Transfer Pricing and Location Choice of Intangibles Spillover and Tax Avoidance through Profit Shifting

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Abstract

Large multinational companies are regularly suspected of using transfer pricing of intangibles to shift profits from high- to low-tax jurisdictions. We study the optimal transfer prices while endogenizing the location choice of intangibles and considering spillovers. In line with the initial intuition, we find that multinationals locate their intangibles in low-tax jurisdictions and deploy royalty flows to minimize tax payments. However, if multinationals face a trade-off between tax minimization and efficient spillover internalization, the so-called ‘home bias’ might occur. Then, for a large spillover, the intangible is optimally located in the high-tax domestic country. This leads to less severe investment distortions because the spillover is internalized. In addition, the model predicts that curtailing profit shifting possibilities can either harm or facilitate multinationals’ overall investments. This depends heavily on unobservable factors such as the underlying accounting system. Therefore, our analysis highlights challenges for the anti-avoidance legislation of governments.

Keywords. profit shifting, intangibles, spillover, transfer pricing, location choice

JEL Classifications. F23, L24, H26, O34

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1 Introduction

The low effective tax rates enjoyed by large multinational companies (MNCs) and the underlying profit shifting to low-tax jurisdictions have drawn public attention. The European Union and its member states are particularly concerned about collecting the taxes they are owed (Drozdiak, 2017; Wall Street Journal, 2017). Transfer pricing is often used to shift profits. In particular, locating intangibles in low-tax jurisdictions and the subsequent royalty flows are effective means of avoiding tax payments. Empirical evidence reveals that intangibles display a ‘home bias’. Karkinsky and Riedel (2012) show that the average European MNC files 57.1 percent of its annual patent applications from the parent location. For trademarks, Heckemeyer et al. (2018) find an even stronger ‘home bias’. They document that 95.3 percent of the U.S. trademarks registered at the USPTO between 2003 and 2012 are owned by U.S. constituents of the S&P 500. This seems to be counterintuitive at first glance.

The unique nature and especially the public good character of intangibles allow for considerable discretion in their location choice and respective transfer pricing. Moreover, the use of existing intangibles entails no or negligible marginal costs. Additionally, an intangible is typically non-exclusive in its consumption, and spillovers or network effects typically occur (Lev, 2001). These network effects may appear as spillovers from one division’s investments in intangibles to other divisions’ profits. The internalization of these spillovers is crucial for the success of decentralized MNCs (Roberts, 2005). The prior literature demonstrates that transfer pricing might help to induce the internalization of spillovers (Bouwens et al., 2017). However, most of the existing research regarding transfer pricing neglects these aspects and investigates only tax optimization. We extend this strand of literature by incorporating both spillovers and tax optimization. Tax-saving incentives may interfere with the internalization incentives of spillovers, therefore affecting the location choice and the respective transfer pricing. The objective of this paper is to shed light on the impact of an intangible’s specific characteristics on its location choice and corresponding transfer pricing decisions.

Regarding the unique characteristics of intangibles, we focus on missing marginal costs for using an existing intangible, spillovers, non-rivalry in its consumption, and the ease of the location choice. In particular, we examine the following research questions: Is the intangible optimally...
located in the high- or in the low-tax jurisdiction? That is, do MNCs exhibit a ‘home bias’ for their location choice of intangibles? How does a spillover influence the MNCs’ location choice, respective royalty payments, and corresponding investment decisions related to intangibles?

We consider a decentralized MNC comprising a headquarters and a domestic and a foreign division. The MNC’s headquarters and the domestic division are located in a high-tax jurisdiction. The foreign division operates in a low-tax country. Each division seeks to maximize its after-tax divisional profits. The MNC has a ready-to-use intangible (for example, a brand, a patent, a database, or a quality concept) and headquarters determines this intangible’s location, i.e., which part of the MNC owns the intangible. This intangible is separately used by the MNC’s divisions. The use of the intangible by one division is not detrimental to the consumption possibilities of the other division, and marginal costs do not arise from its use. In order to sustain or even increase the expected benefits resulting from the intangible, the divisions using it need to invest in maintenance (Roberts, 2005; Sandner and Block, 2011). For example, creating a brand, a patent, or a database is usually the first step. Failure to maintain the brand in each market might result in its deterioration. Similarly, an unmaintained database might soon become out-of-date and thus useless. Failing to maintain or even establish the MNC’s operations according to the patent’s technology means that the patent’s profit potential cannot be realized. These maintenance investments may create spillovers for other divisions, i.e., one division might benefit from the maintenance investment of another division. For example, advertising investments in the domestic country may also increase the awareness of a brand in a foreign country through word-of-mouth, internet presence, or product placement in movies, sitcoms, and talk shows. In the considered setting, transfer pricing has two functions: first, paying for the use of the existing intangible and, second, providing the divisions with incentives for making maintenance investments. This results in two potentially conflicting objectives of transfer pricing.

The MNC can either implement a one set of books (OSB) or two sets of books (TSB) transfer pricing system. Empirical findings indicate that both accounting systems are used (Klassen et al., 2017; Springsteel, 1999), so we consider each system. First, a OSB setting is investigated where a single transfer price is determined to induce optimal maintenance investments and report the taxable income. Second, we consider a TSB setting that allows the MNC to decouple
its internal decision making from external reporting.\textsuperscript{1}

When an MNC faces no restrictions on internal transfer pricing, the foreign division operating in the low-tax jurisdiction owns the intangible. The external royalty rate\textsuperscript{2} is straightforwardly the highest acceptable rate. Thus, profit is shifted to the low-tax jurisdiction. In general, the optimal internal royalty rate does not equal zero despite the lack of costs incurred from using the intangible. The reason is that adequate maintenance investments are induced by non-zero internal royalty rates. Specifically, the optimal internal royalty rate is positive (negative) for a small (high) spillover. Thus, with a high spillover, the domestic division receives a maintenance investment subsidy. This is beneficial for the foreign division because the domestic division internalizes its spillover on the foreign division’s contribution margin.

Despite the huge tax-saving potential of intangibles’ transfer pricing, companies aim at complying with tax law (Economist, 2004; Cools and Emmanuel, 2006; Cools and Slagmulder, 2009). Moreover, Klassen et al. (2017) have shown in a survey regarding transfer pricing strategies for large multinationals that the majority of MNCs prioritized preventing disputes with tax authorities above the tax minimization objective. Mills (1998) and Mills and Sansing (2000) have highlighted that large book-tax differences create red flags for tax authorities. The identification of large discrepancies between internal and external transfer prices has similar consequences. Thus, an MNC using TSB with large differences between internal and taxable income induces increased scrutiny by tax authorities (EY, 2003). Although, tax avoidance is perfectly legal, higher scrutiny by tax authorities is undesirable since participation in the audit process is costly. On the one hand, time needs to be spent preparing for the audit. On the other hand, tax professionals charge fees for representation. Beck et al. (2000) term this the audit participation penalty. Thus, MNCs aim at avoiding long-lasting audits and disputes. Therefore, MNCs refrain from creating large discrepancies. This creates restrictions on an MNC’s transfer pricing. In particular, we consider a restriction on an MNC’s internal transfer price. For the sake of simplicity, we assume that MNCs refrain from using negative internal royalty rates, while the

\textsuperscript{1} We are not interested in the question of whether OSB or TSB is preferable or used in equilibrium. There is literature investigating this question (see, for example, Haak et al. (2017)).

\textsuperscript{2} The MNC uses royalty-based transfer pricing, so we use the terms royalty rate and transfer price interchangeably throughout the paper.
arm’s length principle requires positive external royalty rates. This non-negativity assumption is a surrogate for a restriction on transfer pricing when MNCs focus on preventing disputes triggered by large discrepancies between internal and external transfer prices. In our model, other restrictions regarding excessive discrepancies between the internal and external transfer price will yield qualitatively identical effects.

When restrictions on the internal royalty rate are present, i.e., either TSB with restrictions or OSB, locating the intangible in the low-tax foreign jurisdiction is discouraged. Then, assigning ownership to the high-tax country can be optimal. Specifically, for small (large) spillovers, the intangible is optimally located in the low-tax (high-tax) jurisdiction. The MNC faces the following trade-off. On the one hand, tax-saving behavior is most effective when the foreign division owns the intangible. On the other hand, better internalization of the spillover is obtained when the intangible is located in the high-tax domestic jurisdiction. For a large spillover, internalization becomes more important. That is, the threat of inconclusive but long-lasting and expensive disputes with the tax authority caused by large discrepancies between internal and external transfer prices can induce MNCs to locate the intangible in the domestic, high-tax jurisdiction. Thus, our findings illustrate that a trade-off between tax minimization and efficient spillover internalization may explain the empirical evidence on MNCs’ tendency to hold intangibles in the parent’s high-tax jurisdiction, the so-called ‘home bias’ (Karkinsky and Riedel, 2012; Griffith et al., 2014; Dischinger et al., 2014; Heckemeyer et al., 2018).

Tax authorities and governments determine the MNCs’ abilities to engage in profitable profit shifting by defining the legal environment. Our results show that the effect of curtailing profit shifting possibilities is intricate. Indeed, restricting profit shifting can harm domestic investment. This is in line with prior research (Desai et al., 2006; Hong and Smart, 2010; Juranek et al., 2018). However, we extend this strand of literature by showing that whether lower profit shifting possibilities are detrimental for investment incentives depends on the underlying accounting system and the spillover’s magnitude. If TSB with restrictions are in place, transfer pricing is already used to optimally tackle tax minimization and induce investment decisions. Thus, decreasing profit shifting possibilities leads to decreased investment. However, under an OSB accounting system, the transfer pricing decision simultaneously targets tax optimization and providing investment incentives. Hence, reducing profit shifting possibilities mitigates the
trade-off because the tax-saving possibilities decrease. This, in turn, may either increase or decrease investment incentives depending on which objective dominates the decision.

This highlights the problem regulators face when designing anti-avoidance legislation. On the one hand, governments are interested in collecting the taxes they are owed and therefore introduce countermeasures to circumvent profit shifting and tax avoidance, such as the recent BEPS project. However, our results show that the outcome of restricting profit shifting depends on the accounting system in place and the spillover’s magnitude. The coexistence of different accounting systems and spillovers are only two of a variety of factors that could lead to unintended consequences. Thus, our results show that implementing anti-avoidance regulations is a very complex task.

The remainder of the paper proceeds as follows. In the next two sections, the related literature and the model are presented. Then, section 4 presents two benchmark cases. The first-best solution and a no-tax world are considered. Section 5 depicts the optimal location choice under OSB. Section 6 discusses the location choice when the MNC keeps TSB and restrictions on internal royalty rates are either absent or present. Section 7 concludes the paper.

2 Literature Review

Hall and Jorgenson (1967) illustrate that taxes affect the attraction of additional capital investment. Our findings show that curtailing profit shifting possibilities can either reduce or increase MNCs’ incentives to invest in intangible maintenance.

The literature on transfer pricing for intangibles (with tax considerations) is scarce. Johnson (2006) examines different transfer pricing methods for intangibles. In the studied setting, two divisions consecutively create the intangible. Her results highlight that royalty-based transfer pricing with renegotiation can achieve the first-best investment incentives when the investments are either quasi-independent or substitutes. As we concentrate on compliant tax avoidance and negotiated transfer prices are perceived as potentially harming tax compliance (Cools and Slagmulder, 2009), our analysis is restricted to royalty-based transfer pricing. We add to the findings of Johnson (2006) by showing that spillovers affect internal transfer prices and that an MNC facing a trade-off between tax minimization and efficient spillover internalization may exhibit a ‘home bias’.
De Simone and Sansing (2014) investigate whether cost sharing arrangements serve to shift intellectual property offshore to low-tax jurisdictions in the presence of spillovers from marketing intangibles. They show that a cost sharing arrangement can be useful to shift profits if the spillover of the domestic division exceeds the foreign spillover on domestic profits. This result occurs because the Internal Revenue Service assumes that marketing intangibles increase only the profits of the division that owns them. Hence, spillovers are neglected in IRS considerations. We show that it is crucial to consider spillovers to estimate the consequences of regulatory activities. Bornemann (2018) additionally investigates different consequences of cost sharing versus licensing agreements. He finds that investment-specific characteristics affect the decision to design a contract as a licensing or cost sharing agreement. In contrast to De Simone and Sansing (2014) and Bornemann (2018), we investigate the location choice of an existing intangible rather than its development because empirical findings show that an intangible’s development and subsequent location choice can easily be disentangled (Karkinsky and Riedel, 2012).

De Waegenaere et al. (2012) model a patent race among MNCs making research and development investments and the subsequent production of tangible assets. During the production of tangible assets, the intangible is exploited. The production can take place either domestically or in the foreign country. De Waegenaere et al. (2012) show that weaker enforcement of the arm’s length principle may improve social welfare. We find related results by showing that narrowing the arm’s length range can harm the investments of an MNC. We extend their findings by showing that investment incentives can also increase depending on spillovers and the accounting system in place.

Recently, Juranek et al. (2018) investigate how different methods employed in determining an arm’s length price influence MNCs’ investment decisions when the intangible is located in a low-tax jurisdiction. Moreover, they are interested in the appropriateness of a source tax for reducing profit shifting via royalties. We add to their findings by considering different accounting systems and a spillover. We show that a spillover combined with decreasing profit shifting possibilities can also induce increasing investment incentives. For a high spillover, in line with the empirically documented ‘home bias’, we find that locating the intangible in the high-tax country can become optimal. Then, it becomes possible to internalize the spillover in the MNC’s investment decisions. Moreover, we respond to the call by Shackelford and Shevlin...
(2001) for more theoretical research regarding the development of theories allowing for the
development of testable hypotheses.

In addition, we contribute to the empirical literature on the location choice for intangibles
(Karkinsky and Riedel, 2012; Griffith et al., 2014; Dischinger et al., 2014; Heckemeyer et al.,
2018). This literature offers several potential explanations for a ‘home bias’. These are that
headquarters often finances the development of the intangible and bears the risk, making it the
legal owner of the intangible (Karkinsky and Riedel, 2012). Moreover, the headquarters exhibits
economies of scale in the administration and management process of intangibles (Karkinsky and
Riedel, 2012; Heckemeyer et al., 2018), and headquarters’ managers value their influence over
valuable assets and, thus, seek to keep them at the headquarters (Dischinger et al., 2014). Fur-
thermore, MNCs want to avoid taxes upon the repatriation of profits from the foreign division
to the headquarters (Dischinger et al., 2014) and to minimize payments regarding withholding
taxes (Heckemeyer et al., 2018). Additionally, particularities in tax transfer pricing regulation
and the law regulating and protecting the intangible can make transferring the intangible to the
low-tax jurisdiction unattractive (Heckemeyer et al., 2018).

Whereas these antecedents of the ‘home bias’ are mostly related to particularities of tax regula-
tions and law, we illustrate the impact of spillovers on the location choice for intangibles. Thus,
we provide an additional economic explanation for the ‘home bias’ documented in the empiri-
cal literature. In addition, our model predicts that the ‘home bias’ of trademarks is most likely
larger than the ‘home bias’ of patents. This implication is supported by empirical evidence
reported by Karkinsky and Riedel (2012) and Heckemeyer et al. (2018).

3 Model Description

We investigate whether an intangible should be located in the low-tax country when restrictions
on transfer pricing exist. We are interested in the implications of the location choice and an
MNC’s maintenance investments. Therefore, in line with prior work of Juranek et al. (2018),
we neglect the initial invention and innovation of the intangible. According to the findings of
Karkinsky and Riedel (2012) and Schwab and Todtenhaupt (2017), neglecting the development
of an intangible is not restrictive. They show that the development of an intangible and its
actual location are independent. This becomes even more relevant if exit taxes are considered.
Obviously, exit taxes make a relocation less attractive. Thus, MNCs will attempt to avoid costly relocations by anticipating subsequent consequences and determine the intangible’s location ex ante. This is in line with empirical findings that the location choice of an intangible typically takes place at an early stage of the development process when the intangible’s prospects are highly uncertain. Thus, we assume that MNCs anticipate the consequences of their location choice, so that the location choice takes place ex ante and no relocation occurs.

We consider a divisionalized MNC operating in a low- and a high-tax country. The MNC has a ready-to-use intangible and comprises a headquarters $HQ$, a domestic division $D$, and a foreign division $F$. The foreign division operates in the low-tax jurisdiction. Its income is taxed at tax rate $t$. The headquarters and the domestic division are located in the high-tax jurisdiction, where their income is taxed at rate $t + h$, where $0 < t, h < 1$ and $t + h < 1$. Both divisions generate profits using the existing intangible. These profits can be increased by maintenance investments of each division $j$, with $j = F, D$. The maintenance investments are costly $c_j = k \theta_j^2$, with $j = F, D$, where $k > 0$ denotes the unit cost of the investment, and $\theta_j \in [0, 1]$ is division $j$’s investment. We assume that $k$ is sufficiently large in order to ensure that $0 \leq \theta_j \leq 1$ holds true. Maintenance investments are expensed. Division $j$ decides on the investment $\theta_j$ to maximize the division’s after-tax profit $\Pi_j$. The headquarters cannot verify the total investment. These costs reduce the investing division’s taxable income. Division $j$ generates direct contribution margin $x_j$, which is either high or low, where division $j$’s investment $\theta_j$ determines the probability of obtaining the high direct contribution margin. That is, $x_j = 1$ is realized with probability $\theta_j$. Otherwise, the investing division faces the baseline contribution margin, which we normalize without loss of generality to $x_j = 0$.

We assume that the investment of the high-tax division has a spillover $\beta$, with $0 \leq \beta \leq 1$, on the contribution margin of the foreign division (the indirect effect on the contribution margin). All results hold true if we consider bilateral spillovers as long as the domestic spillover exceeds the foreign spillover. Thus, we normalize the spillover from the foreign division’s investment and expost costs with $\beta = 0$.

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3 This is a standard assumption in the literature (Johnson, 2006).
4 For the sake of simplicity, we assume that each division has additional operations generating revenues and costs, so that the investment expenditures $c_j$ cannot be inferred.
on the domestic division’s contribution margin to zero. Of course, negative spillovers might also occur. However, if a sufficiently detrimental spillover is expected, it would be reasonable to deny the non-owning division access to the intangible imposing negative externalities on the other division. A typical example of negative spillovers are luxury brands. The allowance to use the brand name in other divisions can be detrimental by inflating the market and thereby destroying the exclusiveness of the brand. For example, Burberry recently attracted adverse media attention by burning tons of clothes rather than discounting them and thereby possibly inflating the market.\footnote{https://www.bbc.com/news/business-44885983.} This shows that MNCs attempt to prevent negative expected spillovers. Thus, in expectation, the spillover should be positive. Therefore, we assume a positive spillover. In line with Bouwens et al. (2017), we model a linear spillover. That is, the total contribution margin of the low-tax division is $M_F = x_F + \beta x_D$, whereas the contribution margin of the domestic division is determined solely by its own investments, i.e., $M_D = x_D$.

Due to the specific features of intangibles, the boundaries of ownership are blurred. In particular, the non-rivalry in consumption allows both divisions to use the intangible without facing scarcity. However, the owning division has the right to decide whether other parties are allowed to use the intangible or not. In particular, the legal owner of the intangible is determined by the right to enjoy, sell, rent, or even destroy an item of property. In line with prior research (Grossman and Hart, 1986), we define the owner of an intangible as the residual claimant. However, in contrast to Grossman and Hart (1986), the right to determine corresponding quantities or investments does not belong to the residual rights in our setting.

The headquarters locates the ready-to-use intangible in order to maximize its overall after-tax profit $\Pi_{HQ}$.\footnote{The divisions’ after-tax profits $\Pi_D$ and $\Pi_F$ and the headquarters’ after-tax profit $\Pi_{HQ}$ depend on the location choice, the determined royalty rates, and the accounting system in place. Whenever necessary, we present the expected profit functions in the main text or the appendix.} The headquarters has various strategic choices. On the one hand, it can decide that one of its two divisions legally owns the intangible. On the other hand, the headquarters can own the intangible or decide that both divisions jointly hold the intangible. That is, we consider four possibilities for the intangible’s location. Either, the domestic division, the foreign division, both divisions jointly, or the headquarters can own the intangible.
We consider an administered transfer pricing environment, i.e., the price setting power remains under the headquarters’ control for all ownership possibilities. Based on prior research, we tie the royalty rate $\gamma \in \mathbb{R}$ to the non-owning division’s contribution margin (see, for example, Johnson (2006) and Bornemann (2018)). The headquarters chooses the transfer prices, i.e., the internal and the external royalty rate, in order to maximize the overall after-tax profit. To ensure that our results do not depend on the underlying but unobservable accounting system, we conduct the analysis twice. First, we consider an OSB setting. Afterward, we investigate the TSB case. In the TSB case, the MNC disentangles the royalty rates for internal and external purposes. In particular, investment decisions might be affected by an internal royalty rate $\gamma_i \in \mathbb{R}$, whereas the external royalty rate $\gamma_r \in [\gamma_r, \overline{\gamma}_r]$ with $0 < \gamma_r < \overline{\gamma}_r < 1$ serves for tax reporting. This range reflects the acceptable arm’s length royalty rates. In line with the transfer pricing literature, we assume exogenous boundaries for the arm’s length range (see, for example, Baldenius et al. (2004) and Johnson (2006)). Since we are interested in tax avoidance rather than illegal tax evasion, the MNC always chooses a price from this exogenous arm’s length range. The timing of the game is depicted in figure 1.

![Figure 1: Timeline](https://ssrn.com/abstract=3314732)

### 4 Benchmark Cases

We now turn to the analysis of the location choice. This section provides two benchmarks to demonstrate that the ‘home bias’ does not occur in the first-best solution or in a no-tax world. In particular, in the first benchmark, we examine the location choice when the headquarters ob-

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7 Juranek et al. (2018) investigate how different transfer pricing methods and the possibly differing arm’s length ranges influence profit shifting with intangibles.
serves and dictates the investment decisions, i.e., the first-best solution. The second benchmark considers a no-tax world.

4.1 Benchmark 1: First-Best Solution

In the first-best solution, the headquarters observes the divisions’ investment decisions. If the divisions implement investment levels different from the headquarters’ preferred ones, the headquarters can punish the division managers. Therefore, investment decisions according to the headquarters’ preferences are induced.

Locating the intangible in the foreign division allows the MNC to legally shift profits from the high- to the low-tax jurisdiction. This reduces the MNC’s tax liability, so that locating the intangible in the foreign division is preferred to ownership by the domestic division, headquarters, or joint ownership.

If the headquarters assigns ownership to the foreign division, the domestic division makes a royalty payment to the low-tax jurisdiction. The maximum profit is shifted to the low-tax jurisdiction by setting the external royalty rate as high as possible, i.e., $\gamma_r = \overline{\gamma_r}$. The first-best investment decisions of the headquarters are:

$$
\theta_{D, fb} = \frac{1}{k} + \frac{\beta(1-t) + h\overline{\gamma_r}}{k(1-t-h)},
$$

$$
\theta_{F, fb} = \frac{1}{k}.
$$

Obviously, the domestic investment level is increasing in the spillover $\beta$, and the foreign investment is unaffected.

**Lemma 1.** In the first-best solution, the MNC locates the intangible in the low-tax foreign division.

4.2 Benchmark 2: No-Tax World

As a second benchmark, we investigate which location is preferable in a no-tax world. This enables us to isolate tax effects in the next section. This is especially interesting because MNCs are often suspected to locate their intangibles solely to reduce their tax liability. Without tax

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8 All proofs are stated in the appendix.
regulation, the MNC is free to design its royalty scheme in order to maximize the overall profit. We acknowledge that taxes induce different first-best investments than in a no-tax world. Therefore, the first-best investments of the domestic division are affected by taxes, so that we consider an adapted level of the first-best domestic investment in a no-tax world. First-best investments cannot be achieved if the domestic division owns the intangible. Basically, the royalty payment from the foreign division leads to a partial internalization of the indirect effect on the foreign contribution margin. However, a royalty payment reduces the investment incentives of the foreign division in a no-tax world. Hence, a trade-off is inherent in designing the transfer pricing scheme even without taxes.\textsuperscript{9} This negative effect can easily be avoided as the following analysis shows. Legal ownership can be assigned to the foreign division. Then, transfer pricing is used to affect the divisions’ decisions regarding maintenance investments. The domestic division expects the following profit:\textsuperscript{10}

\[ E \left[ \Pi_{D,NT}^F \right] = (1 - \gamma) \theta_D - \frac{k}{2} \theta_D^2 \]

and the foreign division’s profit comprises its own revenues and the royalty income. Hence, its expected profit is given by:

\[ E \left[ \Pi_{F,NT}^F \right] = \theta_F + \theta_D (\beta + \gamma) - \frac{k}{2} \theta_F^2. \]

Hence, the division’s investment decisions are as follows:

\[ \theta_{D,NT}^F = \frac{1 - \gamma}{k} \]

and

\[ \theta_{F,NT}^F = \frac{1}{k}. \]

Thus, the investment incentives of the foreign division are not affected by the royalty payment. Nevertheless, the foreign division is also interested in providing investment incentives to the domestic division due to the indirect effect on its own contribution margin. Obviously, a royalty

\textsuperscript{9} The proofs for all four considered ownership settings are in the appendix.

\textsuperscript{10} The subscript \textit{NT} highlights the no-tax cases, whereas the absence of the \textit{NT} subscript signals tax world considerations. The superscript indicates the owner of the intangible.
rate $\gamma_{NT} = -\beta$ induces the first-best domestic investment. For economic reasons, this royalty rate is negative and can be interpreted as an investment subsidy. Although the foreign division owns the intangible, it pays an investment subsidy to the domestic division to ensure that the spillover is internalized correctly.

The same result is achieved if the headquarters owns the intangible. Then, both divisions have to pay royalties in order to secure access to the intangible. First-best investments can be achieved if the foreign division uses the intangible free of charge. Thus, the headquarters asks for a zero royalty $\gamma_{HQ}^{F,NT} = 0$. Furthermore, the headquarters pays an investment subsidy, i.e., $\gamma_{D,NT}^{HQ} = -\beta$ to the domestic division to induce the spillover’s internalization. Hence, first-best investments in both divisions require a redistribution of profits. In a no-tax world without any restrictions concerning the royalty rate, profit shifting is necessary to induce optimal maintenance investments.

With joint ownership, an investment subsidy might be profit enhancing. However, no subsidy can be found that the foreign division is willing to accept. Both divisions own the intangible, so that no royalties are paid, and first-best investments cannot be induced. Hence, foreign ownership or ownership by the domestic headquarters dominates joint ownership.

**Proposition 1.** Without taxes, the MNC is indifferent between locating the intangible in the domestic headquarters or abroad. For either location choice, first-best investments can be induced. Despite the absence of marginal costs, optimal transfer pricing includes non-zero royalty rates.

## 5 Location Choice of Intangibles under OSB

Before examining the TSB case in section 6, we investigate the OSB setting in this section. That is, we restrict the MNC’s transfer pricing flexibility by requiring the internal and the external royalty rate to coincide.

### 5.1 Royalty Rates and Location Choices under OSB

If the foreign division owns the intangible, the overall after-tax profit contains a tax-saving position. Thus, the headquarters’ expected profit is given by:

$$E \left[ \Pi_{HQ}^{F} \right] = (1 - t - h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] + (1 - t) \left[ \beta \theta_D + \theta_F - \frac{k}{2} \theta_F^2 \right] + h \gamma, \theta_D. \quad (1)$$
Under an OSB setting, a single royalty rate has to be determined that balances the conflicting objectives and therefore maximizes the headquarters’ overall after-tax profit. The entire transfer pricing decision is restricted to the interval \([γ_r, \overline{γ}_r]\) because we focus on legal tax avoidance. Thus, a trade-off is inherent in the MNC’s decision. The resulting transfer pricing decision if the intangible is located in the foreign division is given by:\(^{11}\)

\[
γ_{r,\text{OSB}}^F = \begin{cases} 
γ_r & \text{for } β \in [0, β_{1,\text{OSB}}] \\
\frac{h-(1-t)β}{1-t+h} & \text{for } β \in (β_{1,\text{OSB}}, β_{2,\text{OSB}}) \\
\overline{γ}_r & \text{for } β \in [β_{2,\text{OSB}}, 1].
\end{cases}
\]

The divisions’ investment choices with foreign ownership are:

\[
θ_{D,\text{OSB}}^F = \frac{1}{k} \left(1 - γ_{r,\text{OSB}}^F\right),
\]

\[
θ_{F,\text{OSB}}^F = \frac{1}{k}.
\]

If the domestic division owns the intangible, the overall after-tax profit contains a term indicating that incoming royalties have to be taxed at the higher tax rate. Thus, the headquarters’ expected profit is given by:

\[
E[Π_{D,\text{HQ}}] = (1 - t - h) \left[θ_D - \frac{k}{2}θ_F^2\right] + (1 - t) \left[βθ_D + θ_F - \frac{k}{2}θ_F^2\right] - hγ_r (βθ_D + θ_F).
\]

The resulting transfer pricing decision if the intangible is located in the domestic division is given by:

\[
γ_{r,\text{OSB}}^D = \begin{cases} 
γ_r & \text{for } β \in [0, β_{1,\text{OSB}}] \\
\frac{(1-t)β^2-h(1+β)}{β^2(1-t+h)+1-t-2h} & \text{for } β \in (β_{1,\text{OSB}}, β_{2,\text{OSB}}) \\
\overline{γ}_r & \text{for } β \in [β_{2,\text{OSB}}, 1].
\end{cases}
\]

\(^{11}\) All threshold values and findings in this section are presented in the appendix.
The divisions’ investment choices with domestic ownership are:

\[
\theta_{D,OSB} = \frac{1}{k} \left( 1 + \beta r_{D,OSB} \right),
\]

(7)

\[
\theta_{D,OSB} = \frac{1}{k} \left( 1 - \gamma r_{D,OSB} \right).
\]

(8)

With joint ownership, the effect of the spillover is never internalized. That is, both divisions invest \(1/k\).

For a low spillover, i.e., \(\beta < \beta_F\),\(^{12}\) it is optimal to locate the intangible abroad. The ownership of the intangible is assigned to the foreign division, and profits are shifted effectively. While the foreign division implements the first-best investment decision, the domestic division underinvests relative to the first-best solution. This investment distortion is small for a low spillover, so that the tax-saving motive drives the location choice. That is, even for the most restrictive internal pricing policy, i.e., forcing MNCs to use OSB, the tax-saving motive dominates the location choice for a small spillover.

The MNC only uses the most tax-effective transfer price \(\gamma_r\) for a very low spillover, i.e., for \(\beta \in \left[0, \beta_{F,OSB}^1\right]\).\(^{13}\) Otherwise, a transfer price smaller than \(\gamma_r\), i.e., either \(\frac{h - (1-t)\beta}{1-t+h}\) or \(\gamma_r\), is used (see equation (2)). That is, the MNC mitigates the investment distortion by partially forgoing the profit shifting benefits.

If the spillover is high, the investment distortion is detrimental. Therefore, investment decisions drive the location choice. In case of joint ownership, profit shifting does not occur at all. Additionally, while the foreign division still invests according to the first-best solution, the domestic division underinvests less relative to the foreign ownership case. Hence, for a medium spillover, joint ownership becomes optimal in the OSB setting.

The intangible is optimally held in the high-tax jurisdiction for a high spillover. The domestic division owns the intangible under OSB for a high spillover to mitigate the investment distortion. In particular, compared to foreign and joint ownership, the domestic division underinvests less in this case. Paying a royalty induces the foreign division to underinvest. The spillover is so

\(^{12}\)The superscript F and the subscript J indicate that the threshold \(\beta_F^J\) is the level of the spillover at which the headquarters is indifferent between locating the intangible in the foreign division or using joint ownership.

\(^{13}\)As outlined in the appendix: \(0 < \beta_{F,OSB}^1 < \beta_{F,OSB}^2 < \beta_F\).
important that profit shifting to the high-tax country is accepted as a consequence. In sum, we can show that the intangible is located in the high-tax jurisdiction for a high spillover, i.e., $\beta \geq \beta^D_p$, where $\beta^D_p < \beta^D_{1,OSB}$. For $\beta \in [\beta^F_p, \beta^D_{1,OSB}]$, profits are shifted to the high-tax country using the least harmful transfer price $\gamma$. When the spillover is very high, i.e., $\beta > \beta^D_{1,OSB}$, the investment distortions are the most severe. Then, the MNC is willing to shift more profits to the high-tax country by setting a transfer price larger than $\gamma$ (see equation (6)). Our findings are summarized in proposition 2 and illustrated in figure 2.

**Proposition 2.** For $h < \frac{3 - \sqrt{5}}{2} (1 - t)$ and $\gamma_t < \frac{1 - t}{1 - t+h}$, under an OSB accounting system, and

- a low spillover, i.e., $\beta \leq \beta^F_p$, the intangible is located in the low-tax foreign division,
- a medium spillover, i.e., $\beta^F_p < \beta < \beta^P_p$, joint ownership is optimal,
- a high spillover, i.e., $\beta \geq \beta^P_p$, the intangible is located in the high-tax domestic division.

![Figure 2: Expected Firm Profits with Foreign (F), Joint (J) and Domestic (D) Ownership under OSB (plotted for $\gamma = 0.1$, $\gamma_t = 0.5$, $t = 0.2$, $h = 0.15$, and $k = 3$)](https://ssrn.com/abstract=3314732)

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14 The superscript D and the subscript J indicate that the threshold $\beta^D_p$ is the level of the spillover at which the headquarters is indifferent between locating the intangible in the domestic division or using joint ownership.

15 The first threshold is decreasing in the tax rate $t$. For $t = 0.1$ or $t = 0.3$, the first threshold allows a maximal tax rate differential of 0.344 or 0.267, respectively. The second threshold is decreasing in $t$ and $h$. For $t = 0.3$ and $h = 0.25$, the maximal upper bound of the arm’s length range $\gamma_t$ is 0.737. That is, numerous tax jurisdictions fulfill these two criteria regarding $h$ and $\gamma_t$. 

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Electronic copy available at: https://ssrn.com/abstract=3314732
5.2 Profit Shifting Effects on Investments under OSB

Next, we examine the effect of various exogenous factors on our OSB findings. For $\beta \in [\beta_2^{F,OSB}, \beta_f]$, an increase in the lower bound of the arm’s length range $\gamma$ reduces the domestic investment when the intangible is located abroad. Thus, greater investment distortion results from an increasing $\gamma$, while the investment with joint ownership is unaffected. As a consequence, the higher the lower bound of the arm’s length range is, the lower the spillover needs to be for the headquarters to favor foreign ownership. For $\beta \in [\bar{\beta}_f^F, \bar{\beta}_1^{D,OSB}]$ and domestic ownership, a higher arm’s length price $\gamma$ reduces the domestic investment distortion by increasing domestic investment. However, the investment distortion of the foreign division increases. A higher $\gamma$ induces more profits being shifted from the low- to the high-tax jurisdiction. This unfavorable effect dominates the investment effects, so that a higher spillover is needed to induce the headquarters to locate the intangible in the domestic division.

For $\beta \in [\bar{\beta}_1^{F,OSB}, \bar{\beta}_2^{D,OSB}]$, an increase in the upper bound of the arm’s length range $\gamma$ does not affect the divisions’ investment decisions because the used transfer price is smaller than $\gamma$. That is, the attractiveness of domestic, foreign, or joint ownership is unaffected by a rise in $\gamma$.

Furthermore, an increasing tax rate differential $h$ makes profit shifting to the low-tax jurisdiction more attractive and profit shifting to the high-tax jurisdiction more costly. Therefore, a higher spillover is required to make it optimal for the headquarters to use joint and domestic ownership.

**Corollary 1.** The threshold levels of the spillover $\beta_f^D$ and $\beta_f^D$ are

- decreasing and increasing in the lower bound of the arm’s length range $\gamma$, respectively,
- unaffected by a rise in the upper bound of the arm’s length range $\gamma$, and
- increasing in the tax rate differential $h$.

When the headquarters uses a transfer price that is an interior value from the arm’s length range, i.e., $\beta \in (\bar{\beta}_1^{F,OSB}, \bar{\beta}_2^{F,OSB})$ or $\beta \in (\bar{\beta}_1^{D,OSB}, \bar{\beta}_2^{D,OSB})$, the spillover $\beta$ affects the royalty rate. A higher spillover increases the importance of domestic investment. Thus, lowering the royalty rate under foreign ownership provides higher investment incentives to the domestic division. Under domestic ownership, a higher royalty rate provides the domestic division with a larger share of the spillover effect. Therefore, the domestic division’s investment incentives increase. However, an increasing spillover does not affect the royalty rate when the headquarters has already applied a corner value of the arm’s length range.
Proposition 3. For foreign ownership and OSB, an increasing spillover either decreases the royalty rate or the royalty rate is unaffected.  
For domestic ownership and OSB, an increasing spillover either increases the royalty rate or the royalty rate is unaffected.

We are also interested in the effect of reducing the MNC’s profit shifting possibilities by narrowing the arm’s length range. Whenever the headquarters applies a corner value of the arm’s length range as the transfer price, the divisions’ investments are affected by an increasing lower bound or a decreasing upper bound. Specifically, a higher lower bound is detrimental to the MNC’s investment incentives, while a lower upper bound fosters these incentives. This is summarized in proposition 4 and depicted in figure 3.

Proposition 4. For $\beta \in [0, \beta_1^{F,OSB}]$ or $\beta \in [\beta_2^{D,OSB}, 1]$, curtailing profit shifting possibilities by narrowing the arm’s length range leads to increased investment incentives for the MNC under OSB.
For $\beta \in [\beta_2^{F,OSB}, \beta_1^{F,OSB}]$ or $\beta \in [\beta_1^{D,OSB}, \beta_2^{D,OSB}]$, curtailing profit shifting possibilities by narrowing the arm’s length range leads to decreased investment incentives for the MNC under OSB.
For any other spillover $\beta$, curtailing profit shifting possibilities by narrowing the arm’s length range does not affect the investment incentives for the MNC under OSB.

The tax rate differential $h$ affects the divisions’ investment choices only when the headquarters does not use a corner value of the arm’s length range. A higher tax rate differential increases the benefits from shifting profits from the high- to the low-tax jurisdiction but does not affect
the benefits from the spillover. The MNC reacts to the higher tax-saving potential by increasing (decreasing) the royalty rate under foreign (domestic) ownership. This results in lower domestic investment. In the case of domestic ownership, due to the lower royalty rate, the foreign division retains a higher share of its contribution margin. That is, the marginal benefits from foreign investment on foreign profits increase, while the marginal investment costs are unaffected. Thus, the foreign division invests more. When the headquarters uses a corner value of the arm’s length range as the transfer price, a rise in the tax rate differential does not affect the royalty rate. Therefore, domestic and foreign investment are unaffected.

**Proposition 5.** Suppose that the MNC keeps OSB. An increasing tax rate differential
- decreases or does not affect domestic investment and
- increases or does not affect foreign investment.

### 6 Location Choice of Intangibles under TSB

The conflict between the different objectives is mitigated by keeping TSB because the headquarters faces a higher degree of freedom in using different royalty rates for different purposes. Hence, relaxing the requirement that the internal and external royalty rates have to coincide makes the trade-off less severe.

#### 6.1 No Restriction on Transfer Pricing

In a TSB setting without any restrictions on the internal royalty rate, foreign ownership dominates.\(^\text{16}\) Specifically, the expected profits are given by:

\[
E \left[ \Pi_D^F \right] = (1 - t - h) \left( \theta_D - \frac{k}{2} \theta_D^2 \right) - \gamma_i \theta_D + \gamma_r \theta_D (t + h)
\]

and

\[
E \left[ \Pi_F^F \right] = (1 - t) \left( \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right) + \gamma_i \theta_D - t \gamma_r \theta_D.
\]

The headquarters’ expected profit is given by equation (1), which was introduced in section 5. The internal royalty rate is only implicitly considered in the headquarters’ expected profit

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\(^\text{16}\) All proofs are in the appendix.
because it affects the investment decisions of divisional managers. Since the internal incentive provision and external reporting objectives are decoupled, it is obvious that the MNC is interested in the highest possible external transfer price under foreign ownership, i.e., $\gamma_r$, to maximize its tax savings. The divisions choose their investment levels to maximize their own after-tax profits. The divisions’ investment decisions are given by:

$$\theta_D^F = \frac{1}{k} + \frac{1}{k(1-t-h)} [\gamma_r(t+h) - \gamma_i]$$

and

$$\theta_F^F = \frac{1}{k}.$$  

Stipulating the following internal royalty rate induces first-best investments:

$$\gamma_i^F = \gamma_r t - (1-t) \beta.$$  

In this subsection, we do not consider restrictions on transfer prices, so that this internal royalty rate becomes negative for a high spillover $\beta$. Then, the foreign division subsidizes the investment of the domestic division. Therefore, the spillover is optimally exploited. Hence, the underinvestment problem present under OSB is alleviated. In addition to the internalization problem, maximal tax savings can be generated by legally shifting profits from the high-tax to the low-tax jurisdiction.

### 6.2 Restriction on Transfer Pricing and Resulting Home Bias

Recently, Mescall and Klassen (2018) demonstrate that MNCs incorporate the transfer pricing risk due to potential future tax audits into their considerations. Moreover, extant evidence has shown that large discrepancies between internal and external transfer prices entail increased scrutiny in a potential tax audit (Badertscher et al., 2009; Mills, 1998; Mills and Sansing, 2000; Chen and Gavious, 2017). That is, MNCs focusing on preventing long-lasting and costly disputes with the tax authority consider restrictions on transfer pricing to avoid large discrepancies. We assume that internal royalty rates have to be non-negative in cross-border transactions. We use this non-negativity requirement for the internal royalty rate to display restrictions on internal transfer pricing. However, this surrogate is chosen for the sake of simplicity and convenient presentation. Non-negativity is not necessary to obtain our results. Merely the existence of
restrictions on internal transfer pricing decisions is needed, which are decidedly prevalent in MNCs’ decision making (Graham et al., 2014).

If restrictions on transfer pricing are present, an investment subsidy is not possible because large discrepancies should be avoided. Then, it is no longer straightforward that the foreign division owns the intangible.

For a low spillover, namely \( \beta < \beta^F \), optimal investments can be achieved. If the spillover is high, i.e., \( \beta > \beta^F \), first-best investments cannot be induced. Refraining from large discrepancies in cross-border transactions curtails the MNC’s internal pricing possibilities. Thus, the MNC has to trade off the conflicting objectives of tax minimization and investment incentives even when decoupling internal and external decision making.

For a large spillover, ownership by the headquarters can be used to induce less distorted investment incentives for the domestic division by setting appropriate internal transfer prices. The domestic division and the headquarters are located in the same tax jurisdiction. Hence, tax avoidance via profit shifting between the headquarters and the domestic division is not an issue.\(^{17}\) Tax authorities are resource constrained and therefore need to strategically choose which transactions will be considered in greater detail (OECD, 2015). Therefore, it is most likely that cross-border transactions are scrutinized because of the absence of a profit shifting motive in purely domestic transactions. Thus, the headquarters can differentiate the royalty rates so that the restriction on internal transfer pricing is only a concern in cross-border transactions.

If the headquarters owns the intangible, it charges royalty fees to both divisions. Hence, the expected profits of the divisions are as follows:

\[
E\left[\Pi_{HQ}^D\right] = (1 - t - h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] + \theta_D \left[ \gamma_r (t + h) - \gamma_iD \right]
\]

and

\[
E\left[\Pi_{HQ}^F\right] = (1 - t) \left[ \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right] + (\theta_F + \beta \theta_D) \left[ \gamma_r t - \gamma_iF \right].
\]

The headquarters receives the royalty payments. Because the headquarters is located in the high-tax jurisdiction, all royalty income is taxed within the high-tax country. Thus, the expected

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\(^{17}\) This holds true if there is no reduced tax rate for passive income, i.e., no IP-Box. Furthermore, we suppress the possibility of loss carryforwards and hidden distributions.
overall after-tax profit of the MNC is given by:

\[
E \left[ \Pi_{HQ} \right] = (1 - t - h) \left( \theta_D - \frac{k}{2} \theta_D^2 \right) + (1 - t) \left( \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right) - h \gamma_r (\theta_F + \beta \theta_D).
\]

Obviously, the headquarters chooses \( \gamma_r \) in order to minimize its tax liability while complying with the arm’s length principle. The internal trade is perfectly legal because the arm’s length principle is not violated. Thus, the domestic division has to pay an internal royalty rate of:

\[
\gamma_{HQ}^{ID} = \gamma_r (t + h) - \beta (1 - t - h \gamma_r).
\]

The domestic division faces a royalty agreement that can be either positive or negative. However, the domestic tax authorities’ income is not affected. Thus, the MNC cannot be accused of tax avoidance. The foreign division is incentivized with the following internal royalty rate when the headquarters owns the intangible:

\[
\gamma_{HQ}^{IF} = \gamma_r (t + h).
\]

In line with prior research, we show that the internal royalty rates depend on the externally accepted royalty rate (Hyde and Choe, 2005; Haak et al., 2017).

If the indirect effect of the domestic division’s investment on the contribution margin of the foreign division is high, i.e., \( \beta > \beta_{HQ} \), ownership by the headquarters becomes preferable. The intuition is as follows. If the foreign division holds the intangible, tax savings might be generated because profits are shifted to the low-tax jurisdiction. However, a high spillover leads to a severe domestic investment distortion if the domestic division is not forced to internalize this spillover. Hence, appropriate investment incentives become more important as the spillover increases. Ownership by the headquarters leads to a less severe domestic investment distortion because it allows for the subsidization of the domestic division’s investment and thus leads to an internalization of the spillover.

Our findings are summarized in proposition 6 and illustrated in figure 4.

**Proposition 6.** In a TSB setting without restrictions on internal transfer pricing, the intangible is located in the foreign division. With restrictions on internal transfer pricing and

- a low spillover, i.e., \( \beta < \beta_{HQ} \), the intangible is located in the low-tax foreign division
- a large spillover, i.e., \( \beta > \beta_{HQ} \), the intangible is located in the domestic headquarters even though it is in the high-tax jurisdiction.
Despite the absence of marginal costs, optimal transfer pricing schemes include non-zero internal royalty rates for a very low and a large spillover.

Figure 4: Expected Firm Profits with Foreign (F) and Headquarters (HQ) Ownership under Restrictions on Transfer Pricing (plotted for $\gamma_r = 0.1$, $\gamma_F = 0.5$, $t = 0.2$, $h = 0.15$, and $k = 3$)

In contrast to the OSB setting, joint ownership is always dominated by foreign ownership for an MNC keeping TSB. Similar to the OSB setting, the intangible is optimally held in the high-tax jurisdiction under a high spillover, i.e., the 'home bias' occurs. In particular, the spillover is so important that profit shifting to the high-tax country is accepted. With OSB, a single transfer price is used to provide investment incentives to both divisions. That is, higher domestic investment incentives can only be achieved by reducing foreign investment incentives. While decoupling under TSB allows better tax-saving behavior, the link between the domestic and foreign investment incentives persists. However, by using headquarters ownership under TSB, the investment incentives for the domestic and the foreign division can be separated. Therefore, the headquarters can provide higher domestic investment incentives without harming foreign investment incentives. Rather than locating the intangible in the domestic division as under OSB, headquarters ownership is preferred under TSB.

Empirical findings suggest that intangibles are often located in the high-tax jurisdiction of an MNC’s headquarters despite the presence of tax rate differentials and that profit shifting might reduce the MNC’s tax liability (Karkinsky and Riedel, 2012; Dischinger et al., 2014; Heckemeyer et al., 2018). Empirical studies conclude that the so-called 'home bias' is difficult to explain. Potentially, part of this bias stems from spillovers and transfer pricing considerations. We have shown that locating the intangible in the high-tax jurisdiction is preferable for a high
spillover under TSB with restrictions on internal transfer pricing and OSB. That is, a ‘home bias’ might occur whenever the MNC faces a trade-off between tax minimization and efficient investment incentives.

The findings of proposition 6 imply that a high (low) spillover is associated with locating the intangible in the high-tax domestic (low-tax foreign) jurisdiction. Patents relate to a specific technology, product, or process, whereas trademarks likely affect the entire business of an MNC. That is, trademarks seems to have larger spillovers than patents. Thus, our model predicts that trademarks exhibit a larger ‘home bias’ than patents. This empirical implication is supported. Whereas Heckemeyer et al. (2018) document that 95.3 percent of US trademarks are located in the US, Karkinsky and Riedel (2012) depict that only 57.1 percent of patent applications occur in the parent location. This finding seems to be especially surprising because the results of Pfeiffer and Voget (2017) indicate that MNCs use trademarks more frequently for tax planning than they do patents. According to our model, this difference might stem from spillovers and considerations regarding the prevention of inconclusive but costly disputes with the tax authority.

Of course, there is a large body of additional explanations of the ‘home bias’. Typical examples are litigation costs, legal certainty in the home country, and exit taxes. We do not negate all these potential explanations for the ‘home bias’. Our aim is to show that there might be economic reasons in addition to all the other factors that might lead to a ‘home bias’. Hence, the location choice of intangibles might be much more complex than it appears at first sight. That is, although tax-saving potentials are considered in the location choice of the intangible, the MNC also considers spillover effects. Our results might help to better understand reasons for intangible location choice beyond pure tax and legal considerations.

6.3 Profit Shifting Effects on Investments

In the following, we investigate how our results are affected by varying exogenous factors. The threshold $\beta^{HQ}$ determines the minimum spillover that is needed to optimally locate the intangible in the high-tax jurisdiction under TSB with restrictions on internal transfer pricing. This threshold is increasing in the lower bound of the arm’s length range $\gamma$. An increase in $\gamma$ forces the MNC with headquarters ownership to shift more profit from the low-tax to the high-tax jurisdiction.
jurisdiction, whereas the MNC’s profit under foreign ownership is unaffected. Thus, to induce the MNC to locate the intangible at the headquarters, which is in the high-tax jurisdiction, the investment incentives need to become more important. Therefore, the threshold $\beta_{HQ}$ increases with a rise in $\gamma$. This is similar to the result under OSB in corollary 1. When the upper bound of the arm’s length range $\gamma_r$ increases, the MNC’s profit shifting possibilities under foreign ownership increase. The arm’s length price $\gamma_r$ does not affect the MNC’s profit under headquarters ownership. This means that solely foreign ownership becomes more attractive. Thus, a higher spillover is required to make it optimal to assign ownership to the headquarters.

This finding is contrary to the OSB finding in corollary 1, where an increase in the upper bound of the arm’s length range does not affect the location choice. The reason is that in the OSB setting, the royalty rate for a medium spillover is smaller than the upper bound of the arm’s length range. Therefore, the expected profits are unaffected.

A higher tax rate differential implies higher incentives for shifting profits to the low-tax jurisdiction. With foreign ownership, the MNC can optimally exploit legal tax-saving possibilities. This is not possible with ownership by the headquarters because profits are shifted to the high-tax country and then have to be taxed at the higher tax rate. Hence, foreign ownership becomes more attractive. However, whereas foreign ownership results in a greater distortion of the domestic investment decision, headquarters ownership allows better domestic investment. In order to still outweigh the increasing benefits of foreign ownership due to an increase in the tax rate differential, the minimum spillover $\beta_{HQ}$ has to increase to make headquarters ownership optimal. This is similar to the OSB finding in corollary 1.

**Corollary 2.** The threshold level of the spillover $\beta_{HQ}$ is increasing in

- the lower bound of the arm’s length range $\gamma_r$,
- the upper bound of the arm’s length range $\gamma_r$, and
- the tax differential $h$ for $h < (1 - t)/2$.

When the spillover is high, its internalization becomes important. The internal royalty rate becomes negative when preventing disputes with the tax authority is not an issue, i.e., no restriction on the internal transfer price is imposed. This can be interpreted as an investment subsidy. Nevertheless, an increasing spillover leads to decreased internal royalty rates under foreign ownership. Two effects on the headquarters’ expected profit occur. First, an increasing
spillover leads to a higher foreign contribution margin. Second, the domestic investment affects both the domestic and the foreign divisions’ contribution margins. Hence, with an increasing spillover, the investment incentives of the domestic division become more important from the headquarters’ perspective. If the MNC is interested in preventing long-lasting and expensive disputes, ownership by the headquarters allows the implementation of less distorted domestic investment. The headquarters faces a higher degree of freedom in the transfer pricing design if the intangible is located in the high-tax jurisdiction. The internal royalty rate for cross-border transactions does not depend on the spillover. However, the internal royalty rate for domestic transactions decreases with an increasing spillover. In particular, the investment subsidy increases because a higher spillover makes domestic investment incentives more important.

**Proposition 7. An increasing spillover either decreases the internal royalty rate, or the internal royalty rate is unaffected.**

The finding of proposition 7 is similar to the result regarding foreign ownership under OSB (proposition 3). However, proposition 3 states a contrary finding for domestic ownership under OSB. With domestic ownership, the foreign division makes a royalty payment to the domestic division. For a higher spillover and thus higher benefits from less distorted domestic investment, the MNC induces the domestic division to invest more by using a higher royalty rate. When the MNC already uses a corner value of the arm’s length range, a marginal increase in the spillover benefits cannot be exploited by increasing the royalty rate.

Furthermore, we are interested in the effect of reducing the profit shifting possibilities. The arm’s length range determines the MNC’s possibilities to engage in legal tax avoidance and corresponding profit shifting. In line with prior theoretical research (Desai et al., 2006; Hong and Smart, 2010; Juranek et al., 2018) and empirical findings (Schwab and Todtenhaupt, 2017), we can show that narrowing the arm’s length range and corresponding reduction in profit shifting possibilities harms the investment incentives in the TSB setting. If the intangible is located in the low-tax jurisdiction, the investment incentives provided to the domestic division decreases if less profit shifting is possible. The investment incentives of the foreign division remain the same because its investment affects only its own profits. In the case of headquarters ownership, reducing profit shifting possibilities harms the investment incentives for both divisions.

Our result also contributes to prior findings of De Waegenaere et al. (2012), who show that a
weaker enforcement of the arm’s length principle may improve social welfare. Under TSB, the deterioration of the overall investment incentives due to reduced profit shifting possibilities is not sensitive to the ownership location of the intangible. That is, tight transfer pricing regulations may have negative impacts on real investment decisions. This finding is summarized in Proposition 8.

**Proposition 8.** Curtailing profit shifting possibilities by narrowing the arm’s length range leads to decreased investment incentives for the MNC under TSB.

Parts of related OSB findings in proposition 4 are contrary to proposition 8. The difference occurs because an MNC keeping OSB has to use a transfer price belonging to the arm’s length range for both tax and internal objectives. Whenever a corner value of the arm’s length range is applied, one of the purposes dominates. For example, the tax-saving objective dominates for a very low spillover, so that the MNC locates the intangible in the low-tax foreign jurisdiction and uses the upper bound of the arm’s length range as the transfer price. This allows maximal legal profit shifting while providing little investment incentives for the domestic division. By curtailing the profit shifting possibilities, the internal objective receives more emphasis. That is, the MNC’s investment incentives increase. Propositions 4 and 8 illustrate that the effect of curtailing profit shifting possibilities depends on the underlying accounting system and with OSB additionally on the spillover’s magnitude. Both the accounting system and the spillover are usually unobservable. As a consequence, regulators that curtail profit shifting possibilities have difficulty estimating the consequences of their actions for MNCs’ investments. This makes anti-avoidance regulation a complex task.

Next, we consider the impact of the tax rate differential $h$ on the divisions’ investment incentives. An increase in the tax rate differential decreases the domestic division’s after-tax investment costs because the investment costs are tax deductible. A higher tax rate differential does not affect the benefits from the domestic division’s maintenance investment, so that in sum, the domestic investment increases. This is true for both foreign and headquarters ownership.

The impact on the foreign division’s investment incentives depends on the location choice. First, an increase in the tax rate differential does not affect the foreign division’s investment decision at all in the case of foreign ownership. Second, under ownership by the headquarters, the foreign division pays a positive external royalty rate for using the intangible. The headquarters in turn
enjoys royalty income. An increase in the tax rate differential decreases the after-tax benefit from this royalty income. However, the foreign division’s investment costs are unaffected. As a consequence, headquarters provides less investment incentives through a higher internal royalty rate. In sum, the location choice does not affect the impact of an increasing tax rate differential on the domestic investment decision. The impact on the foreign investment decision depends on the location choice.

**Proposition 9.** Suppose that the MNC keeps TSB. An increase in the tax rate differential

- increases the domestic investment,
- decreases (does not affect) foreign investment when the intangible is located in the high-tax headquarters (low-tax foreign division).

Most parts of proposition 9 are contrary to the related OSB findings in proposition 5. Again, using a single transfer price for both tax optimization and to provide investment incentives under OSB is responsible for the difference. The tax rate differential affects the investments under OSB only when neither of the inherent objectives dominates. This is the case when the transfer price employed is not a corner value of the arm’s length range. A higher tax rate differential increases the benefits from profit shifting to the low-tax jurisdiction so that the tax optimization objective gains importance. With foreign ownership, the MNC increases the royalty rate to shift more profits from the domestic to the foreign division. This curbs the domestic investment benefits. As with TSB, the foreign investment benefits are unaffected. With domestic ownership under OSB, the MNC decreases the royalty rate payable by the foreign to the domestic division. Thus, the domestic division obtains a smaller part of the spillover. Therefore, the marginal investment benefits decrease, while the marginal investment costs are unaffected. A smaller royalty rate increases the foreign division’s marginal investment benefits, so that foreign investment rises. As with curtailing profit shifting possibilities, the MNC’s accounting system affects how changes in the tax rate differential influence the investments.

7 Conclusion

Intangibles are critical for an MNC’s success and are often unique but not exclusive in their consumption. Furthermore, the use of an intangible is typically associated with no or negligible marginal costs, and spillovers regularly occur. Nevertheless, when an intangible is used
by several divisions, internal royalty payments are necessary to induce adequate maintenance investments. In addition to this internal role of royalty payments, an external transfer price is mandatory to report taxable income. Cross-border transactions are likely to entail tax audits. Therefore, MNCs that are especially concerned with the prevention of disputes with the tax authority refrain from large discrepancies between the internal and external transfer price. We study the optimal royalty rates while endogenizing the location choice of an intangible. Non-zero royalty rates are necessary to induce adequate maintenance investments because of a spillover from the domestic to the foreign division’s contribution margin.

Our model highlights that without restrictions on the internal transfer price, the intangible is located in the low-tax jurisdiction. This allows the MNC to optimally shift profits to minimize its tax liability. This result is in line with initial intuition. However, it is well known that large discrepancies between internal and external transfer prices trigger increased scrutiny and mistrust. MNCs that are interested in preventing disputes with the tax authority while keeping TSB therefore consider restrictions on internal transfer prices.

If restrictions on the internal transfer price are present and spillovers are low, locating the intangible in the low-tax jurisdiction is still optimal. However, for a high spillover, the MNC needs to trade-off effective legal profit shifting and investment distortions. Beneficial profit shifting is obtained when the intangible is held by the foreign division operating in the low-tax jurisdiction. A higher spillover results in higher benefits from adequate maintenance investments. As a consequence, for a large spillover, the benefits from less severe domestic investment distortions exceed the costs arising from ineffective profit shifting. Thus, the intangible is located in the high-tax domestic jurisdiction. A similar finding occurs when the MNC keeps OSB. This provides a potential explanation for the ‘home bias’ found in the empirical literature.

Recently, governments and tax authorities have sought to curtail MNCs’ profit shifting possibilities. In particular, the BEPS project is intended to reduce profit shifting. Our analysis illustrates that the consequences of restricting profit shifting possibilities depend on several parameters. Our work has identified the unobservable accounting system and spillovers as two factors influencing the outcome of such regulations. Thus, curtailing profit shifting possibilities can either increase or decrease the MNC’s investment incentives. This highlights the complexity that legislators, tax authorities, and supranational organizations such as the OECD and the EU face.
when designing anti-avoidance legislation while preventing unintended outcomes.
8 Appendix

8.1 Proof of Lemma 1
When the foreign division owns the intangible headquarters’ expected profit is:

\[ E[\Pi_{HQ, fb}] = (1 - t - h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] + (1 - t) \left[ \beta \theta_D + \theta_F - \frac{k}{2} \theta_F^2 \right] + h \gamma \theta_D \]

The MNC is interested in the highest possible external transfer price, i.e., $\gamma$, in order to maximize its tax savings. Headquarters is interested in investment decisions maximizing overall after-tax profits:

\[
FOC_{\theta_D} : (1 - t - h) (1 - k \theta_1) + \beta (1 - t) + h \gamma (t + h) = 0
\]

\[
SOC_{\theta_D} : (1 - t - h) (-k) < 0
\]

\[
FOC_{\theta_F} : (1 - t) (1 - k \theta_2) = 0
\]

\[
SOC_{\theta_F} : (1 - t) (-k) < 0.
\]

Thus, the FOCs determine a local maximum: $\theta_{D,fb}$ and $\theta_{F,fb}$.

8.2 Proof of Proposition 1
We first consider all possible location choices in a no-tax world.

8.2.1 The Domestic Division owns the Intangible
Expected profits are given by:

\[ E[\Pi_D] = \theta_D - \frac{k}{2} \theta_D^2 + \gamma (\theta_F + \beta \theta_D) \]

and

\[ E[\Pi_F] = (1 - \gamma) (\theta_F + \beta \theta_D) - \frac{k}{2} \theta_F^2. \]

The divisions choose their investments in order to maximize the divisional profit:

\[
FOC_{\theta_D} : 1 - k \theta_D + \gamma \beta = 0
\]

\[
SOC_{\theta_D} : -k < 0
\]

\[
FOC_{\theta_F} : 1 - k \theta_F - \gamma = 0
\]

\[
SOC_{\theta_F} : -k < 0.
\]

Thus, the FOCs determine a local maximum:

\[ \theta_D^* = \frac{1 + \gamma \beta}{k} \]

and

\[ \theta_F^* = \frac{1 - \gamma}{k}. \]
The headquarters’ profit is equal to:

\[ E[\Pi_{HQ}] = \theta_D + \theta_F + \beta \theta_D - \frac{k}{2} (\theta_D^2 + \theta_F^2). \]  

(12)

First-best investments cannot be achieved. The headquarters chooses the transfer price in order to maximize the overall profit given the division’s investments:

\[
FOC \gamma: \frac{1}{k} \left[ \beta - 1 + \beta^2 - \frac{1}{2} (2\beta + 2\beta^2 \gamma - 2 - 2\gamma) \right]
\]

\[
SOC \gamma: \frac{1}{k} \left( (2\beta^2 + 2) - \frac{1}{2} \right) < 0.
\]

Thus, the FOC determines a local maximum. The optimal transfer price is:

\[ \gamma^D = \frac{\beta^2}{1 + \beta^2}. \]  

(13)

8.2.2 The Foreign Division owns the Intangible

Expected profit of the domestic division, incorporating royalty payments is:

\[ E[\Pi_D] = (1 - \gamma) \theta_D - \frac{k}{2} \theta_D^2 \]

and the foreign division expects a profit of:

\[ E[\Pi_F] = \theta_F + (\gamma + \beta \theta_D) - \frac{k}{2} \theta_F^2. \]

Following the procedure used in section 8.2.1 yields:

\[ \theta_D^F = \frac{1 - \gamma}{k} \]

and

\[ \theta_F^F = \frac{1}{k}. \]

The headquarters objective remains in all no-tax scenarios unchanged and are depicted in (12). First-best investments can easily be achieved setting \( \gamma = -\beta \). The foreign division is willing to accept a negative royalty payment administered by the headquarters because its expected profit with the subsidy

\[ E[\Pi_F] = \frac{1}{k} + \beta \frac{1 + \beta}{k} - \frac{k}{2} \frac{1}{k^2} - \beta \frac{1 + \beta}{k} = \frac{1}{2k} \]

(14)

equals the expected profit of the foreign division if it denies access to the intangible for the domestic division:

\[ E[\Pi_F] = \frac{1}{k} \frac{k}{2} \frac{1}{k^2} = \frac{1}{2k}. \]

First-best investments imply \( E[\Pi_{F_{HQ}}] > E[\Pi_{D_{HQ}}] \) where the superscript denotes the location choice of the intangible.
8.2.3 Joint Ownership of the Intangible

In case of a joint ownership no division faces royalty payments. The expected profits are:

\[ E[\Pi_D] = \theta_D - \frac{k}{2} \theta_D^2 \]

and

\[ E[\Pi_F] = \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2. \]

Following the procedure used in section 8.2.1 yields:

\[ \theta_D^J = \frac{1}{k} \]

and

\[ \theta_F^J = \frac{1}{k}. \]

Despite the absence of royalty payments an investment subsidy might be profit enhancing. However, no subsidy can be found the foreign division is willing to accept. This result is due to the joint ownership. No division is able to deny the other division access to the intangible. Hence, both divisions use the intangible without permission of the other one. Thus, the expected profit of the foreign division without subsidy:

\[ E[\Pi_F] = \frac{1}{k} + \frac{\beta}{k} - \frac{k}{2k} \left( \frac{1}{k^2} \right) = \frac{1}{2k} (1 + 2\beta) \]  

(15)

is higher than with subsidy because \((15) > (14)\).

The investment incentives with foreign ownership can easily replicate the incentives under consideration using \(\gamma = 0\). This implies that \(E[\Pi_{HQ}^F] > E[\Pi_{HQ}^J]\) holds true so that joint ownership of the intangible is strictly dominated.

8.2.4 The Headquarters owns the Intangible

Both divisions pay royalty fees for using the intangible. Expected profits are:

\[ E[\Pi_D] = (1 - \gamma) \theta_D - \frac{k}{2} \theta_D^2 \]

and

\[ E[\Pi_F] = (1 - \gamma)(\theta_F + \beta \theta_D) - \frac{k}{2} \theta_F^2. \]

Following the procedure used in section 8.2.1 yields:

\[ \theta_D^{HQ} = \frac{1 - \gamma}{k} \]

and

\[ \theta_F^{HQ} = \frac{1 - \gamma}{k}. \]

First-best investments can be achieved using \(\gamma_D^{HQ} = -\beta\) and \(\gamma_F^{HQ} = 0\). This implies \(E[\Pi_{HQ}^F] = E[\Pi_{HQ}^J]\).
8.3 Proof of Proposition 2

We now provide an overview over possible location choices in a tax-world when OSB is kept.

8.3.1 The Domestic Division owns the Intangible

Expected profit of the domestic division is given by:

\[
E \left[ \Pi_D^D \right] = (1 - t - h) \left[ \theta_D + \gamma (\beta \theta_D + \theta_F) - \frac{k}{2} \theta_D^2 \right]
\]

and the expected profit of the royalty paying foreign division is given by:

\[
E \left[ \Pi_F^D \right] = (1 - t) \left[ (1 - \gamma) (\beta \theta_D + \theta_F) - \frac{k}{2} \theta_F^2 \right].
\]

The divisions choose their investment levels in order to maximize their own after-tax profits.

FOC \(\theta_D\):

\[
(1 - t - h) (1 + \gamma \beta - k \theta_D) = 0
\]

SOC \(\theta_D\):

\[
(1 - t - h) (-k) < 0
\]

FOC \(\theta_F\):

\[
(1 - t) (1 - \gamma - k \theta_F) = 0
\]

SOC \(\theta_F\):

\[
(1 - t) (-k) < 0.
\]

Thus, the FOCs determine a local maximum and the investments are:

\[
\theta_D^{D,OSB} = \frac{1}{k} (1 + \gamma \beta)
\]

and

\[
\theta_F^{D,OSB} = \frac{1}{k} (1 - \gamma).
\]

Headquarters expects the following profit:

\[
E \left[ \Pi_{HQ}^D \right] = (1 - t - h) \left[ \theta_D^{D,OSB} - \frac{k}{2} (\theta_D^{D,OSB})^2 \right]
\]

\[
+ (1 - t) \left[ \beta \theta_D^{D,OSB} + \theta_F^{D,OSB} - \frac{k}{2} (\theta_F^{D,OSB})^2 \right] - h \gamma \left( \beta \theta_D^{D,OSB} + \theta_F^{D,OSB} \right)
\]

Differentiating headquarters’ expected profit with respect to \(\gamma\) yields:

FOC \(\gamma\):

\[
\frac{1}{k} \left[ \gamma (2h - 1 + \beta (1 - t + h)) + (1 - t) \beta^2 - h (1 - \beta) \right] = 0
\]

SOC \(\gamma\):

\[
\frac{1}{k} \left[ 2h - 1 + \beta^2 (1 - t + h) \right],
\]

which is negative for \(h < (1 - t)/2\). Thus, the FOC determines a local maximum. Hence, the optimal royalty rate is:

\[
\gamma_{D,OSB} = \frac{(1 - t) \beta^2 - h (1 + \beta)}{\beta^2 (1 - t + h) + (1 - t - 2h)}.
\]
However, the royalty rate needs to belong to the arm’s length range. For $\gamma_r \leq \frac{1-t}{1-t+h}$ and $h < \frac{1-t}{2}$, $\gamma^{D,OSB}_t \geq \gamma_r$ if and only if

$$\beta \geq \beta^{D,OSB}_1 := \frac{1}{2(1-t-\gamma_r(1-t+h))} \left[ h + \sqrt{h^2 + 4(1-t-\gamma_r(1-t+h))(h+(1-t-2h)\gamma_r)} \right].$$

For $\gamma_r \leq \frac{1-t}{1-t+h}$ and $h < \frac{1-t}{2}$, $\gamma^{D,OSB}_t \leq \gamma_r$ if and only if

$$\beta \leq \beta^{D,OSB}_2 := \frac{1}{2(1-t-\gamma_r(1-t+h))} \left[ h + \sqrt{h^2 + 4(1-t-\gamma_r(1-t+h))(h+(1-t-2h)\gamma_r)} \right].$$

In sum, for $\gamma_r \leq \frac{1-t}{1-t+h}$ and $h < \frac{1-t}{2}$ the optimal royalty rate is as stated in equation (6).

### 8.3.2 The Foreign Division owns the Intangible

Expected profit of the royalty paying domestic division is given by:

$$E[\Pi^F_D] = (1-t-h) \left[ (1-\gamma)\theta_D - \frac{k}{2} \theta_D^2 \right]$$

and the expected profit of the foreign division is given by:

$$E[\Pi^F_F] = (1-t) \left[ \beta\theta_F + \theta_D + \gamma\theta_D - \frac{k}{2} \theta_F^2 \right].$$

Following the procedure used in section 8.3.1 yields:

$$\theta^{F,OSB}_D = \frac{1}{k}(1-\gamma) \quad (20)$$

and

$$\theta^{F,OSB}_F = \frac{1}{k}. \quad (21)$$

Headquarters expects the following profit:

$$E[\Pi^F_{HQ}] = (1-t-h) \left[ \theta^{F,OSB}_D - \frac{k}{2} \left( \theta^{F,OSB}_D \right)^2 \right]$$

$$+ (1-t) \left[ \beta\theta^{F,OSB}_D + \theta^{F,OSB}_F - \frac{k}{2} \left( \theta^{F,OSB}_F \right)^2 \right] + h\gamma\theta^{F,OSB}_D. \quad (22)$$

Differentiating headquarters’ expected profit with respect to $\gamma$ yields:

$$FOC\gamma: \frac{1}{k} \left[ -\gamma(1-t+h) + h - (1-t)\beta \right] = 0$$

$$SOC\gamma: -\frac{1}{k} (1-t+h) < 0.$$  

Thus, the FOC determines a local maximum and the optimal royalty rate is:

$$\gamma^{F,OSB}_1 = \frac{h - \beta(1-t)}{1-t+h}. \quad (23)$$
However, the royalty rate needs to belong to the arm’s length range. \( \gamma_{1}^{F,OSB} \geq \gamma_{r} \) if and only if
\[
\beta \leq \beta_{2}^{F,OSB} := \frac{h - \gamma_{r}(1-t+h)}{1-t}.
\]
\( \gamma_{1}^{F,OSB} \leq \gamma_{r} \) if and only if
\[
\beta \geq \beta_{1}^{F,OSB} := \frac{h - \gamma_{r}(1-t+h)}{1-t}.
\]
In sum, the optimal royalty rate is as stated in equation 2.

### 8.3.3 Joint Ownership of the Intangible

Expected profit of the domestic division:
\[
E \left[ \Pi_{D}^{J} \right] = (1-t-h) \left[ \theta_{D} - \frac{k}{2} \theta_{D}^{2} \right]
\]
and
\[
E \left[ \Pi_{F}^{J} \right] = (1-t) \left[ \theta_{F} + \beta \theta_{D} - \frac{k}{2} \theta_{F}^{2} \right].
\]
Following the procedure used in section 8.3.1 yields:
\[
\theta_{D}^{J,OSB} = \frac{1}{k} \quad (24)
\]
and
\[
\theta_{F}^{J,OSB} = \frac{1}{k} \quad (25)
\]
Headquarters expected profit is:
\[
E \left[ \Pi_{HQ}^{J} \right] = (1-t-h) \left[ \theta_{D}^{J,OSB} + \frac{k}{2} \left( \theta_{D}^{J,OSB} \right)^{2} \right] + (1-t) \left[ \theta_{F}^{J,OSB} + \beta \theta_{D} - \frac{k}{2} \theta_{F}^{2} \right].
\]

### 8.3.4 Headquarters’ Ownership of the Intangible

Expected profit of the domestic division is:
\[
E \left[ \Pi_{D}^{HQ} \right] = (1-t-h) \left[ (1-\gamma_{D}) \theta_{D} - \frac{k}{2} \theta_{D}^{2} \right]
\]
and the expected profit of the foreign division is:
\[
E \left[ \Pi_{F}^{HQ} \right] = (1-t) \left[ (1-\gamma_{F})(\beta \theta_{D} + \theta_{F}) - \frac{k}{2} \theta_{F}^{2} \right].
\]
Following the procedure used in section 8.3.1 yields:
\[
\theta_{D}^{HQ,OSB} = \frac{1}{k}(1-\gamma_{D}) \quad (26)
\]
and
\[
\theta_{F}^{HQ,OSB} = \frac{1}{k}(1-\gamma_{F}) \quad (27)
\]
Headquarters expected profit is:

$$E\left[ \Pi^\text{HQ}_{HQ} \right] = (1-t-h) \left[ \theta^\text{HQ,OSB}_D - \frac{k}{2} \left( \theta^\text{HQ,OSB}_D \right)^2 \right] + (1-t) \left[ (1-\gamma_2)(\theta^\text{HQ,OSB}_F + \beta \theta^\text{HQ,OSB}_D) - \frac{k}{2} \left( \theta^\text{HQ,OSB}_F \right)^2 \right] + (1-t-h) \gamma_2 \left( \theta^\text{HQ,OSB}_F + \beta \theta^\text{HQ,OSB}_D \right).$$

The determinant of the Hessian matrix is

$$\frac{1}{k} \left( (1-t-h)(1-t-2h) - \beta^2 h^2 \right),$$

which is positive for $h < (1-t)(3 - \sqrt{5})/2 < (1-t)/2$. Thus, the Hessian matrix is negative definite and the headquarters’ expected profit is concave.

The headquarters maximizes this expected profit under the restriction that the transfer prices belong to the arm’s length range. This restriction satisfies the constraint qualification. Thus, the Kuhn-Tucker maximum conditions are necessary for an optimal solution. The headquarters expected profit is differentiable and concave in the non-negative orthant. According to the Kuhn-Tucker sufficiency theorem, transfer prices satisfying the Kuhn-Tucker maximum conditions give a global maximum. In sum, the Kuhn-Tucker maximum conditions are necessary and sufficient for a maximum.

For $\gamma_D = \gamma_F$ and $\gamma_F = \gamma_F$, all Kuhn-Tucker maximum conditions are satisfied.

$$E \left[ \Pi^\text{HQ}_{HQ} \right] \geq E \left[ \Pi^\text{HQ,OSB}_{HQ} \right]$$

so that headquarters’ ownership is dominated by joint ownership. $E \left[ \Pi^\text{D}_{HQ} \right] \geq E \left[ \Pi^\text{D}_{HQ} \right]$ if and only if $\beta < \beta^D_F$, where

$$\beta^D_F := \frac{h + \sqrt{h^2 + (\gamma_F(1+h-t) + 2(t-1))(\gamma_F(2h+t-1) - 2h)}}{2(1-t) - \gamma_F(1+h-t)}. \quad (28)$$

$$E \left[ \Pi^\text{D}_{HQ} \right] \geq E \left[ \Pi^\text{F}_{HQ} \right]$$

if and only if $\beta > \beta^F_F$, where

$$\beta^F_F := \frac{2h + \gamma_F(t-h-1)}{2(1-t)} \text{ and} \quad (29)$$

$$\beta^D,OSB < \beta^F,OSB < \beta^F_F < \beta^D_F < \beta^D,OSB.$$
8.4 Proof of Corollary 1

This directly follows from calculating the first derivatives of equations (28) and (29) with respect to \( \gamma_r, \overline{\gamma}_r, \) or \( h. \)

8.5 Proof of Proposition 3

For \( \beta \leq \beta_f^D \), the intangible is located in the foreign division. For \( \beta \in [0, \beta_1^{F, OSB}] \) and \( \beta \in [\beta_2^{F, OSB}, \beta_f^D] \), \( \overline{\gamma}_r \) and \( \gamma_r \) are used, respectively. Then, \( \partial \gamma_r^{F, OSB} / \partial \beta = 0 \). For \( \beta \in (\beta_1^{F, OSB}, \beta_2^{F, OSB}) \), \( \partial \gamma_r^{F, OSB} / \partial \beta < 0 \).

For \( \beta \geq \beta_f^D \), the intangible is located in the domestic division. For \( \beta \in [\beta_f^D, \beta_1^{D, OSB}] \) and \( \beta \in [\beta_2^{D, OSB}, 1] \), \( \gamma_r \) and \( \overline{\gamma}_r \) are used, respectively. Then, \( \partial \gamma_r^{D, OSB} / \partial \beta = 0 \). For \( \beta \in (\beta_1^{D, OSB}, \beta_2^{D, OSB}) \), \( \partial \gamma_r^{D, OSB} / \partial \beta > 0 \).

8.6 Proof of Proposition 4

Consider the equations (2), (3), (4), (6), (7), and (8). For \( \beta \leq \beta_f^D \), the intangible is located in the foreign division so that the MNC invests \( \theta_{D, OSB} + \theta_{F, OSB} \) in total. The first derivatives of total investment with regard to \( \gamma_r \) and \( \overline{\gamma}_r \) are:

\[
\frac{\partial}{\partial \gamma_r} \left( \theta_{D, OSB} + \theta_{F, OSB} \right) = \begin{cases} 0 & \text{for } \beta \in [0, \beta_2^{F, OSB}] \\ \frac{-1}{k} & \text{for } \beta \in (\beta_2^{F, OSB}, \beta_f^D] \\ \frac{-1}{k} & \text{for } \beta \in [0, \beta_1^{F, OSB}] \\ 0 & \text{for } \beta \in (\beta_1^{F, OSB}, \beta_f^D] \\ \end{cases}
\]

For \( \beta \geq \beta_f^D \), the intangible is located in the domestic division so that the MNC invests \( \theta_{D, OSB}^{D, OSB} + \theta_{F, OSB}^{D, OSB} \) in total. The first derivatives of total investment with regard to \( \gamma_r \) and \( \overline{\gamma}_r \) are:

\[
\frac{\partial}{\partial \gamma_r} \left( \theta_{D, OSB}^{D, OSB} + \theta_{F, OSB}^{D, OSB} \right) = \begin{cases} \frac{\beta - 1}{k} & \text{for } \beta \in [\beta_f^D, \beta_1^{D, OSB}] \\ 0 & \text{for } \beta \in (\beta_1^{D, OSB}, 1] \\ \frac{\beta - 1}{k} & \text{for } \beta \in [\beta_f^D, \beta_2^{D, OSB}] \\ 0 & \text{for } \beta \in (\beta_2^{D, OSB}, 1] \\ \end{cases}
\]

Decreasing \( \overline{\gamma}_r \) and increasing \( \gamma_r \) jointly present curtailing profit shifting possibilities.

8.7 Proof of Proposition 5

Consider the equations (2), (3), (4), (6), (7), and (8). For \( \beta \leq \beta_f^D \), the intangible is located in the foreign division. The first derivatives of domestic and foreign investment with regard to \( h \)
are:

\[
\frac{\partial \theta_{D,OSB}^F}{\partial h} = \begin{cases} 
0 & \text{for } \beta \in \left[0, \beta_{1}^{F,OSB}\right] \\
- \frac{(1+\beta)(1-t)}{k(1-t+h)^2} < 0 & \text{for } \beta \in \left(\beta_{1}^{F,OSB}, \beta_{2}^{F,OSB}\right] \\
0 & \text{for } \beta \in \left[\beta_{2}^{F,OSB}, \beta_{F}\right] .
\end{cases}
\]

\[
\frac{\partial \theta_{F,OSB}^D}{\partial h} = 0,
\]

For \( \beta \geq \beta_{F}^{D} \), the intangible is located in the domestic division. The first derivatives of domestic and foreign investment with regard to \( h \) are:

\[
\frac{\partial \theta_{D,OSB}^D}{\partial h} = \begin{cases} 
0 & \text{for } \beta \in \left[\beta_{D}, \beta_{1}^{D,OSB}\right] \\
\frac{\beta(1+\beta-\beta^2+\beta^3+\beta^4)(1-t)}{k(-1+2h+t+\beta^2(t-h-1))^2} < 0 & \text{for } \beta \in \left(\beta_{1}^{D,OSB}, \beta_{2}^{D,OSB}\right) \\
0 & \text{for } \beta \in \left[\beta_{2}^{D,OSB}, 1\right] ,
\end{cases}
\]

\[
\frac{\partial \theta_{F,OSB}^D}{\partial h} = \begin{cases} 
0 & \text{for } \beta \in \left[\beta_{D}, \beta_{1}^{D,OSB}\right] \\
\frac{(1+\beta-\beta^2+\beta^3+\beta^4)(1-t)}{k(-1+2h+t+\beta^2(t-h-1))^2} > 0 & \text{for } \beta \in \left(\beta_{1}^{D,OSB}, \beta_{2}^{D,OSB}\right) \\
0 & \text{for } \beta \in \left[\beta_{2}^{D,OSB}, 1\right] .
\end{cases}
\]

\[\Box\]

### 8.8 Proof of Proposition 6

We now provide an overview over possible location choices in a tax-world keeping TSB.

#### 8.8.1 The Domestic Division owns the Intangible

Expected profit of division 1 is given by:

\[
E \left[\Pi_{D}^{D}\right] = (1-t-h) \left[-\frac{k}{2} \theta_{D}^2\right] + \gamma(t \theta_{D} + \theta_{F}) - (t+h) \gamma(t \theta_{D} + \theta_{F})
\]

and the expected profit of the royalty paying foreign division is given by:

\[
E \left[\Pi_{F}^{D}\right] = (1-t) \left[\beta \theta_{D} + \theta_{F} - \frac{k}{2} \theta_{F}^2\right] - \gamma(t \theta_{D} + \theta_{F}) + t \gamma(t \theta_{D} + \theta_{F}).
\]

Due to the tax rate differential the transfer price is not canceled out. The transfer pricing decision affects MNC’s overall after-tax profit. Similar to the no-tax world the divisions choose their investment levels in order to maximize their own after-tax profits. They have to take into account the internal as well as the tax royalty rate.

\[
FOC \theta_{D} : (1-t-h)(1-k \theta_{D}) + \gamma \beta \beta \gamma_{F}(t+h) = 0
\]

\[
SOC \theta_{D} : (1-t-h)(-k) < 0
\]

\[
FOC \theta_{F} : (1-t)(1-k \theta_{F}) - \gamma + t \gamma_{F} = 0
\]
Thus, the FOCs determine a local maximum and the investments are:

\[
\theta_F^D = \frac{1}{k} + \frac{1}{k(1-t-h)} \left[ \beta \left( \gamma - \gamma(t+h) \right) \right]
\]

and

\[
\theta_F^F = \frac{1}{k} + \frac{1}{k(1-t)} \left[ t \gamma - \gamma \right]. \tag{31}
\]

The internal royalty rate \(\gamma\) affects both divisions’ investment decision so that first-best investments cannot be achieved. Hence, the headquarters maximizes its overall after-tax profit choosing the internal royalty rate taking into account the divisions’ investment decisions.

\[
FOC\gamma_d : \frac{1}{1-t-h} \left[ \beta^2 \gamma_d (t+h) - \beta^2 \gamma_d + \beta^2 (1-t) - \beta^2 h \gamma_d \right] + \frac{1}{1-t} \left[ \gamma_d (t+h) - \gamma_d \right] = 0
\]

\[
SOC\gamma_d : \frac{1}{1-t-h} (-\beta^3) - \frac{1}{1-t} < 0.
\]

Hence, the optimal internal royalty rate is:

\[
\gamma^D = \frac{1}{1-t-h+\beta^2(1-t)} \left[ \beta^2 (1-t) \left( t \gamma + 1 - t \right) + \gamma (t+h) \left( 1-t-h \right) \right]. \tag{32}
\]

### 8.8.2 The Foreign Division owns the Intangible

Expected profit of the domestic division:

\[
E \left[ \Pi_D^D \right] = (1-t-h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] - \gamma \theta_D + \gamma \theta_D (t+h)
\]

and of the foreign:

\[
E \left[ \Pi_F^F \right] = (1-t) \left[ \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right] + \gamma \theta_D - t \gamma \theta_D.
\]

Following the procedure used in section 8.8.1 yields:

\[
\theta_F^D = \frac{1}{k} + \frac{1}{k(1-t-h)} \left[ \gamma (t+h) - \gamma \right] \tag{33}
\]

and

\[
\theta_F^F = \frac{1}{k} \tag{34}
\]

Stipulating the following internal royalty rate induces first-best investments:

\[
\gamma^F = \gamma - \beta (1-t) \tag{35}
\]

### 8.8.3 Joint Ownership of the Intangible

Expected profit of the domestic division:

\[
E \left[ \Pi_D^J \right] = (1-t-h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right]
\]
and

\[ E \left[ \Pi'_F \right] = (1 - t) \left[ \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right]. \]

Following the procedure used in section 8.8.1 yields:

\[ \theta'_D = \frac{1}{k} \quad (36) \]

and

\[ \theta'_F = \frac{1}{k} \quad (37) \]

By setting \( \gamma_i = \gamma_r (t + h) \) in 8.8.2 the investment incentives in 8.8.3 can be replicated. But \( \theta'_D \neq \theta'_F \). Hence, \( E \left[ \Pi'_{HQ} \right] > E \left[ \Pi'_{HQ} \right] \).

### 8.8.4 Headquarters’ Ownership of the Intangible

The domestic (foreign) division pays a royalty rate \( \gamma_D (\gamma_F) \). The expected profit of the domestic division is:

\[ E \left[ \Pi'_{HQ} \right] = (1 - t - h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] - \gamma_D \theta_D + \gamma_D (t + h) \]

and the expected profit of the foreign division is:

\[ E \left[ \Pi'_{HQ} \right] = (1 - t) \left[ \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right] - \gamma_F (\beta \theta_D + \theta_F) + t \gamma_r (\beta \theta_D + \theta_F). \]

Following the procedure used in section 8.8.1 yields:

\[ \theta'^{HQ}_D = \frac{1}{k} + \frac{1}{k (1 - t - h)} \left[ \gamma_r (t + h) - \gamma_D \right] \quad (38) \]

and

\[ \theta'^{HQ}_F = \frac{1}{k} + \frac{1}{k (1 - t)} \left[ t \gamma_r - \gamma_F \right]. \quad (39) \]

Headquarters expected profit is:

\[ E \left[ \Pi'^{HQ} \right] = (1 - t - h) \left[ \theta_D - \frac{k}{2} \theta_D^2 \right] + (1 - t) \left[ \theta_F + \beta \theta_D - \frac{k}{2} \theta_F^2 \right] - h \gamma_r (\theta_F + \beta \theta_D). \]

The MNC is interested in the lowest possible external transfer price, i.e., \( \gamma_r \), in order to minimize its tax liabilities. Headquarters is interested in investment decisions maximizing overall after-tax profits:

\[
\begin{align*}
FOC_{\theta_D} & : (1 - t - h) \left( 1 - k \theta_D \right) + \beta (1 - t) - h \beta \gamma_r = 0 \\
SOC_{\theta_D} & : (1 - t - h) (-k) < 0 \\
FOC_{\theta_F} & : (1 - t) \left( 1 - k \theta_F \right) - h \gamma_r = 0 \\
SOC_{\theta_F} & : (1 - t) (-k) < 0.
\end{align*}
\]

The Hessian matrix is negative definite. Thus, the FOCs determine a local maximum. These second-best investments are induced by stipulating the following internal royalty rates:

\[ \gamma'^{HQ}_D = \gamma_r (t + h) - \left( 1 - t - h \gamma_r \right) \beta \quad (40) \]
and
\[ \gamma^H_Q = \gamma (t + h). \]  
(41)

In a world without restrictions on transfer pricing the foreign division always owns the intangible, i.e., \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^D_{HQ} \right] > E \left[ \Pi^J_{HQ} \right] \) and \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^H_{HQ} \right] \).

With restrictions on transfer pricing, we have \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^J_{HQ} \right] \) and \( E \left[ \Pi^H_{HQ} \right] > E \left[ \Pi^D_{HQ} \right] \). Thus, either foreign or headquarters’ ownership is optimal. For \( \beta \geq \beta^F \), foreign ownership is optimal as \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^H_{HQ} \right] \). For \( \beta > \beta^F \), foreign ownership dominates headquarters’ ownership if and only if
\[ E \left[ \Pi^F_{HQ} \right] \geq E \left[ \Pi^H_{HQ} \right]. \]

With restrictions on transfer pricing, we have \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^J_{HQ} \right] \) and \( E \left[ \Pi^H_{HQ} \right] > E \left[ \Pi^D_{HQ} \right] \). Thus, either foreign or headquarters’ ownership is optimal. For \( \beta \geq \beta^F \), foreign ownership is optimal as \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^H_{HQ} \right] \). For \( \beta > \beta^F \), foreign ownership dominates headquarters’ ownership if and only if
\[ E \left[ \Pi^F_{HQ} \right] \geq E \left[ \Pi^H_{HQ} \right]. \]

Due to \( A < 0 \), \( \delta \) is inversely U-shaped in \( \beta \). Setting \( \delta \) equal to zero yields two thresholds
\[ \beta_1 = \frac{1}{2A} \left[ -B + \sqrt{B^2 - 4AC} \right] \quad \text{and} \quad \beta^{HQ} = \frac{1}{2A} \left[ -B - \sqrt{B^2 - 4AC} \right]. \]

\( \beta_1 \) is smaller than \( \beta^{HQ} \). Using \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^H_{HQ} \right] \) for \( \beta = \beta^F \) and that \( \delta \) is inversely U-shaped in \( \beta \) yields that for \( \beta < \beta^{HQ} \) (\( \beta > \beta^H_Q \), \( E \left[ \Pi^F_{HQ} \right] > E \left[ \Pi^H_{HQ} \right] \) (\( E \left[ \Pi^F_{HQ} \right] < E \left[ \Pi^H_{HQ} \right] \)). As the example in figure 4 demonstrates, \( \beta^{HQ} \) can be smaller than 1. Thus, headquarters’ ownership can become optimal. \( \square \)

8.9 Proof of Corollary 2

As stated in the proof of proposition 6, the threshold \( \beta^{HQ} \) is determined by \( A\beta^2 + B\beta + C = 0 \) (see equations (42)). Define \( G := A\beta^2 + B\beta + C \).

\[ \frac{\partial G}{\partial \beta^{HQ}} = 2A\beta^{HQ} + B < 0. \]

\[ \frac{\partial G}{\partial \gamma} = 2h \left[ \beta (1-t)(1-t-h) + \beta^2 (1-t)(1-\gamma h - t) + (1-t-h)(1-\gamma h - t) \right] \geq 0. \]
Using the implicit function theorem yields
\[
\frac{\partial B_{HQ}}{\partial \gamma r} = -\frac{\partial G}{\partial \gamma r} \frac{\partial G}{\partial B_{HQ}} > 0.
\]

\[
\frac{\partial G}{\partial \gamma r} = 2(1-t) \left[ \frac{h(1-t-h) + \beta(1-t)(h+t) + \gamma r(h^2 - t^2)}{>0} \right],
\]

which is positive for \( \beta \geq \beta^F \). Using the implicit function theorem yields
\[
\frac{\partial B_{HQ}}{\partial G} = -\frac{\partial G}{\partial \gamma r} \frac{\partial G}{\partial B_{HQ}} > 0.
\]

\[
\frac{\partial G}{\partial h} = 2\gamma r^2 h(1-t) + 2\gamma r(1-t)(1-t-2h + \beta(1-t)) + \
\gamma r \left[ \gamma r h(3h - 2(1-t)) + 2(1+\beta)(1-t)(1-t-2h) + 2\beta^2(1-t)(1-\gamma r h - t) \right],
\]

which is positive for \( h < (1-t)/2 \). Using the implicit function theorem yields
\[
\frac{\partial \beta_{HQ}}{\partial h} = -\frac{\partial G}{\partial h} \frac{\partial G}{\partial \beta_{HQ}} > 0.
\]

\[\square\]

8.10 Proof of Proposition 7

For \( \beta \leq \beta^{HQ} \), the intangible is located in the foreign division. The internal transfer price is given by: \( \gamma^F_{Ir} = t \gamma r - (1-t) \beta \), where \( \gamma^F_{Ir} \) is non-zero if there is no restriction on tax-avoidance or if restrictions are present for \( \beta < \beta^F \) and \( \gamma^F_{Ir} = 0 \) for \( \beta^F \leq \beta \leq \beta^{HQ} \). A non-zero internal royalty rate decreases with an increasing spillover:
\[
\frac{\partial \gamma^F_{Ir}}{\partial \beta} = -(1-t) < 0.
\]
Otherwise, if \( \gamma^F_{Ir} = 0 \) the internal royalty rate is unaffected.

For \( \beta > \beta^{HQ} \), the intangible is held in the headquarters. The internal royalty rate for purely domestic transactions is given by: \( \gamma^{HQ}_{iD} = \gamma r (t + h) - \left( 1 - t - h \gamma r \right) \beta \) and the internal royalty rate for cross-border transactions is \( \gamma^{HQ}_{iF} = \gamma r (t + h) \). Thus, the internal royalty rate for purely domestic transactions decreases with an increasing spillover:
\[
\frac{\partial \gamma^{HQ}_{iD}}{\partial \beta} = -(1-t) + h \gamma r < 0.
\]

The internal royalty rate for cross-border transactions is unaffected. \[\square\]

8.11 Proof of Proposition 8

For \( \beta \leq \beta^{HQ} \), the intangible is located in the foreign division. For \( \beta \leq \beta^F \), first-best investments are achievable and are given by \( \theta^F_D = \frac{1}{k} + \frac{1}{h(1-t-h)} \left[ (1-t) \beta + h \gamma r \right] \). If \( \beta^F < \beta \leq \beta^{HQ} \)
an investment distortion occurs; the distorted investment decisions of the domestic division is
given by (33). The derivative is
\[
\frac{\partial \theta^F_D}{\partial \gamma} = \begin{cases}
\frac{h}{k(1-t-h)} > 0 & \text{for } \beta \in [0, \beta^F] \\
\frac{t+h}{k(1-t-h)} > 0 & \text{for } \beta \in (\beta^F, \beta^{HQ}].
\end{cases}
\]

Thus, curtailing profit shifting, i.e., decreasing \( \gamma \), leads to decreasing investments in the
 domestic division. The investment decision of the foreign country is shown in (34). The investment
incentives are unaffected and remain the same so that the MNC’s overall investment decreases.
For \( \beta > \beta^{HQ} \), the intangible is located in the headquarters. The investment decisions are
described in (38) and (39). The derivatives with respect to the external royalty rate are:
\[
\frac{\partial \theta^{HQ}_D}{\partial \gamma} = -\frac{h\beta}{k(1-t-h)} < 0
\]
and
\[
\frac{\partial \theta^{HQ}_F}{\partial \gamma} = -\frac{h}{k(1-t)} < 0.
\]

Thus, curtailing profit shifting possibilities, i.e., increasing \( \gamma \), leads to less investments in both
divisions. \( \square \)

8.12 Proof of Proposition 9

With foreign ownership the derivative of the domestic division’s investment with respect to the
tax rate differential is:
\[
\frac{\partial \theta^F_D}{\partial h} = \begin{cases}
\frac{\gamma}{k(1-t-h)^2} > 0 & \text{for } \beta \in [0, \beta^F] \\
\frac{(1-t)(\gamma+\beta)}{k(1-t-h)^2} > 0 & \text{for } \beta \in (\beta^F, \beta^{HQ}].
\end{cases}
\]

With foreign ownership the derivative of the foreign division’s investment with respect to the
tax rate differential is
\[
\frac{\partial \theta^F_F}{\partial h} = 0.
\]

With headquarters’ ownership the derivatives of both divisions’ investments with respect to the
tax rate differential are
\[
\frac{\partial \theta^{HQ}_D}{\partial h} = \frac{\beta(1-t)(1-\gamma)}{k(1-t-h)^2} > 0
\]
and
\[
\frac{\partial \theta^{HQ}_F}{\partial h} = -\frac{\gamma}{k(1-t-h)} < 0.
\]
\( \square \)
References


Springsteel, I., 1999. Separate but unequal. when tax-based transfer prices fall short, a second managerial system helps some companies measure internal profits better. CFO 15, 89–92.