhase & Wielhouwer, 2022; Baersch et al., 2023) have empirically analyzed some implications of this effect and potential countermeasures. In this study, we aim to further open the "black box of tax planning" (Dyreng & Maydew, 2018) by analyzing whether European MNCs organize their internal management structures in a way that mitigates such agency costs by using so-called vertical manager interlocks (VMIs). VMI refers to a management structure in which one person simultaneously holds management positions at the headquarter and at least one subsidiary of the same MNC. We analyze the management structure of high-tax and low-tax subsidiaries separately. This allows us to investigate the broader question of the extent to which the internal agency conflict for tax-motivated profit shifting is confined to high-tax subsidiaries, which typically face an outward shifting of profits. We also examine whether the use of VMI is associated with lower effective tax rates. Finally, we directly analyze the impact on transfer pricing and debt shifting, the two most important profit shifting channels (Heckemeyer & Overesch, 2017), and assess how their efficacy correlates with VMI usage.

Agency conflicts arise when the objectives of managers and owners differ (Jensen & Meckling, 1976). Within MNCs, top-level agency conflicts may exist between headquarters management and shareholders, as well as internal agency conflicts between subsidiaries and headquarters managers (Scharfstein & Stein, 2000; Stein, 2003). These conflicts have implications for tax avoidance, an issue that has only recently gained closer attention from an agency perspective

(Hanlon & Heitzman, 2010). The internal agency conflict may impact tax avoidance through two channels. Firstly, effective tax planning necessitates high internal information quality (Gallemore & Labro, 2015). Although subsidiary managers have superior access to relevant information, they may hesitate to share all information with the headquarters (Kohlhase & Wielhouwer, 2022; Feltham & Hofmann, 2012). Secondly, MNCs can increase their after-tax profits by shifting tax profits from high-tax to low-tax subsidiaries. Since managers' compensation or other personal benefits may be tied to the success of their business unit (Fey and Furu, 2008), managers of subsidiaries in high-tax countries may, however, oppose any reduction in profits resulting from tax-motivated profit shifting.

MNCs can resolve or at least mitigate this internal agency conflict in several ways, for example, by incentivizing subsidiary managers through performance-based pay (e.g., Phillips, 2003). We analyze the implications of another option, the use of VMIs. According to a global survey by Deloitte (2013), 65 percent of large MNCs use this type of management structure. In our data, more than 20 percent of all considered European MNCs and roughly 18 percent of European MNC with sales above € 750 million apply it. We expect VMIs to improve the effectiveness of tax planning, especially by facilitating the flow of information between headquarters and subsidiaries (Deloitte, 2016; Wang et al., 2022) and by aligning the subsidiary managers' interests with the MNC headquarters. In addition, the VMI manager can also control and monitor the decisions made by other subsidiary managers. In contrast to the centralization of decision rights, this solution should also prevent the coordination function of transfer prices from being impaired (Baersch et al., 2023).

Our study contributes to a recent and expanding body of literature that empirically analyzes the implications of the internal agency conflict on MNC's tax avoidance and the effectiveness of different countermeasures. Kohlhase & Wielhouwer (2022) use confidential transfer pricing data

for a single MNC and show empirically how decision rights regarding tax and tariff planning are allocated between headquarter and business units. They particularly find that firms rather delegate decisions whenever informational asymmetries are large, while central decision-making is preferred in the presence of severe agency conflicts. Klassen & Valle Ruiz (2022) show that the internal agency conflict could motivate subsidiary managers to artificially inflate subsidiary profits if managerial targets are not properly adjusted for changing transfer prices. Gallemore & Labro (2015) point to the relevance of internal information quality for effective tax planning without analyzing specific instruments to improve it. Baersch et al. (2023) use a confidential survey among transfer pricing managers of MNCs with affiliated companies from German-speaking countries to show that centralized transfer pricing is associated with more disputes with local tax authorities and potential internal coordination conflicts.

The study most directly related to our analysis is Wang et al. (2022). Based on a Chinese panel, they find that firms with VMIs in their internal management structure have effective income tax rates that are, on average, 0.7 percentage points lower. However, there are at least three reasons why their findings cannot be directly transferred to our setting. First, 80 percent of Wang et al. (2022) sample firms are purely domestic. Hence, they rather examine to what extent VMIs help Chinese firms to exploit tax advantages in their local market than analyze profit shifting of MNCs. According to Delis et al. (2021), corporate governance implications for domestic tax planning will likely be different from those for cross-border profit shifting. Second, more than 40 percent of their observations relate to state-owned firms, which may be subject to special governance frameworks. Third, Chen & Yang (2021) argue that the motives for using VMIs in China may differ from those in other countries. Since large state-owned enterprises or private enterprise groups cannot be directly listed on the Chinese stock market, listing parts of these business groups is common

practice. In many of these cases, the unlisted parent companies send executives or directors to the management boards of the listed entities to assert their interests against minority shareholders.

Our empirical analysis is based on cross-sectional data for 6,567 European MNCs obtained from the AMADEUS database, which merges financial and management information at the affiliate level. The dataset encompasses information on 21,365 affiliates and 82,051 distinct management positions. We employ this dataset to document three findings. First, we demonstrate that VMIs are significantly more prevalent in MNCs with greater potential for tax planning, as evidenced by higher differences in statutory tax rates within the MNC. A one standard deviation increase in the statutory tax rate volatility within an MNC is associated with 1.2 percent more VMIs, representing over 25 percent of the sample average. As anticipated, we also observe a significant increase in the use of VMIs in subsidiaries with above-average statutory tax rates. Second, our findings support the notion that VMIs facilitate more effective tax planning for MNCs. Ceteris paribus, MNCs with a one standard deviation higher proportion of VMIs are subject to a 0.71 percentage point reduction in GAAP ETR. The impact of VMIs in high-tax countries is almost twice as large. Third, we demonstrate that VMIs positively impact MNCs' tax planning through the transfer pricing channel but not through the debt shifting channel. This finding is consistent with the analytical predictions made by Ortmann & Schindler (2022).

Our paper presents one of the first empirical analyses of the importance of an internal agency conflict on the efficiency of tax avoidance executed by MNCs. Our results underline the significance of the agency dimension, specifically concerning the transfer pricing channel of profit shifting. Our estimated coefficients most likely underestimate the true overall effect of the internal agency conflict, as we only consider one feasible countermeasure. But despite this, a reduction in the effective tax rate by 0.71 percentage points, as described above for a one standard deviation increase in average VMI usage, is noteworthy, considering that GAAP effective tax rates for large

European MNCs were, on average, only one percentage point below the headquarters' statutory tax rate during our sample period (Koch & Scheider, 2022). The effect size also corresponds to findings by Gallemore & Labro (2015), who find that a one standard deviation increase in the continuous measure of internal information quality is associated with a reduction in Cash ETRs between one and two percentage points.

Furthermore, we show that a suitable internal management structure design can proficiently address internal agency conflicts and improve tax planning effectiveness. In this sense, we extend prior research that rather focuses on compensation-based incentivization (e.g., Phillips, 2003) and centralization of tax planning decisions (e.g., Baersch et al., 2023) as countermeasures.

Our paper informs both businesses and researchers about the importance of the agency perspective on tax avoidance and stresses the need for additional research in this area, as suggested by Hanlon and Heitzman (2010). Moreover, it has wider implications for other management fields that encounter comparable agency conflicts. Finally, our paper informs tax authorities that using VMI in high-tax countries can signal more tax avoidance without subjective evaluations.

The remainder of this paper is organized as follows. Section 2 provides a summary of previous research and derives our main hypotheses. Sections 3 and 4 outline the econometric design and utilized dataset. In Section 5, we present the empirical results. The paper concludes in Section 6.

II. THEORETICAL BACKGROUND AND PRIOR RESEARCH

Tax avoidance and agency conflicts within MNCs

Empirical studies document that many firms have effective tax rates close to the statutory rates (e.g., Dyreng et al., 2008) and show significant unexplained heterogeneity in effective tax rates across firms (Jacob et al., 2021). One possible explanation for the surprisingly low level of

tax avoidance is that agency conflicts prevent MNC managers from engaging in tax avoidance to the expected extent (Desai & Dharmapala, 2009).

There are two levels of agency conflict within MNCs: a top-level conflict between headquarters management and shareholders and an internal conflict between headquarters management and the management of a foreign subsidiary (Vaysman, 1996; Scharfstein & Stein, 2000; Amberger et al., 2021).[1] Both levels of agency conflict can affect a firm's involvement in tax avoidance.

The top-level agency conflict arises when MNCs do not properly incentivize their central management to reduce taxes. Chen & Chu (2005) and Crocker & Slemrod (2005) use a formal model to show that MNC managers may refrain from tax avoidance if potential personal penalties are not adequately compensated. Desai & Dharmapala (2009) and Jacob et al. (2021) argue that tax avoidance can be used to extract managerial rents, especially in firms with weak governance. Firms may, therefore, adjust their incentive schemes to prevent high levels of tax avoidance (Jacob et al., 2021).[2] The importance of managerial compensation for tax avoidance has also been empirically documented. Phillips (2003) shows that compensating managers based on after-tax accounting performance helps firms reduce their effective tax rate. He finds this effect for business unit managers but no similar effect for CEO compensation. Gaertner (2014) and Armstrong et al. (2012) complement this research by documenting similar effects for CEOs (Gaertner, 2014) and tax directors (Armstrong et al., 2012).

The analytical literature also points to the relevance of an internal principal-agent conflict resulting from a misalignment between the goals of headquarter and subsidiary management (e.g.,

[1] Other studies focus, e.g., on the effect of a principal-agent conflict on optimal team size (Duerr et al., 2020). While this is closely related, we abstain from drawing conclusions for this stream of literature.
[2] Other studies show that more disclosure of tax-relevant information (Luo et al., 2023), increasing the power of the board (Li et al., 2022), and the introduction of M&A laws (Hu et al., 2021) mitigate the agency conflict.

Vaysman, 1996; Smith, 2002; Baldenius et al., 2004; Ortmann & Schindler, 2022). It can affect tax avoidance through at least two different channels. On the one hand, effective tax planning by MNCs requires detailed and high-quality information from different business units, especially in MNCs with highly dispersed operations (Gallemore & Labro, 2015). MNCs, e.g., minimize explicit taxes through international profit shifting when they allocate profits to subsidiaries with the lowest marginal tax rate (De Simone et al., 2017; Hopland et al., 2018). However, a firm's marginal tax rate is not directly observable but depends at least on the statutory tax rate, the current and expected future performance of the firm, and the applicable tax loss offset rules (Graham, 1996). Subsidiary managers should have superior access to this information (Kohlhase & Wielhouwer, 2022) but may pursue individual objectives (Jensen & Meckling, 1976; Hoenen & Kostova, 2015; Kostova et al., 2018). Hence, they may be reluctant to share it with headquarters management, for example, to increase the subsidiary's investment budget on the MNC's internal capital market (Stein, 2002; Amberger et al., 2021).

On the other hand, the same agency conflict may directly affect tax planning outcomes when the tax planning process involves decentralized decision-making at the subsidiary level. From the MNC's headquarters perspective, shifting profits from a high-tax subsidiary to a low-tax subsidiary is desired because it increases the MNC's global after-tax profits. However, if the MNC operates a one-book system of transfer prices, these transfer prices serve not only a tax minimization function but also a coordination function (Reineke et al., 2022). For example, the profitability of a business unit can affect future investment budgets as well as the compensation or other personal benefits of business unit managers. Thus, if management objectives and incentive schemes do not properly reflect the implications of profit shifting or other central tax planning measures, managers of a high-tax subsidiary may oppose profit shifting abroad (Baldenius et al.,

2004). If a central tax department sets transfer prices, managers of foreign affiliates may, in this case, reduce their efforts (Ortmann & Schindler, 2022).

Only very few papers document the implications of this internal agency conflict for profit shifting and tax avoidance empirically. Gallemore & Labro (2015) analyze the relationship between internal information quality and tax avoidance. They find that internal information quality is a relevant determinant of firms' effective tax rates but abstract from analyzing the reasons for heterogeneity in it. Kohlhase & Wielhouwer (2022) provide a more direct test. Using confidential transfer pricing data for a single MNC, they show how decision rights regarding tax and tariff planning are allocated between headquarters and business units. They find that MNCs favor central decision-making in the presence of strong information asymmetries and decentralized decision-making under severe agency conflicts. Klassen and Valle Ruiz (2022) show that a conflict of interest within an MNC can also arise if incentives do not properly reflect internal transfer prices. They demonstrate that managers tend to inflate profits of their own unit after a change within the MNC's transfer pricing policies due to incongruences between the new transfer price and their personal incentives. Baersch et al. (2023) use a survey among transfer pricing managers of MNCs with affiliated companies from German-speaking countries to show that centralized transfer pricing is associated with more disputes with local tax authorities and potential internal coordination conflicts.

Measures against the internal agency conflict

It is the task of the MNC's headquarter to design organizational control systems that help align the subsidiary manager's goals with those that the headquarters have for that particular subsidiary (O'Donnell, 1999, 154) and thus to resolve or at least mitigate the internal agency conflict described above.

One possible solution is centralizing transfer pricing and other tax planning decisions (Baldenius et al., 2004; Kohlhase & Wielhouwer, 2022). Few empirical studies document that MNCs concentrate transfer pricing decisions to some extent (Chen et al., 2015; Baersch et al., 2023). Delegation of transfer pricing increases with lower tax rate differentials (Chen et al., 2015) and decreases, especially in the presence of internal coordination conflicts (Baersch et al., 2023). Kohlhase & Wielhouwer (2022) note that transfer pricing centralization is not a perfect solution to the internal agency conflict, as it does not solve the problem of subsidiary managers withholding superior information. Nonetheless, Blouin et al. (2018) show that MNCs could reduce their overall tax burden by increasing coordination on transfer pricing.

Alternatively, MNCs could decouple transfer prices for tax and managerial accounting purposes (Baldenius et al., 2004). However, the use of such a two-book system involves important drawbacks. Duerr & Goex (2011) demonstrate analytically that using one set of books is the preferred option for MNCs operating in markets with a small number of competitors and uniform products, as it allows for strategic use of the observable transfer price. Several studies emphasize otherwise higher costs and suspicious tax authorities (e.g., Baldenius et al., 2004; Nielsen and Raimondos-Møller, 2012) as reasons for keeping one set of books. In addition, Nielsen et al. (2008) point out that using two sets of books is an illegal practice in some countries. In this line, survey results of EY (2003) and Baersch et al. (2023) show that about 80 percent of the analyzed MNCs use a one-book transfer pricing system.

A third option is to use a variable component of the subsidiary manager's salary to align his preferences with the overall goals of the MNC. Roth & O'Donnell (1996) and Oxley & Pandher (2016) suggest that the interests of the subsidiary manager can be aligned with those of the MNC headquarters by increasing the proportion of the subsidiary manager's salary that is based on the MNC's overall performance. The relative importance of global over local performance measures

should increase with the level of decision-making authority (Wulf, 2007). However, this may involve additional costs and has the inherent disadvantage that the variable pay component is not directly related to the performance of the unit that the manager controls. Consistent with the cost argument, Fey and Furu (2008) provide evidence that subsidiary managers are often compensated with a salary and a variable component based on the subsidiary's short-term performance. In this line, the literature has criticized these structures as overly complex and inconsistent with commonly used contract structures in practice (Baiman, 1990). Ortmann & Schindler (2022) and Klassen & Valle Ruiz (2022) show that subsidiary managers can also be properly incentivized by flexibly adjusting the variable compensation component related to the subsidiary's performance to the effects of profit shifting and other instruments of central tax planning.

For our analysis, we consider a further option to mitigate the internal agency conflict: using VMIs.[3] Managerial interlocks refer to a management pattern in which an individual simultaneously holds managerial positions in at least two firms.[4] These positions may be in different MNCs (Horizontal Manager Interlocks, HMI) or in the headquarter and a subsidiary within the same MNC (Vertical Manager Interlocks, VMI). VMIs are a common business practice among large MNCs, as evidenced by a recent Deloitte survey of its international client service partners (Deloitte, 2013). 65 percent of respondents indicated that their clients use VMIs as part of the management structure of their subsidiaries. The prevalence of VMIs varies from country to country and also depends on specific regulatory requirements. It is particularly common in China and other emerging economies

[3] Other studies propose different factors to be included in the principal-agent-framework, e.g., moral and altruism solutions, where the agent is morally sensible and receives lower utilities from acting against the principal's interests (Stevens & Thevaranjan, 2010) or the agent's altruism and social norms affecting the agent's actions (Abernethy et al., 2022).

[4] In this regard they are different from including an experienced tax manager as a senior executive at the headquarter (Kubick et al., 2020).

(Chen & Yang, 2021). According to Deloitte (2016), headquarters directors or senior managers are typically used for VMI structures.

In contrast to HMIs, for which positive knowledge spillovers are very well documented empirically (see, e.g., Brown and Drake (2014) for tax avoidance knowledge sharing among MNCs), there is little empirical evidence on the impact of VMIs on agency conflicts within MNCs. Chen & Yang (2021) show that Chinese firms with VMIs have lower cash holdings on average. Wang et al. (2022) investigate the impact of vertical integration on tax avoidance. Using a dataset of Chinese firms, they examine the effect of appointing the top manager of an MNC (chairman or CEO) as a subsidiary manager on the ETR of the MNC. They find a negative effect and attribute it, particularly to an improved sharing of information within MNCS, which leads to a more efficient implementation of tax avoidance strategies. However, 40 percent of their sample firms are state-owned, and only 20 percent have at least one foreign subsidiary. Therefore, their findings cannot be directly extrapolated to the tax avoidance practices of European multinationals, particularly since corporate governance implications for domestic tax planning and cross-border profit shifting may likely differ (Delis et al., 2021).

Vertical manager interlocks and MNCs' tax avoidance

VMIs are expected to enhance knowledge sharing within MNCs and improve subsidiary managers' compliance with global MNC goals. Nonetheless, the benefits of better oversight and improved knowledge sharing are not limited to tax issues. Chen and Yang (2021) demonstrate that the majority owners of Chinese firms employ VMIs to exploit private benefits from listed subsidiaries at the cost of minority shareholders. Manager interlocks across MNCs (HMIs) have been shown to facilitate knowledge sharing regarding tax information (Brown & Drake, 2014), as well as increase R&D expenditure (Helmers et al., 2017) and promote new product development (Mazzola et al., 2016). Therefore, it is an empirical question to what extent VMIs are employed for

tax avoidance purposes. Given the complexity of the information required for effective tax planning by MNCs (Delis et al., 2021), we find it reasonable that VMI usage is, at least, partially motivated by tax considerations.

Compared to employing a local manager, establishing a VMI structure in a foreign subsidiary incurs costs, such as travel expenses and efficiency losses due to language and cultural disparities.[5] If VMIs are installed for tax purposes, we, therefore, expect to observe them more often in MNCs with greater potential for profit shifting. This assumption is consistent with Nielsen et al. (2008), who analytically investigate the impact of tax rate differences on decision-making coordination. Their model suggests that profit-maximizing MNCs should decide on profit shifting more centrally as the tax rate differential within the group increases.[6]

These tax rate differences should also determine the allocation of VMIs within multinational corporations. Internal agency conflicts regarding profit shifting are especially relevant to managing subsidiaries with high tax rates. These managers need aligned incentives to accept a shift in subsidiary profits and fully share subsidiary-related information. Based on these considerations, we formulate our first hypothesis.

> ***H1****: Vertical manager interlocks are more likely in MNCs with a greater potential for profit shifting and foreign subsidiaries with a high statutory tax rate.*

Following Hypothesis 1, it seems straightforward to assume that VMIs installed in high-tax subsidiaries facilitate effective tax planning and are thus associated with lower effective tax rates. However, even if managers are installed to improve the effectiveness of tax planning, these structures may not necessarily achieve their objectives. For example, previous studies have shown

[5] Prior research also suggests differences in the perception of potential future tax repayments and penalties due to differences in the distinction of the future from the present across languages, resulting in different tax avoidance behaviors (Na & Yan, 2022). This could potentially also induce costs if headquarter and subsidiary management's language differs in this regard.

[6] In this regard, we consider the use of VMIs as more centralization.

that busy directors are less effective monitors (Fich et al., 2006; Falato et al., 2012). Wang et al. (2022) argue that the same may be true for managers with multiple simultaneous positions within the MNC.

It is even more questionable whether VMIs in low-tax subsidiaries are associated with lower effective tax rates. Low-tax subsidiaries benefit from tax-motivated profit shifting, so that their managers do not need additional incentives or control in this respect. However, these managers may also have incentives to withhold relevant information for non-tax reasons. Subsidiaries with a medium tax rate but weak performance and a negative performance outlook may be the subsidiaries with the lowest marginal tax rate within the MNC and, thus, the optimal target for profit shifting. However, if managers hide the negative outlook from headquarters to avoid consequences for investment allocation, this may exacerbate effective tax planning. Based on these considerations, we formulate our second hypothesis as follows.

> ***H2****: MNCs with a high share of vertical manager interlocks have, ceteris paribus, a lower GAAP ETR. This relationship is stronger when vertical manager interlocks are implemented in high-tax subsidiaries.*

Our third hypothesis relates to the effectiveness of vertical manager interlocks with respect to alternative profit shifting channels. According to Heckemeyer & Overesch (2017), transfer pricing and profit shifting via licensing are the dominant profit shifting channels, while tax-motivated debt shifting is less relevant overall. Ortmann & Schindler (2022) argue that the relevance of internal agency conflicts may differ across profit shifting channels. While they predict it may affect profit shifting via intangibles, they do not expect a similar effect for internal debt shifting. The intuitive explanation for these differences is that they assume, in line with empirical evidence (Meridian, 2018; PwC, 2010), that MNCs incentivize subsidiary managers through variable salary components related to their subsidiary's EBIT or EBITDA. Thus, these managers

may experience negative consequences from profit shifting via intangibles or transfer pricing but not from the tax-optimal allocation of debt within the MNC. This leads us to formulate our third hypothesis as follows.

> ***H3****: The use of vertical manager interlocks enhances the effectiveness of profit shifting via transfer pricing and has an ambiguous effect on debt shifting.*

III. EMPIRICAL IDENTIFICATION

We begin our empirical analysis by examining whether MNCs employ VMIs for tax purposes. According to Hypothesis 1, we expect this to be true if VMIs are more common in MNCs with more opportunities for tax-efficient profit shifting. To this end, we estimate Equation (1) based on financial data and manager information aggregated at the level of each MNC *j*.

$$Avg\_VMI_j = \beta_0 + \beta_1\, tap_j + \beta_2\, \Phi_j + \beta_3\, \eta_j + \varepsilon_j \quad (1)$$

Our dependent variable, Avg_VMI_j, measures the extent to which MNC *j* installs VMIs for managing its subsidiaries. It is calculated as the MNC-wide average share of VMIs in total managers per subsidiary. The explanatory variable of main interest is tap_j, which reflects the MNC's potential for tax avoidance. Following previous studies, we employ the standard deviation of statutory tax rates within the MNC and the difference between the minimum and maximum statutory tax rate within the MNC to evaluate profit shifting potential (Moen et al., 2011). According to Hypothesis 1, we expect a positive correlation between VMI usage and profit shifting potential, resulting in a positive coefficient estimate for tap_j. We use a comprehensive set of MNC-specific controls (Φ_j) in order to control for other determinants of tax avoidance ($DebtRatio_j$ and the intensity of intangibles Int_j), the economies of scale ($Employees_j$ and $FixedAssets_j$) as well as the international dispersion of the MNC. ($No\_Countries_j$ and $No\_Subsidiaries_j$). We further include MNC industry fixed effects (η_j) to account for industry-specific differences.

Equation (1) may be biased by unobservable characteristics of MNCs. To address this concern, we employ a second research design (Equation 2) to investigate the allocation of VMIs within MNCs. It is based on the notion that VMIs should help to enhance tax planning, especially when implemented in subsidiaries with high tax rates.

$$Scaled\_VMI_i = \beta_0 + \beta_1 hightax_i + \beta_2 \Psi_i + \beta_3 x_c + \beta_4 \lambda_{cj} + \beta_5 \gamma_j + \varepsilon_i \quad (2)$$

We use the subsidiary-level share of vertical manager interlocks ($Scaled\_VMI_i$) as the dependent variable. It is defined as the number of VMIs employed by subsidiary *i* scaled by the total number of managers of that subsidiary. We test Hypothesis 1 by including $hightax_i$, a dummy variable that indicates whether the statutory tax rate of subsidiary *i* is above the MNC-wide asset-weighted average of statutory tax rates. In additional tests, we refer directly to tax rate differential as a continuous variable. Hypothesis 1 predicts a positive coefficient for β_1.

Variation in $hightax_i$ stems from the MNC-level (MNC-wide weighted average tax rate) and the subsidiary country-level (subsidiary's tax rate), which prevents us from simultaneously including MNC fixed effects and subsidiary country fixed effects in the same regression. Instead, we employ MNC fixed effects (γ_j) and a comprehensive set of subsidiary-level (Ψ_i), subsidiary country-level (x_c), and MNC-subsidiary country-level (λ_{cj}) controls in our main specification (a full list can be found in Table 1 and 2). We test the robustness of our findings by using subsidiary country and MNC industry fixed effects (instead of subsidiary country-level controls) and MNC-level controls (instead of MNC fixed effects) in an alternative specification.

Hypothesis 2 and 3 relate to the effectiveness of VMI structures in alleviating tax avoidance. Again, we test these hypotheses using data aggregated at the MNC level (Hypothesis 2) and data at the subsidiary level (Hypothesis 3). We estimate Equation (3) in order to test Hypothesis 2.

$$ETR_j = \beta_0 + \beta_1 Avg\_VMI_j + \beta_2 \Phi_j + \beta_3 \eta_j + \varepsilon_j \quad (3)$$

We use one-year and three-year GAAP ETRs for defining our dependent variable ETR_j, which captures the effectiveness of an MNC's tax planning. The main explanatory variable is Avg_VMI_j, the MNC-wide share of vertical manager interlocks. Hypothesis 2 predicts that more intense use of VMIs is associated with lower effective tax rates and, thus, a negative coefficient for β_1. We estimate additional specifications and differentiate between VMIs in high-tax and low-tax subsidiaries. Therefore, we can investigate to what extent the relevance of an internal agency conflict for MNCs' tax avoidance is confined to high-tax subsidiaries.

The cross-sectional nature of our data prevents us from incorporating MNC fixed effects. We, therefore, apply, again, a comprehensive set of MNC-specific controls (Φ_j), including the debt-to-asset ratio, the intensity of intangible fixed assets, and various variables that control for the size and use of production factors as well as the profitability of the MNC.[7] Since GAAP ETRs depend largely on the location of foreign subsidiaries and applicable statutory tax rates, we control for the asset-weighted average of statutory tax rates per MNC. Additionally, we include industry fixed effects (η_j). A full list of control variables is provided in Table 1, and descriptives are presented in Table 3. To address remaining concerns that our estimates may be biased through unobserved MNC characteristics, we re-estimate Equation (3) based on matched samples of MNCs as a robustness test.

Similar to Hypothesis 1, we test the effectiveness of VMI usage for improving MNCs' tax planning also based on subsidiary-level data. Since MNCs apply conforming and non-conforming tax avoidance, we do not refer to subsidiary-level effective tax rates but rather investigate the use of two specific profit-shifting channels: transfer pricing and debt finance. This additional analysis has two particular advantages over the preceding examination of Hypothesis 2. First, we are able to analyze the implications of VMI usage for the effectiveness of MNCs' tax planning while

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

controlling for (observable and unobservable) MNC characteristics via fixed effects. Second, it allows us to test the analytical prediction by Ortmann & Schindler (2022) that the internal agency conflict is particularly relevant for the transfer pricing channel of profit shifting (instead of the debt shifting channel; see Hypothesis 3).

Hypothesis 3 is tested based on the following regression model.

$$\lambda_i = \beta_0 + \beta_1 C_i + \beta_2 Scaled\_VMI_i + \beta_3 C_i * Scaled\_VMI_i + \beta_4 \Psi_i + \beta_5 x_c + \beta_6 \gamma_j + \varepsilon_i \quad (4)$$

Following De Simone et al. (2017) and Huizinga et al. (2016), we use the natural logarithm of return on assets (EBIT divided by total assets, Ln_ROA_i) and the debt quota (total debt divided by total assets, $DebtRatio_i$) as our dependent variable (λ_i), respectively. Following Huizinga & Laeven (2008) and Huizinga et al. (2016), C_i represents the capital-weighted differential tax rate of the subsidiary relative to all other subsidiaries of the MNC. Positive values of C_i imply that MNCs have an incentive to shift profits out of country i. To test Hypothesis 3, we include $Scaled\_VMI_i$ as well as the interaction of C_i and $Scaled\_VMI_i$. Following Schindler & Ortmann (2022), we expect a negative and statistically significant coefficient for this interaction if return on assets is used as the dependent variable and no similar effect for the debt ratio. In line with De Simone et al. (2017) and Huizinga et al. (2016), we include subsidiary- (Ψ_i) and country-level controls (x_c) as well as MNC fixed effects (γ_j).

IV. DATA

Database and Sample Selection

We base our analysis on management, shareholder, and unconsolidated financial information obtained from the AMADEUS database for the headquarters and 21,365 foreign European subsidiaries of 6,567 MNCs. Our dataset contains financial information in the standardized AMADEUS format for the period 2010 to 2014. We further employ the manager information which is provided in AMADEUS separately for each headquarter and subsidiary,

particularly the unique manager identifier, the job description, and the standardized level of decision-making power. This information is provided in our dataset only for the year 2014. Lastly, we use the ultimate owner information provided in AMADEUS to match MNCs' headquarters with their European subsidiaries.

We use this information to construct two unique datasets. For our subsidiary-level analysis (Sample 1), we refer directly to the subsidiary-level information for all European subsidiaries that are held (directly or indirectly) to at least 50 percent by a foreign headquarter. According to the sample selection process described in Table 4, we restrict our sample to active firms and firms in the legal form of a private or public limited company. We exclude financial and insurance companies and companies with an unknown industry, as these firms may be subject to industry-specific tax or accounting regulations. We also drop subsidiaries with insufficient financial or management information. Summary statistics for the resulting sample, which is used for estimating Equations (2) and (4)[8], are reported in Table 2 in the Appendix.

Sample 2, used to test Hypotheses 1 and 2, results from a similar selection process but consists of data aggregated at the MNC level. To this end, we select all (domestic and foreign) subsidiaries with the required financial, industry, and management information. We then aggregate accounting information MNC-wise at the level of the headquarter (i.e., the ultimate parent company). Finally, we drop MNCs with a negative tax expense or negative EBIT. Again, summary statistics for the resulting sample can be found in Table 3 in the Appendix.

Construction of the VMI variable

The generation of our dependent variables $Scaled\_VMI_i$ and Avg_VMI_j follows a four-step procedure. In the first step, we collect all headquarter managers with their unique identifiers for

[8] For estimating Equations (4), we only consider MNCs with at least five (domestic or foreign) subsdiaries.

each MNC in our sample. In the second step, we identify all relevant managers of each foreign subsidiary for these MNCs. We only consider managers with positions broadly related to tax issues based on the AMADEUS variable *dmctypeofposition*.[9] We further require relevant managers to hold a position with a reasonable decision-making power in the subsidiary, which we assume for C-level employees as well as employees with a higher management position (Deloitte, 2016).[10] In step three, we match the two sets of managers in order to identify vertical manager interlocks within MNCs. Lastly, we determine $Scaled\_VMI_i$ by scaling the number of VMIs by the overall number of relevant managers per foreign subsidiary. Avg_VMI_j is then calculated as the MNC-wide average of $Scaled\_VMI_i$.

V. EMPIRICAL RESULTS

The use of VMIs by European MNCs

Empirical evidence for the use of VMIs by European multinationals is scarce. Therefore, we begin our empirical analysis with some descriptives on the use of this management structure in our data (Table 5). Overall, 23.21 percent of our sample's MNCs use this management structure and have implemented at least one VMI in their subsidiaries (see Table 5). The prevalence is thus somewhat smaller than that observed by Wang et al. (2022) in a similar analysis for Chinese firms (36.4 percent) and that reported in a global survey by Deloitte (2013) for large MNCs (65 percent). However, it clearly underlines the practical relevance of this type of management structure. MNCs

[9] We assume this to be the case for the following management positions and department associations: Administrative Department, Advisory Board, Branch Officer, Executive Board, Executive Committee (Board), Finance and Accounting, Proxy, Senior Manager, and Sales.

[10] 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.

with at least one VMI typically use this structure multiple times. On average, each of these MNCs operates VMIs in 1.8 different subsidiaries, with a maximum number of 5. The usage is considerably more prevalent for publicly-listed MNCs, MNCs with more subsidiaries, and large MNCs (> € 750m in sales, see Table 5).

Motives for the use of VMI

VMIs can help headquarters assert their economic interests in foreign affiliates by improving knowledge sharing within MNCs and resolving internal agency problems that may arise when the preferences of headquarter managers and subsidiary managers are not perfectly aligned. These benefits of VMIs are not limited to tax issues. We, therefore, begin our analysis by examining the extent to which the use of VMIs is motivated by tax considerations. While we cannot directly observe managers' goals and motives, we take an indirect approach and analyze the extent to which the use of VMis usage is positively correlated with potential tax savings (Hypothesis 1).

Table 6 analyzes this question based on MNC-level data by estimating Equation 1. The dependent variable *Avg_VMI* captures the MNC-wide share of VMIs. In Column 1, we analyze only the non-tax determinants of VMI usage. We find that VMIs are more common in MNCs with a higher number of subsidiaries and a lower degree of international dispersion. In Columns 2 to 4, we add three different measures for tax rate differentials within MNCs (*sd_staxr, minmax_staxr,* and *minmax_dummy*[11]) to the equation, which aims to proxy the tax planning potential of MNCs. As predicted by Hypothesis 1, we estimate positive and statistically significant coefficients on all three variables. The sharp increase in the adjusted R^2 and the size of the coefficients underscore that tax considerations are a relevant determinant of VMI use. A one standard deviation increase

[11] *minmax_dummy* is an indicator variable taking the value of one if the MNC's difference between the maximum and minimum statutory tax rate is is above the sample mean and zero otherwise.

in the respective tax rate differential measure is associated with an increase in VMI equivalent to 24 percent (column 2) to 144 percent (column 3) of the sample mean.

We use a second identification strategy that examines the allocation of VMIs within MNCs based on subsidiary-level data. Hypothesis 1 predicts that the frequency of VMIs increases the more the tax rate of the subsidiary exceeds the average tax rate of the MNC. This prediction is based on the assumption that the internal agency conflict prevents particularly managers of high-tax subsidiaries from following the headquarter's guidelines on tax-motivated profit shifting.

Figure 1 shows the relationship between the frequency of VMIs and the difference between the tax rate of the subsidiary and the asset-weighted tax rate of the MNC. It shows that the majority of VMIs are observed in subsidiaries with above-average tax rates. The frequency of VMIs increases sharply with the size of the tax rate differential.[12]

We complement Figure 1 with a regression analysis of the subsidiary-level determinants of VMI allocation within MNCs in Tables 7 to 11. The dependent variable is the subsidiary-specific share of VMIs ($Scaled\_VMI_i$). In Table 7, we estimate equation 2 to investigate whether the frequency of VMIs is higher for the high-tax segment of subsidiaries. The explanatory variable $hightax_i$ indicates whether the tax rate of subsidiary i is above the asset-weighted MNC average ($hightax_i$=1) or not.

Both non-tax factors and the subsidiary's tax rate play a role in the decision for or against the use of VMIs. In column 1 of Table 7, we analyze the non-tax determinants. We find that the frequency of VMI increases significantly when the distance between the headquarters and the subsidiary is smaller and when both countries share a common language. The significantly negative coefficient for $Employees_i$ may indicate that subsidiaries with more employees, on average, are

[12] For the below-average tax rate subsidiaries, we find a similar effect for tax rate differentials between 0 and -10. However, the slope stagnates for values below -10. This points to potential non-tax reasons for the use of VMIs.

more autonomous. Including $hightax_i$ in the regression equation in column 2 increases the overall explanatory power of the model by about ten percent. The frequency of VMIs is 1.1 percentage points higher in the high-tax segment of subsidiaries, which corresponds to 24 percent of the sample average of $Scaled\_VMI_i$. Both results underscore the importance of tax considerations in this decision.

The regression results reported in columns 1 and 2 of Table 7 are based on a model with MNC fixed effects. Including MNC fixed effects allows us to control for unobserved group characteristics but also filters out some of the variation in $hightax_i$. We, therefore, test the robustness of our results and report additional specifications that include subsidiary country or MNC industry fixed effects and MNC-level controls in columns 3 and 4, both the magnitude and the significance of the coefficient for $hightax_i$ increase.

We now examine whether the use of VMIs depends not only on the sign but also on the magnitude of the tax rate differential. To do so, we split our sample into a high-tax and low-tax segment of subsidiaries and run separate regressions of equation 2 for both subsamples. However, we now capture the tax incentive by a continuous variable defined as the difference between the subsidiary's tax rate and the MNC-wide weighted average ($taxdiff_i$). Hypothesis 1 predicts a positive effect for $taxdiff_i$ in the high-tax segment of subsidiaries and an ambiguous effect for the low-tax subsample. Results reported in Table 8 confirm this prediction. In column 1 (high-tax segment) $Scaled\_VMI_i$ correlates significantly positive with $taxdiff_i$. A one percentage point increase in $taxdiff_i$ translates into a 0.3 percentage points increase in $Scaled\_VMI_i$, which corresponds to 5.5 percent of the sample mean. We find no similar effect in the low-tax segment of subsidiaries.

Previous research has shown that MNCs respond with their transfer pricing to differences between the subsidiary's tax rate and the MNC average (e.g., Huizinga & Laeven, 2008). However,

other tax planning strategies involving financial centers or tax haven affiliates may respond more to the lowest tax rate within the MNC (Moen et al., 2011). The inclusion of MNC fixed effects in Table 8 does not allow us to compare the relevance of these two tax rate differentials. Therefore, we report additional regression results in Table 9 that instead include subsidiary country and/or MNC industry fixed effects. We include either $taxdiff_i$ (defined with respect to the MNC's asset-weighted average tax rate) or taxdiff_2i (defined with respect to the MNC's minimum tax rate). Our results in Table 9 show that the decision is significantly influenced by the average tax rate of the MNC but not the minimum tax rate. This outcome is consistent with the predictions of Ortmann & Schindler (2022) that the internal agency conflict influences transfer pricing decisions and the location of intangibles rather than internal debt shifting.[13]

Robustness tests

We examine the robustness of our results against changes in relevant regression parameters. The definitions of $hightax_i$ and $taxdiff_i$ as well as the separation of high-tax and low-tax subsidiaries, have been based on an asset-weighted average of tax rates in the analyses so far. We test the robustness of our results to this definition by repeating the main regressions from Table 7 (column 2) and Table 8 (column 1) using an unweighted definition of the average tax rate (see Table 10, columns 1 and 2). The coefficients for $hightax_i$ and $taxdiff_i$ remain statistically significant and even increase slightly in magnitude.

A second robustness test concerns the distribution of the dependent variable and the regression model used. In Tables 7 to 10, we define $Scaled\_VMI_i$ as the ratio of VMIs to the total number of relevant subsidiary managers and use OLS regressions. In Table 11, we re-estimate the baseline specification from Table 7 (column 2) but instead consider a binary and count data

[13] We further investigate the predictions of Ortmann & Schindler (2022) concerning transfer pricing and debt shifting in Table 15.

specification. In column 1, we define VMI_i as a binary variable indicating whether the subsidiary has at least one VMI and run a probit regression. In column 2, we use the number of VMIs at the subsidiary level directly as the dependent variable and estimate a negative binomial model.[14] The coefficients for $hightax_i$ are statistically significant and positive in both specifications, further confirming our baseline findings. The coefficient of 1.0695 estimated for $hightax_i$ in column 2 translates into an incidence ratio of about 2.9, further underscoring the economic relevance of this association. According to this specification, high-tax affiliates have almost three times as many VMIs as low-tax affiliates.

The use of VMIs and effective tax rates

Our results in the previous sections have documented that the use of VMIs is common practice among European MNCs and that the use of VMIs is significantly correlated with the potential for tax planning, both between and within MNCs. In this section, we analyze whether the use of VMIs is associated with improved tax outcomes for the MNC.

In Tables 12 and 13, we analyze this question using data aggregated at the MNC level and test the prediction from Hypothesis 2 that a more intensive use of VMIs is associated with a lower effective tax rate of the MNC. The dependent variable in Table 12 is the one-year or three-year GAAP ETR. The explanatory variable of main interest is Avg_VMI_j, the MNC-wide share of VMIs. Consistent with Hypothesis 2, we find negative and statistically significant coefficients for Avg_VMI_j for both definitions of the effective tax rate considered. These coefficients also indicate an economically relevant effect size. A one standard deviation increase in Avg_VMI_j is associated

[14] Allison & Waterman (2002) demonstrate that the conditional negative binomial model proposed by Hausman et al. (1984), implemented in the negative binomial estimator in STATA "is not a true fixed-effects model" since it does not properly account for all stable covariates. Their proposed best suited alternative estimation method for our study, an uncondicitional negative binomial regression estimator with dummy variables to represent the fixed effects does not converge. Hence, we apply a regression design without MNC fixed effects when using count-data estimation.

with a 1.2 percentage point reduction in the three-year GAAP ETR. This reduction corresponds to almost 5 percent of the average three-year GAAP ETR.

In the previous section, we presented evidence that MNCs prefer VMI in high-tax subsidiaries. This observation is consistent with Hypothesis 1, as the internal principal-agent conflict regarding tax-motivated profit shifting is particularly relevant here. On the other hand, any VMI (in high-tax or low-tax subsidiaries) should improve knowledge sharing within MNCs, which enhances tax planning efficiency. Therefore, in Table 13, we investigate whether the positive impact of VMI on effective tax rates is limited to VMIs in high-tax subsidiaries. We repeat the regressions from Table 12, considering separately VMIs in high-tax subsidiaries (columns 1 and 3) and VMIs in low-tax subsidiaries (columns 2 and 4).[15] We estimate negative coefficients for both categories of VMIs. However, the coefficient estimated for VMIs in high-tax subsidiaries is more than 20 percent higher and also more significant. Nevertheless, the positive impact of VMIs on tax planning does not seem to be limited to high-tax subsidiaries.

MNCs with and without VMIs may differ in terms of their overall governance mechanisms or other unobservable characteristics, which could bias our findings. Therefore, we validate our findings by presenting additional regression results based on different matched samples of MNCs. We match the two groups of MNCs according to their potential to shift profits[16] using various matching techniques[17] and re-estimate the regressions from Table 12. Respective results are reported in Table 14.[18] The coefficient estimates for Avg_VMI_i are negative in all specifications

[15] This procedure yields two distinct samples, one only consisting of subsidiaries with above MNC-wide average statutory tax rate and the other one with a statutory tax rate below the MNC-wide average.

[16] We use variables such as total assets, EBIT scaled by total assets, leverage, r&d expenses scaled by total assets, and intangibles scaled by total assets to capture the profit shifting potential. See Overesch et al. (2020) for a similar approach.

[17] By utilizing various matching techniques and parameters, along with unmatched regression results, we adhere to Leamer's (1983) concern that findings may be influenced by a specific research design.

[18] Line 1 of Table 14 displays results for a one-to-one propensity score matching without replacement, utilizing a caliper set to 0.2 times the pooled standard deviation of the logit of the propensity score, as is customary in the

reported in Table 14, with five out of six being statistically significant at least at the ten percent confidence interval.

The use of VMIs and profit shifting channels

Lastly, we test the implications of VMIs for tax planning using data at the subsidiary level (Table 15).[19] This allows us to ensure that the results in the previous section are not biased by unobserved MNC characteristics. It also allows us to compare the relevance of VMIs for different profit shifting channels. We test Hypothesis 3, which, based on the analytical model of Ortmann & Schindler (2022), predicts that the internal agency conflict is more relevant for the transfer pricing channel than for the debt shifting channel.

In columns 1 to 3 of Table 15, we examine the impact of VMIs on the transfer pricing channel based on the empirical model first used by Huizinga & Laeven (2008). Following De Simone et al. (2017), we define the dependent variable as the natural logarithm of return on assets, while tax incentives for profit shifting are captured by the measure C_i. C_i is the capital-weighted average of the tax rate differentials between the subsidiary and all other subsidiaries within the MNC (Huizinga & Laeven, 2008).[20] High-tax subsidiaries are characterized by high values of C_i. We extend the model of Huizinga & Laeven (2008) and include VMI_i (one_VMI_i[21]) as well as the interactions of C_i and VMI_i (C_i and one_VMI_i) in the regression equation in columns 2 to 4 of Table 15 to examine the impact of VMIs on the transfer pricing channel. In columns 5 to 8, we follow

accounting literature (Shipman et al., 2017). Lines 2 presents the results of similar propensity score matchings, but use a one-to-three matching with replacement. Line 4 reports the outcomes of covariate matching utilizing one-to-one nearest neighbor.

[19] In this regard, we only consider international tax planning and abstain from analyzing effects on local tax planning (Beuselinck & Pierk, 2022).

[20] C is calculated using the following formula: $C_i = \frac{\sum_{j \neq i}^{n} K_j (t_i - t_j)}{\sum_{j=1}^{n} K_j}$, with n countries, K_j being the economic activity in country j using capital as a proxy, and t representing the statutory tax rate of countries i and j.

[21] One_VMI_i indicates whether a subsidiary employs at least one VMI. This allows us to compare the intensive and the extensive margin of the effect.

Huizinga et al. (2008) and apply a similar regression model for the debt-shifting channel of profit shifting. Here, the dependent variable is the debt-equity ratio of the subsidiary.

The baseline effect of C_i on return and leverage in our regressions confirms the findings of Huizinga & Laeven (2008) and Huizinga et al. (2008). We find a significant and negative correlation between C_i and the subsidiary's return on assets and a significant positive correlation between C_i and the subsidiary's leverage ratio. However, differences between the two profit shifting channels emerge when it comes to the impact of VMI use. As predicted by Ortmann & Schindler (2022) and in our hypothesis 3, our results show a stronger relationship between C_i and ROA_i when the subsidiary has more VMIs or at least one VMI. In specification 2 of Table 15, we estimate coefficients of -2.40 for VMI_i and -2.19 for $C_i\#VMI_i$. These coefficients imply that, compared to the baseline effect, an increase in VMI_i by one standard deviation (0.17) is associated with a 15.5 percent higher sensitivity of return on assets to C_i.[22] The results in Table 15, column 4 indicate that the extensive margin of this effect is more relevant than the intensive margin. In contrast, we do not find a similar effect of VMIs for the debt-shifting channel.

VI. CONCLUSION

Using Vertical Manager Interlocks to manage subsidiaries is common among multinational corporations. In particular, VMIs improve the exchange of information between headquarters managers and subsidiary managers and help mitigate internal agency conflicts. In our European MNCs sample, 67.9 percent of all listed MNCs and 17.5 percent of all large MNCs (with sales above € 750 million) use this management structure.

We analyze to what extent the use of VMIs is motivated by tax considerations and whether it helps MNCs increase tax planning efficiency. We show that VMIs are significantly more

[22] (-2.1941*0.17)/-2.4004.

common in MNCs with a higher potential for profit shifting, as indicated by larger tax rate differentials. Tax considerations also seem to play a role in allocating VMIs within MNCs. The frequency of VMIs is 1.1 percentage points higher in the high-tax segment of subsidiaries, corresponding to 24 percent of the sample average. We also find that a more intensive use of VMIs is associated with lower GAAP effective tax rates and a stronger correlation between return on assets and tax rate differentials at the foreign subsidiary level. We find no similar effect for the debt-shifting channel of profit shifting.

Our results underscore the importance of internal agency conflicts for tax avoidance in multinational corporations. In doing so, we contribute to a recent strand of literature that analyzes this relationship and the implications of potential solutions adopted by firms. We emphasize the importance of the management structure as an alternative to solving the internal agency conflict through the design of employee compensation.

We acknowledge that our study has some limitations. First, our analysis is limited to European subsidiaries and, thus, to a specific part of MNCs. However, we have no reason to believe that this limitation biases our results. Second, the available management information is cross-sectional in nature. This limits our ability to identify causal relationships. We address this concern by analyzing the effects at both the MNC and subsidiary levels, allowing us to control for unobservable MNC characteristics and by presenting results also for a matched sample of MNCs. Our results are robust across these different settings.

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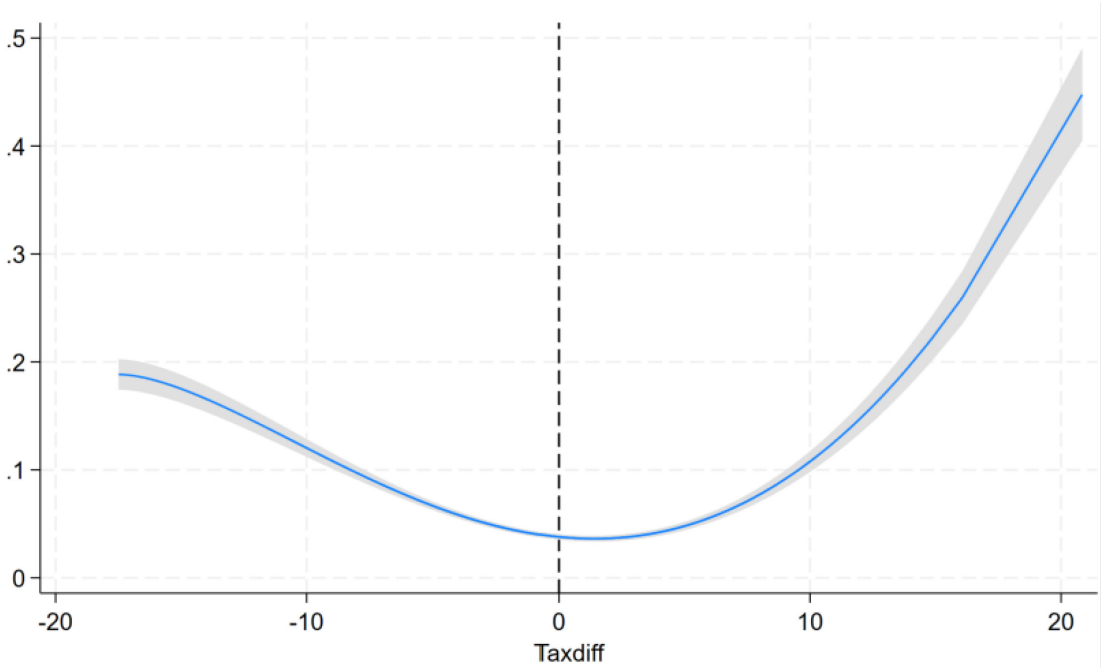
Appendix

FIGURE 1
Use of VMI across the taxdiff distribution



Notes: This figure displays the average usage of VMIs in subsidiaries across the tax differential distribution. On the horizontal axes *Taxdiff* is displayed. It is the tax differential between the statutory tax rate of subsidiary i and the MNC-wide asset-weighted average of statutory tax rates. *Scaled VMI* is presented at the vertical axes and is the number of employees with an additional position at the headquarter scaled by the number of the subsidiary's employees.

TABLE 1
Definition of Variables

Variables	Definition
Equation 1	
Avg_VMI	MNC-wide average proportion of VMIs per subsidiary.
SD_staxr	Standard deviation of statutory tax rate of MNC's operating countries.
minmax_staxr	Difference between the maximum and minimum statutory tax rate within the MNC.
minmax_dummy	Indicator variable taking the value of one if the MNC's difference between the maximum and minimum statutory tax rate is above the sample mean and zero otherwise.
DebtRatio	Natural logarithm of the ratio of MNC's debt to total assets.
Int	Intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level.
Employees	Natural logarithm of MNC's number of employees.
FixedAssets	Natural logarithm of total assets.
No_Countries	Number of countries the MNC is operating in.
No_Subs	Natural logarithm of the number of subsidiaries of the MNC.
Equation 2	
Scaled_VMI	Number of managers of subsidiary i with co-positions at the headquarter of MNC j, scaled by the total number of managers employed in that subsidiary.
VMI (counts)	Number of managers of subsidiary i with co-positions at the headquarter of MNC j.
VMI (indicator)	Indicator variable that takes the value of one if at least one VMI is present in the respective subsidiary and zero otherwise.
hightax	Indicator variable that indicates whether the statutory tax rate of subsidiary i is above the MNC-wide asset-weighted average of statutory tax rates.
taxdiff (weighted)	Tax differential between the statutory tax rate of subsidiary i and the MNC-wide asset-weighted average of statutory tax rates.
taxdiff (unweighted)	Tax differential between the statutory tax rate of subsidiary i and the MNC-wide average of statutory tax rates.
taxdiff_2	Tax differential between the subsidiary's statutory tax rate and the MNC's lowest statutory tax rate.
Subsidiary-level	
Int	Intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level.
Employees	Natural logarithm of subsidiary's number of employees.
FixedAssets	Natural logarithm of fixed assets.
FirmAge	Natural logarithm of the firms age, measured as 2014 minus the year of incorporation.
Distance	Capturing the distance between the headquarter country's capital and the subsidiary country's capital. Data from the CEPII Database.
Language	Indicator variable taking one if the headquarter and subsidiary country share a common language and zero otherwise. Data from the CEPII Database.
DebtRatio	Natural logarithm of the ratio of the subsidiary's debt to total assets.
MNC-level	
Int	Intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level.
Employees	Natural logarithm of MNC number of employees.
FixedAssets	Natural logarithm of fixed assets.

No_Subs	Natural logarithm of the number of subsidiaries of an MNC.
No_Countries	Number of countries an MNC is operating in.
Country-level	
GDPgrowth	Change in GPD calculated as GDP in 2014 less GDP in 2013, scaled by GDP in 2013. Data from the International Monetary Fund.
GDP	natural logarithm of the gross domestic product of the subsidiary's country. Data from the International Monetary Fund.
GDPperCapita	Natural logarithm of the subsidiary country's GDP per capita. Data from the International Monetary Fund.
CorruptionIndex	Subsidiary country's corruption index value for 2014. Data from Transparency International.
UnemploymentRate	Subsidiary country's unemployment rate. Data from the International Monetary Fund.
No_Subs_Country	Natural logarithm of the MNC's total number of subsidiaries in subsidiary i's country.
Equation 3	
Avg_VMI	MNC-wide average proportion of VMIs per subsidiary.
Avg_VMI (hightax)	MNC-wide average proportion of VMIs in high-taxed subsidiaries.
Avg_VMI (lowtax)	MNC-wide average proportion of VMIs in low-taxed subsidiaries.
GAAP ETR	One-year GAAP effective tax rate, calculated as MNC's tax expense over three years divided by pre-tax income over the same period. Observations with a negative denominator are dropped from the sample.
3Y GAAP ETR	Three-year average GAAP effective tax rate, calculated as the sum of a MNC's tax expense over three years divided by the sum of its total pre-tax income over the same period. Observations with a negative denominator are dropped from the sample.
DebtRatio	Debt scaled by total assets.
Int	Intangible assets scaled by total assets.
Employees	Number of employees.
AssetsFixed	Natural logarithm of fixed assets.
EBIT	Earnings before interest and taxes.
No_ Subs	Number of subsidiaries.
Sales	Natural logarithm of sales.
Average STAXR	Asset-weighted average tax rate across all countries the MNC is operating in.
Equation 4	
Ln_ROA	Natural logarithm of return on assets, where return on assets is calculated as EBIT scaled by total assets. EBIT is earnings before interest and taxes.
DebtRatio	Ratio of subsidiary total liabilities to subsidiary total assets (financial leverage).
C	The capital-weighted differential statutory tax rate between the affiliate and all related affiliates in the same MNC.
Scaled_VMI	Number of managers of subsidiary i with co-positions at the headquarter of MNC j, scaled by the total number of managers employed in that subsidiary.
one_VMI	Indicator variable taking the value of one if at least in one subsidiary of the MNC a VMI is present.
TangibleAssets	Natural logarithm of tangible assets.
EmployeeCosts	Natural logarithm of compensation expenses.
IndustryROA	Country-industry median return on assets.
Age	Natural logarithm of the firms age, measured as 2014 minus the year of incorporation.

GDPgrowth	Change in GPD calculated as GDP in 2014 less GDP in 2013, scaled by GDP in 2013.
Tangibility	Ratio of subsidiary fixed assets to subsidiary total asset.
Sales	Natural logarithm of sales.
ROA	Ratio of subsidiary earnings before interest, taxes, depreciation, and amortization to subsidiary total assets.
CreditorRights	Creditor rights is the index of country creditor rights from Djankov, McLiesh, and Shleifer (2007). Most recent data from 2002 is used.
Inflation	Annual percentage change in CPI of the subsidiary's host country. Data from the International Monetary Fund.
Salesgrowth	Median of the annual growth rate of subsidiary sales in a subsidiary's country and industry.

Table 2
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
Scaled_VMI (OLS Regression)	21,365	0.0419	0.170	0	0.333
VMI (counts)	21,365	0.100	0.392	0	5
one_VMI (indicator)	7,317	0.053	0.2249	0	1
C	7,317	0.0075	0.058	-0.099	0.096
Subsidiary-level controls					
DebtRatio [percent]	21,365	-0.702	0.992	-2.317	0.134
Int [percent]	21,365	0.0200	0.0647	0	0.124
Employees [count]	21,365	3.711	1.592	1.099	6.323
FixedAssets [thousand €]	21,365	6.589	2.809	1.792	11.14
FirmAge [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					
DebtRatio [percent]	21,365	-0.672	0.785	-1.993	0.0706
Int [percent]	21,365	0.0202	0.0506	0	0.103
Employees [count]	21,365	5.461	2.510	1.609	9.740
FixedAssets [thousand €]	21,365	9.519	4.218	2.708	16.29
No_Subs [count]	21,365	1.408	1.551	0	4.277
No_Countries [count]	21,365	1.416	0.887	0.693	3.091

Country controls					
GDPgrowth [percent]	21,365	-0.00633	0.0474	-0.0895	0.0408
GDP [thousand $]	21,365	9.918	2.465	7.616	13.69
GDPperCapita [thousand $]	21,365	10.23	0.615	9.210	10.98
CorruptionIndex	21,365	8.811	5.010	5.008	24.44
UnemploymentRate [percent]	21,365	5.635	2.081	2.700	8.600
No_Subs_Country	21,365	0.489	0.845	0	2.303

Table 3
Descriptive Statistics, Sample 2

VARIABLES	(1) N	(2) mean	(3) sd	(4) p5	(5) 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
Avg_VMI	6,592	0.0486	0.164	0	0.333
Avg_ 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
DebtRatio [percent]	6,592	-0.648	0.633	-1.863	-0.00983
Int [percent]	6,592	0.0212	0.0535	0	0.117
Employees [count]	6,592	4.299	2.007	1.099	7.867
AssetsFixed [thousand €]	6,592	7.823	3.173	2.773	13.35
EBIT [thousand €]	6,592	6.806	2.316	3.258	10.93
No_Subs [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

TABLE 4
Sample selection process Hypothesis 2

Total number of available companies (MNC 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 1. The population is all available companies in the AMADEUS database.

TABLE 5
Descriptives VMI

Panel A

	Number	Percent
MNCs with at least one VMI	1,524	23.21%
of which subsidiaries with at least one VMI	1,613	28.22%
of which subsidiaries with one VMI	1,196	74.15%
of which subsidiaries with two VMI	320	19.84%
of which subsidiaries with three VMI	76	4.71%
of which subsidiaries with four VMI	19	1.18%
of which subsidiaries with five VMI	2	0.12%

Panel B

	Share of MNCs using VMI	
Publicly-listed	67.89 %	
Non-publicly-listed	8.53 %	-59.36***
MNCs >€ 750m sales	17.53 %	
MNCs <€ 750m sales	2.4 %	-15.13***
	Number of subs	
MNCs with at least one VMI	10.67	
MNCs without VMI	3.30	-7.37***

Panel A of this table displays the distribution of VMIs within our sample. VMI is measured as an employee having a position at the head office as well as the respective subsidiary. Panel B of this table provides t-statistics on the difference in the usage of VMIs for listed vs. non-listed and larger vs. smaller MNCs as well as the number of subsidiaries for MNCs with and without a VMI structure.

TABLE 6
Tax motivated use of VMIs

Dependent variable:	(1)	(2)	(3)	(4)
Avg_VMI	OLS	OLS	OLS	OLS
DebtRatio	-0.0009	-0.0011	0.0006	0.0016
	(-0.33)	(-0.39)	(0.20)	(0.58)
Int	-0.0481	-0.0460	-0.0370	-0.0358
	(-1.30)	(-1.24)	(-1.00)	(-0.99)
Employees	-0.0006	-0.0009	-0.0006	-0.0005
	(-0.33)	(-0.49)	(-0.30)	(-0.28)
FixedAssets	-0.0022**	-0.0022*	-0.0019*	-0.0017
	(-1.96)	(-1.92)	(-1.67)	(-1.52)
No_Subs	0.0725***	0.0732***	0.0418***	0.0263***
	(12.66)	(12.80)	(7.68)	(4.81)
No_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 *Avg_VMI*. *SD_staxr* represents the standard deviation of the MNC's statutory tax rate. *minimax_staxr* is the maximum statutory tax rate less the minimum statutory tax rate of the respective MNC. *minmax_dummy* represents an indicator variable taking the value of 1 if the MNCs *minmax_staxr* is above the average, 0 otherwise. We control for MNC specifics by using *DebtRatio* representing the natural logarithm of the ratio of company's debt to total assets. *Int* representing the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of the MNC's total number of employees. *FixedAssets* is the natural logarithm of fixed assets, *No_Countries* represents the number of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. ***, ** 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 the country level.

TABLE 7
The use of VMIs in High-tax Subsidiaries

Dependent variable:	(1)	(2)	(3)	(4)
Scaled_VMI	OLS	OLS	OLS	OLS
hightax		**0.0111***	**0.0428*****	**0.0438*****
		(1.76)	**(4.55)**	**(5.16)**
DebtRatio (sub)	0.0008	0.0006	0.0009	0.0007
	(0.33)	(0.23)	(0.38)	(0.41)
Int (sub)	-0.0023	-0.0039	-0.0264	-0.0264
	(-0.08)	(-0.13)	(-1.13)	(-1.13)
Employees (sub)	-0.0028*	-0.0027	-0.0052***	-0.0052***
	(-1.67)	(-1.59)	(-3.63)	(-3.63)
FixedAssets (sub)	0.0023***	0.0022**	-0.0021***	-0.0020***
	(2.69)	(2.62)	(-2.89)	(-2.72)
FirmAge (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)
DebtRatio (MNC)			-0.0010	-0.0008
			(-0.49)	(-0.40)
Int (MNC)			0.0338	0.0370
			(1.04)	(1.14)
Employees (MNC)			0.0055***	0.0053***
			(3.46)	(3.37)
FixedAssets (MNC)			0.0034***	0.0035***
			(4.11)	(4.26)
No_Countries (MNC)			-0.0067	-0.0060
			(-1.40)	(-1.30)
No_Subs (MNC)			-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)
GDPperCapita	0.0157***	-0.0036		0.0003
	(3.19)	(-0.42)		(0.07)
UnemploymentRate	-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)
No_Subs_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 *Scaled_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 MNC. For the subsidiary-level controls, *DebtRatio* represents the natural logarithm of the ratio of company's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of subsidiary's number of employees. *FixedAssets* is the natural logarithm of fixed assets and *FirmAge* 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. *DebtRatio, Int, Employees,* and *FixedAssets* are calculated likewise for the group-level controls with respect to the MNC. *No_Countries* represents the number

of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. *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, *GDPperCapita* represents the natural logarithm of the country's GDP per capita, *UnemploymentRate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *No_Subs_Country* is the natural logarithm of the MNC'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 the country level.

TABLE 8
The use of VMIs in High-tax Subsidiaries II

Dependent variable:	(1)	(2)
Scaled_VMI	OLS	OLS
taxdiff	**0.0033*****	**0.0016**
	(3.81)	**(1.29)**
DebtRatio (sub)	-0.0016	-0.0007
	(-0.43)	(-0.23)
Int (sub)	0.0146	-0.0094
	(0.38)	(-0.20)
Employees (sub)	-0.0043*	-0.0012
	(-1.79)	(-0.47)
FixedAssets (sub)	0.0027**	0.0012
	(2.41)	(0.89)
FirmAge (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 (2) for the dependent variable *Scaled_VMI*. *taxdiff* is the subsidiary's statutory tax rate less the asset-weighted average statutory tax rate of the MNC. For the subsidiary-level controls, *DebtRatio* represents the natural logarithm of the ratio of company's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of subsidiary's number of employees. *FixedAssets* is the natural logarithm of fixed assets and *FirmAge* 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. *DebtRatio, Int, Employees,* and *FixedAssets* are calculated likewise for the Group-level controls with respect to the MNC. *No_Countries* represents the number of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. *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, *GDPperCapita* represents the natural logarithm of the country's GDP per capita, *UnemploymentRate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *No_Subs_Country* is the natural logarithm of the MNC'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 the country level.

TABLE 9
The use of VMIs in High-tax Subsidiaries III

Dependent variable:	(1)	(2)	(3)	(4)
Scaled_VMI	OLS	OLS	OLS	OLS
taxdiff	**0.0021***	**0.0024****		
	(1.76)	**(2.42)**		
taxdiff_2			**0.0012**	**-0.0002**
			(1.11)	**(-0.19)**
DebtRatio (sub)	-0.0003	0.0004	-0.0004	0.0006
	(-0.10)	(0.13)	(-0.12)	(0.19)
Int (sub)	-0.0038	-0.0070	-0.0028	-0.0172
	(-0.11)	(-0.20)	(-0.08)	(-0.50)
Employees (sub)	-0.0057**	-0.0054**	-0.0059**	-0.0061***
	(-2.41)	(-2.27)	(-2.46)	(-2.67)
FixedAssets (sub)	0.0018	0.0016	0.0014	0.0012
	(1.56)	(1.36)	(1.21)	(1.05)
FirmAge (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 (2) for an alternative definition of *taxdiff*. The dependent variable is *Scaled_VMI*. *taxdiff_2* represents the difference between the subsidiary's statutory tax rate and the MNC's lowest statutory tax rate. The control variables are the following. For the subsidiary-level controls, *DebtRatio* represents the natural logarithm of the ratio of company's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of subsidiary's number of employees. *FixedAssets* is the natural logarithm of fixed assets and *FirmAge* 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 *DebtRatio, Int, Employees*, and *FixedAssets* calculated likewise for the Group-level. *No_Countries* represents the number of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. *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, *GDPperCapita* represents the natural logarithm of the country's GDP per capita, *UnemploymentRate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *No_Subs_Country* is the natural logarithm of the MNC'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 the country level.

TABLE 10
The use of VMIs in High-tax Subsidiaries (Robustness I)

Specification	*Unweighted Taxdiff*	*Unweighted Taxdiff*
Model	OLS	OLS
hightax	**0.0165****	
	(2.57)	
taxdiff		**0.0024*****
		(3.99)
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 *Scaled_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 MNC. 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. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of subsidiary's number of employees. *FixedAssets* is the natural logarithm of fixed assets and *FirmAge* 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. *DebtRatio, Int, Employees*, and *FixedAssets* are calculated likewise for the Group-level controls with respect to the MNC. *No_Countries* represents the number of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. *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, *GDPperCapita* represents the natural logarithm of the country's GDP per capita, *UnemploymentRate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *No_Subs_Country* is the natural logarithm of the MNC'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 the country level.

TABLE 11
The use of VMIs in High-tax Subsidiaries (Robustness II)

Specification	Binary Variable	Count Data Model
Model	Probit	NBREG
hightax	**0.4118*****	**1.0604*****
	(12.15)	**(4.27)**
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 *Scaled_VMI*. In Column 1, the dependent variable takes the value of 1 if *Scaled_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 MNC. The not reported control variables are the following. For the subsidiary-level controls, *DebtRatio* represents the natural logarithm of the ratio of company's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of subsidiary's number of employees. *FixedAssets* is the natural logarithm of fixed assets and *FirmAge* 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. *DebtRatio, Int, Employees*, and *FixedAssets* are calculated likewise for the Group-level controls with respect to the MNC. Group ATR is the MNC's asset-weighted average statutory tax rate. *No_Countries* represents the number of countries an MNC is working in and *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC. *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, *GDPperCapita* represents the natural logarithm of the country's GDP per capita, *UnemploymentRate* is the respective unemployment rate, and *Corruption* is the subsidiary country's corruption index value for 2014. *No_Subs_Country* is the natural logarithm of the MNC'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 the country level.

TABLE 12
The effect of VMI structures on ETR I

	(1) *GAAP ETR*	(2) *3 year GAAP ETR*
Avg_VMI	***-0.0434****	***-0.0632*****
	(-1.91)	***(-3.54)***
DebtRatio	0.0401***	-0.0444***
	(7.35)	(-6.47)
Int	0.5028***	0.3807***
	(2.79)	(2.62)
Employees	0.0070*	0.0136***
	(1.92)	(4.42)
FixedAssets	0.0147***	0.0103***
	(5.73)	(3.92)
EBIT	-0.0684***	-0.0841***
	(-13.52)	(-13.10)
No_Subs	0.0047	0.0274***
	(0.87)	(5.84)
Sales	0.0177***	0.0356***
	(3.99)	(7.97)
Average STAXR	1.2867***	1.3624***
	(19.49)	(21.16)
Industry FE	Yes	Yes
Sample	Full	Full
Observations	6,592	5,583
Adj. R-sq	0.1722	0.2319

This table presents the estimates of Equation (3) for variable *Avg_VMI*, where the dependent variables are the *GAAP ETR* and a *3 year GAAP ETR.* The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by pre-tax income, winsorized at the 1 % level. *Avg_VMI* is calculated as the total of *Scaled_VMI* divided by the MNC's overall number of subsidiaries. *DebtRatio* is the natural logarithm of MNC's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of MNC's Number of employees. *FixedAssets* is the natural logarithm of MNC's fixed assets. *EBIT* represents the logarithm of MNC's earnings before interest, *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC, and tax and *Sales* represents the logarithm of MNC'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.

TABLE 13
The effect of VMI structures on ETR II

	(1)	(2)	(3)	(4)
	GAAP ETR	*GAAP ETR*	*3 year GAAP ETR*	*3 year GAAP ETR*
Avg_VMI (hightax)	**-0.0474****		**-0.0704*****	
	(-2.04)		**(-3.05)**	
Avg_VMI (lowtax)		**-0.0376**		**-0.0577****
		(-1.53)		**(-2.88)**
F-test		**-0.0098*****		**-0.0127*****
Industry FE	Yes	Yes	Yes	Yes
Observations	2,283	4,309	2,157	3,426
Adj. R-sq	0.1785	0.1335	0.2286	0.2412

This table presents the estimates of Equation (3) for the variable *Avg_VMI (hightax)* and *Avg_VMI (lowtax)* where the dependent variables are the *GAAP ETR* and a *3 year GAAP ETR*. The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by pre-tax income, winsorized at the 1 % level. *Avg_VMI (hightax)* (*Avg_VMI (lowtax))* is calculated as the total of *Scaled_VMI* in high-tax (low-tax) countries divided by the MNC's overall number of subsidiaries. Nondisplayed controls are the following. *DebtRatio* is the natural logarithm of MNC's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of MNC's Number of employees. *FixedAssets* is the natural logarithm of MNC's fixed assets. *EBIT* represents the logarithm of MNC's earnings before interest and tax, *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC, and *Sales* represents the logarithm of MNC'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.

TABLE 14
The effect of VMI structures on ETR (Robustness)

Coefficient estimates:	(1)	(2)
Avg_VMI	*GAAP ETR*	*3 year GAAP ETR*
Matching Characteristics		
Size/ROA/Leverage/R&D/Intangibles	**-0.0735*****	**-0.1103*****
(One-to-one Propensity Score Matching, Caliper)	**(-1.99)**	**(-3.17)**
Size/ROA/Leverage/R&D/Intangibles	**-0.0560**	**-0.1049*****
(One-to-three Propensity Score Matching)	**(-1.45)**	**(-2.83)**
Size/ROA/Leverage/R&D/Intangibles	**-0.0256***	**-0.0335*****
(Covariate Matching One-to-one Nearest Neighbor with replacement)	**(-1.80)**	**(-3.19)**

This table presents double robust estimates for Equation (3) for the variable *Avg_VMI* where the dependent variables are the *GAAP ETR* and a *3 year GAAP ETR.* The *GAAP ETR* is the financial effective tax rate for 2014 defined as total tax expense scaled by pre-tax income, winsorized at the 1 % level. *Avg_VMI* is calculated as the total of *VMI* divided by the MNC's overall number of subsidiaries. Non-displayed controls are the following. *DebtRatio* is the natural logarithm of MNC's debt to total assets. *Int* represents the intensity of intangible assets, calculated as intangible assets scaled by total assets, winsorized at the 1 % level. *Employees* is the natural logarithm of MNC's Number of employees. *FixedAssets* is the natural logarithm of MNC's fixed assets. *EBIT* represents the logarithm of MNC's earnings before interest and tax, *No_Subs* is the natural logarithm of the number of subsidiaries of an MNC, and *Sales* represents the logarithm of MNC's sales. The MNC'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.

Table 15
Profit shifting via Transfer Pricing vs. Debt Shifting

	(1) *Ln_ROA*	(2) *Ln_ROA*	(3) *Ln_ROA*	(4) *Ln_ROA*	(5) *DebtRatio*	(6) *DebtRatio*	(7) *DebtRatio*	(8) *DebtRatio*
C	**-2.4697*****	**-2.4004*****	**-2.0717*****	**-2.0341*****	**0.2347**	**0.2862***	**0.3587****	**0.3892****
	(-5.91)	**(-5.76)**	**(-4.10)**	**(-4.04)**	**(1.54)**	**(1.86)**	**(2.48)**	**(2.54)**
Scaled_VMI		**0.2315**		**0.2308**		**0.1680**		**0.1686**
		(1.61)		**(1.62)**		**(1.48)**		**(1.49)**
C# Scaled_VMI		**-2.1941***		**-1.8242**		**-2.1432**		**-2.0454**
		(-1.73)		**(-1.45)**		**(-1.15)**		**(-1.10)**
C # one_VMI			**-1.3010***	**-1.2411***			**-0.4061***	**-0.3473***
			(-1.97)	**(-1.91)**			**(-1.92)**	**(-1.83)**
TangibleAssets	-0.1700***	-0.1701***	-0.1699***	-0.1700***				
	(-9.56)	(-9.53)	(-9.51)	(-9.49)				
EmployeeCosts	0.1966***	0.1962***	0.1964***	0.1960***				
	(6.76)	(6.70)	(6.75)	(6.69)				
IndustryROA	2.0490	2.0669	2.0363	2.0547				
	(1.66)	(1.68)	(1.65)	(1.68)				
FirmAge	-0.0797***	-0.0790***	-0.0784***	-0.0777***				
	(-2.99)	(-2.97)	(-2.96)	(-2.94)				
GDPgrowth	0.5751	0.5366	0.6002	0.5575				
	(0.48)	(0.45)	(0.51)	(0.47)				
Tangibility					-0.1846***	-0.1850***	-0.1843***	-0.1848***
					(-5.82)	(-5.82)	(-5.75)	(-5.76)
Sales					0.0114*	0.0110	0.0115*	0.0110
					(1.83)	(1.71)	(1.84)	(1.72)
ROA					-0.1809	-0.1879	-0.1819	-0.1885
					(-1.26)	(-1.37)	(-1.27)	(-1.38)
Creditor rights					0.0026	0.0035	0.0028	0.0036
					(0.37)	(0.51)	(0.39)	(0.52)
Inflation					-0.0000	-0.0000	-0.0000	-0.0000
					(-0.50)	(-0.71)	(-0.50)	(-0.71)
Salesgrowth					0.2987	0.2866	0.2986	0.2867
					(1.40)	(1.36)	(1.39)	(1.36)
Industry FE	No	No	No	No	No	No	No	No
Country FE	No	No	No	No	No	No	No	No
Group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	At least 5 subs	At least 5 subs	At least 5 subs	At least 5 subs	At least 5 subs	At least 5 subs	At least 5 subs	At least 5 subs
Observations	7,317	7,317	7,317	7,317	6,969	6,969	6,969	6,969
Adj. R-sq	0.0890	0.0894	0.0895	0.0898	0.0134	0.0170	0.0138	0.0173

This table presents the estimates of Equation (4) for the variable *Scaled_VMI* where the dependent variables are the *Ln_ROA* and *DebtRatio*. Following De Simone et al. (2017), *Ln_ROA* is the natural logarithm of return on assets, measured as EBIT scaled by lagged total assets. *DebtRatio* is the subsidiary's total debt to total assets, as defined by Huizinga et al. (2008). *C* is the capital-weighted differential statutory tax rate between the affiliate and all related affiliates in the same MNC. ***, ** 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 the country level.

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