Income Shifting and Management Incentives [*]

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INCOMPLETE AND PRELIMINARY

Abstract

The tax literature shows that income shifting within multinational companies collides with optimal incentivization of managers in subsidiaries. The different modes of income shifting have received different attention, however, and the incentive implications of internal debt shifting have not yet been investigated. We analyze the different impacts of tax-efficiently setting intercompany prices for the use of intangibles (royalties) and debt shifting on incentivization of affiliate managers. Different from most other studies, we focus on endogenous, unobservable managerial effort and the firm's optimal design of the (linear) compensation contract. For EBIT(DA) as performance measure, we find that internal debt shifting does not have a direct effect on management incentives, but has an ambiguous indirect effect via its positive effect on investment. In contrast, tax-motivated royalty payments have a clearly negative incentive effect that is fully offset, however, by an higher compensation rate. Hence, the adjustment of the compensation payment reveals the firm's aggressiveness in income shifting via intangibles. There is no confounding indirect effect from tax-motivated royalty payments because these royalty payments do not affect investment.

Keywords: income shifting, management incentives, debt shifting, transfer pricing, compensation schemes

JEL classification: H25, F23, D82

1 Introduction

Multinational companies (henceforth MNCs) put enormous efforts into reaping tax savings related to international income shifting.[1] Research based on firm-level microdata identifies tax-motivated transfer prices and internal debt shifting as significant and substantial mechanisms to avoid corporate taxation (see Heckemeyer and Overesch 2017, for a meta-study). Independent of income shifting, it is also well-known that MNCs suffer from agency conflicts and moral hazard by local managers in their subsidiaries. In order to align goals of these managers with those of the MNC, local managers are usually incentivized on the basis of their subsidiaries' performance. As income shifting affects these profit metrics in subsidiaries, it also impacts the agency conflicts and may trigger additional trade-offs.

Nevertheless, the major part of the income-shifting literature neglects agency issues related to decentralized decisions within the firm. In addition, the existing literature on income shifting under decentralization almost exclusively focuses on tax-motivated transfer pricing and the coordination of intra-firm trade.[2] Furthermore, only a small literature analyzes the interplay between income shifting and managerial effort and endogenizes the design of the tax-efficient compensation contract (Elitzur and Mintz 1996; Köthenbürger and Stimmelmayr 2016). In sum, the process behind income shifting under decentralization and endogenous managerial effort largely is still part of the "black box behind tax planning" (Dyreng and Maydew 2018).

In this study, we aim to better understand this black box by shedding light on the interplay of income shifting and agency conflicts in a decentralized firm structure. For this purpose, we embed a principal-agent model in an income-shifting setting. As shifting devices, we allow for both transfer pricing in intangibles, which empirically is a prominent strategy, and internal debt shifting, which implies replacing subsidiaries' equity partly by debt borrowed from a related affiliate at the market interest rate. A local manager has to provide managerial effort as input in order to organize production and manage sales in a subsidiary of the MNC. The headquarters resides in a low-tax country, owns a patent on valuable production technology and operates as an internal bank. Thus, the headquarters

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[1]Recent empirical evidence suggests that MNCs shift 40% of their global profits to tax havens (Tørsløv et al. 2018) and that the tax savings related to income shifted from EU countries amount to about EUR 36 billion in corporate tax revenues, equivalent to 0.2% of GDP in the EU (Álvarez-Martínez et al. 2018). The OECD (2017a) reports total tax savings from BEPS of USD 100 to 240 billion per annum. These numbers, perceived as a revenue loss to the public sector, also put the topic high on the agenda of both politicians, researchers and the general public. See, for example, the joint initiative of the G20 countries and the OECD resulting in the BEPS Action Plan (OECD 2013, 2015a).

[2]Some literature based on Slemrod (2004) incorporates non-tax costs of corporate tax avoidance that follow from the separation of ownership and control, and some focuses on the optimal resource allocation across subsidiaries, the conflict between maximizing subsidiaries' profits and the profit of the MNC, and transfer prices for an intermediate good (e.g., Halperin and Srinidhi 1991; Baldenius et al. 2004; Martini et al. 2012). See Hanlon and Heitzman (2010) and Göx and Schiller (2007), respectively, for some overviews.

charges royalty payments on the use of the patent and provides the subsidiary with tax-deductible internal debt.[3] To align objectives of the MNC and the local manager, the headquarters implements an executive-compensation scheme. We base our analysis on the widely used incentivization and compensation measure EBIT(DA). We build on empirical evidence documenting that earnings before interest and taxes (EBIT) and earnings before interest, taxes, depreciation, and amortization (EBITDA) are the most frequently used profit metrics to incentivize subsidiaries' managers (Meridian 2018; Thompson et al. 2017; PwC 2010). The headquarters can shift income via internal debt and tax-efficient royalties. Besides the tax planning, the headquarters decides on the investment budget and the wage bill. The local manager decides on her effort and organizes production and sales given the investment budgets and the compensation scheme that the headquarters sets.

We find sharp differences between the impacts of internal debt shifting and tax-efficient royalty payments on management incentivization. Internal debt shifting does not have a direct effect on EBIT(DA) and consequently on management incentives, but has an indirect and ambiguous effect via its positive effect on investment. In particular, the total effect of debt shifting on manager's performance and the compensation contract depends on the strength of risk aversion of the local manager. In contrast, tax-motivated royalty payments have a clearly negative incentive effect on EBIT(DA) and, all else equal, on managerial effort. The incentive effect gets, however, fully offset by an adjustment of the compensation payment.

The adjusted, higher compensation rate fully captures the tax-motivated overinvoicing of royalty payments, such that observing these incentive contracts might reveal the income-shifting strategy in royalties of a subsidiary. There is no confounding indirect effect from tax-motivated royalties because these royalty payments do not affect investment. The reason is that for optimal behavior, marginal tax savings from tax-motivated royalties are balanced against marginal shifting costs so that effective marginal costs of investment remain unchanged. This balance remains unaffected by principal-agent issues as long as compensation schemes can be adjusted flexibly.[4]

By analyzing exogenous changes in income-shifting incentives, our results allow for deducing empirically testable hypotheses. Most interesting here, our results predict that a change in transfer price regulation will trigger a relative change in the managers' compensation rate that is equal to the relative change in after-royalty sales revenues of the subsidiary.

Our findings contribute in several ways to the literature on international corporate

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[3]This simplified structure serves as a reduced form of a more sophisticated multinational structure with several affiliates and the optimal location of valuable patents and the internal bank in the lowest-taxed (tax-haven) affiliate. The results and implications are the same. See the discussion in Section 4.3.1

[4]Importantly, our findings on tax-motivated royalties are robust to changes in the performance measure. As long as the subsidiary is operating as a profit center, the effects under EBIT(DA) and (after- or before-tax) profits are equivalent. See also Section 4.3.4 for some discussion.

tax avoidance. First, we directly take the call by Dyreng and Maydew (2018) to better investigate the "black box" of tax avoidance, and shed more light on the process of tax planning in decentralized MNCs. We analyze the specific impact of a) internal debt shifting and b) tax-motivated royalty payments on agency conflicts in the subsidiaries, i.e., on the effort choice of local management. Hence, we model and capture two of the empirically most relevant modes of income shifting. We point out that there are strong differences between tax-motivated royalty payments and debt shifting when it comes to tax-efficient compensation schemes for managers based on EBIT(DA). This is particularly relevant because EBIT(DA) is one of the most frequent profit metrics for incentive contracts in corporations.

Second, more specifically, we find that although tax-efficient royalty payments have a negative direct effect on managers' incentives to exert effort and organize their subsidiaries efficiently, this agency cost of income shifting optimally gets neutralized by adjusting the managers' compensation rate in firms' EBIT(DA). Using sales-dependent royalty payments for income shifting proportionally reduces profits and profit risk in the productive subsidiary. Increasing the compensation rate for the variable manager compensation accordingly, to keep the effective compensation rate in absence of income shifting constant, keeps both the EBIT(DA) share and the risk exposure of the manager at their optimal level. Hence, the agency problem is disjunct from tax planning without the need for operating with two books.[5] Thus, our finding generalizes a result in Elitzur and Mintz (1996) who focus on a case with risk-neutral managers and separate transfer prices for tax purposes and internal control. Our finding might also provide an additional explanation for why most income shifting happens via intangibles. The standard explanation for this fact is that shifting in intangibles causes lower tax-engineering costs because there are usually no market parallels to the royalty payments and the arm's-length payment is unclear. Consequently, MNCs have substantial leeway to optimize their royalties for tax purposes. We show that in addition, income shifting in intangibles causes less efficiency costs, because any conflict between income shifting and management incentives can easily be avoided. In contrast, such separability does not apply for income shifting via tangible intermediate goods, which makes that mode more expensive, all else equal.

Third, in contrast to transfer pricing, debt shifting does not have a direct effect on compensation schemes because EBIT(DA) does not respond to interest expenses. Nevertheless, this form of income shifting can affect the agency problem in the MNC. Internal debt reduces effective capital costs and has a positive investment effect, all else equal. Higher investment, however, affects both marginal productivity of managerial effort and the manager's exposure to risk. This creates an indirect effect on managerial effort that

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[5]Importantly, this separability also applies to a setting where the royalty payments are going to a high-tax headquarters and income shifting implies underinvoicing royalties so that income effectively is shifted to productive subsidiaries. See Section 4.3.2.

can be positive or negative, depending on the level of risk aversion of the manager and on assumptions on complementarity of input factors. This ambiguity triggers an ambiguous effect on compensation schemes and can trigger additional agency costs of income shifting that are absent in the case of tax-efficient royalties. The economics literature has acknowledged the positive investment effect of debt shifting (e.g., Hong and Smart 2010; Schindler and Schjelderup 2012), but to the best of our knowledge, the indirect agency costs of internal debt shifting have not been analyzed in the literature.

Fourth, our results speak to a couple of issues raised in Hanlon and Heitzman (2010). These authors ask how MNCs, engaging in transfer pricing, can balance performance measurement in their subsidiaries and the tax objectives on MNC level and how, if at all, tax-driven transfer pricing affects real investment (section 4.4.1). Furthermore, they call for more theory on accounting and tax research providing a framework to guide research efforts (p. 168f). For the empirically relevant case of manipulating royalty payments, our results suggest that there is no conflict between performance measurement and tax objectives as long as MNCs can flexibly adjust the variable compensation component of local managers.[6] Doing so is possible because manipulating royalty payments in response to tax incentives does not affect marginal investment incentives. Accordingly, in contrast to internal debt, there is no indirect effect on managerial effort and production outcomes. This generalizes findings under centralized decision making that show that tax-motivated income shifting via intangibles does not affect real investment in production subsidiaries and triggers pure shifting of paper profits (Juranek et al. 2018, 2020).[7] In general, our model offers a basis that allows for analyzing income shifting in a principal-agent setting. In contrast to previous agency models on tax avoidance (e.g., Slemrod 2004; Crocker and Slemrod 2005), our framework models different income-shifting channels in detail and highlights their different implications.

Fifth, our analysis complements concurrent empirical research on the interaction of income shifting with agency conflicts and managerial behavior on subsidiary level. In a recent study, Klassen and Valle Ruiz (2020) empirically analyze the effect of transfer pricing risk (i.e., tighter transfer price regulation) on both income shifting in an MNC and the local accrual-based earnings management by subsidiaries' managers. The latter serves as a proxy for the adjustment in managerial incentives. These authors identify an increase in accrual-based earnings management as a response to lower subsidiary profit. Importantly, the effect persists around one year and disappears thereafter. Klassen and

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[6]In reality, such flexibility does not imply that existing manager contracts can be changed in response to tax rate changes. But the MNCs will anticipate their tax-motivated royalty payments when signing contracts with new managers and will implement changes in the statutory compensation rate whenever an existing contract of a manager gets prolonged.

[7]The results focus on investment in final-good production, given existing intangibles, and abstract from investment in new intangibles in R&D affiliates. They do not necessarily carry over for investment into R&D, when the remuneration on R&D efforts is determined in a bargain between the R&D unit and the productive subsidiary, as the results in Johnson (2006) show.

Valle Ruiz (2020) hypothesize that there are adjustment frictions in the short run, but that the managerial targets and the compensation scheme get adjusted after that. Their hypothesis is fully in line with our theoretical predictions. Our analysis shows for a frictionless setting that MNCs rather easily can fully neutralize the effect of income shifting, conducted via transfer pricing in intangibles, on managerial incentives. Realistically adding some adjustment frictions, there would be some misalignment of incentives in the short run before the incentive system can get adjusted. This then fully corresponds to the empirical findings in Klassen and Valle Ruiz (2020).

Lastly, our sensitivity analysis provides empirically testable hypotheses on the impact of tax incentives on income shifting and the structure of executive compensation. These results can inform tax legislators on how income-shifting behavior of MNCs is linked to observable management compensation schemes and enable tax auditors to deduce targeted audit patterns. For example, the aggressiveness in income shifting via royalties is perfectly revealed by the managers' compensation rate. Our results confirm the suspicion that subsidiaries that consistently report low EBIT(DA) over several years, but provide their managers with high compensation rates in their profit metrics, operate tax-aggressive income shifting using their intellectual property (e.g., patents on technology or trade marks). Such subsidiary characteristics should trigger red flags for the tax authorities.

The paper proceeds as follows. A brief review of related literature follows in Section 2. In Section 3, we introduce the basic model. We derive the optimal behavior of the firm and its manager in Section 4. For doing so, we first determine the optimal decisions of the manager and, building on those, we characterize the optimal choices, including the compensation contract, of the headquarters. In Section 5, we analyze the sensitivity of the outcomes, particularly of the optimal incentive contract, with respect to changes in the incentives to do transfer pricing and internal debt shifting. Section 6 concludes.

2 Tax-efficient Structures, Related Literature, and Performance Measures

Recent macro studies that use aggregate data show that MNCs' tax savings related to income shifting are significant and lead to a sizable reduction of corporate tax revenue in high-tax countries. Their annual revenue losses are estimated between 0.2% and 1.0% of GDP in developed countries (Crivelli et al. 2015; Álvarez-Martíneza et al. 2021) or USD 100 to 240 billion in absolute numbers (OECD 2017a).[8] As main shifting mechanisms, transfer pricing and internal debt shifting are discussed in the literature. The standard modeling for transfer pricing assumes convex shifting costs so that the optimal transfer

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[8]These numbers need to be handled with some care as there is a (potential) double-counting issue, see Blouin and Robinson (2020). A consensus estimate is, however, that income shifting reduces corporate tax revenue by about 10%, see, e.g., Heckemeyer and Overesch (2017).

price is determined by the marginal tax savings (i.e., the tax rate differential) from shifting income from a high-tax to a low-tax country equal to marginal shifting costs. See, e.g., Haufler and Schjelderup (2000) and Grubert (2003) for basic models. Huizinga and Laeven (2008) stress the importance of weighted tax differentials when income is shifted via intra-firm trade of intermediate goods across all subsidiaries. Empirically, transfer pricing is found to be significant and substantial (e.g., Clausing 2003; Davies et al. 2018).[9]

The importance of internal debt shifting was first documented empirically by Collins and Shackelford (1997) and the analysis became formalized in Mintz and Smart (2004). The headquarters (henceforth HQ) of an MNC places equity in its lowest-taxed subsidiary. That serves as internal bank and lends the money to all other subsidiaries. That way, tax savings from deductible interest expenses in the borrowing subsidiaries overcompensates tax payments on interest income in the internal bank. Similarly to transfer pricing, the resulting tax differential measures the marginal tax shield and optimal internal leverage balances these tax savings against marginal costs of internal debt shifting. Also this mechanism finds strong empirical support (e.g., Dharmapala and Riedel 2012; Büttner and Wamser 2013).

The literature on income shifting points out that the internal bank and the profit center, receiving internal interest income, should locate in the lowest-tax affiliate of an MNC to establish a tax-efficient structure (e.g., Mintz and Smart 2004; Schindler and Schjelderup 2012). It is straightforward to show that the same considerations imply that intangibles used for income shifting should be placed in the lowest-tax affiliate as well (e.g., Hopland et al. 2019). That way, the MNC minimizes tax payments on shifted income and maximizes the tax differential for each bilateral transaction. Indeed, there is empirical evidence that supports the theoretical predictions of such structures. Both internal banks (Møen et al. 2018) and the owners of valuable patents on which internal royalties are invoiced (Karkinsky and Riedel 2012, Baumann et al. 2020), predominantly reside for tax purposes in low-tax jurisdictions or subsidiaries that benefit from special tax regimes. Furthermore, the empirical literature documents that patent or innovation boxes, granting low tax rates on royalty income, are heavily used for shifting income to the low-tax subsidiaries (e.g., Chen et al. 2017; Köthenbürger et al. 2018).

There is also ample anecdotic evidence. In 2012, it turned out that, since many years, Statoil and Statkraft, two large, (partially) state-owned Norwegian MNCs, rely on Belgian affiliates that serve as internal banks and benefit from special tax regimes. These affiliates have less than 20 employees, but reported equity of EUR 12.4 bn and EUR 7.6 bn, respectively, that is used for providing internal loans to related affiliates. This lending generated EUR 400 (330)m in taxable profits that faced an effective tax rate of about 10%, see Bjørnestad (2012). With respect to royalty payments and intangibles, the prime

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[9]See Gresik (2001) for a summary of the early transfer-pricing literature and Sansing (2014) for more recent approaches.

example is Google (Alphabet) that developed the famous 'Double-Irish-Dutch Sandwich' to shift payments for the use of the search and advertisement algorithms via Ireland and the Netherlands to Bermuda where the corporate tax rate is zero.

As we will focus on income shifted from productive affiliates with real activity and production, however, the best example likely is the Swedish furniture company IKEA. IKEA has substantial activity on the ground in its affiliates, but is also known for operating complicated internal-payment structures to aggressively reduce tax payments (Auerbach 2016). For example, it turned out that the Norwegian affiliates of IKEA are extremely leveraged and had interest deductions that amounted to 57% of EBITDA. The internal bank IKEA Service Centre resides in Belgium. In 2014, the Norwegian Tax Authority forced IKEA Norway to repay 123m NOK in additional taxes, and IKEA lost the following court case at the Norwegian Highest Court in 2016 (e.g., Dagens Næringsliv from 21st of October 2016). Furthermore, as remuneration for its brand name, IKEA levies a 3% license fee on sales revenue in all affiliates worldwide and channels the royalty payments by a complex structure via the Netherlands and Luxembourg to the Interogo foundation in Liechtenstein (see also http://www.thelocal.se/20110126/31650). With all its internal transactions, IKEA managed to achieve an effective tax rate of 3% and, alone in Europe, saved in estimation at least EUR 1 bn in taxes between 2009 and 2014 (Auerbach 2016, p. 4). Figure 1 provides a simplified summary of the payments within IKEA and illustrates how a tax-efficient structure in an MNC looks like.[10]

[Insert Figure 1 about here]

Heckemeyer and Overesch (2017) conduct a meta-study on 27 profit-shifting studies and identify a semi elasticity of profits with respect to international tax differentials of about -0.8. They find the effect of transfer pricing, including licensing, to be four times stronger than the one from debt shifting (-0.65 to -0.15). Both Heckemeyer and Overesch (2017) and the OECD (2015b) stress that transfer pricing in intangibles is particularly popular because it is very difficult to determine the arm's-length price for the use of intellectual property because market parallels are lacking.

Importantly, most of the income-shifting literature focuses on centralized decision making in MNCs and neglects issues related to decentralization. This is particularly true for the economics literature.[11] There is some literature, however, that incorporates decentralized decision making and agency issues into models of income shifting. The

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[10]Our theoretical model will be based on such a tax-efficient structure in a simplified two-country setting. All results generalize to a structure that includes several affiliates and a tax havens. Importantly, however, our results on transfer pricing qualitatively also apply to MNCs that host their patents in high-tax HQs. See section 4.3 for these generalizations.

[11]Notable exceptions are Schjelderup and Sørgard (1997) and Nielsen et al. (2008). They analyze the trade-off between tax-induced transfer pricing and a strategic effect from inducing more aggressive behavior in subsidiaries under oligopolistic competition. The latter authors also derive the optimal allocation of decision rights.

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majority of these papers focuses on the optimal allocation of resources between upstream and downstream subsidiaries, the bargaining of transfer prices between these subsidiaries and the interplay with tax incentives, see, e.g., Halperin and Srinidhi (1991), Baldenius et al. (2004), Johnson (2006), and Martini et al. (2012). Göx and Schiller (2007, chapter 9.6) provide an overview on relevant effects. They also point out that the inefficiency related to bargaining does not matter in case of unlimited communication between HQ and its subsidiaries and perfect information on the implications of transfer prices.[12] Note, however, that this does not apply to agency conflicts in which managers maximize private utility and follow personal goals that are not aligned with the ones of the MNC.

Most relevant for our study are the papers that incorporate decision making by local manager and incentive schemes installed by the MNC to align the goals of the MNC and the local managers. Based on a model-theoretical approach, Li and Balachandran (1996) show that corporate taxes state a decisive factor in determining transfer prices which are charged by the HQ to their foreign divisions. As each division manager, compensated based upon the pre-tax division profits, reveals true production costs to the HQ and thereby constrains the bandwidth for transfer prices, the MNC will not shift all profits to the low-tax jurisdiction. The optimal transfer pricing system should balance the tax effects as well as the incentive effects on the transfer pricing problem. In contrast, Choi and Day (1998) look at a setting in which incentive contracts for divisional managers depend on the division's after-tax profits. They analyze the trade-off between tax-induced transfer prices to shift income and the reduction in managers' effort triggered by tax avoidance. Under continuous effort and divisional performance measures, these authors find that the effort exerted by the sales division managers decreases with the corporate tax differential between tax jurisdictions. Based on a two-book-system, Smith (2002) shows that transfer prices affect after-tax income both by influencing the manager's production decisions ex ante and by allocating income ex post across tax jurisdictions. If the ex-ante incentive role dominates the ex-post tax role, the firm increases the transfer price received by the subsidiary even if the tax rate of the subsidiary increases.

Closest related to our study are Elitzur and Mintz (1996). They document that income shifting has no impact on the manager's equilibrium effort level as the principal compensates the manager for any tax-induced utility reductions. They investigate, however, a special case where the firm effectively uses two books and where local managers are risk-neutral. In their setting the tax rate acts similarly to a cost markup for the production division. Similarly, Köthenbürger and Stimmelmayr (2016) analyze agency costs from moral hazard by local managers in relation to income shifting by the MNC. The latter authors compare the different allocations of decisions rights, i.e., the level of

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[12]By showing that MNCs with an intensive use of information technology in management control and tax planning experience higher profitability and lower effective tax rates, Bärsch et al. (2019) provide supporting evidence that improved information mitigates the consequences of conflicting managerial and tax objectives.

centralization, under different forms of transfer-price regulation. One surprising result is that a centralized decision making can align the agency problem and tax planning if managerial effort in the downstream subsidiary is sufficiently more important than the one in the upstream subsidiary.

Empirical research on the implications of income shifting for managerial behavior and agency conflicts on subsidiary level is largely absent, due to a lack of available data. In a recent, concurrent (and purely) empirical study, Klassen and Valle Ruiz (2020) are first to provide some evidence on the interplay between these two aspects. They use accrual-based earnings management on subsidiary level as a proxy for (incomplete) adjustment of managerial targets and incentive systems. Furthermore, they instrument the income shifting incentives by the C-measure (i.e., the weighted tax differential across all subsidiaries), as brought forward by Huizinga and Laeven (2008), and utilize changes in transfer price risk (i.e., transfer price regulation), as identified in Mescall and Klassen (2018), as exogenous shock to the income shifting position of an MNC. Their main focus lies on the behavior of the manager on the receiving end in a transaction between productive subsidiaries. Consequently, they effectively focus on transfer pricing in trading intermediate goods between productive (i.e., non-haven) subsidiaries (cf. Hopland et al. 2019).

Based on the Amadeus data base on European MNCs, Klassen and Valle Ruiz (2020) find in their main regression that higher transfer price risk reduces income shifting in an MNC, but fosters accrual-based earnings management by local managers in low-tax subsidiaries. These managers experience a reduction in their subsidiary's performance, because there is less income shifted in, and in response to that, the managers try to compensate by 'cooking their books' to maintain their original performance position. This behavior clearly indicates agency conflicts between MNCs and their local managers and suggests that managerial targets and compensation schemes do not get properly adjusted. Importantly, however, Klassen and Valle Ruiz (2020) also find that the accrual-based earnings management persists only for about one year and completely vanishes afterwards. Hence, their empirical findings suggest adjustment frictions in the short run (less than one year) and a full neutralization of income shifting effects in the medium and long run (more than one year). If one allows for adjustment frictions in the short run, these empirical findings perfectly coincide with the predictions from (our) theory.

Importantly, none of the above papers models the impact of internal debt shifting on the agency costs. Eisdorfer et al. (2013) include effects via the capital structure, but they examine how the similarity between the executive compensation leverage ratio and the firm leverage ratio affects the quality of the firm's investment decisions. A larger leverage gap (i.e., a bigger difference between these two ratios) leads to more investment distortions. Managers with more debt-like compensation components tend to underinvest, whereas managers with larger equity-based compensation engage more in overinvestment. Contrary to our study, however, they do not take into account managerial effort but

instead focus on managerial investment decisions. Moreover, the aspect of debt as an income-shifting channel is not part of their analysis.

To the best of our knowledge, no paper analyzes income shifting in combination with EBIT(DA) as a performance measure either. To date, the academic literature bases the performance component on (before- or after-tax) profits. This is surprising, because EBIT and EBITDA are the dominant performance measures for executive compensation observed in praxis. For North-America, Meridian (2018) recently conducted a survey study based on responses from 127 companies with a median market value of USD 5,708 million, active across a diverse range of industries. Allowing for multiple answers, the study documents that EBIT or EBITDA are the most prominent annual incentive performance metrics, used in 57% of the responding firms. In addition, sales or revenues are used by 42% of the respondents for that purpose. Looking also at the long-term performance measures, Meridian (2018) reports that 24% of the respondents use EBIT or EBITDA there, and 18% rely on sales and revenues. In the universe of incentive mechanisms, EBIT(DA) and sales turn out to be the most widely used performance measures in North-American public companies.[13] Notable examples of U.S. firms that adopt EBITDA as performance measures in determining executive bonus include Time Warner Inc. and Flower Foods (Liu and Tsang 2014). For German-speaking countries, PwC (2010) surveyed 70 respondents of German, Austrian and Swiss companies of which 81% were listed. Again allowing for multiple answers, the study reports that about 50% of the firms rely on EBIT, about 30% use EBITDA, and about 50% of the respondents rely on sales as measure to compensate their executives.

3   The Model

To save notation and complexity, without loss of generality and without affecting the results, we assume a risk-neutral MNC that only consists of a holding company as HQ in a low-tax country h and a fully-owned, productive subsidiary in country s.[14] The corporate tax rate in country h, τ_h is lower than the one in country s, τ_s, so that $\tau_s - \tau_h > 0$. Hence, compared to the tax-efficient structure described in Section 2 and in Figure 1, we collapse the internal bank, the profit center, and the HQ in one affiliate that serves as a tax haven.[15] We assume that the ruling principle of separate accounting applies, that is, legally independent entities are taxed based on their reported taxable (entity) profits,

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[13]The result on long-term incentivization corresponds to findings in a similar survey by Thompson et al. (2017), focusing on financial executives. There, 18% of public companies use EBIT(DA) as long-term incentive compensation. It is the measure with the highest frequency. This study is based on 100 large public firms.

[14]Following Ethier (1986) and Tirole (1988), the main body of literature on MNCs assumes them to be risk-neutral.

[15]A more complex structure with a separated HQ in a high-tax country and special purpose entities in tax havens does not affect our results. See the discussion in section 4.3.2.

not based on an apportioned value of total group profits. Furthermore, we assume a territorial tax system with tax-exemption of inter-corporate dividends to be in place so that the dividends on the equity part of capital investment are tax-exempt at the parent level (i.e., the HQ).[16] Finally, we follow the main body of the income-shifting literature that – implicitly – assumes perfect loss offsets (or equivalently, the absence of loss-making subsidiaries). In times with very low and almost zero interest rates and in which most countries have abolished restrictions on the time period for which losses can be carried forward, this does likely not constitute a strong assumption.[17]

The HQ serves as a financial center and provides the productive subsidiary with real capital K. Capital is either provided as equity E or as internal debt D. As a further simplification, we assume that external capital markets are not available. Moreover, the HQ owns the patent for an intellectual property that we interpret as a specific production technology $\bar{X}$, used in the subsidiary. Importantly, no matter whether in our simplified structure or in a more sophisticated tax-efficient organizational forms of an MNC, all interest and royalty income needs to be shifted to the low-tax affiliate. There are no payments related to these items between related, non-haven affiliates. Furthermore, tax authorities in the hosting tax havens usually do not target incoming income. Consequently, these forms of income shifting only depend on the bilateral tax differential between each productive subsidiary and the tax haven, and not on the weighted tax differential across all affiliates that is also known as the 'C measure' in accounting research.[18]

The subsidiary is run by a local manager and uses capital K, labor input L, and the technology $\bar{X}$ to produce an output good under decreasing returns to scale. In addition, the subsidiary requires effort e from the manager. This effort can be interpreted either as sales and marketing activities of the manager in the local market, coordination of the production process, or supervision of the workforce. Effort has a positive, but decreasing marginal productivity and without any effort, sales revenue will drop to zero.

Total sales revenue S is stochastic and depends on an idiosyncratic shock $\tilde{\varepsilon}$ that is normally distributed with zero expected value and a variance σ^2.[19] Hence, $\tilde{\varepsilon} \sim N(0, \sigma^2)$.

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[16]Note that since the U.S. tax reform 2018, i.e., the 'Tax Cut and Jobs Act', only few countries are left that do not use the exemption method for inter-corporate dividends. In the OECD, effectively only Chile, Israel, Mexico, and South Korea stick with a world-wide tax system.

[17]For imperfect loss offsets, a small, recent strand of literature has documented that loss-making subsidiaries have implications for income shifting (De Simone et al. 2017, Hopland et al. 2018) and investment behavior (Köthenbürger et al. 2019) that differ from the results in the standard literature.

[18]The 'C measures', introduced by Huizinga and Laeven (2008), only matters for income shifting in intermediate goods. See Hopland et al. (2019) for a formal analysis and discussion of the different modes of income shifting and their relevant tax differentials. We come back to this issue in Section 4.3.1.

[19]In some states of nature, sales can become negative in our model. One interpretation of such a situation is that due to an undetected malfunction in the production process, the sold product might become 'poisonous' and cause harm for the customers. Then, the firm needs to pay compensation and faces an effectively negative sales price.

The properties of the sales function can be summarized as

$$\tilde{S} = (1 + \tilde{\varepsilon})S(K, L, e; \bar{X}) \text{ with } S_a > 0, S_{aa} < 0 \; \forall \; a = K, L, e \text{ and } S(K, L, 0; \bar{X}) = 0, \quad (1)$$

where '$\sim$' indicates a stochastic variable and $\bar{X}$ is a fixed asset that we will suppress in the following.[20]

For the use of the intellectual property, the HQ receives a royalty payment TP that is tax deductible in the productive subsidiary in country s. Empirical evidence documents that most royalty payments are based on sales revenues or a two-part tariff with a lump-sum payment and a sales-dependent component.[21] Therefore, we model the royalty payment as the fraction $p_x + tp$ of sales revenues. The true arm's-length price, mirroring actual value, is p_x while the deviation (or surcharge) tp allows for shifting income. In sum, total royalty payments are stochastic and given by

$$\tilde{TP} = (p_x + tp)(1 + \tilde{\varepsilon})S(K, L, e). \quad (2)$$

As the true arm's-length price cannot be perfectly observed by tax authorities and because there is some ambiguity in transfer-price regulation, the MNC can decide to deviate from the arm's-length price in order to shift profits to the low-tax country. Such a deviation, however, causes convex shifting costs (e.g., Haufler and Schjelderup 2000; Grubert 2003). These costs can be expected fines for violating (or ignoring) regulation, but also include incurring valuable managerial time, hiring lawyers and accountants to conceal the true arm's-length price, and/or working around various regulations such as controlled-foreign-company (CFC) rules.[22] For royalty payments, Juranek et al. (2018) show that the best way to capture the implications of OECD standard transfer pricing methods on the costs of shifting income is to define the shifting costs over the deviation from the arm's-length payment.[23] In the following, we assume the OECD standard methods to

---

[20]A multiplicative shock on sales realistically captures demand shocks working via sales prices or productivity shocks related to (new) technology. Most literature on management incentives and moral hazard focuses on additive profit shocks, however. We point out in section 4.3.5 that our main findings are robust to such a general additive profit risk, and we discuss the special implications of a specific additive sales shock.

[21]See San Martín and Saracho (2010) for an overview and discussion of empirical evidence on royalty payments.

[22]Randolph et al. (2005), 319, provide evidence that transfer pricing also causes costs from negative effects of income shifting on an affiliate's financial accounts (e.g., current net income and the rate of return). An example is reduced credit-worthiness of the affiliate. Such effects would add to our shifting costs if we extend the model to incorporate external debt.

[23]According to the OECD (2015c, 2017b), the standard methods are Controlled Unrelated Price Method, Transactional Net Margin Method and Cost Plus Method. For profit-allocation methods such as the Transactional Profit Split Method, however, the specification does not work well. See Juranek et al. (2018) for details.

apply and define the shifting costs of transfer pricing as a U-shaped function

$$C^P = C^P(TP^a) = C^P(tp(1 + \tilde{\varepsilon})S(K, L, e)) \tag{3}$$

with $C^P(0) = 0$, $\frac{\partial C^P}{\partial TP^a} \cdot TP^a > 0$ and $\frac{\partial^2 C^P}{\partial (TP^a)^2} > 0$ and where $TP^a = tp(1 + \tilde{\varepsilon})S(K, L, e)$ captures the abusive, tax-induced part of the royalty payment.

Following the main body of the debt-shifting literature, we abstract from risk so that user costs of capital for both equity E and internal debt D are equal to the normal world-market interest rate r. In our setting, this implies that shareholders are risk-neutral investors and the expected return on equity equals the market interest rate.[24] As there are no external capital markets, the subsidiary cannot acquire financial means from any other source. For the debt portion, we define the (internal) leverage ratio as $b = D/K$. All interest expenses on internal debt, i.e., rbK, are tax deductible in the affiliate, but trigger taxable income in the HQ. In contrast, following most OECD tax codes, costs of equity are not deductible in the corporate tax base.

Effectively, internal debt is re-labeled equity. Indeed, it features many properties of equity, the main difference being that its interest costs are deductible. Because of this tax feature, the finance literature perceives internal debt as 'tax-preferred equity' (e.g., Chowdhry and Coval 1998, 87; Gertner et al. 1994), and its related costs are different from agency costs (and benefits) of external debt.

We restrict our analysis to transfer pricing in intangibles and internal debt shifting. Consequently, all internal debt is traded at the world-market interest rate, and there is no mispricing of internal interest rates.[25] In order to reap the tax savings of internal debt, the MNC needs to incur shifting costs C^I to conceal debt shifting resulting in thin capitalization for over-levered affiliates. Similar to transfer pricing, the motivation for these costs rests on various expenses related to circumventing thin capitalization rules, CFC rules or related regulation. Following the standard in the literature (e.g., Mintz and Smart 2004; Schindler and Schjelderup 2012), these costs are increasing above average with the leverage ratio b, but assumed to be proportional to the amount of capital employed.[26] Firms that do not host internal debt do not face shifting costs either. Formally,

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[24]In a setting that realistically includes external debt, the implicit assumption in face of the potentially negative sales revenues of the affiliate is that the MNC fully guarantees for the affiliate's liabilities (see, e.g., Huizinga et al. 2008) and has sufficiently 'deep pockets' from other operations (i.e., other affiliates with positive sales shocks).

[25]Schindler and Schjelderup (2016) embed transfer pricing in interest rates into a model of external debt and internal debt shifting. They show that the main inferences on income shifting from standard models do not change. The interaction matters for reactions on tax-rate and regulation changes and is driven by the shape of the shifting-cost function.

[26]Defining the costs of internal debt over the total level of internal debt (i.e., $C^I = C^I(D^I)$) or to incorporate the investment level into the convex cost function (i.e., $C^I = C^I(bK)$ or $C^I = C^I(rbK)$) implies that internal debt does not have any (intensive) investment effect, different from the standard modeling. This contradicts strong empirical evidence that restricting internal debt reduces investment, see, e.g., Egger and Wamser (2015) and Büttner et al. (2018). An alternative that is in line with

we summarize the shifting costs of internal debt as

$$C^I = C^I(b) \quad \text{with} \quad \frac{\partial C^I}{\partial b} > 0, \frac{\partial^2 C^I}{\partial b^2} > 0 \quad \text{and} \quad C_i^I(0) = \frac{\partial C_i^I(0)}{\partial b_i} = 0. \tag{4}$$

Finally, labor is hired at the wage rate w, and the manager exerts effort. Without any effort from the manager, $e = 0$, there will be no sales. The manager is required to organize and observe production in the foreign subsidiary and has to provide marketing and sales services in the local market. Managerial effort is non-verifiable and not observable for the HQ, however, and the MNC cannot differentiate between effort of the manager and the random sales shock. As effort is costly for the manager, the MNC needs to incentivize and compensate the effort. Therefore, the MNC implements a performance-based contract for the manager.

We follow a large body of literature that rests on Holmström and Milgrom (1987), assumes a risk-averse manager with constant absolute risk aversion, and a linear, two-part compensation scheme (see, e.g., Elitzur and Mintz 1996; Köthenbürger and Stimmelmayr 2016). The manager derives expected utility from consuming her income and has utility costs $c(e)$ from providing effort. Her expected utility function is given by

$$EU = \mathrm{E}[U(\tilde{W})] - c(e), \tag{5}$$

where $\tilde{W}$ denotes manager's income. We assume that the value of the manager's outside option is normalized to zero so that the compensation contract will satisfy $EU = 0$.

Following this approach implies that the manager has unlimited liability. Our liability assumption might be at odds with reality when managers receive option-type bonuses and do not participate in losses of their firm. In reality, however, managers that report enormous losses might also get fired and will lose their compensation pay for future periods. Then, one could interpret the latter dynamic income loss as the equivalent to the manager participating in losses and potentially facing a negative variable pay component in some states of nature in our static model.[27]

To capture actual firm behavior better, we deviate from standard literature and define the compensation scheme over EBIT which is the most prominent performance measure

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empirical evidence would be to define the costs over the share of interest payments in EBIT, i.e., $C^I = C^I(\frac{rbK}{(1-p_x-tp)f(K,L,e)-wL})$, similar to an earnings stripping rule. This will, however, substantially complicate the analysis without affecting the main results regarding the interaction of income shifting and managerial incentives.

[27] Unfortunately, we cannot apply the 'Approximation Assumption' by Dye and Sridhar (2008). To assume that sales are approximately non-negative requires that the mean of the stochastic variable is sufficiently large. That would be at odds, however, with the transformation into a mean-variance approach to come. Furthermore, explicitly modeling limited liability on the manager side would add substantial tractability issues and likely add little to the focus of our analysis. See, for example, Edmans et al. (2017, section 3.2) for a discussion of limited liability and risk-averse managers as (separate) cases in an executive compensation setting and the benefits of the Holmström-Milgrom approach.

in practice.[28] See the discussion at the end of Section 2. In Section 4.3.4, we are going to argue that using after-tax profits as performance measure would not have large effects on our results as long as the subsidiary is run as a profit, not an investment center.

For now, we assume that the manager in subsidiary s receives a fixed payment α plus a share $0 \leq \beta \leq 1$ of the subsidiary's EBIT.[29] Hence, manager income is given by

$$\tilde{W} = \alpha + \beta \cdot E\tilde{B}IT = \alpha + \beta \left[(1 + \tilde{\varepsilon})S(K, L, e) - \tilde{T}P - wL\right], \tag{6}$$

where we defined EBIT before manager compensation.

Under the assumptions of a normally distributed shock and constant absolute risk aversion of the manager, maximizing expected utility according to the utility function (5) and maximizing the certainty equivalent of income, that is, applying a mean-variance framework based on the expected value and variance of manager's income (6) are equivalent.[30] As the latter simplifies the derivations to come, we choose the mean-variance approach and display the manager's objective function as

$$EU = \alpha + \beta \left[(1 - p_x - tp)S(K, L, e) - wL\right] - \beta^2(1 - p_x - tp)^2 S(K, L, e)^2 d\sigma^2 - c(e), \tag{7}$$

where d is a measure for the absolute risk aversion of the manager.

The decision structure in the MNC is as follows. Traditionally, decisions on income shifting are allocated to the HQ (e.g., Choi and Day 1998; Elitzur and Mintz 1996). With respect to transfer pricing, a local manager does not have any incentive to shift profits to a low-tax country and reduce profitability in her own affiliate. In contrast, a local manager would choose an excessive internal leverage because internal debt shifting allocates all tax savings to the borrowing subsidiaries and externalizes tax payments on shifted income to the internal bank. In other words, a local manager does not acknowledge all benefits from transfer pricing and neglects substantial costs from internal debt shifting. Consequently, it will be the HQ that determines the abusive transfer price tp and internal leverage b. In doing so, the HQ runs a one-book system where the transfer prices for tax reporting coincide with the transfer prices in the internal book used for management control and

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[28]As we neglect depreciations in our model, there is no difference between EBIT and EBITDA in our model. Note as well that other papers such as Li and Balachandran (1996), Elitzur and Mintz (1996), and Smith (2002) do not model capital costs explicitly so that their profit measures effectively collapse to EBIT as well. But, these papers cannot analyze internal debt shifting and its interplay with managerial incentives. Note that (almost) all papers on executive compensation use profit measures before the compensation payment to the manager, and so will we.

[29]Note that compensation systems based on sales revenues are a subset of our approach. When effects working via labor demand are eliminated, all results to come will apply to a system that is based on sales revenues as well.

[30]This transformation mostly is applied to models of additive risk. But it also holds for multiplicative risk as long as the choice variables in the deterministic factor – $S(K, L, e)$ in our case – do not affect the distribution and probabilities of the shock parameter ε. This condition is fulfilled because capital, labor, and effort are chosen before the shock realizes so that the realization of ε is independent.

incentivization.[31]

Furthermore, in most cases, the HQ specifies a capital budget that can be expensed. For simplicity, we capture this by assuming that the HQ decides on the amount of capital investment K in the subsidiary. Importantly, with an incentive system written on EBIT(DA), a local manager would overinvest and maximize sales instead of profits because capital costs do not enter her compensation scheme. In addition, we will assume that the HQ decides on the budget for wage expenditure, i.e., effectively decides on labor demand L in the subsidiary.[32] We will discuss the implications of the latter assumption in the next section.

The manager still has several functions and plays a crucial role in the subsidiary which does not have any sales without managerial effort, i.e., $S(K, L, e) = 0$ if $e = 0$. The manager is fully responsible for the entire sales division, has to provide information on the local market and must organize the local supply and distribution chains. Furthermore, she has to organize and supervise the production process, decide on the use of the capital units and manage the labor force (given a total wage bill wL). All these tasks are summarized in managerial effort e.

Taken together, in other words, the affiliate is run as a profit center in which the local manager additionally has decision power on how to use the available inputs. The affiliate is no investment center, however, in which the manager could decide on the *levels* of capital investment and workforce. The main ingredients of the model, in particular the financial flows, are summarized in Figure 2.

[Insert Figure 2 about here]

As the HQ decides on all income shifting, we allocate all costs related to income shifting to the HQ as well. Whether these costs should be fully tax deductible is unclear because part of the costs are expected fines for violation of the respective regulation. For simplicity and to save notation, we will assume that these costs are not tax deductible. This assumption will not affect the results to come. Besides shifting costs C^P and C^I, the

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[31]In principle, MNCs can insulate their income shifting from principle-agent problems by operating with two books (e.g., Smith 2002; Baldenius et al. 2004; Nielsen and Raimondos-Møller 2012). One book contains the transfer prices reported to the tax authorities, the other book is for internal use and the coordination between the HQ and the subsidiaries. Running two books can, however, create substantial costs, for example in justifying differences in transfer prices both internally and towards tax authorities. The empirical evidence is mixed. It seems that most firms operate with one book only, whereas large, tax-aggressive firms rather opt for two books; see Göx and Schiller (2007, 692), Klassen et al. (2017), and Bauer et al. (2018). Most recently, Bärsch et al. (2019) report that only 9% of firms in their survey among large MNCs with major operations in Austria, Germany, or Switzerland rely on a two-book strategy. In any case, our basic approach continues to hold even with several books as long as there are costs involved in justifying the differences across different books so that the books are interlinked, and management incentives and tax considerations confound each other.

[32]In case of compensation systems based on sales revenues, managers cannot decide on the wage bill. Otherwise a problem similar to EBIT(DA) and capital investment emerges: managers will maximize revenues and neglect labor costs.

HQ also carries some fixed costs C_f that result from a former R&D process to establish the intellectual property and from costs related to maintaining the patent on this intangible. The global after-tax profit of the MNC can be summarized as the sum over expected after-tax profits of the HQ and the subsidiary, that is

$$
\begin{aligned}
\Pi \;=\;& \mathrm{E}[\pi_s] + \mathrm{E}[\pi_h] = (1 - \tau_s)\left[S(K, L, e) - TP - wL - rD - W\right] - rE \\
& + \;(1 - \tau_h)TP + (1 - \tau_h)rbK - rD - C^I(b)K - C^P(TP^a) - (1 - \tau_h)C_f \\
\;=\;& (1 - \tau_s)(1 - \beta)\left[(1 - p_x - tp)S(K, L, e) - wL\right] - (1 - \tau_s)\alpha - \left[r - (\tau_s - \tau_h)rb + C^I(b)\right]K \\
& + \;(1 - \tau_h)(p_x + tp)S(K, L, e) - \mathrm{E}[C^P\left(tp(1 + \tilde{\varepsilon})S(K, L, e)\right)] - (1 - \tau_h)C_f, \quad (8)
\end{aligned}
$$

where $D = bK$ and $E + D = K$. The first line shows expected after-tax book profits in the subsidiary, given as the after-tax value of sales $S(.)$ minus transfer payments TP, the wage bill wL, interest payments on internal debt rD, and the manager compensation W, minus costs of equity employed, rE. The second line reports profits of the HQ as the after-tax value of received license payments TP plus the after-tax interest income rbK minus user costs of capital rD minus shifting costs for internal debt C^I and transfer pricing $\mathrm{E}[C^P]$ and the fixed costs for maintaining the patent (C_f) after tax.

4 Firm Behavior

In the first stage, the HQ chooses the investment budgets, the transfer price and internal leverage, and the payment details for the manager. Thereby, the HQ will anticipate manager's response in effort choice. In the second stage, the manager will choose her effort observing the details of her compensation contract, the income-shifting choices and the capital and labor budgets set by the HQ. We will solve firm behavior by backward induction. Thereby, we assume that the HQ can perfectly commit to its choices so that the manager cannot get exploited after she decided on her effort level.[33]

4.1 The Manager's Decision

The manager will work in the subsidiary and exert costly effort whenever doing so delivers at least as much utility as her outside option that is set equal to $\bar{U} = 0$. If that participation constraint is fulfilled, the manager chooses effort by maximizing her expected utility function (7) so that her maximization problem becomes

$$
\max_{e} EU = \alpha + \beta^*\left[S(K, L, e) - \frac{w}{1 - p_x - tp}L\right] - (\beta^*)^2 S(K, L, e)^2 d\sigma^2 - c(e), \quad (9)
$$

---

[33]This assumption is weak and not restrictive. Investment and labor input are irreversible at the moment when production and sales activities start. Consequently, the manager always can observe the true, effective investment budget when deciding on her effort.

where we have defined

$$\beta^* = \beta \cdot (1 - p_x - tp) \tag{10}$$

as the manager's effective compensation rate in sales revenue. The first-order condition can be rearranged to

$$[\beta^* - 2(\beta^*)^2 S(K, L, e)d\sigma^2]S_e = c'(e), \tag{11}$$

where $S_e = \frac{\partial S}{\partial e}$ denotes the partial derivative of the sales function.

The manager chooses effort by balancing the marginal risk-adjusted return on effort with her marginal effort costs $c'(e)$. Assuming effort and the other inputs to be complements, i.e., $S_{eK}, S_{eL} > 0$, the manager's effort increases with capital and labor in the subsidiary as long as the risk aversion is sufficiently low. More inputs render exerting effort more productive, but the higher production also magnifies the exposure to the sales shock.[34] Formally, we find from implicitly differentiating condition (11)

$$\frac{\partial e}{\partial j} = -\frac{[\beta^* - 2(\beta^*)^2 S(K, L, e)d\sigma^2]S_{ej} - 2(\beta^*)^2 d\sigma^2 S_e S_j}{[\beta^* - 2(\beta^*)^2 S(K, L, e)d\sigma^2]S_{ee} - 2(\beta^*)^2 d\sigma^2 S_e^2 - c''(e)} \quad j = K, L \tag{12}$$

where the denominator as second-order condition for effort choice is always negative.

Importantly, income shifting does not affect the manager's decision as long as the HQ keeps capital investment and the effective compensation rate β^*, respectively, constant, that is, $\frac{\partial e}{\partial b}|_{K=const.} = 0$ and $\frac{\partial e}{\partial tp}|_{\beta^*=const.} = 0$. As the manager is incentivized via EBIT, internal debt shifting does not affect her compensation for any given level of capital K. Consequently, the HQ can shift income by internal debt without any direct effect on the agency conflict in the subsidiary.[35] Furthermore, transfer pricing does not affect managerial effort either as long as the HQ increases the statutory compensation rate β in order to compensate the manager for shifted profits, i.e., to keep the effective rate β^* constant. The latter finding also generalizes the result of a compensating increase in the compensation rate in Elitzur and Mintz (1996) to a setting with risk-averse manager and a one-book system. An increase in the royalty rate tp proportionally reduces revenues and their variance. This reduction in risk exposure compensates for the higher risk that the manager carries, all else equal, when her compensation rate β increases.

However, the manager's maximization problem (29) also highlights the limiting case for the separability of income shifting and agency conflicts. If the manager does not only organize and supervise production, but receives decision rights on how much workforce to hire, transfer pricing will have a direct effect on management decisions. Assume for now, that the manager also chooses labor demand L. Then, there is a second first-order

---

[34]If effort and the other inputs are substitutes, more investment always reduces managerial effort. The reason is that effort becomes less productive, but still risk increases.

[35]As we will document later, there is, however, an indirect effect on the compensation rate. In contrast to transfer pricing in royalties, debt shifting reduces capital costs and fosters investment.

condition that reads

$$[1 - 2\beta^* S(K, L, e)d\sigma^2]S_L = \frac{w}{1 - p_x - tp}, \tag{13}$$

balancing manager's marginal expected return to labor with effective wage costs. Importantly, the royalty payment participates in the return on labor, but does not share the wage bill. Hence, from view point of the manager, the royalty payment acts like an increase of the wage rate, rendering labor less profitable. This implies that tax-induced transfer pricing will always distort labor demand because a higher royalty rate tp is equivalent to an increase in the wage rate of workers. Thus, while there still is no direct effect on managerial effort, the conflict between income shifting and management incentives reenters via a distortion in labor demand. A higher compensation rate β^* cannot compensate this effect. In contrast, the choice of internal leverage does not have any effect on labor demand so that internal debt shifting and agency conflicts are still independent of each other, for given investment levels.

In the following, we will stick to our original assumption that the subsidiary's manager organizes and supervises production, i.e., determines the optimal labor structure, whereas the HQ decides on the size of the workforce, i.e., the wage bill.

4.2 The Choices by the Headquarters

The HQ knows that the manager will work whenever the compensation contract results in utility that is at least as high as the value of the outside option. Consequently, the HQ will set the fixed payment α such that the participation constraint just binds, i.e., so that $EU = \bar{U} = 0$ holds. From this follows that the fixed payment will be equal to

$$\alpha = -\beta[(1 - p_x - tp)S(K, L, e) - wL] + \beta^2(1 - p_x - tp)^2 S(K, L, e)^2 d\sigma^2 + c(e). \tag{14}$$

Using condition (14) in the profit function (8) of the MNC and utilizing that the HQ actually will choose the effective compensation rate $\beta^* = \beta(1 - p_x - tp)$ and the surcharge tp on royalty payments, instead of the compensation rate β and the transfer price tp, we can rewrite the expected profits of the MNC as expected-profit-maximization problem

$$
\begin{aligned}
\max_{b, tp, \beta^*, L, K} \Pi = {}& (1 - \tau_s)\left[S(K, L, e) - wL - (\beta^*)^2 S(K, L, e)^2 d\sigma^2 - c(e)\right] \\
& + (\tau_s - \tau_h)(p_x + tp)S(K, L, e) - \mathrm{E}\left[C^P(tp(1 + \tilde{\varepsilon})S(K, L, e))\right] \\
& - [r - (\tau_s - \tau_h)rb + C^I(b)]K - (1 - \tau_h)C_f. \tag{15}
\end{aligned}
$$

The corresponding first-order conditions are

$$\frac{\partial \Pi}{\partial b} = -\left[-(\tau_s - \tau_h)r + \frac{\partial C^I}{\partial b}\right] K = 0, \tag{16}$$

$$\frac{\partial \Pi}{\partial tp} = (\tau_s - \tau_h)S(K, L, e) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}(1 + \tilde{\varepsilon})S(K, L, e)\right] = 0, \tag{17}$$

$$\frac{\partial \Pi}{\partial \beta^*} = (1 - \tau_s)(-2)\beta^* S(K, L, e)^2 d\sigma^2 + \Delta_e \frac{\partial e}{\partial \beta^*} = 0, \tag{18}$$

$$\frac{\partial \Pi}{\partial L} = (1 - \tau_s)\left[1 - 2(\beta^*)^2 S(K, L, e)d\sigma^2\right] S_L - (1 - \tau_s)w$$
$$+ \left[(\tau_s - \tau_h)(p_x + tp) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}(1 + \tilde{\varepsilon})\right] tp\right] S_L + \Delta_e \frac{\partial e}{\partial L} = 0, \tag{19}$$

$$\frac{\partial \Pi}{\partial K} = (1 - \tau_s)\left[1 - 2(\beta^*)^2 S(K, L, e)d\sigma^2\right] S_K - \left[r - (\tau_s - \tau_h)rb + C^I(b)\right]$$
$$+ \left[(\tau_s - \tau_h)(p_x + tp) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}(1 + \tilde{\varepsilon})\right] tp\right] S_K + \Delta_e \frac{\partial e}{\partial K} = 0, \tag{20}$$

where the profit wedge of an additional unit of effort is given by

$$\Delta_e = (1 - \tau_s)\left[\left(1 - 2(\beta^*)^2 S(K, L, e)d\sigma^2\right) S_e - c'(e)\right]$$
$$+ \left[(\tau_s - \tau_h)(p_x + tp) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}(1 + \tilde{\varepsilon})\right] tp\right] S_e$$
$$= \left[(1 - \tau_s)(1 - \beta^*) + (\tau_s - \tau_h)p_x\right] S_e > 0. \tag{21}$$

The second equality in equation (21) stems from applying the manager's first-order condition (11) to replace $c'(e)$ in the first line and utilizing the first-order condition for optimal transfer pricing (17) in the second line.

First, from equation (16) follows the standard condition for internal debt shifting:

$$(\tau_s - \tau_h)r = \frac{\partial C^I(b)}{\partial b}. \tag{22}$$

The marginal debt tax shield of internal debt must be equal to marginal costs of internal debt shifting. As in the standard models (Mintz and Smart 2004; Schindler and Schjelderup 2012), the tax-efficient capital structure is independent of production. For a compensation scheme based on EBIT, the capital structure is also unaffected by the principal-agent problem. Furthermore, there is no influence from transfer pricing as long as shifting costs of internal debt and transfer pricing are separable.

Second, for optimal transfer pricing follows from equation (17) that marginal tax savings from overinvoicing the royalty rate need to meet marginal expected shifting costs, i.e.,

$$\tau_s - \tau_h = \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}(1 + \tilde{\varepsilon})\right]. \tag{23}$$

The optimal royalty rate tp is independent of the capital structure, but depends on investment in capital and labor because the production level determines marginal shifting. Effectively, however, the HQ chooses an optimal level of income TP^a that shall be shifted. This level is determined by the tax rate differential and independent of production and sales. Accordingly, stochastic shifting costs and principal-agent problems do not affect the standard finding that abusive transfer pricing does not have an intensive-margin effect on investment, see Juranek et al. (2018, 2020).

Third, the optimal effective compensation rate of the manager follows as trade-off between the marginal profitability from inducing more effort and the marginal costs from compensating the manager for the higher income risk she has to bear. Formally, equation (18) implies

$$\frac{\beta^*}{1-\beta^*} = \frac{\left(1 + \frac{(\tau_s-\tau_h)p_x}{(1-\beta^*)(1-\tau_s)}\right) S_e \frac{\partial e}{\partial \beta^*}}{2S(K,L,e)^2 d\sigma^2}. \tag{24}$$

If the manager would be risk-neutral, i.e., if $d = 0$, an effective compensation rate of $\beta^* = 1$ would be optimal and a first-best is reached (cf. Holmström and Milgrom 1987). All risk and marginal profits would be allocated to the manager while the HQ extracts expected profits via a negative fixed salary. For risk-averse managers with $d > 0$, a full participation in business risk is too expensive, and we end up with an interior solution $\beta^* \in (0,1)$.

Importantly, the abusive transfer price tp does not affect the effective compensation rate β^* in (24). But the effective rate translates into an optimal statutory compensation rate that incorporates the dilution of profits via royalty payments. We have

$$\beta = \frac{\beta^*}{1 - p_x - tp}. \tag{25}$$

Consequently, the observed compensation rate increases with royalty payments and particularly with income shifting. Firms that use their transfer pricing tp more aggressively will sign compensation contracts that feature a higher share of EBIT for managers. In contrast, internal debt shifting and the capital structure do not have a direct effect on executive pay.

Fourth, the fact that there is no intensive-margin effect of transfer pricing allows for simplifying the first-order condition for labor demand. Applying equation (23) in (19), it follows that optimal labor demand balances marginal revenue from an additional worker plus the tax savings from an higher arm's-length royalty payment and the net effect via adjustments in managerial effort against the wage rate, that is,

$$\left[1 - 2(\beta^*)^2 S(K,L,e)d\sigma^2\right] S_L + \frac{\tau_s - \tau_h}{1-\tau_s}p_x\left[S_L + S_e\frac{\partial e}{\partial L}\right] + (1-\beta^*)S_e\frac{\partial e}{\partial L} = w. \tag{26}$$

Importantly, for a given effective compensation rate β^*, the choice of the abusive transfer

price tp does not affect the labor-demand condition. Similarly, internal leverage does not directly affect the demand for labor, but it has an indirect effect via capital investment as becomes clear from the next equation.

Finally, rearranging the first-order condition for capital demand (20) leads to

$$\left[1 - 2(\beta^*)^2 S(K, L, e)d\sigma^2\right] S_K + \frac{\tau_s - \tau_h}{1 - \tau_s} p_x \left[S_K + S_e \frac{\partial e}{\partial K}\right] + (1 - \beta^*)S_e \frac{\partial e}{\partial K} = \frac{r - (\tau_s - \tau_h)rb + C^I(b)}{1 - \tau_s}, \tag{27}$$

where the non-deductibility of part of the capital costs triggers the standard corporate-tax distortion that increases effective capital costs. In optimum, these effective capital costs, i.e., the right hand side in equation (27), are balanced against marginal revenue from higher capital investment plus the tax savings from an higher arm's-length royalty payment and the net effect via adjustments in managerial effort. As in the case of labor demand, abusive transfer pricing does not have any effect on optimal factor demand. In contrast, debt shifting has a first-order effect on effective capital costs because internal leverage b shelters part of the normal rate of return from local taxation and reduces costs (cf. Hong and Smart 2010; Schindler and Schjelderup 2012). Consequently, debt shifting induces higher capital investment, all else equal.

In sum, our findings also offer an additional reasoning for why most tax-induced transfer pricing happens via intangibles, i.e., royalties and license payments (cf. Heckemeyer and Overesch 2017). Income shifting via intermediate goods is done by adjusting both the price of the good and the quantity used in the production process. Hence, the HQ either needs to determine the affiliate's optimal use of the input *and* the input price to get the income shifting right. As the adjusted use of the intermediate input will affect production and further investment, however, the management incentives are no longer separable. An increase in the compensation rate cannot fully eliminate the impact from income shifting. Alternatively, the HQ sets the price for the intermediate good and classifies expenses on the intermediate good as 'non-controllable cost' for the local manager so that they are excluded from the bonus-relevant profit metrics. In that case, the HQ sacrifices efficiency in income shifting and runs the risk that the local manager maximizes sales rather than affiliate's profits. For income shifting by intangibles, these problems do not occur because a simple adjustment of the compensation rate neutralizes the adverse effects on management incentives without affecting real production, i.e., physical inputs and output.[36]

The latter insight also corresponds with some basic principles in management accounting and the economics of the firm. As long as the HQ has sufficient instruments to control

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[36]The fact that intangibles are so valuable for cost-efficient income shifting under decentralized decision making also should imply that MNCs are willing to spend more resources on R&D effort on a previous stage in order to build proper intangibles that can then be used for income shifting. We leave this aspect for further research.

all relevant margins, it should be able to install an efficient structure of decision making. In our case, the HQ could declare the royalty payments to non-controllable costs outside the responsibility of the subsidiary's manager. This would imply to adjust the profit metrics. To properly identify the relevant controllable margin, EBIT(DA) additionally should be adjusted for the returns on the patent, i.e., the production technology. Doing so neutralizes any impact of income shifting on management incentives. It requires, however, significant effort to estimate the return on the patent and calculate the controllable margin, whereas EBIT(DA) is a standard profitability measure that is calculated anyway. Thus, the easier solution for the HQ is sticking to EBIT(DA) as profit metrics and adjusting the statutory compensation rate. This delivers an equivalent outcome, but the profit metrics remains more transparent, also for the manager in the subsidiary. Adjusting the manager contract is also in line with Coase's idea of an efficient firm (Coase 1937). As long as there is a sufficient number of contracts available, there is no reason why the HQ should harm itself by designing a structure in which income shifting collides with incentives of local management. Redefining the internal contracts maintains the efficient functioning of the firm in total.

We can summarize our results so far as

Proposition 1 *For compensation schemes based on EBIT(DA), income shifting via internal debt (*b*) has no direct effect on managerial incentives and compensation pay, but fosters capital investment. In contrast, tax-induced transfer pricing in royalty payments (*tp*) does not affect investment and production, but has a first-order negative effect on managerial effort. In order to set incentives correctly, the statutory compensation rate (*β*) will compensate managers for income shifting. Thus, the observable compensation structure is a mirror image of the transfer-pricing strategy of the firm.*

The complete independence of managerial incentives and income shifting by transfer pricing needs to be taken with a salt of grain. First, we have shown the result for transfer pricing in *intangibles* which is the most relevant shifting channel and for which there is no indirect effect via investment. In theory, it is likely difficult to fully eliminate effects from transfer pricing in intermediate goods (i.e., in *tangibles*) on management incentives because there will be an indirect effect via a change in economic activity. Second, when affiliates have some probability to report losses and face imperfect loss offsets, their optimal transfer pricing gets 'loss-constrained' and marginal tax savings and marginal shifting costs do not balance. Then, transfer pricing reduces capital costs and sets an incentive to increase investment so that the loss constraint relaxes and more profits can be shifted, see Köthenbürger et al. (2019). In such a case, the perfect neutrality result will not hold. Nevertheless, higher income shifting will trigger a higher statutory compensation rate so that the compensation contract still provides a signal for tax authorities.

Third, in reality, there will be adjustment frictions in the short run such that existing

manager contracts cannot be changed immediately in response to a change in tax incentives. But the MNCs will anticipate their tax-motivated royalty payments when signing contracts with new managers and will implement changes in the statutory compensation rate whenever an existing contract of a manager gets prolonged. Hence, if one extends our model to a (much more complicated) dynamic setting with some short-term adjustment costs, one will find a mismatch of income shifting by transfer pricing and management incentives in the short run that will vanish in the medium and long run.

Fortunately, with such an extension in mind, the results from our theoretical analysis perfectly match the empirical results in Klassen and Valle Ruiz (2020): local managers will counteract adverse income-shifting effects on their subsidiary's performance by accrual-based earnings management. Importantly, however, the accrual effects completely vanish after about one year. Furthermore, in better integrated subsidiaries, to which our basic modeling assumptions of a profit center fit better, there is less earnings management in response to transfer pricing risk, if any at all. Hence, the available empirical evidence suggests (potential) adjustment frictions in the short run (less than one year), but a full neutralization of transfer pricing effects and separability of managerial incentives in the medium and long run (more than one year).

Interestingly, while our theoretical analysis documents full separability of income shifting and management incentives for transfer pricing in intangibles, Klassen and Valle Ruiz (2020) focus on transfer pricing in intermediate goods, and their results still suggest that there is full separability in the medium run. Empirically, the independence of income shifting and managerial incentives might therefore be even more relevant and general than suggested by (our) theory.

Independent of adjustment frictions, Proposition 1 supports the view that high compensation rates and compensation payments to managers that consistently deliver low profitability, i.e., a low EBIT(DA), over several years should form a red flag for tax authorities. Unprofitable firms with high variable compensation payments (i.e., high compensation rates for their executive managers) are likely reporting no income because of substantial income shifting in royalty payments. The case of internal debt is more involved, and we will provide a more detailed analysis in section 5. Nevertheless, it is obvious already that there are major differences in the implications of the different income-shifting channels.

4.3   Extensions and Generalizations

In this subsection, we will discuss the impact of some important assumptions and simplifications and point out that our results carry over to more general settings and earlier approaches in the literature.

4.3.1 More sophisticated firm structures

Our model assumes a simple MNC structure in which the HQ resides in a low-tax country and only owns one productive subsidiary that is located in a high-tax country. As a matter of fact, most MNCs are headquartered in high-tax countries, but rely on internal banks and profit centers in low-tax countries or tax havens. In addition, most MNCs, particularly the large and tax-aggressive ones, own significantly more than one productive subsidiary. See the discussion in Section 2 and Figure 1. Nevertheless, our results fully apply for such more sophisticated structures without any change as long as the exemption method for inter-corporate dividends, i.e., a territorial tax system, applies – as it does also in the U.S. since 2018.

Under a territorial tax system, the internal bank and the profit center receive shifted income from all other related subsidiaries and get definitely taxed at a low or no tax rate. The after-tax profits in the special purpose entities can then be distributed as dividends, free of additional taxes, to the HQ.[37] Consequently, the location of the HQ does not matter for income-shifting decisions. Moreover, by the nature of the transaction, there is only one owner of a patent and internal loans are (optimally) provided by one (or several) low-taxed subsidiary, see again Møen et al. (2018) for empirical evidence. This implies that there are no payments between medium- and high-taxed affiliates when it comes to interest and royalty payments. Receiving interest income never triggers any compliance costs, and also 'excessive' royalty income does not cause additional shifting costs in receiving subsidiaries that locate in designated tax havens or operate under dedicated special tax regimes. Hence, the weighted tax differential and the C-measure, developed in Huizinga and Laeven (2008), does not apply to these transaction even if one models an MNC with many productive subsidiaries, see also Hopland et al. (2019).

The C-measure mattered if we introduced several productive subsidiaries that trade some intermediary input with each other. Then, there will be income shifting also between productive subsidiaries and likely shifting costs both for the paying and the receiving subsidiary. In such a setting, costs and benefits from income shifting in *intermediates* need to balanced on all subsidiaries, and the weighted tax differential comes into play. As income shifting in intermediates can have effects on production, there will always be indirect effects on the performance measure and incentivization of subsidiaries' managers. In addition, income shifting via intermediate inputs can also have direct effects on managers' incentives, depending on the exact structure of the performance measure. Therefore, different from income shifting via intangibles, it is not clear (and unlikely) whether these effects can be neutralized by simply adjusting the compensation schemes. Accordingly,

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[37]In principle, controlled-foreign-country (CFC) rules might interfere here, but these rules can often easily be circumvented. For EU MNCs, CFC rules do not apply to profit centers located in tax havens within the European Union (EU) because of the Cadbury-Schweppes ruling by the European Court of Justice in 2006. In the U.S., CFC rules, codified in Subpart F, can be bypassed via the check-the-box provision that came into place in 1997, see, e.g., Blouin and Krull (2015).

incentivizing managers becomes more involved when there is income shifting by intermediate goods. As argued above, this might be another reason why using transfer pricing in royalty payments and intangibles is the dominant form of income shifting, see the summary of empirical evidence in Heckemeyer and Overesch (2017).

4.3.2 Patents in high-tax headquarters

Besides residing in high-tax countries, many HQs also decide to behave less tax aggressive and hesitate to place their valuable assets (e.g., patents) or substantial equity in tax-haven subsidiaries. There is some empirical literature that finds that intra-firm payments sometimes are going directly to the HQ and suggests that there are agency problems related to placing patents and equity in – thinking of classical offshore tax havens – often remote places, see Dischinger et al. (2014a, 2014b). Anecdotal evidence shows that, for example, some of the large German DAX-30 firms such as Adidas and Siemens consistently had effective tax rates of 25-30% (and above) in the last ten years, and there is a trend to less tax aggressiveness in Europe since 2003, likely driven by tax policy changes (Alexander et al. 2020). What does this imply for our model and our results?

If a high-taxed HQ operates as internal bank and profit center, internal debt will only be used in subsidiaries that have an even higher tax rate than the HQ. For these cases, the tax differentials shrinks, but all other findings on internal debt remain unchanged qualitatively. For all other subsidiaries, it is cheaper to provide equity than internal debt, because the return on equity will be taxed at a lower rate than interest income is taxed at the HQ. Thus, for these subsidiaries, there is no internal debt (and our internal-debt results disappear). Most important, however, the findings on transfer pricing and particularly the separability result remain unaffected. For affiliates with a lower tax rate than the HQ, the tax differential in equation (23) turns negative and there is an incentive to *underinvoice* royalty payments now. Thus, income is shifted from the HQ to the subsidiaries. Shifting costs are convex (U-shaped) because underinvoicing now requires to justify the tax base to the tax authority in the country of the HQ. Therefore, an interior solution is still guaranteed. But this implies that abusive transfer pricing still does not trigger any investment effect, i.e., equations (24) and (27) remain unchanged. As there is additional income shifted *into* some of the subsidiaries now, the only consequence is that the statutory compensation rate β in these subsidiaries will decrease (because formally, tp will be negative instead of positive) to keep the effective compensation rate β^* on its optimal level. In sum, our results also apply to MNCs that locate their intangibles in a high-taxed HQ.

4.3.3 Endogenous R&D investment

In our static model, the intangible asset already exists and leads to royalty payments for the use of the related patent. The R&D process to develop the patent, however, is neglected. Johnson (2006) analyzes a model with a decentralized setting in which a R&D unit and a downstream subsidiary negotiate about the transfer price for an intangible input to be produced. She neglects income shifting and allows for decoupled transfer prices, i.e., allows for two books. Her Proposition 5 shows that renegotiated royalty-based transfer payments always dominate negotiated transfer prices. Furthermore, for uniform transfer payments, i.e., a one-book system, Johnson (2006) finds that a royalty-based system always leads to underinvestment in both units, relative to the centralized decision making, when investments in each subsidiary are quasi-independent (Proposition 1). The case of complementary inputs is less clear. A robust finding, however, is that royalty-based transfer payments mitigate or even heal the hold-up problem for the R&D unit.

The results of embedding such a setting into our model with income shifting and agency conflicts in the downstream subsidiary would not be straightforward. As long as the productive (downstream) subsidiary is treated as a profit center, however, for which the budget for capital investment is determined by the HQ, a substantial part of the inefficiencies should disappear. The HQ will ensure an efficient capital budget and can correct any effect of the transfer price on managerial effort by adjusting the statutory compensation rate (β). Whether R&D investment is endogenous or the patent is pre-existing already does not add a new effect to the moral-hazard problem of incentivizing the downstream subsidiary's manager. The outcome will be the standard underprovision of managerial effort that is inherent in such principal-agent models. To ensure a tax-efficient outcome, the HQ must continue to impose the tax-driven transfer payment on the productive affiliate. The resulting income shifting to the R&D unit should reduce the underinvestment, that is identified in Johnson (2006), and potentially can lead to overinvestment even. The latter is avoided under the assumption that the R&D process is sufficiently centralized. This assumption appears realistic in case of important R&D projects and remuneration decisions related to patents.

Actually, the empirical management literature suggests that traditionally, R&D units had a low level of decentralization and HQs imposed a 'participative centralization management style', see Cheng and Bolon (1993) for an overview. Even after increasing globalization, it seems that HQs like to maintain control over their R&D units. Based on a survey study with Austrian R&D subsidiaries of MNCs, Ecker et al. (2013) find that decision making rather remains centralized when there are complex and highly intensive R&D and advanced R&D processes. Note that also in our IKEA example in Section 2, the 3% royalty fee for the trademark was imposed by the HQ and not bargained between

subsidiaries. Accordingly, we believe that our findings on income shifting and management incentives also apply to *tax-efficient* organizational structures with endogenous R&D investment.

In sum, with a sufficiently centralized R&D unit and a HQ that ensures tax-efficient transfer payments, adjusting the statutory compensation rate should allow the HQ to implement the same managerial effort in a downstream profit center like for the case of exogenous R&D. Effort and production in the subsidiary will still be below first best, but the reason for this is the principal-agent conflict, not issues related to R&D investment. In contrast, the effect of endogenous R&D investment in a fully decentralized structure that includes income shifting and moral hazard remains unclear, and we agree with Johnson (2006) that such an extension constitutes an interesting avenue for further research.

4.3.4 Performance measurement based on after-tax profits

Previous literature used (after-tax) profits as the metrics to determine the performance of local managers. A relevant question is how sensitive our findings are with respect to the chosen profit metrics. If one writes the compensation contract on after-tax book profits,[38] manager income in equation (6) changes to

$$\tilde{W} = \alpha + \beta \cdot \tilde{AP} = \alpha + \beta \left(1 - \tau_s\right) \left[(1 + \tilde{\varepsilon})S(K, L, e) - \tilde{TP} - wL - rbK\right], \qquad (28)$$

where AP stands for after-tax book profits and where the main difference to the baseline modeling is that interest expenses on internal debt, i.e., rbK, are deducted from the profit metrics now. Following the same steps as before, the maximization problem of the manager can be written as

$$\max_e EU = \alpha + \beta^* \left[S(K, L, e) - \frac{w}{1 - p_x - tp}L - \frac{r}{1 - p_x - tp}bK\right] - (\beta^*)^2 S(K, L, e)^2 d\sigma^2 - c(e), \tag{29}$$

where we have redefined the effective compensation rate here as

$$\beta^* = \beta \cdot (1 - p_x - tp)(1 - \tau_s). \tag{30}$$

Maintaining our assumption that the subsidiary operates as a profit center with given labor and capital budgets, i.e., the HQ decides about the levels of L and K, the first-order condition for managerial effort (11) remains unchanged. Consequently, all our findings on transfer pricing continue to hold also under after-tax profits as performance measure. The lump-sum compensation α needs to adjust, however, in order to compensate for the lower variable income payment. Interestingly, there is no difference between after- or

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[38]Note that book profits follow standard tax rules under which costs of equity are not tax deductible. Hence, after-tax economic profits are lower than after-tax book profits.

before-tax profits either, because the adjusted effective compensation rate β^* in equation (30) also allows for eliminating the negative effect from tax payments in the subsidiary on managerial effort.

Surprisingly, debt shifting does not have any direct effect on managerial effort either. Larger debt shifting reduces the profit metrics, but does not have an impact on the marginal return on managerial effort. It will only effect the lump-sum compensation so that the participation constraint $EU = 0$ continues to hold. Furthermore, the positive indirect effect of debt shifting, working via increased capital investment, remains. Thus, also the findings on debt shifting in Proposition 1 carry over to (after-tax) profits as performance measure.

In particular the latter results, however, crucially depend on the fact that the manager does not control the investment level and operates in a profit center. Allowing the manager to decide on capital investment will on the one hand still induce overinvestment, because she does not incorporate all capital costs into her decision making. On the other hand, now, there is an incentive for underinvestment because transfer pricing acts like an increase of the effective interest rate. The latter effect is analogous to the problem of inefficient labor demand, discussed after equation (13).

4.3.5 Additive sales shock

Our baseline model operates with a sales shock that triggers multiplicative risk. This modeling captures well uncertainty in the sales price, for example caused by a change in market demand, or uncertainty related to the effectiveness of the production technology (e.g., of new process innovation). It also allows for incorporating the fact that larger firm activity inflates the exposure to (demand) shocks and that this has feedback effects on risk-averse managers. For sake of simplicity, however, the major part of the underlying strand in the management literature on agency problems and managerial effort assumes an (unspecific) additive shock on affiliates' profits, e.g., via (fixed) costs. This eliminates some risk effects that are present in our model, and it begs the question whether our results are driven by assuming multiplicative risk. The good news is that an additive shock on total profits does not change our qualitative results, and in particular, the separability of transfer pricing and management incentives remains in place.[39]

The results do, however, not fully carry over to a specific additive shock on sales. The reason is an effect working via stochastic costs of transfer pricing and an asymmetry between shifting via the royalty rate and via higher real activity. For such a specific additive shock, stochastic sales turn into $\tilde{S} = S(K, L, e; \bar{X}) + \tilde{\varepsilon}$ and the sales-dependent

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[39]We do not explicitly model an additive shock on total profits. But recognizing that sales and royalty payments are deterministic for such an unspecific additive shock and evaluating the derivations for an additive sales shock in Appendix A.1 accordingly, it is obvious that all relevant findings from the baseline model carry over to additive shocks on total profits.

royalty payments $\tilde{TP}$ become $\tilde{TP} = (p_x + tp)[S(K, L, e) + \tilde{\varepsilon}]$. The manager continues to apply a mean-variance framework and chooses her effort according to (see Appendix A.1 for more details of the derivations)

$$\beta(1 - p_x - tp)S_e = \beta^* S_e = c'(e), \tag{31}$$

where once again $\beta^* = \beta(1 - p_x - tp)$ is the effective compensation rate of the manager. With an additive shock, higher effort does not increase the exposure to risk, because risk and investment are fully separable. Consequently, the choice of effort is independent of the variance of the shock and the risk preferences of the manager now, but optimal effort still increases with capital investment and labor input.

Setting up total profits of the MNC and the optimization problem of the HQ, we can derive the following first-order conditions under an additive sales shock (see again Appendix A.1 for details). The condition for optimal leverage is identical to the one in our baseline model, compare (22) and (32).

$$(\tau_s - \tau_h)r = \frac{\partial C^I}{\partial b}. \tag{32}$$

Marginal tax savings equal to marginal cost of internal debt unambiguously determine (internal) leverage independent of all other choices.

Additionally, the first-order condition for transfer pricing still determines an optimal amount of shifted income by equating expected tax savings to expected shifting costs, but it also contains a stochastic cost effect that only applies to shifting via an increase in the transfer price, see the second term on the right hand side of equation (33)

$$(\tau_s - \tau_h) = \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\right] + \frac{\mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon}\right]}{S(K, L, e)}. \tag{33}$$

The second term follows from the fact that increasing the transfer price will shift more of the stochastic sales revenues and trigger stochastic shifting costs. As shifting costs are convex, this will cause higher average costs than shifting a deterministic portion of income only. Hence, with respect to tax engineering costs, shifting via an increased surcharge rate for royalty payments (tp) is no longer equivalent to shifting via increased sales, i.e., by higher real investment.

The stochastic cost effect of transfer pricing has a significant impact on the first-order conditions for the production factors labor and capital (34) and (35). Because of the specific additive shock, the risk adjustment for increased sales vanishes, but a new term

related to the transfer price tp enters:

$$S_L + \frac{\tau_s - \tau_h}{1 - \tau_s} p_x \left[S_L + S_e \frac{\partial e}{\partial L} \right] + (1 - \beta^*) S_e \frac{\partial e}{\partial L} + \mathrm{E} \left[\frac{\partial C^P}{\partial TP^a} \tilde{\varepsilon} \right] \frac{tp \left(S_L + S_e \frac{\partial e}{\partial L} \right)}{S(K, L, e)} = w, \text{ (34)}$$

$$S_K + \frac{\tau_s - \tau_h}{1 - \tau_s} p_x \left[S_K + S_e \frac{\partial e}{\partial K} \right] + (1 - \beta^*) S_e \frac{\partial e}{\partial K} + \mathrm{E} \left[\frac{\partial C^P}{\partial TP^a} \tilde{\varepsilon} \right] \frac{tp \left(S_K + S_e \frac{\partial e}{\partial K} \right)}{S(K, L, e)} = r^e, \text{ (35)}$$

where $r^e = \frac{r - (\tau_s - \tau_h) rb + C^I(b)}{1 - \tau_s}$ are effective capital costs. Relative to the baseline model with multiplicative risk, both changes work in favor of higher investment and labor demand. Higher investment does no longer require a higher compensation of risk payable to the manager so that investment becomes cheaper, all else equal. At the same time, higher investment K and L triggers higher effort and higher sales so that more income is shifted for a given surcharge rate $tp > 0$. This is beneficial now because this marginal income shifting is purely deterministic and avoids the higher expected shifting costs triggered by the stochastic component of sales, see the last terms on the left hand sides of equations (34) and (35).[40] Consequently, transfer pricing and real investment are no longer fully separable.

With respect to management incentivization, the fact that transfer pricing now fosters real investment implies that the effect of transfer pricing cannot simply be undone by adjusting the statutory compensation rate β to keep the effective compensation rate β^* constant. There is both a direct and an indirect effect working in a favor of a higher effective compensation rate to foster managerial effort. Both effects are driven by the intention to increase sales, and by them, deterministic income shifting so that the stochastic shifting costs get reduced. The indirect effect works via increasing both S_e and $\frac{\partial e}{\partial \beta^*}$ in equation (36)

$$\frac{\beta^*}{1 - \beta^*} = \frac{\left(1 + \frac{(\tau_s - \tau_h) p_x}{(1 - \beta^*)(1 - \tau_s)} + \mathrm{E} \left[\frac{\partial C^P}{\partial TP^a} \tilde{\varepsilon} \right] \frac{tp}{(1 - \tau_s)(1 - \beta^*) S(K, L, e)} \right) S_e \frac{\partial e}{\partial \beta^*}}{2 d \sigma^2}. \text{ (36)}$$

To summarize, with an additive shock on sales that translates into stochastic royalty payments, there is both a direct and an indirect effect fostering the effective compensation rate together with the surcharge rate tp of transfer pricing. Driving force behind both effect is the aim to avoid additional costs related to the variance in shifted income by reducing the surcharge rate and increasing effort and investment to shift more income by increasing (deterministic) sales. Additive sales shocks, however, seem to be rather special because demand shocks rather materialize as multiplicative price risk. Importantly, for an unspecific additive shock on firms' profits, royalty payments are deterministic and the

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[40]The stochastic cost effect becomes clearest for a quadratic cost function $C^P = \frac{\eta}{2} \left(tp[S(K, L, e) + \tilde{\varepsilon}] \right)^2$ so that $\mathrm{E} \left[\frac{\partial C^P}{\partial TP^a} \tilde{\varepsilon} \right] = \eta \, cov(tp[S(K, L, e) + \tilde{\varepsilon}]) = \eta \, tp \, cov(\tilde{\varepsilon}, \tilde{\varepsilon}) = \eta \, tp \, \sigma^2 > 0$. For convex shifting costs, expected costs of shifting a stochastic amount of income are higher than shifting costs of a deterministic amount that is equal to the expected value of the stochastic shifting.

31

indirect effect vanishes so that our results from the baseline model are in place again.

4.3.6 Two-part tariffs for royalty payments

According to the studies reviewed in San Martín and Saracho (2010), the majority of firms rely on royalty payments when it comes to contracting the use of patents. A significant share of firms, and in some countries like France even the majority of firms, however, use two-part tariffs that consist of (sales-dependent) royalty payments and a fixed fee. How does such a combination affect our findings and do firms prefer to shift income via the royalty payments or by the fixed fee?

If we assume a (deterministic) fixed payment with an arm's-length value P^x and the possibility to deviate from the arm's-length payment by a fixed surcharge P^{tp}, the total transfer payment for the use of the production technology changes to $\tilde{TP} = (p_x + tp)(1 + \tilde{\varepsilon})S(K, L, e) + (P^X + P^{tp})$. Maintaining the assumption that there is ambiguity in transfer-price regulation and that the shifting costs depend on the deviation from the arm's-length payment, these costs can be captured as $C^P = C^P(TP^a) = C^P(tp(1 + \tilde{\varepsilon})S(K, L, e) + P^{tp})$ now, with the same properties as in the baseline model. Importantly, the fixed payment $P^X + P^{tp}$ does not affect the maximization problem of the manager and does not impact her effort. From point of view of the manager, the fixed payment simply is a fixed cost outside her control (and she gets compensated for any income shifting via an adjustment of her fixed compensation payment α).

The maximization problem (15) of the firm changes slightly to

$$
\begin{aligned}
\max_{b, tp, P^{tp}, \beta^*, L, K} \Pi \; = \; & (1 - \tau_s)\left[S(K, L, e) - wL - (\beta^*)^2 S(K, L, e)^2 d\sigma^2 - c(e)\right] \\
& + \; (\tau_s - \tau_h)[(p_x + tp)S(K, L, e) + (P^x + P^{tp})] - \mathrm{E}\left[C^P(tp(1 + \tilde{\varepsilon})S(K, L, e) + P^{tp})\right] \\
& - \; [r - (\tau_s - \tau_h)rb + C^I(b)]K - (1 - \tau_h)C_f.
\end{aligned}
\tag{37}
$$

Importantly, all first-order conditions (16) to (20) do not change at all, because the fixed transfer payment neither interacts with any input factor in the production process nor with the compensation rate (as the adjustment is made via the fixed compensation payment α). There is, however, an additional first-order condition for the optimal surcharge P^{tp} on the fixed transfer payment. From $\frac{\partial \Pi}{\partial P^{tp}} = 0$ follows

$$
\tau_s - \tau_h = \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\right].
\tag{38}
$$

For a deterministic shifting via a fixed payment, the marginal tax savings are balanced against the expected shifting costs in the optimum. Applying condition (38) together with Steiner's Rule, $\mathrm{E}[\tilde{X}\tilde{Y}] = \mathrm{E}[\tilde{X}]\mathrm{E}[\tilde{Y}] + cov(X, Y)$ and $\mathrm{E}[\tilde{\varepsilon}] = 0$ in equation (23), we

find

$$(\tau_s - \tau_h) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\right] = \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\varepsilon\right] = cov\left(\frac{\partial C^P}{\partial TP^a}, \tilde{\varepsilon}\right) = 0 \quad \Rightarrow \quad tp^* = 0. \qquad (39)$$

Thus, if the firm can freely choose, it will do all income shifting by transfer pricing via a deterministic surcharge on the fixed fee component. Just as in the previous case of additive sales shocks, the driving force is to avoid excessive shifting costs that are triggered by a stochastic shifting base. Compared to shifting a deterministic amount, shifting a stochastic income component with the same expected value causes higher expected cost whenever the cost function is convex.

In sum, adding a fixed component therefore strengthens the finding that income shifting and managerial incentives are fully separable and extends the separability also to the case of a specific additive shock on sales, but the compensation rate β^* no longer mirrors the income-shifting position of the subsidiary. The latter result in the baseline model should, however, be partially restored when one assumes imperfect loss offset. In that case, income shifting when the subsidiary is reporting taxable losses turns excessively expensive. As Hopland et al. (2018, 2019) pointed out, sales-dependent royalty payments are an attractive feature then to automatically condition the income-shifting position to the profit or loss position of the subsidiary. Hence, it likely will trigger some shifting by sales-dependent royalty payments that will be captured by an adjusted compensation rate.[41]

5 Responsiveness of Income Shifting and Compensation Schemes

To keep the model tractable when analyzing the impact of income-shifting incentives formally, we assume in this section that the sales function $S(K, L, e)$ is multiplicative in managerial effort and takes the form $S = s(K, L) \cdot e$. Furthermore, we assume that the effort costs of the manager are quadratic and take the form $c(e) = \frac{e^2}{2}$. These two assumptions allow for deriving managerial effort explicitly from the first-order condition (11). Applying these functional forms leads to an optimal effort choice by the manager of

$$e = \frac{\beta^* s(K, L)}{1 + 2(\beta^*)^2 s(K, L)^2 d\sigma^2}. \qquad (40)$$

Moreover, we introduce the cost parameters ψ and χ that measure the tightness of thin

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[41]Imperfect loss offset also will imply, however, that transfer pricing will interact with investment because larger investment will relax the zero-profitability constraint. See Köthenbürger et al. (2019). Consequently, the link between income shifting and the compensation rate will be partially restored, but the separability between transfer pricing and managerial incentives gets impaired.

capitalization rules and transfer pricing regulation, respectively. A higher ψ indicates that it is more difficult to justify higher interest expenses on internal debt so that both absolute and marginal costs of debt shifting increase, i.e., $C_\psi^I > 0$ and $C_{b\psi}^I > 0$. Similarly, a higher χ implies that abusive transfer pricing is more expensive, both absolute and on the margin; hence, $C_\chi^P > 0$ and $C_{TP\chi}^P > 0$. Note that the tightness measures are not identical with maximally or minimally supportable transfer prices and safe-harbor debt-to-asset ratios. The measures are about necessary effort to bypass regulation depending, for example, on different documentation requirements for transfer prices or the availability of various escape clauses in thin capitalization rules. A tight band of supportable transfer prices or acceptable debt-to-asset ratios, however, provides a good indicator for the strictness of regulation.

With these additional cost parameters, we can analyze three different aspects of income shifting. First, a decrease in the tax rate of the HQ τ_h shows the impact of a larger tax differential and higher incentives to shift income, both via arm's-length payments on the patent (p_x), debt shifting (b) and abusive transfer pricing (tp). Second, variation in ψ allows for isolating the impact of incentives to conduct debt shifting. Equivalently, a variation in χ identifies the effects of abusive transfer pricing. Additionally, we can examine how personal characteristics of the local manager, captured by her risk aversion parameter d influence production and income shifting.

In order to derive the comparative static effects analytically, we have to totally differentiate the system of first-order conditions of the HQ, equations (16) to (20), and optimal managerial effort (40). See Appendix A.2 for details. The comparative statics confirm that the choice of the income shifting strategies is neither affected by the moral hazard problem related to managerial effort nor investment decisions in the affiliate. It also documents, however, that the reverse is not true. In particular, *both* income-shifting channels will have an impact on the compensation scheme of the manager.

In more detail, a change in regulation that only affects the cost of transfer pricing, i.e., a change in χ, makes transfer pricing marginally more expensive, and for given tax savings, induces a reduction in the amount of income shifted. Formally, it follows (see Appendix A.2)

$$\frac{dTP}{d\chi} = \frac{-C_{bb}^I E[C_{TP\chi}^P(1+\epsilon)] \cdot |BH|}{C_{bb}^I E[C_{TPTP}^P(1+\epsilon)] \cdot |BH|} = -\frac{E[C_{TP\chi}^P(1+\epsilon)]}{E[C_{TPTP}^P(1+\epsilon)]} < 0. \qquad (41)$$

At the same time, transfer pricing does not affect investment, production and the effective compensation rate of the manager because it follows from equation (A.25) that

$$\frac{dL}{d\chi} = \frac{dK}{d\chi} = \frac{d\beta^*}{d\chi} = \frac{de}{d\chi} = 0. \qquad (42)$$

At the margin, tax savings and income-shifting costs balance each other so that there

is no net investment incentive. Furthermore, holding the effective compensation rate β^* constant ensures that income shifting does not affect managerial effort and allows for separating the principal-agent problem. Hence, our results generalize findings under centralized decision making that transfer pricing in intangibles is a pure lump-sum shifting of income without any investment and production effects (see Juranek et al. 2018). From our analysis follows that adding an endogenous effort choice by a local affiliate manager and incorporating a principal-agent problem into the income-shifting setting does not affect this finding.

Our results imply that any adjustment of transfer pricing is handled via the surcharge tp on the arm's-length royalty rate and it follows from equation (2) that the change in expected royalty payments $TP = E[\tilde{TP}]$ is equal to

$$\frac{dTP}{d\chi} = \frac{dtp}{d\chi} s(K, L) e \quad \Longleftrightarrow \quad \frac{dtp}{d\chi} = \frac{dTP/d\chi}{S(K, L)}. \tag{43}$$

Then, the optimal change in the statutory compensation rate β is obtained by differentiating equation (25) as

$$\frac{d\beta}{d\chi} = \frac{\beta^*}{(1 - p_x - tp)^2} \frac{dtp}{d\chi} = \beta \cdot \frac{dTP/d\chi}{(1 - p_x - tp)S(K, L)}, \tag{44}$$

where $(1 - p_x - tp)S(K, L)$ is expected sales revenue after royalty payments in the affiliate.

Accordingly, we can extent our result in Proposition 1 that the statutory compensation rate mirrors the transfer-pricing strategy of the firm by a hypothesis that is directly empirically testable:

Proposition 2 *In expected values, a change in tax-induced transfer pricing triggers a corresponding adjustment in the compensation schemes of affiliate managers such that the relative change in the compensation rate $\frac{d\beta/d\chi}{\beta}$ meets the relative change in after-royalty sales revenue $\frac{dTP/d\chi}{(1 - p_x - tp)S(K, L)}$.*

Similarly to the case of transfer pricing, a change in regulation that only affects the cost of debt shifting, i.e., a change in ψ, leads to the standard effects that are well-known under centralized decision making. Stricter regulation increases the marginal costs of internal leverage and reduces debt shifting as (see Appendix A.2 again)

$$\frac{db}{d\psi} = \frac{-C_{b\psi}^I E[C_{TPTP}^P(1 + \epsilon)] \cdot |BH|}{C_{bb}^I E[C_{TPTP}^P(1 + \epsilon)] \cdot |BH|} = -\frac{C_{b\psi}^I}{C_{bb}^I} < 0. \tag{45}$$

Once more, the choice of the income-shifting device neither is affected by investment decisions nor by the problem of incentivizing the local manager. As debt shifting does not affect EBIT(DA), the latter result is not surprising. In contrast to transfer pricing, however, there is an indirect effect via investment choices. Higher internal leverage reduces

effective capital costs and fosters capital investment. Larger capital investment triggers higher production and a larger EBIT(DA), but also more risk for the manager. The former investment effect relaxes the incentivization problem because $\frac{de}{dK} > 0$ as long as risk aversion is sufficiently low and the assumption in equation (A.24) holds. Thus, the indirect investment effect lowers the effective compensation rate, all else equal. The latter risk effect implies higher costs to incentivize managers that increase with their risk aversion. Hence, the risk effect should lead to a further decrease in the effective compensation rate β^*, and this decrease is stronger the higher the risk aversion of the manager.

Formally, we can show so far that

$$\frac{dz}{d\psi} \neq 0 \quad \forall z = L, K, \beta^*, e, \tag{46}$$

and conclude with another empirically testable hypothesis as

Proposition 3 *Although a change in debt shifting does not have a direct effect on an EBIT(DA)-based compensation scheme for affiliate managers, there is an indirect effect via changes in investment. Regulation that reduces debt shifting will affect manager compensation and likely increases the compensation rate.*

Both Propositions 2 and 3 should be empirically testable if sufficient data on the accounts of affiliates and the compensation schemes of their managers are available. For subsidiaries that are run as public companies falling under U.S. SEC regulation, for example, it should be possible to infer information an executive bonus and the compensation rate of high-level executive officers by combining information disclosed in the Summary Compensation Table and the Compensation Discussion and Analysis section of the annual proxy statement.[42] In order to isolate and identify the different effects from transfer pricing and debt shifting separately then, it appears preferable to utilize changes in the income-shifting regulation as exogenous shocks. With respect to transfer pricing, there have been various changes in the documentation rules that trigger higher shifting costs, see, e.g., Lohse and Riedel (2013). Variation in transfer pricing risk (e.g., Mescall and Klassen 2018) might also generate sufficient exogenous variation. When it comes to regulation of debt shifting, there have been various changes in thin capitalization rules over time that have been used to analyze the impact on capital structure and firm's investment (e.g., Büttner et al. 2012; Blouin et al. 2014; Büttner et al. 2018). No study, however, has analyzed the link to compensation schemes yet.

The implementation of the OECD BEPS Action Plan (OECD 2015a) should provide even more variation in regulation and costs of income shifting. Resting the analysis on

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[42]See https://www.sec.gov/fast-answers/answers-execomphtm.html for a brief overview on the SEC requirements to disclose information on executive pay.

changes in regulation is preferable compared to using the statutory tax differential as a measure for specific income-shifting channels, because a larger tax differential fosters both transfer pricing and debt shifting. As the two strategies likely have offsetting effects on the compensation rate, a clear identification might become difficult. Furthermore, a larger tax differential also fosters the tax savings from the arm's-length royalty payment. Under centralized decision making, the arm's-length payment has a positive investment effect (Juranek et al. 2018), and this should carry over to our setting as long as risk aversion of the affiliate manager is not too high. Then, a change in the tax rate differential triggers additional confounding effects.

Formally, the three different margins of a change in the tax differential become visible in the vector related to a change in the HQ's tax rate t_h in equation (A.25). The term related to br in the fifth row captures the investment effect of debt shifting. All terms related to p_x in rows three to five capture the impact of the arm's-length royalty payment.

6   Conclusions

In this study, we theoretically model the interaction of income shifting via intangibles and internal (intra-firm) debt and agency costs resulting from moral hazard by managers that endogenously choose their unobservable working effort in a decentralized firm structure. Most of the income-shifting literature only focuses on centralized decision making and neglects issues resulting from decentralized decision rights. The literature that incorporates decentralized decision making analyzes the coordination of production between (upstream and downstream) subsidiaries and the bargaining of transfer prices. By and large, agency costs resulting from managerial effort and the implications for compensation schemes are still part of a "black box" in the process of international tax planning, and in particular the effects of internal debt shifting have been ignored completely.

To improve the understanding of this process, we look at a setting where a local manager is incentivized by compensation payments depending on EBIT(DA). We find that shifting of internal debt does not have a direct effect on management incentives, but has positive effects on investments. Thus, there is an indirect effect that is ambiguous and depends on the level of managers' risk aversion and on assumptions on complementarity of input factors. In contrast, tax-motivated royalty payments have a negative direct incentive effect that is neutralized, however, by adjusting the compensation contract, i.e. increasing the compensation rate in the profit metrics. Importantly, there is no indirect effect from this channel because the tax-motivated part of royalty payments does not affect investment or production. Hence, the higher compensation rate maps the transfer pricing strategy of the firm on the firm's executive payments so that observable information on compensation schemes may reveal the transfer pricing of the MNC.

Besides shedding light on the process behind international tax planning in a decen-

tralized firm and offering a framework that allows for incorporating principal-agent aspects and endogenous compensation schemes to incentivize managers, our results directly speak to tax auditors. More precisely, our results might allow for deducing audit targets. For example, as the transfer-pricing strategy in intangibles is perfectly mirrored in the compensation rate of managers, subsidiaries that consistently report low EBIT(DA) over several years, but provide their managers with high compensation rates in their profit metrics, very likely operate a tax-aggressive pricing scheme for the use of their intellectual property. Hence, such firms should be prime targets for tax audits.

If suitable data is available, we believe that our hypotheses can be tested empirically. This might be particularly interesting if firm-level data can be combined with personal characteristics of the local managers. Moreover, on the theoretical side, our set-up can be extended to capture different allocations of decision rights between the headquarters and subsidiaries and additional trade-offs from incorporating the bargaining process for intermediate goods between upstream and downstream subsidiaries. We leave these aspects for future research.

A   Appendix

A.1   Additive sales shock

With an additive shock, the stochastic variable $\tilde{\varepsilon}$ enters the sales function additively so that stochastic sales $\tilde{S}$ turn into

$$\tilde{S} = S(K, L, e; \bar{X}) + \tilde{\varepsilon} \text{ with } S_a > 0, S_{aa} < 0 \ \forall \ a = K, L, e \text{ and } S(K, L, 0; \bar{X}) = 0, \quad \text{(A.1)}$$

and the sales-dependent royalty payments $\tilde{TP}$ turn into

$$\tilde{TP} = (p_x + tp)[S(K, L, e) + \tilde{\varepsilon}]. \quad \text{(A.2)}$$

We maintain the assumption that the sales shock is normally distributed with an expected value of zero, i.e., $\mathrm{E}[\tilde{\varepsilon}] = 0$, and that the manager has a constant absolute risk aversion. Therefore, we can still transform the manager's expected-utility function into a function of expected value and variance, and the manager's optimization problem to choose her optimal effort reads

$$\max_e EU = \alpha + \beta \left[(1 - p_x - tp) S(K, L, e) - wL \right] - \beta^2 (1 - p_x - tp)^2 d\sigma^2 - c(e). \quad \text{(A.3)}$$

Compared to the case of a multiplicative shock, the corresponding first-order condition

simplifies to balancing the expected marginal return on effort to the marginal effort costs:

$$\beta(1 - p_x - tp)S_e = \beta^* S_e = c'(e), \tag{A.4}$$

where once again $\beta^* = \beta(1 - p_x - tp)$ is the effective compensation rate of the manager. Implicit differentiation shows that higher capital investment and a larger labor share foster managerial effort

$$\frac{\partial e}{\partial j} = -\frac{\beta^* S_{ej}}{\beta^* S_{ee} - c''(e)} > 0 \quad j = K, L \tag{A.5}$$

as long as the factor inputs are complements, that is, $S_{eK}, S_{eL} > 0$.

On firm level, total profits of the MNC turn into

$$
\begin{aligned}
\Pi &= \mathrm{E}[\pi_s] + \mathrm{E}[\pi_h] = (1 - \tau_s)\left[S(K, L, e) - TP - wL - rD - W\right] - rE \\
&+ (1 - \tau_h)TP + (1 - \tau_h)rbK - rD - C^I(b)K - C^P(TP^a) - (1 - \tau_h)C_f \\
&= (1 - \tau_s)(1 - \beta)\left[(1 - p_x - tp)S(K, L, e) - wL\right] - (1 - \tau_s)\alpha - [r - (\tau_s - \tau_h)rb + C^I(b)]K \\
&+ (1 - \tau_h)(p_x + tp)S(K, L, e) - \mathrm{E}[C^P((p_x + tp)(S(K, L, e) + \varepsilon))] - (1 - \tau_h)C_f, \tag{A.6}
\end{aligned}
$$

the optimal fixed payment α still puts the manager on the utility of the outside option, $EU = \bar{U} = 0$, so that

$$\alpha = -\beta[(1 - p_x - tp)S(K, L, e) - wL] + \beta^2(1 - p_x - tp)^2 d\sigma^2 + c(e), \tag{A.7}$$

and applying condition (A.7) in the profit function (A.6) as well as the effective compensation rate $\beta^* = \beta(1 - p_x - tp)$ eventually gives the maximization problem of the HQ:

$$
\begin{aligned}
\max_{b, tp, \beta^*, L, K} \Pi &= (1 - \tau_s)\left[S(K, L, e) - wL - (\beta^*)^2 d\sigma^2 - c(e)\right] - [r - (\tau_s - \tau_h)rb + C^I(b)]K \\
&+ (\tau_s - \tau_h)(p_x + tp)S(K, L, e) - \mathrm{E}\left[C^P(tp(S(K, L, e) + \tilde{\varepsilon})\right] \\
&- (1 - \tau_h)C_f. \tag{A.8}
\end{aligned}
$$

Then, the corresponding first-order conditions are

$$\frac{\partial \Pi}{\partial b} = -\left[-(\tau_s - \tau_h)r + \frac{\partial C^I}{\partial b} \right] K = 0, \tag{A.9}$$

$$\frac{\partial \Pi}{\partial tp} = (\tau_s - \tau_h)S(K,L,e) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\{S(K,L,e) + \tilde{\varepsilon}\} \right] = 0, \tag{A.10}$$

$$\frac{\partial \Pi}{\partial \beta^*} = (1 - \tau_s)(-2)\beta^* d\sigma^2 + \Delta_e \frac{\partial e}{\partial \beta^*} = 0, \tag{A.11}$$

$$\frac{\partial \Pi}{\partial L} = (1 - \tau_s)\left[S_L - w \right] + \left[(\tau_s - \tau_h)(p_x + tp) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a} \right] tp \right] S_L + \Delta_e \frac{\partial e}{\partial L} = 0, \tag{A.12}$$

$$\frac{\partial \Pi}{\partial K} = (1 - \tau_s)S_K - \left[r - (\tau_s - \tau_h)rb + C^I(b) \right] + \left[(\tau_s - \tau_h)(p_x + tp) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a} \right] tp \right] S_K$$

$$+ \Delta_e \frac{\partial e}{\partial K} = 0, \tag{A.13}$$

where the profit wedge of an additional unit of effort is

$$\Delta_e = (1 - \tau_s)[S_e - c'(e)] + (\tau_s - \tau_h)p_x S_e + \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon} \right] \frac{tp\, S_e}{S(K,L,e)}$$

$$= [(1 - \tau_s)(1 - \beta^*) + (\tau_s - \tau_h)p_x]S_e + \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon} \right] \frac{tp\, S_e}{S(K,L,e)} > 0. \tag{A.14}$$

After applying the manager's first-order condition, the first two terms are identical to the profit wedge under a multiplicative sales shock in our baseline model. In case of an additive sales shock, however, higher effort allows for higher sales and larger 'deterministic' income shifting. Hence, the abusive royalty rate tp can be reduced and the firm saves shifting costs that are triggered by stochastic sales shocks.

First-order condition (A.9) is identical to the baseline model and marginal tax savings equal to marginal cost of internal debt unambiguously determine (internal) leverage independent of all other choices:

$$(\tau_s - \tau_h)r = \frac{\partial C^I}{\partial b}. \tag{A.15}$$

Additionally, the first-order condition for transfer pricing still determines an optimal amount of shifted income by equating expected tax savings to expected shifting costs, but it also contains a stochastic cost effect that only applies to shifting via an increase in the transfer price, see the term on the right hand side of equation (A.10)

$$(\tau_s - \tau_h) - \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a} \right] = \frac{\mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon} \right]}{S(K,L,e)}. \tag{A.16}$$

Increasing the transfer price will shift more of the stochastic sales revenues and trigger stochastic shifting costs. As shifting costs are convex, this will cause higher costs than

shifting a deterministic portion of income only.

The stochastic cost effect has a significant impact on the first-order conditions for the production factors labor and capital (A.12) and (A.13). While the risk adjustment for increased sales vanishes, a new term related to the transfer price tp enters. Relative to the baseline model with multiplicative risk, both changes work in favor of higher investment and labor demand,

$$S_L + \frac{\tau_s - \tau_h}{1 - \tau_s} p_x \, S_L + \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon}\right]\frac{tpS_L}{S(K,L,e)} + \Delta_e\frac{\partial e}{\partial L} \;=\; w, \qquad (A.17)$$

$$S_K + \frac{\tau_s - \tau_h}{1 - \tau_s} p_x \, S_K + \mathrm{E}\left[\frac{\partial C^P}{\partial TP^a}\tilde{\varepsilon}\right]\frac{tpS_K}{S(K,L,e)} + \Delta_e\frac{\partial e}{\partial K} \;=\; r^e, \qquad (A.18)$$

where $r^e = \frac{r - (\tau_s - \tau_h)rb + C^I(b)}{1 - \tau_s}$ are effective capital costs and where we have used condition (A.16). Applying the profit wedge of effort (A.14) and collecting terms gives equations (34) and (35) in the main text.

The fact that transfer pricing now fosters real investment implies that the effect of transfer pricing cannot simply be undone by adjusting the statutory compensation rate β to keep the effective compensation rate β^* constant because rearranging (A.11) leads to

$$\beta^* = \frac{\Delta_e\frac{\partial e}{\partial \beta^*}}{2d\sigma^2}, \qquad (A.19)$$

where the profit wedge directly and indirectly depends on tp now. Inserting equation (A.14) and collecting terms results in equation (36) in the main text.

A.2   Comparative static analysis

For later use, we derive the comparative-static effects on managerial effort first. Thereto, we partially differentiate equation (40) to find

$$\frac{\partial e}{\partial \beta^*} \;=\; \frac{1 - 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2}{[1 + 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2]^2}\, s(K,L), \qquad (A.20)$$

$$\frac{\partial e}{\partial L} \;=\; \frac{1 - 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2}{[1 + 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2]^2}\, \beta^* s_L, \qquad (A.21)$$

$$\frac{\partial e}{\partial K} \;=\; \frac{1 - 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2}{[1 + 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2]^2}\, \beta^* s_K, \qquad (A.22)$$

$$\frac{\partial e}{\partial d} \;=\; -\frac{2(\beta^*)^2 s(K,L)^2 \cdot \sigma^2}{[1 + 2(\beta^*)^2 s(K,L)^2 \cdot d \cdot \sigma^2]^2}\, \beta^* s(K,L) < 0. \qquad (A.23)$$

Neither internal leverage b nor transfer pricing tp have a direct impact on the manager's effort decision as long as the HQ adjusts the effective remuneration rate β in order to compensate effects from transfer pricing. Furthermore, the tax rate of the HQ, τ_h, and

the tightness of income shifting regulation, parameters ψ and χ, do not affect the effort decision directly. Consequently $\frac{\partial e}{\partial b} = \frac{\partial e}{\partial tp} = \frac{\partial e}{\partial \tau_h} = \frac{\partial e}{\partial \psi} = \frac{\partial e}{\partial \chi} = 0$.

In the following, we will assume that the risk aversion of the manager is sufficiently low to ensure that the standard incentive effects on managerial effort hold. More specifically, we assume that

$$1 - 2(\beta^*)^2 s(K, L)^2 \cdot d \cdot \sigma^2 > 0, \tag{A.24}$$

which is also a sufficient condition for the second-order condition of effort choice to be guaranteed. Under assumption (A.24), we have that $\frac{\partial e}{\partial \beta^*} > 0$, $\frac{\partial e}{\partial L} > 0$ and $\frac{\partial e}{\partial K} > 0$. A higher participation in EBIT(DA) and an increased use of production factors, leading to higher sales, foster the return on effort and induce the manager to work harder.

The sensitivities of the effort elasticity follow as

$$\frac{\partial^2 e}{\partial(\beta^*)^2} = -\frac{4\beta^* s(K,L)^3 d \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] < 0,$$

$$\frac{\partial^2 e}{\partial\beta\partial L} = \frac{s_L}{N^3} - s_L \frac{4(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2}{N^3} \cdot \left[3 - (\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right],$$

$$\frac{\partial^2 e}{\partial\beta^*\partial K} = \frac{s_K}{N^3} - s_K \frac{4(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2}{N^3} \cdot \left[3 - (\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] = \frac{s_L}{s_K}\frac{\partial^2 e}{\partial\beta\partial L},$$

$$\frac{\partial^2 e}{\partial\beta\partial d} = -s(K,L)\frac{2(\beta^*)^2 s(K,L)^2 \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] = \frac{\beta^*}{2d}\frac{\partial^2 e}{\partial(\beta^*)^2} < 0,$$

$$\frac{\partial^2 e}{\partial L^2} = \beta^* s_{LL}\frac{1 - 2(\beta^*)^2 s(K,L)^2 d\sigma^2}{N^3} - \beta^* s_L \frac{4(\beta^*)^2 s(K,L)s_L d \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] < 0,$$

$$\frac{\partial^2 e}{\partial L\partial K} = \beta^* s_{LK}\frac{1 - 2(\beta^*)^2 s(K,L)^2 d\sigma^2}{N^3} - \beta^* s_K \frac{4(\beta^*)^2 s(K,L)s_L d \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right],$$

$$\frac{\partial^2 e}{\partial L\partial d} = -\beta^* s_L \frac{2(\beta^*)^2 s(K,L)^2 \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] < 0,$$

$$\frac{\partial^2 e}{\partial K^2} = \beta^* s_{KK}\frac{1 - 2(\beta^*)^2 s(K,L)^2 d\sigma^2}{N^3} - \beta^* s_K \frac{4(\beta^*)^2 s(K,L)s_K d \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] < 0,$$

$$\frac{\partial^2 e}{\partial K\partial d} = -\beta^* s_K \frac{2(\beta^*)^2 s(K,L)^2 \cdot \sigma^2}{N^3} \cdot \left[3 - 2(\beta^*)^2 s(K,L)^2 d \cdot \sigma^2\right] < 0,$$

where $N = 1 + 2(\beta^*)^2 s(K,L)^2 d\sigma^2$.

Totally differentiating the system of first-order conditions of the HQ's profit-maximization problem, equations (16) to (20), and the manager's optimal effort choice (40) leads to

$$
\begin{pmatrix}
-C^I_{bb} & 0 & 0 & 0 & 0 & 0 \\
0 & -E[C^P_{TPTP} \cdot (1+\epsilon)] & 0 & 0 & 0 & 0 \\
0 & 0 & & & & \\
0 & 0 & & BH & & \\
0 & 0 & & & & \\
0 & 0 & & & &
\end{pmatrix}
\begin{pmatrix}
db \\
dTP^a \\
d\beta^* \\
dL \\
dK \\
de
\end{pmatrix}
=
\begin{pmatrix}
r \\
1 \\
\frac{p_x}{1-\tau_s}\frac{\partial e}{\partial \beta^*} \\
\frac{p_x}{1-\tau_s}\left(s_L e + s(K,L)\frac{\partial e}{\partial L}\right) \\
\frac{br}{1-\tau_s} + \frac{p_x}{1-\tau_s}\left(s_K e + s(K,L)\frac{\partial e}{\partial K}\right) \\
0
\end{pmatrix}
d\tau_h +
\begin{pmatrix}
C^I_{b\psi} \\
0 \\
0 \\
0 \\
\frac{C^I_\psi}{1-\tau_s} \\
0
\end{pmatrix}
d\psi +
\begin{pmatrix}
0 \\
E[C^P_{TP\chi} \cdot (1+\epsilon)] \\
0 \\
0 \\
0 \\
0
\end{pmatrix}
d\chi,
$$

(A.25)

where the submatrix BH is given by

$$
\begin{pmatrix}
B_\beta s(K,L)e - \frac{\partial e}{\partial \beta^*} + A_2\frac{\partial^2 e}{\partial(\beta^*)^2} & B_\beta \beta^* s_L e + A_2\frac{\partial^2 e}{\partial \beta^* \partial L} & B_\beta \beta^* s_K e + A_2\frac{\partial^2 e}{\partial \beta^* \partial K} & 2B_\beta \beta^* s(K,L) \\
2B_L s(K,L)e - s(K,L)\frac{\partial e}{\partial L} + A_2\frac{\partial^2 e}{\partial L\partial\beta^*} & B_L\beta^* s_L e + A_1 s_{LL}e + A_2\left(s_L\frac{\partial e}{\partial L} + s(K,L)\frac{\partial^2 e}{\partial L^2}\right) & B_L\beta^* s_K e + A_1 s_{LK}e + A_2\left(s_K\frac{\partial e}{\partial L} + s(K,L)\frac{\partial^2 e}{\partial L\partial K}\right) & B_L\beta^* s(K,L) + A_1 s_L \\
2B_K s(K,L)e - s(K,L)\frac{\partial e}{\partial K} + A_2\frac{\partial^2 e}{\partial K\partial\beta^*} & B_K\beta^* s_L e + A_1 s_{KL}e + A_2\left(s_L\frac{\partial e}{\partial K} + s(K,L)\frac{\partial^2 e}{\partial K\partial L}\right) & B_K\beta^* s_K e + A_1 s_{KK}e + A_2\left(s_K\frac{\partial e}{\partial K} + s(K,L)\frac{\partial^2 e}{\partial K^2}\right) & B_K\beta^* s(K,L) + A_1 s_K \\
(B_e - 1)s(K,L) & (B_e - 1)\beta^* s_L & (B_e - 1)\beta^* s_K & [1 + 2(\beta^*)^2 s(K,L)^2 d\sigma^2]^2
\end{pmatrix}
$$

where we differentiated for the total volume of profits shifted by transfer pricing (TP^a) instead of the abusive royalty rate tp, and where

$$
A_1 = 1 + \frac{\tau_s - \tau_h}{1 - \tau_s}p_x - 2(\beta^*)^2 s(K,L)e \cdot d \cdot \sigma^2, \tag{A.26}
$$

$$
A_2 = 1 - \beta^* + \frac{\tau_s - \tau_h}{1 - \tau_s}p_x > 0, \tag{A.27}
$$

$$
B_\beta = -2e \cdot d \cdot \sigma^2 < 0, \tag{A.28}
$$

$$
B_L = -2\beta^* \cdot d \cdot \sigma^2 \cdot s_L \cdot e < 0, \tag{A.29}
$$

$$
B_K = -2\beta^* \cdot d \cdot \sigma^2 \cdot s_K \cdot e < 0, \tag{A.30}
$$

$$
B_e = 2(\beta^*)^2 s(K,L)^2 \cdot e \cdot d \cdot \sigma^2 > 0. \tag{A.31}
$$

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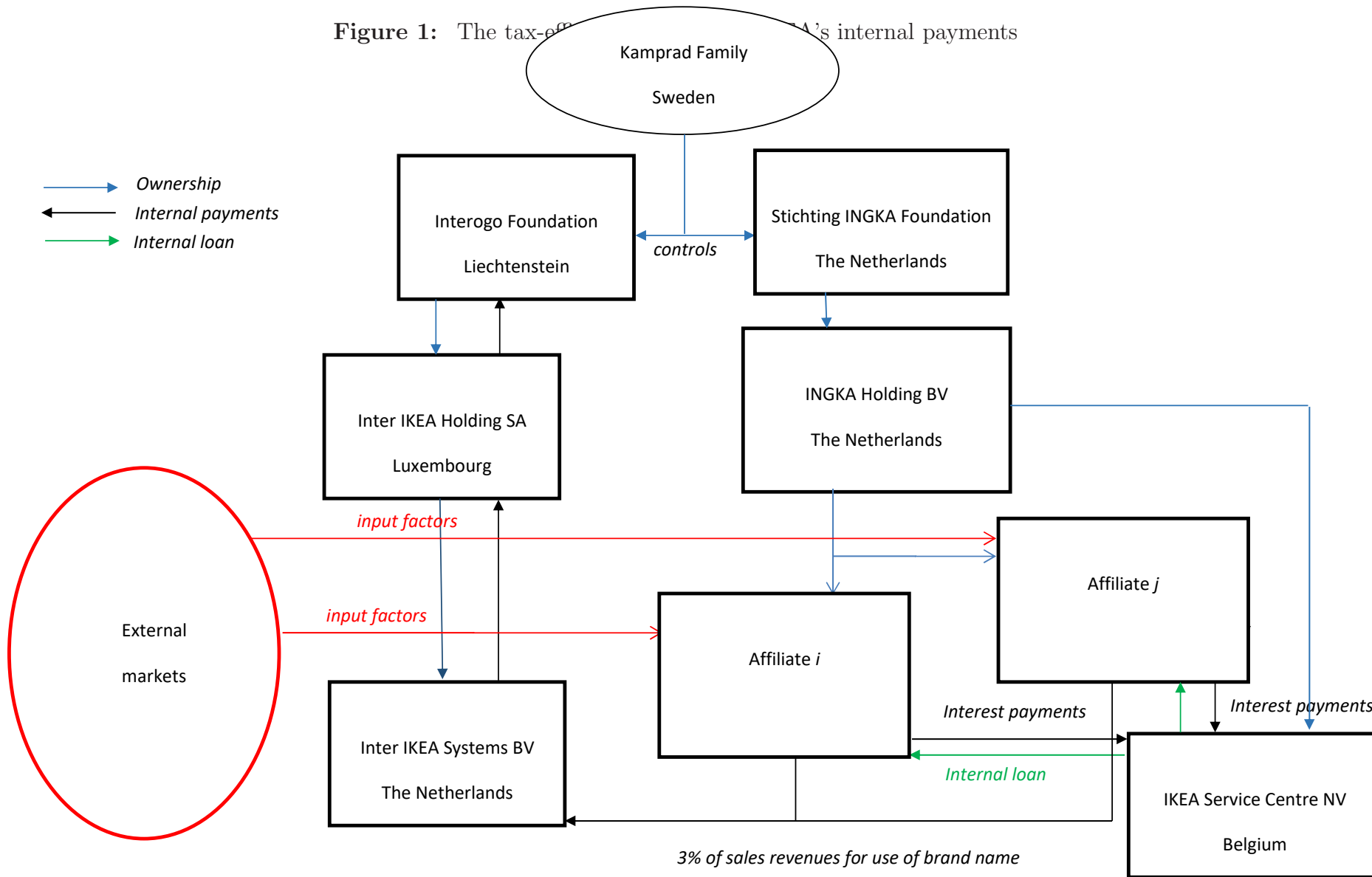Gresik, T. 2001. The taxing task of taxing transnationals. *Journal of Economic Literature* 39 (3): 800–838.

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Figure 1: The tax-e????????A's internal payments

This figure provides a simplified overview on the internal payments within the IKEA universe to avoid taxes. The illustration is mainly based on the report by Auerbach (2016).

Figure 2: MNC structure and financial flows

Country h (low-tax)

Country s (high-tax)

equity E
debt D

dividend payments
internal interest payments

input factors
- capital K
- labor L
- production technology $\bar{X}$

royalty payments TP

production technology $\bar{X}$

effort e for marketing activities
and coordination of production