ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Becker, Johannes; Davies, Ronald B.

Working Paper

A negotiation-based model of tax-induced transfer pricing

UCD Centre for Economic Research Working Paper Series, No. WP14/11

Provided in Cooperation with:
UCD School of Economics, University College Dublin (UCD)

Suggested Citation: Becker, Johannes; Davies, Ronald B. (2014) : A negotiation-based model of tax-induced transfer pricing, UCD Centre for Economic Research Working Paper Series, No. WP14/11, University College Dublin, UCD School of Economics, Dublin

This Version is available at:
https://hdl.handle.net/10419/109713

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

UCD CENTRE FOR ECONOMIC RESEARCH

WORKING PAPER SERIES

2014

A Negotiation-Based Model of Tax-Induced Transfer Pricing

Johannes Becker, University of Münster and
Ronald B Davies, University College Dublin

WP14/11

July 2014

UCD SCHOOL OF ECONOMICS
UNIVERSITY COLLEGE DUBLIN
BELFIELD DUBLIN 4

A Negotiation-Based Model of Tax-Induced Transfer Pricing*

Johannes Becker
University of Münster
Institute of Public Economics
Wilmergasse 6-8
48143 Münster
Germany
johannes.becker@wiwi.uni-muenster.de

Ronald B. Davies
University College Dublin
G215 Newman Building
Belfield
Dublin 4
Ireland
ronbdavies@gmail.com

July 4, 2014

Abstract

We present a new model of tax induced transfer pricing as an alternative to the oft-used concealment model. Inspired by interviews with practitioners, we consider a large multinational firm which is audited by the tax authority in the high-tax location. When this country adjusts the transfer prices proposed by the firm, the low-tax location may dispute this decision and initiate negotiations. Since negotiations are costly, the high-tax location sets a transfer price that prevents the low-tax location from entering negotiations. We compare this model's predictions to those of the concealment model. The negotiation model replicates the predictions on the tax rate effects on transfer pricing, while adding new predictions. Profit shifting is expected to fall in the high-tax country's bargaining power and to rise in firm profits and domestic firm ownership in both countries. Most importantly, profit shifting occurs even if tax enforcement is perfect. We analyze the effects of an introduction of a common consolidated corporate tax base with formula apportionment and conclude that the negotiation model may change the perspective on such a policy. Specifically, strong countries with large bargaining power may find this reform unappealing.

JEL classification: H25, H32, H87

Keywords: transfer pricing, Nash bargaining, tax avoidance, corporate taxation

*We thank Hartmut Förster, Tom Gresik, Andreas Haufler, Carolin Holzmann, Yaron Lahav, Dominika Langenmayr, Nadine Riedel, Dirk Schindler, Michael Stimmelmayr and Robert Ullmann as well as participants at workshops and conferences at Mannheim, Brussels, Nuremberg and Oxford for helpful comments. The usual disclaimer applies.

1 Introduction

A large body of empirical evidence demonstrates that, within a multinational firm, reported locational profits systematically vary with locational corporate tax rates (see e.g. Huizinga and Laeven, 2008). With almost unanimity, this phenomenon is explained by profit shifting from high-tax to low-tax locations, either by manipulating transfer prices or by choosing adequate financial policies (like thin capitalization).

The prevalent model of tax-induced transfer pricing is a version of the Allingham and Sandmo (1972) model. In this model, there is usually a "true" transfer price which the tax authorities want to be applied. The firm, however, may choose a transfer price that deviates from the true price but this deviation comes at a (convex) concealment cost. This cost is typically motivated by the cost of using accountants to "cook the books" and/or a penalty that is incurred if the firm is audited and found to be setting an inappropriate transfer price. The profit-maximizing firm thus chooses a transfer price that equalizes the marginal tax saving with the marginal concealment cost. As a consequence, an increase in the tax rate differential increases (tax-motivated) profit shifting resulting in associated real resource costs due to the concealment activity.

This "concealment model", as we will henceforth label it, has great appeal: it is parsimonious, elegant and fits the empirical facts (negative correlation of profit and tax rates). It is therefore not surprising that it is currently *the* model of tax induced transfer pricing.[2] It is not without criticism, though. If broadly interpreted (i.e. firms may somehow affect transfer prices to their advantage), the concealment model's black box approach does not offer a clean and clear mapping to empirical predictions. If narrowly interpreted (i.e. firms state false transfer prices and are punished if detected), we found in interviews that we conducted with practitioners that they find that the concealment model is at odds with current transfer pricing reality.

In this paper, we take account of these critiques and offer an alternative model in which transfer prices are determined in a negotiation game. In these negotiations, the two tax authorities and the firm attempt to influence the agreed upon transfer price in a manner consistent with the own objectives. The "negotiation model" sets out to closely reflect the regulatory environment in which transfer pricing takes place.[3] A firm is considered

[2] Dozens of papers use the concealment model in various versions, both in the in the theoretical literature (starting with Kant, 1988, and, more recently, Haufler and Schjelderup, 2000) and the empirical literature (see, e.g., Huizinga and Laeven, 2008).

[3] See PwC (2013) for a discussion of these regulations from the perspective of an audited

that has operations in two countries with different tax rates. Each year, the firm submits a tax statement to both involved tax authorities which includes a proposed transfer price. The statement is audited with certainty by the high-tax location's authorities – thus, the firm cannot conceal anything from the government.[4] In line with the actual implementation of tax policy, the high-tax country considers adjusting the transfer price. In this case, the firm may call for a Mutual Agreement Procedure (MAP, see section 2.3). The first step in this procedure is that the low-tax country considers accepting the adjustment of the transfer price. If it does, the transfer price applies for all subsequent periods.[5] If not, the two countries enter costly negotiations. The firm affects negotiations in two ways. First, it has an outside option; if the transfer price is unfavorable, it may leave the two countries for some third location. Second, it provides transfer price documentation which helps in justifying transfer prices that are favorable for both the firm and the low-tax country. It may thus lower the low-tax country's negotiation cost.

Our analysis yields a number of novel predictions for empirical work.[6] As in the concealment model, profit shifting to the low-tax location increases in the tax rate differential.[7] In contrast to the concealment model, profit shifting occurs even if the firm is fully audited.[8] Moreover, profit shifting decreases in the (relative) bargaining power of the high-tax location (and thus increases in the bargaining power of the low-tax location) and increases in profits and the firm's outside option profits. Local ownership of the firm, meanwhile, increases profit shifting to the low-tax location as a portion of the firm's benefits from doing so make both countries more willing to tolerate such activities. These effects have so far been neglected in the empirical

firm.

[4] Of course, in more complex models, audits may vary in intensity and success probabilities etc. In this paper, we assume that, if the firm, is audited, its transfer price policies become perfectly transparent.

[5] In its transfer pricing guide for firms (PwC, 2013), accounting firm PwC urges them to ensure that whatever price is agreed upon is adhered to for several years.

[6] While, with appropriate verbal justification, one can argue that some of these can be shoehorned into the black box of the concealment cost, one of our goals is to open this black box.

[7] Thus, to the extent that this is the key factor of interest, the parsimonious concealment model has its advantages.

[8] Bauer and Langenmayr (2013) demonstrate that, in the presence of cost heterogeneity across firms, profit shifting may occur even though the firm is fully audited. The reason is that, in their model, firms have an incentive to engage in intra-firm trade if their cost is small (or high) relative to the accepted transfer price such that profit is effectively shifted to the low-tax jurisdiction.

work. As an important policy implication, we emphasize that the introduction of a common consolidated tax base with formula apportionment (as, for instance, proposed by the European Union, see Fuest, 2008) may harm powerful countries with high negotiation power. This is because such nations are able to successfully negotiate transfer prices more in line with their interests, resulting in more preferred equilibrium rates. Since the proponents of formula apportionment usually argue that the large countries (which are presumably also the powerful ones) will gain from such a policy reform, we provide arguments against this stance.

Finally, we make a first attempt at blending traditional concealment cost model and the negotiation model. We do so by allowing for audit rates below 100 percent. We show that audited as well as non-audited transfer prices react to tax rate differentials with non-trivial interactions due to the relationship between the negotiation and concealment motivations.

Thus, the current paper contributes to the discussion of tax-motivated transfer pricing in two ways. First, it provides a more realistic foundation for the predictions regarding the relationship between transfer prices and international tax differences. Second, it provides additional testable implications not found in the concealment model. It is our hope, therefore, that it serves as a springboard for future empirical research on the topic.

The remainder of the paper is organized as follows. The next section reviews the evidence, reports the criticism of the concealment model and provides some institutional background. Section 3 lays out the model and derives the main results. In section 4, we compare the model results with those in an equivalent version of the concealment model. Section 5 discusses some extensions, section 7 concludes.

2 Evidence, critique of the concealment model and institutional background

In this section, we briefly review the evidence of tax induced transfer pricing. Then, we discuss the merits of the concealment model and its shortcomings, particularly in light of a series of interviews we conducted with tax authorities, major accounting firms, and managers of multinational enterprises regarding the ways transfer prices are set in practice. In the last part of this section, we outline the institutional background for dealing with transfer price issues (primarily provided by the OECD). The latter then forms the basis for the model outlined in the subsequent section.

2.1 Evidence of tax induced transfer pricing

The evidence on transfer pricing is, in most cases, indirect. Most studies compare some profit indicator in low-tax and high-tax locations and conclude that there is a systematic correlation between profit rates and tax rates (see e.g. Dharmapala, 2014, and the literature cited there). The causal link is established by considering tax rate changes and the subsequent variation in profits rates. The measured effects are usually substantial: Huizinga and Laeven (2008) estimate that an increase of the statutory tax rate in one location by ten percentage points reduces the reported profits in this location by thirteen percent. Weichenrieder (2009) who uses administrative data from Deutsche Bundesbank finds somewhat lower, but still large, effects. An alternative approach is offered by Dharmapala and Riedel (2013) who consider earnings shocks and how they propagate within the firm. Their results hint at quantitatively smaller elasticities of the tax base with respect to tax rates. A meta-study by Heckemeyer and Overesch (2013) estimates the semi-elasticity of profits with respect to the tax rate of 0.8.

While there is no consensus about the precise level of the tax effects on profit shifting, there is near unanimity about the existence of this phenomenon. It is less clear, however, how profits are shifted, whether through transfer pricing or through adequate financial policies. Some recent papers set out to disentangle this effect, albeit with different conclusions. While Dharmapala and Riedel (2013) find that it is mainly financial policy that shifts profits, Heckemeyer and Overesch (2013) conclude that the main driver behind profit shifting is transfer pricing and licencing.

Although it seems straightforward to look at more direct indicators for profit shifting, a very small number of studies do so due to data limitations. We review them here according to their main data source. Bartelsman and Beetsma (2003) use data on value added from different manufacturing sectors in OECD countries. They estimate a value added function depending on, among other things, corporate tax rates and find strong hints at profit shifting via transfer pricing. Overesch (2006) focusses on balance sheet items from German multinational firms which reflect intra-firm trade ('*accounts receivable from affiliated companies*' or '*accounts receivable from parent company*') and shows that these indicators vary systematically with the tax rate differentials between Germany and the foreign parent/affiliate location. Swenson (2001) analyzes prices for imports into the US and finds that they react to changes in the incentive to shift profits (due to taxes and tariffs). Clausing (2003) bases her study on price indexes for US exports and imports and finds strong and significant impact of taxes on trade prices, in

line with the profit shifting motive. She estimates an elasticity of trade prices with respect to the effective tax rate of around 2. The most direct evidence is presented by Bernard, Jensen and Schott (2006) and Davies et al. (2014) who use data on individual cross-border transactions between related or unrelated parties for U.S. and French firms respectively. Both find strong and significant evidence for tax-motivated transfer pricing. Bernard, Jensen and Schott (2006) estimate that a one percentage point increase in the tax rate is associated with a decrease of 0.5 to 1.7 percent of the tax wedge (the price difference between transactions of related and non-related parties). Davies et al. (2014) find a comparable result, however, this is driven by tax haven countries.

With an additional variety of anecdotal evidence, there is near unanimity in the field that transfer prices are used to systematically manipulate reported profits for tax saving purposes. What all these studies (and stories) do not show – because they cannot – is whether transfer prices have been manipulated by the firm against the tax authorities' wills or whether they have been agreed upon by all parties involved. That is, these studies do not serve as a horse race between the concealment and negotiation models.

2.2 Merits and critiques of the concealment model

As indicated in the introduction, the concealment model has a number of doubtless advantages that explain its great success in the literature. First, its predictions fit the data, i.e. an increase in the tax rate differential increases the low-tax location's profit rate. Second, it is tractable and can easily be introduced to various model frameworks. This aspect should not be underestimated for the success of a model. Third, it is sufficiently parsimonious to allow for various interpretations of the features it represents. While this is clearly an advantage for a theory to have as much scope of validity as possible, it makes it hard to falsify or to criticize. Therefore, we will, in the following, differentiate between the concealment model in the narrow sense and the concealment model in the broad sense. The former has been criticized by practitioners, critiques which inspired the negotiation model, while the latter may easily be reconciled with the negotiation model (in fact, in section 6, we set out to synthesize these two model classes).

The concealment in the narrow sense is based on the assumption of a true transfer price (the equivalent of true income in the Allingham and Sandmo (1972) model). The firm deviates from the true price by providing false or incomplete information to the tax authority. With a certain probability, the firm is audited and the misinformation is detected and then punished.

During 2012 and 2013, we conducted a series of interviews with several practitioners, including the competent tax authorities from high and low tax countries, employees at major accounting firms, and multinational firm managers. These interviews resulted in the identification of three major criticisms of the concealment model from the perspective of those involved in transfer pricing issues. First, they argue that there is no "true" transfer price. Although in theory, with perfect data availability, there would be a single appropriate method of setting the transfer price, the reality is that data is never perfect. Instead, the OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations (OECD 2010) admit that "transfer pricing is not an exact science" (pg. 2) and that there is a range of acceptable methodologies resulting in a range of reasonable transfer prices. Firms therefore have the choice between a range of methods of calculating the transfer price, e.g. the the comparable uncontrolled price method, the cost plus method, the transactional net margin method, etc. (all listed in Chapter 2 of OECD, 2010).[9] Depending on the choice of method, tax payments may vary. Because of this, firms have preferences across methods, with the preference depending on their individual circumstances (including the tax rate differential). Intentional mispricing which triggers a penalty seems to occur rather rarely. Second, since all of these methods are in principle approved of by the tax authorities, there is nothing to conceal. That said, just as firms have preferences across transfer price calculation methods, so too do the authorities. Because of this, the authorities may disagree with a firm's choice of method and then adjust it, sometimes after bilateral negotiations between the two involved countries since their preferred methods may also differ from one another. In any case, it is unlikely that there will be a legal penalty; instead, the firm is required to apply this new transfer price and pay any additional tax owed (as well as interest on underpayments in previous years). Third, representatives of large firms report that audits are frequent. For instance, the average large German firm has a yearly probability of being audited of around 20 percent, i.e. every five years (see Bundesfinanzministerium, 2014) – although the very large are probably constantly audited. Since the transfer price adjustment with the eventual audit is applied retroactively, this effectively eliminates the ability to set a transfer price that is unjustifiable by *some* method.[10] Therefore,

[9] See Gresik (2001) for a general discussion and Devereux and Keuschnigg (2013) as well as Bauer and Langenmayr (2013) for a critique of the arm's length principle.

[10] In a recent ruling, the German Supreme Tax Court assumed that the average probability that the tax statement in an individual year is audited (i.e. in this year or in the future) is around eighty percent for large firms (see Bundesfinanzhof, 2012).

concealment would not make sense as the firm will eventually be found out. Combining these, the reality of transfer pricing is not that firms conceal and misrepresent hoping to avoid detection but that the conflict is over the method applied in a given situation.

However, proponents of the concealment model correctly point out that firms put substantial amounts of money and talent into transfer pricing. One potential explanation for this is the various and extensive documentation obligations that have recently been implemented by most countries. The transfer pricing report provides a justification for why the firm used the price it did; that is to reveal and reinforce its chosen method, not to conceal. One benefit of a "convincing" report is that it can be used by the tax authorities in the negotiation process. In particular, as the low-tax jurisdiction's preferred transfer price method aligns with the firm, a higher quality report which convincingly justifies why the firm's situation, data availability, and so forth warrants a particular method of setting the transfer price lowers the low-tax jurisdiction's negotiation costs. As such, this can lead to a shift in the agreed-upon transfer price in the firm's preferred direction.

With appropriate word-smithing, the firm's cost of producing this report can be interpreted as in line with the concealment model in the broad sense. Thus, the negotiation model's contribution is to correct for some issues in the concealment model in the narrow sense, while opening the black box of tax-induced transfer pricing in the broad sense of the concealment model.

2.3 Institutional background

The next section's model attempts to reflect the regulatory environment in which transfer pricing occurs. For an illustration of this environment, consider a firm that has operations in two countries with different tax rates. For the model results, it does not matter in which country the firm's headquarters is; both affiliates are sufficiently large such that its income is fully taxable in the country where it locates. The income of both affiliates is effectively determined by the set of transfer prices applied to the transactions between the two affiliates. This setup also mirrors that typically found in the concealment model so as to ease comparison across the two models.

At the end of the tax year, the firm submits a tax statement to both countries' authorities and files a report which includes the transfer prices chosen and their justification (including the method, its appropriateness, and the relevant data to support the outcomes of its application). In principle, both authorities have the right to audit the firm. In practice, it is mostly the high-tax location's authority that engages in an audit. It then

decides whether or not to adjust the transfer price (in line with Art. 9 of the OECD Model Tax Convention). In case of adjustment, the firm faces double taxation since part of the income is taxed in both jurisdictions.[11] To avoid this, the firm may call for a Mutual Agreement Procedure (MAP, see OECD 2007). The case is then transferred to the Competent Authorities (CAs) in both countries (in most cases not identical with the tax authorities) which are assigned to deal with transfer pricing disputes.[12] The high-tax country's CA reconsiders the adjustment; if it does not reverse it, it is the low-tax country's turn to decide whether or not to accept the adjustment. If it does not accept it, the two CAs enter negotiations. These negotiations are costly as the CAs must analyze firm information, collect additional information as needed, and decide on their preferred transfer price method. The report provided by the firm, however, can reduce these costs, particularly for the low-tax CA since its interest are aligned with that of the firm's, i.e. they both prefer that the transfer price allocates the greatest possible share of the tax base to the low-tax location. In the model presented below, we assume that the higher quality the report, the lower the low-tax CAs negotiation costs, making it more willing to enter negotiations. Note that negotiations need not end with an agreement as the MAP guidelines do not formally oblige the two involved countries to agree. This is different for negotiations between EU members where the EU Arbitration Convention applies. When negotiations fail, the EU Arbitration Panel sets a transfer price that is binding for both involved Member States. That said, it seems that in nearly all cases, this threat suffices to induce agreement at the MAP stage.

Independent of how the transfer price is attained, at the end of the day, the firm decides between accepting the transfer price or submitting it to a court; the latter of which rarely happens, though, as practitioners tell us. In the model, we will assume that the firm may then choose to exercise an outside option, e.g. to relocates its activity to more amenable locales. This behavioral response by the firm then places participation constraints on the negotiation process.

[11] In practice, it does not happen that a tax authority reduces the size of the tax base (which would lead to untaxed – or: white – income).

[12] In the theoretical literature, transfer pricing disputes have largely been ignored. Notable exceptions are Mintz (1999) and Mansori and Weichenrieder (2001).

3 The model

We consider a world with three countries with index i: a low-tax country (l) and a high-tax country (h) and a third country. There is an infinitely-lived multinational firm with production sites in countries l and h. It does not matter which one is the headquarters and the affiliate. The role of the third country is explained below.

Before moving on to specifics, it is helpful to provide an overview of the model. In each period, the firm produces and earns profits. Since there is intra-firm trade, a transfer price is used to determine the income level (and, thus, the tax bases) at the low-tax and the high-tax location. Both involved tax authorities may contest the transfer prices used by the firm. If a transfer price is adjusted, this may involve costly negotiations between authorities. Once this is set, the resulting transfer price is used from that point forward (as long as the firm does not exercise its outside option). We now describe the model in detail.

In each period, the firm produces output in the high-tax country which is sold at an exogenously given market price. Production requires a renewable fixed asset and variable inputs, the latter of which are acquired in the high-tax country. Per period income net of variable input cost is denoted by $\pi \in \mathbb{R}_+$. The fixed asset is a composite input good produced at the low-tax location at zero cost. The affiliate in country l sells the fixed asset to the affiliate in h at a transfer price of $\tilde{q} \in \mathbb{R}$.[13] As discussed in the introduction, there is a set of generally accepted methods of transfer pricing. This subset of transfer prices is given by $\left[\underline{q}, \bar{q}\right]$ where $\underline{q} \geq 0$ and $\bar{q} \leq \pi$ denote the lower and upper bounds of the set of "regulatory" transfer prices, i.e. those that are achievable from the different generally acceptable transfer pricing methods.[14]

The tax rates in the two countries are $t_i \in [0, 1]$ with $t_l < t_h$ and taken as

[13] Assuming that only the fixed asset is traded substantially simplifies the analysis since the transfer price only redistributes profit without affecting the firm's quantity decision. Allowing for variable inputs to be traded would require additional assumptions. Although such effects would impact the preferred tax rates of the countries, it does not affect the basic nature of the negotiation process and therefore renders the model more complex without adding insights vis-a-vis bargaining over transfer prices.

[14] For a single good, the set of generally accepted transfer prices would be finite number of discrete values. By assuming a composite fixed asset, we effectively suppose that this input consists of a continuum of different goods each of which has to be priced separately. Thus, the transfer price for the composite fixed asset can be measured on a continuous scale.

given.[15,16] Both countries apply a territorial system of income taxation, i.e. the high-tax country does not tax the firm's income in the low-tax location and vice versa.

For a clear-cut contrast to the concealment model, we assume that the audit probability is one. Specifically, the high-tax country's tax authority audits the firm in period 1 and all subsequent periods.[17] If audits are costless, this would be consistent with the equilibrium choice of auditing probabilities by the high-tax country. Alternative assumptions, including audits with less than 100 percent probability, are discussed in Section 6. This audit will then determine the transfer price that will be applied, both in period 1 and in all subsequent periods.[18]

The firm makes four decisions. First, in each period it chooses the quantity of variable inputs, thus determining the size of production. Since neither the tax rates nor the transfer price policy affect this decision, it will henceforth be neglected. Second, in each period in which the firm is active in countries l and h, the firm submits tax statements to the tax authorities in both countries. In the first period, this includes a proposed a transfer price determining the size of the tax bases; in subsequent periods, it uses the transfer price resulting from the audit. Third, as part of its tax filing, the firm submits a report in which it explains and justifies its choice of transfer price applied in the tax statement. For reasons to be explained momentarily, the firm may invest in the report quality, denoted by $\tilde{z} \in \mathbb{R}_+$, where higher quality comes at an increasing convex cost $C(\tilde{z})$ that is deductible from the tax base in country l. Since the transfer price is fixed by the period 1 audit in period 2 on, $\tilde{z} = 0$ after period 1. Combining these three choices, when the firm is active in the two countries in all time periods, the present discounted value of after-tax profits (according to the firm's tax statements)

[15] It may happen that jurisdictions change their general business tax policy when competing for a single firm, but we assume that this would instead happen at the municipal or regional level.

[16] "Tax havens" are sometimes described as passive and unwilling to enter into negotiations on behalf of the firm (potentially due to high negotiation costs on their part). We assume here that the low-tax country is a non-haven country which differs from the high-tax country by its tax rate level.

[17] Since in practice audits are typically performed by the high-tax country, we only consider that case here.

[18] As nothing changes over time in the model, there is no reason to revise it later on. The model could be extended to allow for that, however, this adds complexity with no additional insight.

is given by, where $\delta < 1$ is the discount rate:

$$\Pi = (1 - t_h) \frac{\pi - q}{1 - \delta} + (1 - t_l) \left(\frac{q}{1 - \delta} - C(z) \right) \tag{1}$$

where q and z denote the firm's choices of $\tilde{q}$ and $\tilde{z}$.

Fourth and finally, after the tax authorities in both countries have accepted or adjusted the transfer price as part of the period 1 audit, the firm may choose to exercise its outside option.[19] We can think of a wide variety of outside options, including the firm shifting all its activity to country l, the firm shifting all its activity to country h, or the firm leaving entirely for the third country.[20] In any case, once the firm implements this outside option, its per-period after-tax profits, denoted by $\bar{\pi}$. Thus, if the transfer price used is q, the present discounted value of profits will be:

$$\bar{\Pi} = (1 - t_h)(\pi - q) + (1 - t_l)(q - C(z)) + \frac{\delta}{1 - \delta} \bar{\pi}. \tag{2}$$

In this case, the per-period tax bases in the high-tax and the low-tax countries are given by $\bar{\pi}_h$ and $\bar{\pi}_l$, respectively. Note that $\bar{\pi}$ potentially depends on the limits of the regulatory transfer prices and tax rates.[21] We assume that the firm's threat to exercise its outside option is binding, i.e. at the lowest regulatively permissive transfer price it chooses to use it, but non-prohibitive, i.e. at the highest regulatively permissive transfer transfer price it does not. Since the firm does not relocate until after the first period (i.e. after it has incurred the after-tax cost of preparing the report), for any choice of $\tilde{z}$ this implies that:

$$(1 - t_h)\left(\pi - \underline{q}\right) + (1 - t_l)\,\underline{q} < \bar{\pi} < (1 - t_h)(\pi - \bar{q}) + (1 - t_l)\,\bar{q}. \tag{3}$$

[19] Note that this occurs after period 1 production. Since the equilibrium is such that it will not use the outside option in equilibrium, we leave out discussion on its use prior to period 1.

[20] One (but not the only) consistent story would have the firm sell its output entirely to consumers in the high-tax country, with the headquarters (with all patents) being in the low-tax country. This would be in line with the horizontal model of FDI, comparable to Markusen (1984). Evidence pointing towards the predominance of horizontal FDI is provided by Blonigen et al. (2003) and Davies (2008).

[21] This is because, should the firm resort to its outside option, both countries will impose their most preferred transfer price ($\bar{q}$ for the low-tax country and $\underline{q}$ for the high-tax country). If the outside option includes leaving some activities in the two active countries, $\bar{\pi}$ would also depend on tax rates. For example, suppose that the firm shifts some of its production to a tax-free third country, generating $\tilde{\pi}$ there while leaving $\tilde{\pi}_h$ in the high tax country. In this case $\bar{\pi}_h = \tilde{\pi}_h - \underline{q}$, $\bar{\pi}_l = \bar{q}$ and $\bar{\pi} = (1 - t_h)\,\bar{\pi}_h + (1 - t_l)\,\bar{\pi}_l + \tilde{\pi}$. If the firm relocates its activity entirely to the third country (and if the low-tax country does not implement exit taxation), then $\bar{\pi}_h = \bar{\pi}_l = 0$.

In words, this means that the per-period value of the outside option lies between those of remaining and facing the lowest and highest regulatory transfer prices. Otherwise, the firm would either always or never exercise the outside option.

Provided that there is a unique transfer price, the countries have opposing interests regarding its level since $\tilde{q}$ shifts profits from one tax base to the other. If the auditing country (here: country h) does not agree with the firm's choice of $\tilde{q}$, it can adjust the transfer price. Since this will likely imply double taxation (i.e. at least part of the tax base is taxed in both jurisdictions), the firm may call for the Mutual Agreement Procedure (discussed in Sect. 2). This means that country l considers the new transfer price set by country h and either accepts or contests it. If it is contested, both countries enter negotiations. Negotiations imply a cost for both involved countries, denoted by $K_h, K_l \in \mathbb{R}_+$. The cost K_l is a decreasing function of report quality $\tilde{z}$, i.e. $K_l(\tilde{z})$. The intuition here is that, by preparing a more thorough report itself, the firm is able to reduce the low-tax country's information gathering costs should negotiations happen.[22]

When entering negotiations, both country commit to pick their most favorable transfer price in case that negotiations fail, thereby subjecting the firm to double taxation.[23,24] This results in profits equal to $\Pi\left(\underline{q}\right)+t_l\left(\underline{q}-\bar{q}\right)$. By (3), this is worse than $\bar{\Pi}$ evaluated at $\underline{q}$. Thus, if negotiations fail, the firm will exercise its outside option.[25] In any case, once the transfer price(s) used are determined during the audit and potential subsequent negotiations, that price is used in all subsequent periods.

Timing Period 1 consists of six stages. In stage 0, the firm produces. In stage 1, the firm invests in report quality $\tilde{z}$ and chooses a transfer price. It then submits the tax statements and the transfer pricing report to both involved tax authorities. In the second stage, country h audits the firm and decides whether or not to adjust the transfer price. If it is not adjusted, the game continues with stage 5. In the third stage, country l is informed that

[22] It would not do this for the high-tax country as that only buttresses the legal argument for allocating more profits to the high-tax location. Hofmann, Lohse and Riedel (2014) show that high-tax countries were the first to strengthen the information requirements in transfer pricing reports. In the context of the model, this may be interpreted as an attempt to force the firm to help the high-tax country prepare for negotiations.

[23] Note that such behavior may not be rational from an ex-post perspective.

[24] See Mansori and Weichenrieder (2001).

[25] This introduces substantial pressure to agree on a unique transfer price. In contrast, Nielsen, Riamondos-Møller, and Schjelderup (2010) assume that an adjustment by one country only carries a probability of a corresponding adjustment by the other.

country h requests a change of the transfer price and, thus, an adjustment in both tax statements. It decides whether or not to accept the proposed adjustment. If it accepts, the game continues with stage 5. If it rejects the proposal, both countries engage in negotiations over the transfer price during stage 4. In stage 5, the firm decides whether to exercise the outside option. Finally, payoffs accrue. From period 2 onwards, as there is no change in the parameters of the model and the transfer price has been set by the audit/negotiation. Thus, there is no need for further audits or negotiations and the firm will have no reason to reconsider its decision of whether or not to exercise the outside option.

Figure 1 depicts the game tree. We solve the game by backward induction. Since all decisions are determined during period 1, that is our focus.

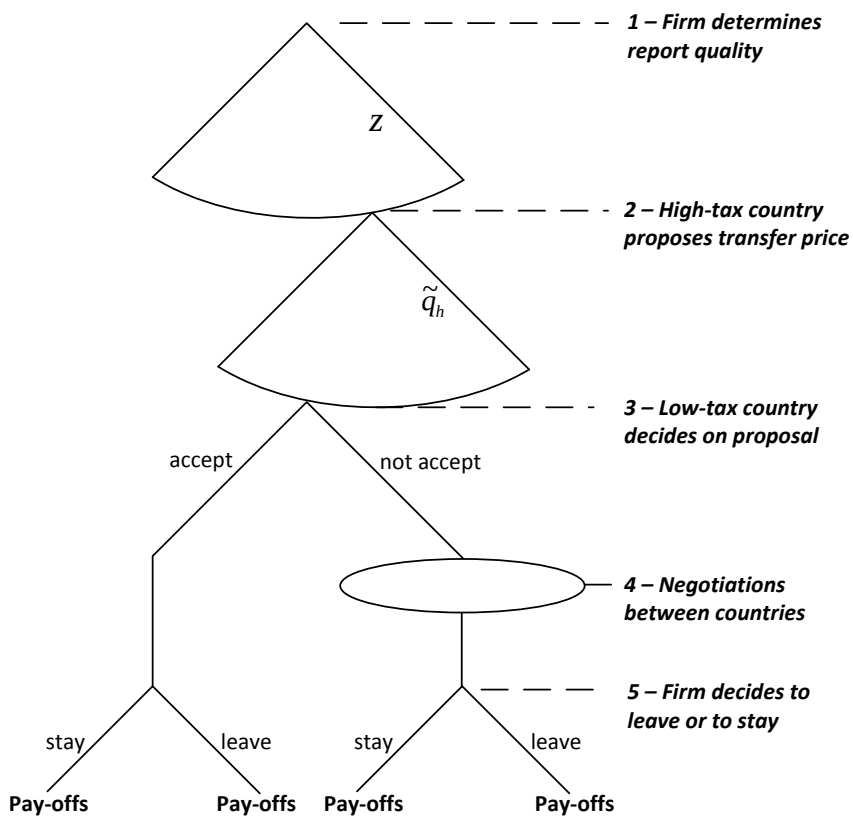

Figure 1: Game tree.

Stage 5: Participation decision In this stage, the firm decides whether or not to use its outside option. It will not if $\Pi \geq \bar{\pi}$, i.e. if its after-tax profits are not smaller than profits in the outside option. Let q^o denote the transfer price at which the firm is just indifferent between using the outside option and not:

$$q^o \equiv \frac{\bar{\pi} - (1 - t_h)\,\pi}{t_h - t_l}. \tag{4}$$

Thus, the firm will not engage the outside option if $\tilde{q} \geq q^o$. Note that, due to (3), $q^o > \underline{q} \geq 0$ for all levels of z.

Stage 4: Negotiations In this stage, countries l and h negotiate over the transfer price, i.e. the allocation of the net gain when the firm does not use the outside option. The net gain is defined as the difference in payoffs between when the firm does not use the outside option and the payoff if negotiations fail (the 'threat points'). If negotiations succeed and the two countries agree on a transfer price q, the present discounted payoffs to countries l and h are $\frac{1}{1-\delta} t_h (\pi - q)$ and $t_l \left(\frac{1}{1-\delta} q - C(z) \right)$, respectively. As discussed above, if negotiations fail, the firm is double taxed in period 1 and then utilizes the outside option. This makes the high-tax country's present discounted payoff in the threat point $t_h \left(\pi - \underline{q} + \frac{\delta}{1-\delta} \bar{\pi}_h \right)$. The low-tax country's threat point payoff is $t_l \left(\bar{q} - C(z) + \frac{\delta}{1-\delta} \bar{\pi}_l \right)$.

Negotiations can only be successful if neither country is worse off than when negotiations fail. For this to be true, there has to be at least one level of q at which both parties have higher tax revenue if negotiations succeed, i.e. one level of q which simultaneously satisfies $q < \delta (\pi - \bar{\pi}_h) + (1 - \delta)\, \underline{q}$ and $q > \delta \bar{\pi}_l + (1 - \delta)\, \bar{q}$. Let Q^N denote the set of transfer prices which satisfy this condition. Moreover, the transfer price has to be sufficiently high to stop the firm from using the outside option, $q \geq q^o$. Finally, the negotiated transfer price is bounded by the regulatory constraints to be in $\left[\underline{q}, \bar{q}\right]$. Since $q^o > \underline{q}$, the latter two conditions can be summarized by requiring $q \in [q^o, \bar{q}]$.

Given this assumption, negotiations solve:[26]

$$\max_{\tilde{q}} \left(t_h \left(\underline{q} - \tilde{q} + \frac{\delta}{1-\delta} \left(\pi - \tilde{q} - \bar{\pi}_h \right) \right) \right)^{\gamma} \left(t_l \left(\tilde{q} - \bar{q} + \frac{\delta}{1-\delta} \left(\tilde{q} - \bar{\pi}_l \right) \right) \right)^{1-\gamma} \tag{5}$$

s.t. $\tilde{q} \in Q^N \cap [q^o, \bar{q}]$ where $\gamma \in (0,1)$ captures the relative negotiation power of the high-tax country.[27]

The solution of the above bargaining game is described by the following Lemma.

Lemma 1. *Suppose that $Q^N \cap [q^o, \bar{q}] \neq \emptyset$. The solution of the negotiation game, denoted by q^N, is given by the following*
(i) Unconstrained negotiations: $q^N = q^{\gamma} \equiv \gamma \left((1-\delta) \bar{q} + \delta \bar{\pi}_l \right) + (1-\gamma) \left((1-\delta) \underline{q} + \delta \left(\pi - \bar{\pi}_h \right) \right)$.
(ii) Outside option constrained negotiations: $q^N = q^o$ if $q^{\gamma} < q^o$.
(iii) Regulation constrained negotiations: $q^N = \bar{q}$ if $q^{\gamma} > \bar{q}$.

Thus, the negotiated price will depend on which, if any, of the constraints bind. With unconstrained negotiations, the negotiation outcome does not depend on the firm's outside option or on legal constraints in the transfer pricing rules. Note further that the negotiated transfer price does not depend on tax rates. The reason is that the two countries negotiate over the tax *base*, not over tax *revenue*. If the unconstrained negotiated transfer price falls short of the minimum transfer price that keeps the firm from using its outside option, that constraint becomes binding and the transfer price equals q^o. Because, by (3), $q^o > \underline{q}$, the lower bound of regulatively acceptable transfer prices has no role.[28] However, that is not true for the upper bound and, if the unconstrained price exceeds this level, the maximum transfer price consistent with regulations is binding.

Stage 3: Low-tax country decides whether to initiate negotiations
Entering this stage, the high-tax country has proposed a transfer price, de-

[26] We assume here that the OECD guidelines (or similar supranational agreements) have some normative power in the negotiations. Thus, if a generally accepted transfer price is feasible (i.e. is an element of Q^N), it will always beat proposals outside $[\underline{q}, \bar{q}]$.

[27] It is sometimes argued that, with rational agents, the relative negotiation power must necessarily be equal, i.e. $\gamma = 0.5$. The more general formulation that we choose here does not rule out this case and may capture – albeit in a very opaque way – all unmodelled aspects that, in real world situations, render negotiations asymmetric (such as relative power in trade negotiations).

[28] If we relax that assumption, the lower bound on the set of equilibrium transfer prices becomes $max\left\{q^0, \underline{q}\right\}$. Since this lower bound is exogenous and not dependent on endogenous variables, to minimize notational complexity, we maintain the assumption in (3).

noted by $\tilde{q}_h$. The low-tax country now has the choice between three alternatives: accept, reject and enter into costly negotiations, and reject and unilaterally set the highest possible transfer price. It will accept if $\tilde{q}_h$ yields net tax revenues at least as large as the maximum of the payoff with negotiations, $t_l\left(\frac{1}{1-\delta}q^N - C(z)\right) - K_l(z)$, and the default payoff, $t_l\left(\bar{q} - C(z) + \frac{\delta}{1-\delta}\bar{\pi}_l\right)$. In case of acceptance, net revenues are $t_l\left(\frac{1}{1-\delta}\tilde{q}_h - C(z)\right)$. Thus, neglecting the outside option constraint and the legal constraints for a moment, country l will accept any offer such that:

$$\tilde{q}_h \geq \max\left\{\bar{q}_l(z), (1-\delta)\,\bar{q} + \delta\bar{\pi}_l\right\} \tag{6}$$

where $\bar{q}_l(z) = q^N - \frac{(1-\delta)K_l(z)}{t_l}$ denotes the threshold below which country l enters negotiations, the level of which depends on the cost of negotiations, which depends on the effort exerted by the firm. Note that since the maximum value of q^N is $\bar{q}$, that $\bar{q}_l(z) < \bar{q}$ for all z.

Stage 2: High-tax country makes an offer on the transfer price In this stage, the high-tax country considers the tax statement and the transfer pricing report submitted by the firm. Since adjusting the transfer price has no direct cost, country h may effectively ignore the firm's proposal and choose a transfer price on its own ($\tilde{q}_h$) that it proposes to country l. For the proposal to be accepted, it has to be at least as high as $\max\left\{\bar{q}_l(z), (1-\delta)\,\bar{q} + \delta\bar{\pi}_l\right\}$, see (6). For it to be desirable, it must be lower than $\delta\left(\pi - \bar{\pi}_h\right) + (1-\delta)\,\underline{q}$ (otherwise the high-tax country's default profits are higher). For it to be legal and feasible, it has to satisfy $\tilde{q}_h \in [q^o, \bar{q}]$. We can now state the following proposition.

Proposition 1. *In equilibrium, negotiations never take place. When a unique transfer price can be reached, the equilibrium transfer price is given by* $\max\left\{\bar{q}_l(z), \min\left\{\delta\bar{\pi}_l + (1-\delta)\,\bar{q}, q^o\right\}\right\}$.

Proof: The first part of the Proposition follows from costly negotiations ($K_h > 0$). If $Q^N \cap [q^o, \bar{q}] = \emptyset$, negotiations will fail with certainty; therefore, it does not make sense to start them. If $Q^N \cap [q^o, \bar{q}] \neq \emptyset$, country h would rather offer $\tilde{q}_h = q^N$ than enter into negotiations. With $q^N \in Q^N \cap [q^o, \bar{q}]$ by assumption, this choice is feasible and always dominates negotiations. Now turn to the second part which builds on $Q^N \cap [q^o, \bar{q}] \neq \emptyset$. Note that the above indicated conditions can be summarized by $\tilde{q}_h \geq \bar{q}_l(z)$ and $\tilde{q}_h \in Q^N \cap [q^o, \bar{q}]$. If $\bar{q}_l(z) \in Q^N \cap [q^o, \bar{q}]$, then country h cannot do better than offer $\bar{q}_l(z)$. If, however, $\bar{q}_l(z) < \min\left\{Q^N \cap [q^o, \bar{q}]\right\} = \min\left\{\delta\bar{\pi}_l + (1-\delta)\,\bar{q}, q^o\right\}$, then country h's best choice is the lowest feasible transfer price where feasibility is

either constrained by the firm's or country l's outside option. $\square$

Thus, in equilibrium, transfer pricing is either determined by the relative bargaining power (in case of unconstrained negotiations), by the outside options of the low-tax country, or by the outside options of the firm. Regulation constraints are not binding. This is due to the fact that country l will always accept some transfer price less than $\bar{q}$ and the firm will always reject one sufficiently close to $\underline{q}$. Note, however, that the regulatory constraints still influence the equilibrium as they affect q^o and, if the negotiated price is $\bar{q}$, $\bar{q}_l(z)$. The finding that negotiations never take place is due to the assumption of complete information. In Section 5.2, we present an alternate model in which the low-tax country's negotiation costs are unknown to the high-tax country. In that setting, negotiations do occur with positive frequency.

Stage 1: Firm submits tax statement and transfer pricing report Since audits occur with certainty and the high-tax country can adjust the firm's proposed transfer price without direct cost, the firm has no incentive to propose something other than the equilibrium transfer price. It can nevertheless influence the equilibrium transfer price via the quality of its report since a better quality report makes the low-tax country more willing to contest country h's offer, resulting in a higher transfer price.[29] Whether or not the firm finds this profitable depends on whether the tax savings outweigh the cost of preparing a quality report.

To determine conditions where the firm exerts positive effort, consider the equilibrium transfer price when $z = 0$. In this case, the offer made by country h will be $\max\{\bar{q}_l(0), \min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\}\}$. If $\min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\} \leq \bar{q}_l(0)$, the impact of effort on the equilibrium transfer price is $\frac{d\bar{q}_l}{d\tilde{z}} = -\frac{1-\delta}{t_l}K_l'(\tilde{z}) > 0$. The marginal cost, meanwhile, is zero when $z = 0$. Thus, the firm will exert positive effort. To maximize profits, the firm sets $\tilde{z}$ in order to solve

$$\max_{\tilde{z}} \left((1-t_h)\frac{\pi}{1-\delta} + (t_h - t_l)\left(\frac{q^N}{1-\delta} - \frac{K_l(\tilde{z})}{t_l}\right) - (1-t_l)C(\tilde{z}) \right) \quad (7)$$

The optimal effort z balances the gain by increasing the transfer price with the cost of doing so:

$$-(1-t_l)C'(z) - \frac{t_h - t_l}{t_l}K_l'(z) = 0 \quad (8)$$

[29] In an unreported alternative, we considered a setting in which these efforts increase the relative bargaining *strength* of country l rather than lowering its bargaining *cost*. Comparable results were found.

from which follows

$$\frac{dz}{dt_h} = \frac{\frac{1}{t_l} K_l'(z)}{\frac{\partial^2 \Pi}{\partial z^2}} > 0 \quad \text{and} \quad \frac{dz}{dt_l} = -\frac{C'(z) + \frac{t_h}{t_l^2} K_l'(z)}{\frac{\partial^2 \Pi}{\partial z^2}} < 0 \tag{9}$$

This implies that an increase in t_h increases z while an increase in t_l reduces it. Note that $\frac{dz}{d\gamma} = 0$.

If, however, $\min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\} > \bar{q}_l(0)$, then for a sufficiently small level of effort, the equilibrium transfer price is independent of effort. However, by expending enough effort, denoted $\bar{z}$, the firm may be able to lower country l's bargaining cost to the point where $\min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\} > \bar{q}_l(\bar{z})$, i.e. where further effort would increase the equilibrium transfer price. For it to choose to do so requires two things. First, the marginal tax savings of additional effort exceeds the marginal cost, i.e. $-(1-t_l)C'(\bar{z}) - \frac{t_h - t_l}{t_l} K_l'(\bar{z}) > 0$. If not, then the firm would not choose to push the transfer price above $\min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\}$, which it could achieve without exerting any effort, making the equilibrium effort $z = 0$. If so, then it would either choose the effort level given by (8) or $z = 0$, depending on which profit level is higher.[30]

This then begs the question of how the equilibrium transfer price depends on tax rates and bargaining power. If the equilibrium transfer price equals $\delta\bar{\pi}_l + (1-\delta)\bar{q}$, it does not depend on tax rates or bargaining power. If it equals q^o, tax effects are given by

$$\frac{dq^o}{dt_l} = -\frac{q^0 + \frac{d\bar{\pi}}{dt_l}}{t_h - t_l} < 0 \quad \text{and} \quad \frac{dq^o}{dt_h} = \frac{\pi - q^o - \frac{d\bar{\pi}}{dt_h}}{t_h - t_l}. \tag{10}$$

Since $\bar{\pi}$ is decreasing in both tax rates, as either tax rate increases, it makes the firm more willing to exercise its outside option, making the participation constraint more binding. This reinforces the direct effect of the lower tax rate, indicating that a rise in the low-tax country's rate reduces this cutoff transfer price. For the high-tax country, however, this is countered by the direct effect. As long as the firm's high country tax base is smaller when it exercises its outside option than when it does not, i.e. the firm reallocates activities so as to reduce the tax burden in the high-tax country, then the direct effect dominates and $\frac{dq^o}{dt_h} > 0$. We assume that this is the case. Thus, the equilibrium transfer price is increasing in country h's tax and decreasing in country l's tax.[31] Furthermore, $\frac{dq^o}{d\gamma} = 0$, i.e. bargaining power does not affect q^o, as expected.

[30] Note the role of discontinuity in profits at $\bar{z}$ in the need for this comparison.

[31] Recall that positive profits must be declared in country h when signing dq^o/dt_h.

If however, the equilibrium transfer price is $\bar{q}_l(z)$ with q^N found in unconstrained negotiations, tax effects are:

$$\frac{d\bar{q}_l}{dt_h} = \frac{d\bar{q}_l}{dz}\frac{dz}{dt_h} > 0 \quad \text{and} \quad \frac{d\bar{q}_l}{dt_l} = (1-\delta)\frac{K_l(z)}{t_l^2} + \frac{d\bar{q}_l}{dz}\frac{dz}{dt_l} \gtrless 0 \tag{11}$$

A rise in the country h's tax increases the transfer price because it increases the incentive to invest in report quality z. The response to country l's tax rate, however, depends on two terms. First, an increase in t_l increases the benefit of securing a higher tax base and, thus, raises the reservation value of the transfer price at which the low-tax country is willing to accept without negotiations (since $K_l(z)$ does not directly depend on t_l). Second, a rise in t_l lowers the tax difference, reducing the firm's effort z and, thus, increasing the cost of negotiation. This second effect serves to at least partially offset the first, resulting in an ambiguous total effect.

The bargaining power γ unambiguously reduces the transfer price:

$$\frac{d\bar{q}_l}{d\gamma} = (1-\delta)\left(\bar{q} - \underline{q}\right) - \delta\left(\pi - \bar{\pi}_h - \bar{\pi}_l\right) < 0 \tag{12}$$

which follows from the assumption that $Q^N \neq 0$.[32]

Proposition 2. *With Prop. 1, if $Q^N \cap [q^o, \bar{q}] \neq \emptyset$, the equilibrium transfer price is either $\delta\bar{\pi}_l + (1-\delta)\bar{q}$ or q^o or $\bar{q}_l(z)$.*
(i) The equilibrium transfer price $\delta\bar{\pi}_l + (1-\delta)\bar{q}$ does not depend on tax rates.
(ii) The equilibrium transfer price q^o falls in t_l and increases in t_h so long as the high-tax country tax base in the outside option is smaller than when the outside option is not used. It increases in $\bar{\pi}$ and falls in π.
(ii) The equilibrium transfer price $\bar{q}_l$ increases in t_h and falls in t_l if $K_l(z)$ is sufficiently small in equilibrium. It rises in profits π and $\bar{\pi}_l$ and falls in $\bar{\pi}_h$ and the high-tax country's bargaining power γ.

Regardless of whether the equilibrium is described by parts (i) and (ii), the results match those in the empirical literature relating tax rates to transfer pricing behavior. In addition, it provides new predictions that can be explored in the literature regarding the impact of profits, both when the firm does and does not exercise its outside option, on transfer pricing. In particular, as the effect of π differs depending on whether the equilibrium offer by country h is driven by the firm or the low-tax country, this provides

[32] $Q^N \neq \emptyset$ requires that there is some q which satsifies $q < \delta(\pi - \bar{\pi}_h) + (1-\delta)\underline{q}$ and $q > \delta\bar{\pi}_l + (1-\delta)\bar{q}$. Then, the right hand side of (12) is negative.

the possibility of determining which of these issues dominates the average transfer price setting.

In the next section, we compare our model to the concealment model.

4 Comparison with concealment model

In this section, we will discuss common features and differences between the above presented negotiation model and the often used concealment model. Therefore, we briefly sketch a typical concealment cost model (subsection 4.1), compare the predictions (4.2) and discuss the difference in performance if a system with formula apportionment is introduced (4.3).

4.1 A typical concealment model

As discussed above, the concealment model usually assumes that there is a "correct" transfer price, here denoted by q^*, which is known by the firm and both governments. Nevertheless, the firm is supposed to have some discretion over the transfer price, i.e. it may deviate from q^*. This, however, comes at a present discounted cost of $\phi\left(\tilde{q}-q^*\right)$ where $\phi' = sgn\left(\tilde{q}-q^*\right)$ and $\phi'' > 0$. This assumption is often justified as reflecting the cost of concealing the deviation or the expected penalty in case of discovery.

The firm's optimization problem is then

$$\max_{\tilde{q}} \left[(1-t_h)\frac{\pi}{1-\delta} + (t_h - t_l)\frac{\tilde{q}}{1-\delta} - \phi\left(\tilde{q}-q^*\right)(1-t_l)\right] \tag{13}$$

where, comparable to the cost of preparing the report in the negotiation model, we assume that the concealment cost can be deducted from the tax base in country l. The profit-maximizing transfer price, q, is implied by $\phi'\left(q-q^*\right) = \frac{t_h - t_l}{(1-\delta)(1-t_l)}$ or

$$q = q^* + \phi'^{-1}\left(\frac{t_h - t_l}{(1-\delta)(1-t_l)}\right). \tag{14}$$

The equilibrium transfer price increases in the tax gap $(t_h - t_l)$. Ceteris paribus, it increases in t_h and decreases in t_l.

4.2 Predictions: concealment versus negotiation model

How do the predictions of the concealment model differ from those of the negotiation model introduced above? Both models predict that, if certain

conditions are met, the high-tax country's tax rate increases the transfer price while it falls in the low-tax country's tax rate. These predictions have found large and robust support in the empirical literature, as quoted in the introduction.

There are several differences, though. First, the negotiation model predicts that bargaining power affects the transfer price. From an empirical point of view, bargaining power could be measured in different ways. For example, Huizinga and Laeven (2008) show that reported firm earnings increase in national GDP, which could be consistent with larger countries obtaining a larger share of the tax base. However, as they do not control for firm size in these specifications, there is a limit to such conjecture. Alternatively, Davies et. al (2014) find that higher transfer prices are set for French exports to high income countries, a result they attribute to pricing-to-market. Alternatively, this could result from wealthier countries having stronger bargaining power. The concealment model has no prediction in this regard.

Second, the negotiation model has the transfer price dependent on profits whereas the baseline version of the concealment model does not. Note, though, that more sophisticated concealment models may also establish a link between the equilibrium transfer price and profits.[33] Estimates provided by Bernard, Jensen, and Schott (2006) indicate that the amount of transfer pricing by U.S. multinationals is increasing with firm employment.[34] To the extent that larger firms are more profitable (now taken as a stylized fact in the empirical productivity literature), this may be interpreted as evidence of the profit impact.

Third, and maybe most importantly, the concealment model has a clear prediction with regard to the impact of tax differentials and the audit rate. If the audit rate is at a hundred percent, the link between transfer prices and tax differentials should vanish. In contrast, the negotiation model presented above provides an explanation why there should still be a positive impact of tax differences on transfer pricing even when audits are a certainty.

Finally, the concealment model does not predict a link between owner-

[33] For instance, if the detection probability is a negative function of reported profits, more profitable firm can shift more profits abroad. Alternatively, if the transfer price is used to value an input that is used in variable amounts, more productive firms will produce more output, resulting in greater benefit from deviation from q^*. Beyond this, the heterogenous productivity model of Bauer and Langenmayr (2013) provides a link between productivity, profits, and transfer pricing.

[34] Davies et. al (2014) use a single year's worth of data and firm fixed effects and therefore do not directly estimate the impact of firm-level variables.

ship and transfer prices whereas we show below (in section 5) the equilibrium transfer price does depend on ownership shares in the negotiation model.

4.3 Introduction of formula apportionment

As part of its effort to combat tax avoidance, the European Union (EU) has repeatedly considered introducing a common consolidated corporate tax base (CCCTB) with formula apportionment.[35] In our simple framework, formula apportionment would imply that a supra-national institution fixes the transfer price to $\bar{q}^s$ according to some formula depending on the firm's production structure or sales numbers (where the superscript s denotes that this is set by the supra-national authority). It is often argued that a CCCTB with formula apportionment would curb profit shifting to low-tax jurisdictions and, thus, benefit the high-tax jurisdictions. In the following, we consider this claim by evaluating the introduction of $\bar{q}^s$ from the perspective of the concealment model and the negotiation model, respectively. More precisely, we ask under which circumstances the high-tax country benefits from such a policy.

Since the concealment cost is deducted from the low-tax country's tax base, it is sufficient to compare the transfer price levels with each other. In the concealment model, the high-tax country benefits from the introduction of formula apportionment if

$$\bar{q}^s < q^* + \phi'^{-1}\left(\frac{t_h - t_l}{(1-\delta)(1-t_l)}\right) \tag{15}$$

That is, countries with large tax rates are more likely to gain than those with low tax rates.[36] Moreover, countries hosting firms with low marginal cost concealment technologies will benefit as well. These may, for instance, be firms with a high share of intangible goods which, as it is often assumed, facilitates profit shifting. Finally, if ϕ also includes the expected penalties if the firm is caught deviating from q^*, then the CCCTB would benefit countries with low detection rates.

In the negotiation cost model, the equilibrium transfer price is given by $\max\{\bar{q}_l(z), \min\{\delta\bar{\pi}_l + (1-\delta)\bar{q}, q^o\}\}$. For purpose of comparison, assume that the equilibrium transfer price is $\bar{q}_l(z)$ with q^N found in unconstrained

[35] Eichner and Runkel (2008) provide an argument in favor of this. Counterarguments based on the new distortions introduced by a CCCTB include Hines (2010) and Nielsen, Riamondos-Møller, and Schjelderup (2010).

[36] The literature sometimes argues that, if properly determined, the formula ensures $\bar{q}^s = q^*$. Then, high-tax countries will certainly win.

negotiations (alternative assumptions are discussed below). Then, the high-tax country profits from formula apportionment if

$$\bar{q}^s < (1-\delta)\left[\gamma\left(\bar{q}+\frac{\delta}{1-\delta}\bar{\pi}_l\right)+(1-\gamma)\left(\underline{q}+\frac{\delta}{1-\delta}\left(\pi-\bar{\pi}_h\right)\right)-\frac{K_l\left(z\right)}{t_l}\right] \tag{16}$$

Again, countries with large tax rates are more likely to gain than those with low tax rates because z will differ accordingly. Now, however, bargaining power plays a role. Since γ reduces the transfer price, see (12), countries with large bargaining power are more likely to lose from the introduction of a CCCTB. This is because a system with formula apportionment prevents countries with superior bargaining power from manipulating the equilibrium transfer price. Similarly, as the negotiated price is increasing in $\bar{\pi}_l$ but falling in $\bar{\pi}_h$, countries with weak outside options facing countries with large outside option payoffs will tend to benefit from a CCCTB. Further, profitable locations (i.e. those with high levels of π) are likely to gain as, firstly, under formula apportionment the transfer price does not depend on profits whereas the negotiated transfer price increases in it.

Things look different if the equilibrium transfer price is q^o. In this case, the firm's outside options determine the transfer price. The introduction of an inflexible, tax-increasing system like the CCCTB could potentially lead a the firm to exercise its outside option. Thus, both countries may actually lose when the firm has strong outside options since a CCCTB would prevent them from offering the firm a transfer price that makes it continue its activity. In contrast, if the equilibrium transfer price is $\delta\bar{\pi}_l+(1-\delta)\,\bar{q}$, i.e. if the low-tax country's outside option is binding, a CCCTB would improve the high-tax country's situation as long as $\bar{q}^s < \delta\bar{\pi}_l+(1-\delta)\,\bar{q}$, provided that the low-tax country is forced to stick to the CCCTB rules.

The effects of the CCCTB on the low-tax country's welfare are less straightforward to derive since tax revenues depend both on the transfer price and on firm concealment or report-improving effort costs. Thus, even if the CCCTB lowers the transfer price, these losses would be at least partially offset by the elimination of these costs and the attendant rise in the low-tax country's tax base.

5 Extensions

In this section, we consider three extensions of the negotiation model to further characterize its properties.

5.1 Domestic and foreign firm ownership

So far we have assumed that both governments are only interested in the firm's tax payments. However, if households in countries l or h own (part of) the firm, the governments' incentives may change. Let $\lambda_i \geq 0$ denote the weight that the households' income has in the governments' objective function. Furthermore, let $\eta_i \in [0,1]$ denote the fraction of the firm's equity owned by country i's representative household (where the sum of these cannot exceed unity). We define $\Lambda_i \equiv \lambda_i \eta_i$ for $i = r, h$. For simplicity, we set $\bar{\pi}_h, \bar{\pi}_l = 0$ and assume that the negotiated transfer price is $\bar{q}_l(z) = q^\gamma$ (i.e. q^N is found in unconstrained negotiations).

The equilibrium transfer price in negotiation then solves

$$\max_{\tilde{q}} \left(t_h \left(\underline{q} - \tilde{q} + \frac{\delta}{1-\delta}(\pi - \tilde{q}) \right) + \Lambda_h \left(\Pi - \bar{\Pi} \right) \right)^{\gamma} \left(t_l \left(\tilde{q} - \bar{q} + \frac{\delta}{1-\delta}\tilde{q} \right) + \Lambda_l \left(\Pi - \bar{\Pi} \right) \right)^{1-\gamma} \tag{17}$$

s.t. $\tilde{q} \in Q^N \cap [q^o, \bar{q}]$. With $\Pi - \bar{\Pi} = (t_h - t_l)\frac{\tilde{q}}{1-\delta} + t_l\bar{q} - t_h\underline{q} + \frac{\delta}{1-\delta}((1-t_h)\pi - \bar{\pi})$ increasing in $\tilde{q}$, we have to ensure that country h effectively has an interest in lowering the transfer price. We therefore assume $\Lambda_h < \frac{t_h}{t_h - t_l}$ (which is always true as long as the marginal welfare weight of public expenditures is larger than the marginal welfare weight of private consumption).

The Nash bargaining solution is given by

$$\begin{aligned} q^\gamma &= \gamma(1-\delta)\bar{q} + (1-\gamma)\left((1-\delta)\underline{q} + \delta\pi\right) \\ &\quad + (1-\gamma)\Lambda_h \frac{t_l(1-\delta)\left(\bar{q} - \underline{q}\right) + \delta((1-t_l)\pi - \bar{\pi})}{t_h - \Lambda_h(t_h - t_l)} \\ &\quad - \gamma\Lambda_l \frac{t_h(1-\delta)\left(\bar{q} - \underline{q}\right) + \delta((1-t_h)\pi - \bar{\pi})}{t_l + \Lambda_l(t_h - t_l)} \end{aligned} \tag{18}$$

where the first line on the right hand side represents the bargaining outcome in the absence of ownership. When at least one ownership share is non-zero, the solution will generally differ. We can now state the following Proposition.

Proposition 3. *(i) An increase in the high-tax country's firm ownership (or an increase in the high-tax country's valuation of private income) unambiguously increases the transfer price.*
(ii) An increase in the low-tax country's firm ownership (or an increase in the low-tax country's valuation of private income) increases the transfer price if $t_h(1-\delta)\left(\bar{q} - \underline{q}\right) < -\delta((1-t_h)\pi - \bar{\pi})$.

Proof: (i) The derivative of (18) with respect to Λ_h is positive if $t_l\left(1-\delta\right)\left(\bar{q}-\underline{q}\right)+\delta\left(\left(1-t_l\right)\pi-\bar{\pi}\right)>0$. With $\bar{q}>\underline{q}$ by assumption and $\left(1-t_l\right)\pi>\bar{\pi}$ by (3), this is always the case. (ii) The derivative of (18) with respect to Λ_l is positive if $t_h\left(1-\delta\right)\left(\bar{q}-\underline{q}\right)+\delta\left(\left(1-t_h\right)\pi-\bar{\pi}\right)<0$. With (3) $\left(1-t_h\right)\pi<\bar{\pi}$. Thus, the effect is ambiguous. □

If both countries value private income, an increase in the transfer prices *ceteris paribus* benefits both countries. However, it increases the low-tax country's tax revenue, while it reduces the high-tax country's revenue. An increase in $\Lambda_ß$ does two things. First, it increases the relative payoff of country i which, in a bargaining situation, requires a compensation for the other country. Second, it makes increasing the transfer price more valuable; this should *ceteris paribus* lead to an increase of q. Therefore, an increase in Λ_h unambiguously increases the transfer price, while an increase in Λ_l has an ambiguous effect.

Note that, in contrast to the baseline negotiation model, tax rates affect the negotiation outcome. This is because a change in the transfer price no longer amounts to a simple shift in the tax base across countries. Instead, with non-zero ownership shares, it also shifts profits to the firm. Because profits are valued differently than the tax base, due to the weight on profits and the ownership share (both of which are in Λ_i) as well as the share captured by the government via taxes (t_i), this has effects on the negotiated transfer price.

That issue aside, the nature of the equilibrium is much like it is in the baseline. As country h can still offer an acceptable transfer price below that determined by (18), it will do so. Further, since the firm can manipulate the transfer price via country l's negotiation costs, it will find it advantageous to exert effort and write a high-quality report.

5.2 Random negotiation cost K_l

One limitation of the above simple theory is that in equilibrium, negotiations do not happen because the high-tax country simply makes the low-tax country indifferent between accepting the offered transfer price or moving on to costly negotiations. One method of reintroducing equilibrium negotiations is to allow country l's cost of negotiation, K_l, to be distributed randomly with its value known to country l but not h.

To this end, assume that K_l is distributed according to a c.d.f. $F(K_l;\tilde{z})$ where, comparable to the above model, $\tilde{z}$ is chosen by the firm in Stage 1. This function has an associated p.d.f. $f(.)=\frac{dF}{dK_l}$. Further, we assume that

$F(0;\tilde{z}) = 0$ and that $F(t_l q^N;\tilde{z}) = 1$. The first implies that an offer $\tilde{q}_h = 0$ by country h will always be rejected while offering $\tilde{q}_h = q^N$ will always be accepted. Finally, assume that $F_z(K_l;z) \geq 0$, i.e. by investing in report quality, the firm skews the cost distribution towards the lower end, lowering the expected K_l.

Relative to the baseline, stages 5 and 4 are unaffected. In stage 3, country l will continue to accept any transfer price that exceeds its $\bar{q}_l$, with the only difference being that this is now a function of its privately known realization of K_l. However, from the viewpoint of country h, $\bar{q}_l$ is now a random variable. Therefore, it chooses its offer to maximize expected revenues, denoted by $R_h^e(\tilde{q}_h)$ and given by

$$R_h^e(\tilde{q}_h) = \left(1-\bar{F}\right) R(\tilde{q}_h) + \bar{F} R_N \tag{19}$$

where $R(\tilde{q}_h) = \frac{1}{1-\delta} t_h (\pi - \tilde{q}_h)$ and $R_N = \frac{1}{1-\delta} t_h \left(\pi - q^N\right) - K_h$. $\bar{F} \equiv F\left(\overline{K_l}(\tilde{q}_h);z\right)$ represents the probability that country l rejects $\tilde{q}_h$, and $\overline{K_l}(\tilde{q}) = t_l(q^N - \tilde{q})$ denotes the threshold below which country l will enter negotiations.

$R_h^e(\tilde{q}_h)$ is maximized at $\tilde{q}_h = \bar{q}_l^e$ satisfying the first order condition

$$t_l \bar{f}\left[R(\bar{q}_l^e) - R_N\right] - t_h\left(1-\bar{F}\right) = 0 \tag{20}$$

with $\bar{f} = f\left(\overline{K_l}(\bar{q}_l^e);z\right)$. The first term represents the change in the probability of rejection (which was either zero or one in the baseline case) and the second represents the expected change in tax revenues.[37] Country h can only prevent negotiations with certainty by proposing $\tilde{q}_h = q^N$. However, since $R\left(q^N\right) - R_N \leq 0$ (because of $K_h \geq 0$), equation (20) shows that this cannot be an optimum choice. Thus, in equilibrium, both countries enter negotiations with a certain probability $\bar{F} > 0$.

Note that as the firm's effort does not impact the country h's revenues except via its impact on the probability of negotiations:

$$\frac{d\bar{q}_l^e}{dz} = -\frac{t_l \bar{f}_z\left[R(\bar{q}_l^e) - R_N\right] + \bar{F}_z t_h}{\frac{\partial^2 R_h^e(\tilde{q}_h)}{\partial \tilde{q}^2}} \geq 0 \tag{22}$$

[37] The second order condition is negative,

$$-t_l \frac{f'\left(\overline{K_l}(\tilde{q});z\right)}{f\left(\overline{K_l}(\tilde{q});z\right)}\left[t_h\left(q^N - \tilde{q}\right) + K_h\right] - 2t_h < 0 \tag{21}$$

if mild restrictions on $f'(.)$ are met.

where $\frac{\partial^2 R_h^e(\tilde{q}_h)}{\partial \tilde{q}^2} < 0$ is necessary for (20) to describe a revenue maximum. Thus, as before, greater effort on the firm's part increases country l's willingness to negotiate (on average) thereby increasing the transfer price country h offers.

The firm anticipates that the transfer price equals either $\bar{q}_l$ if negotiations do not happen or q^N if they do (note that we assume that $\bar{q}_l \geq q^o$ so that z has a non-zero effect on the equilibrium). Thus, expected profits are:

$$E(\Pi) = \frac{1}{1-\delta}\left((1-t_h)\pi + (t_h - t_l)\right)\left[\left(1-\bar{F}\right)\bar{q}_l^e + \bar{F}q^N\right] - (1-t_l)\,C(\tilde{z}) \tag{23}$$

which is maximized by choosing z such that:

$$\left[\bar{F}_z - \bar{f}t_l\frac{d\bar{q}_l}{dz}\right]\left(q^N - \bar{q}_l^e\right) + \left(1-\bar{F}\right)\frac{d\bar{q}_l}{dz} = (1-\delta)\frac{1-t_l}{t_h-t_l}C'(z) \tag{24}$$

i.e. that the the marginal expected tax saving equals the marginal cost of effort. Using (20), the above equation can be written as showing that the left hand side is clearly positive. With $C'(0) = 0$, this ensures that there is always the incentive to invest in the report quality. Thus, the nature of the equilibrium is quite similar to that in the baseline.

5.3 The Outside Option

In the baseline case, the firm influenced the tax rate by lowering the low tax country's negotiation cost, which increased that nation's willingness to enter negotiations and therefore increased the equilibrium transfer price even though it did not affect q^N, the tax rate resulting from negotiations. Alternatively, we can consider a setting in which, comparable to the cost of writing a quality report, the firm can spend money in order to affect the various outside option payoffs, $\bar{\pi}$, $\bar{\pi}_h$, and/or $\bar{\pi}_l$. For example, suppose that by spending ϕ at the beginning of the game, the firm is able to purchase a more mobile technology so that, if it chooses to exercise its outside option, it receives $\bar{\pi}(\phi)$ which is increasing in ϕ. As this increases the transfer price at which the firm would be willing to exit, q^o, if the equilibrium transfer price is driven by q^o this can be to the firm's advantage (keeping in mind the need to compare these gains with cost). Note that this gives the firm influence over negotiations in cases where it would not in the baseline. Similarly, one can envision settings where the firm would find it advantageous to invest in technologies that increase the low-tax country's outside option payoff or lower that of the high-tax country. As both of these increase q^γ,

this too would increase the equilibrium transfer price potentially benefitting the firm. Such possibilities suggest that firms which find it easier to obtain mobile technologies will be able to set higher transfer prices, a prediction not found in the concealment model where location is typically taken as fixed.

6 An attempt at model synthesis: transfer pricing with infrequent audits

In this section, we make a first attempt to build a model which contains elements of both the concealment model and the negotiation model. We do so by relaxing the assumption of audit certainty. As in indicate in Section 2, large firms are frequently or even constantly audited. However, for medium size firms, the audit probability is around 6 percent (i.e. an audit every fifteen years) and for small size firms around 3 percent (thirty years, see Bundesfinanzministerium, 2014). Although most multinational firms are large, there may be some for which the assumption of infrequent audits holds.

In the baseline negotiation model, however, an audit probability $p \in [0, 1)$ will always make the firm choose the highest regulatory permissable transfer price, $\overline{q}$. This corner solution occurs because, unlike the concealment model, there is no penalty associated with setting a transfer price other than the "correct" one. Thus, in the absence of frequent audits, the transfer price would be independent of the size of the tax differential, something in clear contradiction to the empirical evidence.

We fix this problem by introducing an element that is familiar with the concealment model. We assume that the tax authorities have limited resources implying that they cannot audit each firm in each year. However, they may screen easily accessible indicators like the locational profit (per unit of capital or per employee). If these indicators are outside certain acceptible ranges (i.e. if locational profits are too low), the audit probability increases. Let $T_h = \pi - \tilde{q}$ denote the tax base in the high-tax country. Without an audit, country h cannot observe whether a low tax base is due to low profits π or excessively large transfer prices, $\tilde{q}$. The audit probability p is a function of the tax base T_h with $p'(T_h) < 0$. This implies that firms with higher π have better opportunities to shift profits (see the discussion of the profit impact on transfer pricing above).

As before, this audit occurs in the first period.[38] If the audit occurs, there

[38] If the audit occurs at a later date but the transfer price emerging from the audit is applied retroactively along with interest charges on any tax underpayments owed the high-

is no change to the choices in stages 2 through 5, therefore the analysis of the negotiation remains the same as in the baseline. Stage 1, in which the firm sets its initial transfer price and effort level, does change.

The firm's expected profits are now given by:

$$\begin{aligned} E(\Pi) &= p(T_h)\left((1-t_h)\frac{\pi-\overline{q}_l(z)}{1-\delta}+(1-t_l)\left(\frac{\overline{q}_l(z)}{1-\delta}-C(z)\right)\right) \\ &\quad +(1-p(T_h))\left((1-t_h)\frac{\pi-\tilde{q}}{1-\delta}+(1-t_l)\left(\frac{\tilde{q}}{1-\delta}-C(z)\right)\right) \end{aligned} \tag{25}$$

where $\tilde{q}$ is the transfer price submitted by the firm. The first order condition is $p'(T_h)(t_h-t_l)\frac{q^*-\overline{q}_l(z)}{1-\delta}+(1-p(T_h))\frac{t_h-t_l}{1-\delta}=0$ implying an equilibrium transfer price of

$$q=\overline{q}_l(z)-\frac{1-p(T_h)}{p'(T_h)} \tag{26}$$

Note that the q is strictly larger than $\overline{q}_l(z)$.[39] We can now show that an increase in the negotiation transfer price, $\overline{q}_l(z)$, strictly increases the equilibrium transfer price q, $\frac{dq}{d\overline{q}_l(z)}=p'(T_h)\frac{t_h-t_l}{1-\delta}/\frac{\partial^2 E(\Pi)}{\partial\tilde{q}^2}>0$. In other words, if firms anticipate audits to have mild consequences, they get more aggressive in setting tax-saving transfer prices. Furthermore, equilibrium expected profits can be expressed as:

$$\begin{aligned} E(\Pi) &= (1-t_h)\frac{\pi-\overline{q}_l(z)}{1-\delta}+(1-t_l)\left(\frac{\overline{q}_l(z)}{1-\delta}-C(z)\right) \\ &\quad -\frac{t_h-t_l}{1-\delta}\frac{(1-p(\pi-q))^2}{p'(\pi-q)} \end{aligned} \tag{27}$$

where the first line on the right are the profits of the negotiation model and the second line is introduced due to concealment. The features of the negotiation model profits are discussed above. The value of the concealment effect is strictly positive since $p'(T_h)<0$. It increases in the tax rate differential and decreases in the audit probability $p(T_h)$ as well as the audit sensitivity $p'(T_h)$. Note that the size of this also depends on the high-tax

tax country, the firm's decision is similar to that here so long as the discount rate δ equals the interest rate. Alternatively, one can consider a situation in which there is a statute of limitations for how far back the audit's transfer price can be retroactively applied. The analysis of such cases, however, requires additional assumptions, such as those relating to the treatment of overpayments to the low-tax country. As a proper analysis of that case requires considerable discussion with little additional insight, we do not pursue it here.

[39] If an audit implies a fixed cost for the firm, it may be that it chooses a transfer price below $\overline{q}_l(z)$ in order to reduce the probability of an audit.

country's tax base $\pi - q$ and as such, depends on the parameters governing negotiations. Therefore there is a complex interaction between negotiation and concealment.

Note that this synthesis of the negotiation and the concealment models leaves out several complicating features of the real world. From the viewpoint of the firm, the audit is only important if it leads to an adjustment of the transfer price (neglecting that an audit may involve substantial cost for the firm even if all transfer prices are accepted). Thus, the audit probability may not be equal to the probability that the transfer price is adjusted, possibly due to the complexity of the firm's operations which contain activities not easily priced, leaving the competent authority feeling incompetent to justifiably adjust the transfer price. Second, one unpalatable aspect of this discussion is that it assumes that the transfer pricing report is non-binding for the transfer price(s) indicated in the tax statement. In other words, the firm submits a tax statement that maximizes tax savings and a separate report that is prepared for the case of an audit which argues for a different transfer price. In practice, even low-tax practitioners indicate that such behavior by a firm would be considered unreasonable and, as such, would make the low-tax country less willing to argue against the high-tax country's adjustment to the transfer price. One rationale given to us for this is that, in contrast to the model here, tax authorities interact with one another on repeated occasions as different firms are audited. As a result, choosing to support a single firm offering such contradictory tax statements may result in a breakdown of long-term relationships between tax authorities impacting the negotiations for other firms. Moreover, by credibly threatening not to engage in negotiations if the transfer price is implausible, the low-tax country can force the firm to provide thorough and, above all, consistent information, which may then be used for negotiations with the high-tax country.

7 Conclusion

The purpose of this paper has been to take account of the practitioners' critiques of the prevailing concealment model of tax-induced transfer pricing. We provide a new model of transfer pricing, the 'negotiation model', which abandons the idea that the firm hides or conceals information from the tax authorities hoping that there is no audit or at least none that leads to detection and fines. We instead assume that the firm is certainly audited and that the firm's transfer price is determined by (potential) negotiations

between the high and low-tax countries. The outcome of the bargaining process can be manipulated by the firm via an effort that tilts negotiations in the low-tax country's favor.

As with earlier approaches, this results in an equilibrium transfer price that is increasing in the tax gap.[40] However, the relationship between the transfer price and tax rates becomes more complex because of countervailing effects from the firm's effort and the high-tax country's willingness to engage in negotiations. Thus, while the model does provide reassurance that the results from the existing literature will largely carry over to a more realistic setting of transfer pricing, it does point to the need for caution, particularly when attempting to calibrate models to derive revenue and welfare implications. Whereas in the baseline concealment model, transfer pricing by the firm is a purely wasteful activity, the negotiation model emphasizes the transfer price as a flexible instrument to account for, first, outside options of the firm and, second, for differences in economic power. Thus, the model predicts that firms with better outside options (i.e. more mobile firms) shift more profits and that – ceteris paribus – more powerful countries have higher reported subsidiary profits and, thus, tax bases. The latter result may change the view on policies that are intended to curb profit shifting. For instance, a movement towards a common consolidated corporate tax base with formula apportionment will likely benefit the high-tax countries, but – ceteris paribus – hurt the powerful countries. Furthermore, the concealment model yields the policy prescription to strengthen the instruments of tax enforcement (i.e. increase the rate of audits, the level of fines etc.) – at least up to a point where marginal revenue equals marginal cost. In principle, efficient enforcement may abolish profit shifting entirely. Our model takes a different perspective and shows that, even with perfect enforcement, there will still be a link between tax rate differentials and observed profit rates. Another empirical prediction from the model is that more profitable firms shift more profits (Bauer and Langenmayr, 2013, provide an alternative explanation for this finding). Finally, the model predicts that household ownership of the firms increases the amount of profit shifting to the low-tax country.[41]

[40] It should be noted here that tax authorities and supranational agencies like the OECD and the EU only recently started focussing on transfer prices. For instance, Germany introduced transfer pricing documentation rules no earlier than 2004. The resulting legislation and conventions will potentially weaken the observed link between transfer pricing and tax rate differentials.

[41] The standard version of the concealment model neglects ownership issues. It should be noted, though, that optimal enforcement policy in this model will likely take account

In a final step, we make a first attempt at blending the concealment and the negotiation model. We find that both audited and non-audited transfer prices react to the tax rate differentials, with the negotiated transfer prices positively affecting the non-audited ones. Thus, the negotiation model may, in a way, open the black box and provide a better justification for the observed empirical results and pose additional avenues for future research.

References

[1] Allingham, M.G. and A. Sandmo (1972). Income Tax Evasion: A Theoretical Analysis, Journal of Public Economics 1(3/4): 323-338.

[2] Bartelsman, E. J. and R. M. W. J. Beetsma (2003). Why Pay More? Corporate Tax Avoidance through Transfer Pricing in OECD Countries', Journal of Public Economics, 87, 9–10, 2225–52.

[3] Bauer, C. and D. Langenmayr (2013). Sorting into Outsourcing: Are Profits Taxed at a Gorilla's Arm's Length?, Journal of International Economics 90(2): 326-336.

[4] Bernard, A. B., J. B. Jensen and P. K. Schott (2006). Transfer Pricing by U.S.-based Multinational Firms, NBER Working Paper 12493.

[5] Blonigen, B. A., R. B. Davies and K. Head (2003). Estimating the Knowledge-Capital Model of the Multinational Enterprise: Comment, American Economic Review, 93(3), pp. 980-994.

[6] Bundesfinanzhof (2012). Urteil vom 6.6.2012, I R 99/10.

[7] Bundesfinanzministerium (2014). Datensammlung zur Steuerpolitik, Ausgabe 2013, Berlin.

[8] Clausing, K.A. (2003), Tax-motivated transfer pricing and US intrafirm trade prices, Journal of Public Economics 87, 2207-2223.

[9] Davies, R. B. (2008). Hunting High and Low for Vertical FDI, Review of International Economics, 16(2), pp. 250-267.

[10] Davies, R. B., J. Martin, M. Parenti and F. Toubal (2014). Knocking on Tax Heaven's Door: Multinational Firms and Transfer Pricing, Mimeo.

of household firm ownership.

[11] Devereux, M.P. and C. Keuschnigg (2013). The Arm's Length Principle and Distortions to Multinational Firm Organization, Journal of International Economics 89(2): 432-40.

[12] Dharmapala, D. (2014). What Do We Know About Base Erosion and Profit Shifting? A Review of the Empirical Literature, CESifo Working Paper No. 4612.

[13] Dharmapala, D. and N. Riedel (2013). Earnings Shocks and Tax-Motivated Income-Shifting: Evidence from European Multinationals, Journal of Public Economic 97(1): 95-107.

[14] Eichner, T. and M. Runkel (2008) Why the European Union Should Adopt Formula Apportionment with a Sales Factor, Scandinavian Journal of Economics 110(3), pp. 567-589.

[15] Fuest, Clemens (2008). The European Commission's proposal for a common consolidated corporate tax base, Oxford Review of Economic Policy 24(4): 720-739.

[16] Gresik, T. A. (2001). The Taxing Task of Taxing Transnationals, Journal of Economic Literature, 39(3), pp. 800-838.

[17] Haufler, Andreas; Schjelderup, Guttorm. (2000). Corporate Tax Systems and Cross Country Profit Shifting, Oxford Economic Papers 52(2): 306-25.

[18] Heckemeyer, J. and M. Overesch (2013). Multinationals' Profit Response to Tax Differentials: Effect Size and Shifting Channels, ZEW Discussion Paper No. 13-045.

[19] Hines, J.R. (2010). Income Misattribution Under Formula Apportionment, European Economic Review 54(1): 108-120.

[20] Hofmann, P.; Lohse, T.; Riedel, N. (2014). Do Transfer Pricing Laws Limit International Income Shifting? Evidence from European Multinationals, mimeo.

[21] Huizinga, H. and L. Laeven (2008). International Profit Shifting within Multinationals: A Multi-Country Perspective, Journal of Public Economics 92(5-6): 1164-82.

[22] Kant, Chander (1988). Endogenous Transfer Pricing and the Effects of Uncertain Regulation, Journal of International Economics 24(1/2): 147-157.

[23] Mansori, Kashif S.; Weichenrieder, Alfons J. (2001). Tax Competition and Transfer Pricing Disputes, FinanzArchiv 58(1): 1-11.

[24] Markusen, J. R. (1984) Multinationals, Multi-plant Economies, and the Gains from Trade, Journal of International Economics, 16, pp. 205-26.

[25] Mintz, J.M. (1999). Globalization of the Corporate Income Tax: The Role of Allocation, FinanzArchiv 56(3-4): 389-423.

[26] Nielsen, S.B.; Riamondos-Møller, P.; Schjelderup, G. (2010). Company Taxation and Tax Spillovers: Separate Accounting versus Formula Apportionment, European Economic Review 54(1): 121-132.

[27] OECD (2007). Manual on Effective Mutual Agreement Procedures, 2007 (online) version, http://www.oecd.org/tax/transfer-pricing/manualoneffectivemutualagreementprocedures-index.htm (accessed in Oct. 2013).

[28] OECD (2010). OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations 2010, OECD Publishing.

[29] PwC (2013). International Transfer Pricing 2013/14, PwC Publishing.

[30] Swenson, D.L. (2001). Tax reforms and evidence of transfer pricing, National Tax Journal 54: 7-25.

[31] Weichenrieder, A. (2009). Profit Shifting in the EU: Evidence from Germany. International Tax and Public Finance 16: 281-297.

UCD CENTRE FOR ECONOMIC RESEARCH – RECENT WORKING PAPERS

WP13/06 Karl Whelan: 'Ireland's Economic Crisis - The Good, the Bad and the Ugly' July 2013
WP13/07 Neil Cummins, Morgan Kelly, and Cormac Ó Gráda: 'Living Standards and Plague in London, 1560–1665' July 2013
WP13/08 Neil Cummins, Morgan Kelly and Cormac Ó Gráda: 'Living Standards and Plague in London, 1560–1665' July 2013
WP13/09 Karl Whelan: 'Sovereign Default and the Euro' July 2013
WP13/10 Orla Doyle, Colm Harmon, James J Heckman, Caitriona Logue and Seong Hyeok Moon: 'Measuring Investment in Human Capital Formation: An Experimental Analysis of Early Life Outcomes' August 2013
WP13/11 Morgan Kelly, Joel Mokyr and Cormac Ó Gráda: 'Precocious Albion: a New Interpretation of the British Industrial Revolution' September 2013
WP13/12 Morgan Kelly, Joel Mokyr and Cormac Ó Gráda: 'Appendix to "Precocious Albion: a New Interpretation of the British Industrial Revolution"' September 2013
WP13/13 David Madden: 'Born to Win? The Role of Circumstances and Luck in Early Childhood Health Inequalities' September 2013
WP13/14 Ronald B Davies: 'Tariff-induced Transfer Pricing and the CCCTB' September 2013
WP13/15 David Madden: 'Winners and Losers on the Roller-Coaster: Ireland, 2003-2011' September 2013
WP13/16 Sarah Parlane and Ying-Yi Tsai: 'Optimal Contract Orders and Relationship-Specific Investments in Vertical Organizations' October 2013
WP13/17 Olivier Bargain, Eliane El Badaoui, Prudence Kwenda, Eric Strobl and Frank Walsh: 'The Formal Sector Wage Premium and Firm Size for Self-employed Workers' October 2013
WP13/18 Kevin Denny and Cormac Ó Gráda 'Irish Attitudes to Immigration During and After the Boom' December 2013
WP13/19 Cormac Ó Gráda ''Because She Never Let Them In': Irish Immigration a Century Ago and Today' December 2013
WP14/01 Matthew T Cole and Ronald B Davies: 'Foreign Bidders Going Once, Going Twice... Protection in Government Procurement Auctions' February 2014
WP14/02 Eibhlin Hudson, David Madden and Irene Mosca: 'A Formal Investigation of Inequalities in Health Behaviours after age 50 on the Island of Ireland' February 2014
WP14/03 Cormac Ó Gráda: 'Fame e Capitale Umano in Inghilterra prima della Rivoluzione Industriale (Hunger and Human Capital in England before the Industrial Revolution)' February 2014
WP14/04 Martin D O'Brien and Karl Whelan: 'Changes in Bank Leverage: Evidence from US Bank Holding Companies' March 2014
WP14/05 Sandra E Black, Paul J Devereux and Kjell G Salvanes: 'Does Grief Transfer across Generations? - In-Utero Deaths and Child Outcomes' March 2014
WP14/06 Morgan Kelly and Cormac Ó Gráda: 'Debating the Little Ice Age' March 2014
WP14/07 Alan Fernihough, Cormac Ó Gráda and Brendan M Walsh: 'Mixed Marriages in Ireland A Century Ago' March 2014
WP14/08 Doireann Fitzgerald and Stefanie Haller: 'Exporters and Shocks: Dissecting the International Elasticity Puzzle' April 2014
WP14/09 David Candon: 'The Effects of Cancer in the English Labour Market' May 2014
WP14/10 Cormac Ó Gráda and Morgan Kelly: 'Speed under Sail, 1750–1850' May 2014