Profit Shifting Under a Destination-Based Cash-Flow Tax*

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Abstract

We study how a multinational's choice to centralize or decentralize its decision structure affects profit shifting incentives under a destination-based cash-flow tax (DBCFT) system. When decisions are centralized and the DBCFT is universally adopted, profit shifting incentives vanish. If a single country adopts the DBCFT and decisions are centralized, profits are shifted to the adopting country. When there are strategic reasons to decentralize decisions, we show that profit shifting incentives exist both under universal and unilateral adoption.

Keywords: destination-based cash-flow tax, multinationals, profit shifting, transfer pricing, tax reform

JEL classification: F23, G32, H21, H25, H26

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1 Introduction

This paper investigates how a multinational's choice to centralize or decentralize its decision structure affects profit shifting under a destination-based cash-flow tax (DBCFT) system. When decisions are centralized and the DBCFT is adopted universally, profit shifting incentives vanish. If a single country adopts the DBCFT, profits are shifted to this country. When there are strategic reasons for delegating decisions to decentralized levels, universal adoption of the DBCFT does not eliminate the incentive multinationals (MNEs) have to shift profits. We identify cases where universal adoption actually may worsen profit shifting. If a single country adopts the DBCFT and decisions are delegated, the incentive to shift profits depends on whether it is the country that hosts an exporting or an importing affiliate that implements the DBCFT, and whether price or quantity is the strategic variable.

Multinational companies maximize global after-tax profits. This can be achieved by either taking all decisions at a central authority level, or delegating some decisions to a decentralized authority level. As shown by Nielsen *et al.* (2008) - who study the decision structure in MNEs as an endogenous choice - centralization is more profitable when tax differentials are large. When tax differentials are small, delegating some decisions to the affiliate level will boost profits. The theoretical underpinnings of delegation are described in the industrial organization (IO) literature, where a principal may benefit from hiring an agent and giving him or her the incentive to maximize something other than the welfare of the principal.[1]

Delegation is a crucial component of corporate decision structures. It affects compensation, strategic decisions, production chains, capital allocation, performance evaluation, productivity, and research and development (R&D).[2] Delegation of decision making to national affiliates is, for example, common in the car industry, where the parent company (the producer) de-

[1]See, e.g., Vickers (1985), Fershtman & Judd (1987), Sklivas (1987), and Katz (1991).

[2]See Baldenius & Ziv (2003) for an evaluation of performance in firms with delegated decision making and Bloom *et al.* (2010) for low profitability in firms without delegated decision making. Graham *et al.* (2015) provide a survey of decision making authority within firms.

termines the export price (transfer price) to foreign affiliates, but leaves the responsibility of deciding on the final price to consumers to the importing affiliate. Bourgeois & Eisenhardt (1988) show that delegation of decision making is not only relevant for established industries, but also for high-velocity environments, such as the microcomputer industry and R&D intensive industries.[3]

In the accounting and public finance literature, the main focus is the ability of MNEs to use transfer prices to shift profits to low-taxed affiliates. In this literature, the transfer price has a tax-minimizing role. The IO literature has stressed issues of delegation within MNEs, and transfer prices have been seen as instruments for obtaining strategic advantages vis-á-vis competitors. Thus, transfer prices may have a dual role, that is, a tax-minimizing instrument and a strategic instrument. These two roles may be conflicting depending on the corporate tax system in place. As far as we are aware, the role of transfer price under decentralized decisions and the DBCFT system has not been studied.

Corporate tax differences are integral to the problem of profit shifting by abusive transfer prices. Crivelli *et al.* (2016) estimate the revenue loss from base erosion and profit shifting by multinationals at around 1 percent of gross domestic product in OECD countries.[4] Revenue losses from profit shifting has been a key factor when discussing corporate tax reform. In 2016, the United States (US) House Republican Task Force on Tax Reform proposed a destination-based cash-flow tax to replace the current federal income tax system on corporations. The proposal claimed that a DBCFT would reduce profit shifting and give US companies a tax advantage.[5] It is well understood that under a pure version of the DBCFT, export revenue and import costs are exempted from taxation. For this reason, proponents of the DBCFT have argued that if such a system is well designed and adopted universally, it will

[3]There exists a large literature that both documents and explains the extent of decentralization that takes place within MNEs, see e.g., Grandstand (1992), Almeida (1996), Papanastasiou & Pearce (2005).

[4]Guvenen *et al.* (2017) calculate that MNEs shifted USD 280 billion in profits abroad in 2012. Clausing (2016) arrives at a similar figure using a regression-based method.

[5]The proposal prompted a discussion of whether the proposal was in violation of the World Trade Agreement (WTO), see Cui (2017).

effectively eliminate profit shifting (see Auerbach *et al.* (2017)).

In order to bring forward our arguments as clearly as possible, we choose a model with a multinational enterprise that consists of two affiliates (1 and 2) located in countries 1 and 2, respectively. Affiliate 1 produces a good where part of its production is sold at home and the rest is exported to affiliate 2, which can be seen as a sales arm. In the absence of taxes and with a local competitor facing affiliate 2, it is profitable for the MNE to let the affiliates decide on the price (or output) in their local markets, while the MNE centrally decides the transfer price that affiliate 2 pays for the good it imports from affiliate 1. Assuming that affiliate 2 operates in a market where price is the strategic variable (Bertrand competition), delegation of authority leads the central authority to set a high transfer price. A high transfer price results in higher prices in the market where affiliate 2 faces a local competitor, and thus to higher joint profits. This is the essence of the delegation principle: Using the transfer price as a pre-commitment device, align the incentives of the centralized and the decentralized authority to take global profit maximizing actions.[6]

Tax differentials may alter the incentives that the higher authority has when setting the transfer price. If affiliate 1 faces sufficiently high taxes, the higher authority wants to use the transfer price as a tax saving device and shift profits to affiliate 2 by a low transfer price. A low transfer price inevitably interferes with the pricing game of affiliate 2, which prescribes a high transfer price. The potentially conflicting incentives is in the end what matters for profit shifting incentives.

The main result of the paper is that universal adoption of the DBCFT under decentralized choices does not eliminate profit shifting incentives. The reason is that when production occurs in one country and sales in another, sales revenue is subject to a different tax rate than production costs. This gives rise to corporate tax differentials that leads to profit shifting. In particular, taxation reduces the value of winning market shares, but at the same

[6]Since the MNE can easily alter the transfer price, the decentralization choice is not necessarily contingent on pre-commitment of the transfer price. Nielsen *et al.* (2008) show that letting the affiliates choose their prices or output levels, and finally choosing the transfer price that maximizes global profits sometimes gives the highest profits.

time introduces a subsidy since production costs are tax deductible. It is the sum of these two effects that alters how the transfer price is set compared to a situation when taxes are zero.

An underlying assumption in our analysis is that MNEs do not keep two sets of books where different transfer prices are used in order to save tax payments and provide managerial incentives. In some countries the practice of two sets of books is illegal, while in some countries it is legal if one set is provided for tax accounting and the other for internal resource allocation. The idea that MNEs may assign one transfer price to provide managerial incentives and one to save tax payments, however, does not fit with reality. Most MNEs insist on using only one set of prices both for simplicity and to avoid the possibility that multiple transfer prices become evidence in any disputes with the tax authorities (Baldenius *et al.* (2004), p. 592). This statement is supported by a series of studies on multinationals and transfer pricing behaviour. Ernst & Young (2003), for example, indicate that over 80 % of parent companies use a single set of transfer prices for management and tax purposes.

A few papers have recognized the multiple role of transfer prices. Elitzur & Mintz (1996) model the transfer price both as a tax-minimizing instrument and as an instrument to influence decisions of a self-interested manager in the subsidiary company. More closely related to our paper are studies by Schjelderup & Sørgard (1997) and Nielsen *et al.* (2003) where the transfer price takes on the same dual role as in our paper, and where the decision structure of the MNE is taken as given.

Our analysis is also related to a small but expanding literature on tax reform and the DBCFT. Auerbach *et al.* (2017) consider implications of the DBCFT for three common ways of shifting taxable profits between countries. They conclude that manipulation of transfer prices, use of debt, and locating intangible assets in low-taxed jurisdictions are no longer viable options for MNEs under a DBCFT system, if adopted universally. Shome & Schutte (1993) and Auerbach & Devereux (2017) suggest that income shifting incentives via transfer prices persist under unilateral adoption of the DBCFT. Bond & Gresik (2018) study the economic effects of unilateral adoption of

corporate tax policies that include destination-based taxes and/or cash-flow taxes in a heterogeneous agent model in which multinational firms can endogenously shift income between countries using transfer prices. They find that welfare of the adopting country can decrease both with adoption of destination-based taxes and adoption of cash-flow taxes, and that profit shifting incentives remain under unilateral adoption of the DBCFT.

In what follows we set up a model, and in the subsequent chapters we discuss modes of decision making and bilateral adoption (all countries) and unilateral adoption (one country) of the DBCFT.

2 Centralized Decisions

The model is one of horizontally integrated trade in secondary processed goods.[7] A multinational firm (MNE) consists of affiliates 1 and 2 located in country 1 and country 2. The affiliates are governed by a headquarters. We assume monopolistic competition in national markets.

The affiliate in country 1 produces quantities s_1 and s_2, with a cost function $c(s_1 + s_2)$, where $c' \geq 0$ and $c'' \geq 0$. Quantity s_1 is sold in country 1 at a price $p(s_1)$, yielding revenue $r_1(s_1)$. Quantity s_2 is exported to the affiliate in country 2 at a transfer price q and resold in country 2 at a price $p(s_2)$, earning revenue $r_2(s_2)$. For both affiliates, $r'' \leq 0$ and $p' < 0$. In line with the literature and in order to bring forward the tax incentives in the simplest possible way, we assume that the MNE is able to practice systematic price discrimination between the two markets. Based on these assumptions, the affiliates' profits (absent taxes) are,

$$\pi_1^u = r_1(s_1) - c(s_1 + s_2) + qs_2 \quad \text{and} \quad \pi_2^u = r_2(s_2) - qs_2.$$

In what follows we investigate the role of the transfer price. We start our analysis by studying transfer pricing when all decisions are set at a central level (headquarters). We then relax the assumption about monopoly in national markets and introduce oligopolistic competition in country 2. In this

[7] An early example of this type of model is Horst (1971).

setting we shall assume that decisions about quantities (or prices) in national markets are delegated to national affiliates. We examine two different cases. The first case is when all countries adopt the DBCFT. Since there are only two countries in our model, we label this case as bilateral adoption of the DCBFT. The second case is when only one country implements the DBCFT. We refer to this case as unilateral adoption of the DBCFT. Under unilateral adoption it is useful to investigate transfer pricing incentives when the exporting affiliate is located in a DBCFT country, and when the importing affiliate is located in a DBCFT country. In either case, the country that does not implement the DBCFT is assumed to have a conventional source tax system (sometimes referred to as separate accounting in the literature).

2.1 Bilateral Adoption and Centralized Decisions

Let t_1 and t_2 be the tax rate in country 1 and country 2. If both countries adopt the DBCFT, affiliate 1 exempts the export revenue from its tax base while affiliate 2 is subject to tax on the imported quantity, but can deduct its import costs against revenue from sales. Consequently, the after-tax profit of each affiliate under the DBCFT is

$$\pi_1 = (1 - t_1)[r_1(s_1) - c(s_1 + s_2)] + qs_2,$$

$$\pi_2 = (1 - t_2)[r_2(s_2) - qs_2] - t_2 qs_2 = (1 - t_2)r_2(s_2) - qs_2.$$

The global profit maximizing function of the MNE is the sum of after-tax profits of the affiliates and is given by

$$\Pi = (1 - t_1)[r_1(s_1) - c(s_1 + s_2)] + (1 - t_2)r_2(s_2).$$

As seen from the global after-tax profit function, the transfer pricing terms are eliminated from the equation. Thus, the MNE cannot gain anything from altering the transfer price, so $\partial\Pi/\partial q = 0$. We have:

Proposition 1. *Under centralized decision making and bilateral adoption of the DBCFT, transfer pricing incentives are eliminated.*

Since exports and imports are tax exempt in all countries, the MNE cannot save tax by manipulating the transfer price.

2.2 Unilateral Adoption and Centralized Decisions

In this section we study profit shifting incentives if only one country adopts the DBCFT. The outcome of the analysis depends on whether it is the country that hosts the exporting or the importing affiliate that implements the DBCFT.

2.2.1 Exporting country adopts the DBCFT

If country 1 implements the DBCFT whereas country 2 has a source-based tax system, profit functions of affiliates 1 and 2 are given by

$$\pi_1 = (1-t_1)[r_1(s_1) - c(s_1+s_2)] + qs_2 \quad \text{and} \quad \pi_2 = (1-t_2)[r_2(s_2) - qs_2].$$

The global after-tax profit function of the MNE is the sum of the two profit functions and is given by

$$\Pi = (1-t_1)[r_1(s_1) - c(s_1+s_2)] + qs_2 + (1-t_2)[r_2(s_2) - qs_2].$$

In this case, the transfer pricing policy of the MNE depends on the sign of

$$\frac{\partial \Pi}{\partial q} = s_2 - (1-t_1)s_2 = t_1 s_2 > 0. \tag{1}$$

As seen from equation (1), $t_1 s_2 > 0$ and a high transfer price is desirable since export revenue is not taxed, while import costs are tax deductible. Thus, profits are shifted to the exporting affiliate located in the country that has adopted the DBCFT.

We do not derive the optimal high transfer price since the purpose of our analysis is to highlight incentives for abusive transfer pricing. Absent any costs of mispricing, it is straightforward to verify that the optimal high transfer price is to set q so that profits in country 2 become zero.[8] Such a

[8] See Kant (1988).

transfer price would shift all profits of affiliate 2 to affiliate 1.

2.2.2 Importing country adopts DBCFT

If country 2 adopts DBCFT and country 1 maintains a source tax based system, cross-border intra-group transactions would not appear in the tax base of country 2. After-tax profits of the two affiliates in this case are

$$\pi_1 = (1-t_1)[r_1(s_1) - c(s_1+s_2) + qs_2] \quad \text{and} \quad \pi_2 = (1-t_2)r_2(s_2) - qs_2,$$

and sum of the two profit functions yields the global after-tax profit function

$$\Pi = (1-t_1)[r_1(s_1) - c(s_1+s_2) + qs_2] + (1-t_2)r_2(s_2) - qs_2.$$

The transfer pricing policy of the MNE depends on the sign of

$$\frac{\partial \Pi}{\partial q} = -s_2 + (1-t_1)s_2 = -t_1 s_2 < 0. \tag{2}$$

As seen from equation (2), global after-tax profits are increased by a low transfer price, since revenue from exports by affiliate 1 is subject to tax, whereas affiliate 2's import costs are not tax deductible. The incentive to underinvoice exports means that the MNE shifts profits to country 2, which is the country that has unilaterally adopted the DBCFT. To sum up our results under centralized decision making:

Proposition 2. *When decisions are centralized and only one country implements the DBCFT (unilateral adoption), profits are shifted to the country that has unilaterally adopted the DBCFT.*

These findings are similar in nature to Bond & Gresik (2018). In a general equilibrium model with centralized decision making and trade, they show that MNEs use transfer prices to shift income into the country that unilaterally adopts the DBCFT.

3 Decentralized Decisions under Cournot

We now consider the case when the MNE chooses its transfer price centrally, but decentralizes output decisions to its entities. The game we consider has two stages. At stage one, the transfer price is determined. At stage two, the affiliates take the transfer price as given and set quantities.

Affiliate 2 located in country 2 faces a local competitor. The local competitor, firm 3, sells s_3 units in country 2. The revenue function of affiliate 2 is given by $r_2(s_2, s_3)$ with $\partial^2 r_2/\partial s_2^2 \leq 0$ and $\partial r_2/\partial s_3 < 0$, so the two competing products are imperfect substitutes. The headquarters must take into account the effect of the transfer price on competition. We assume that decentralization is implemented by a pre-commitment of the transfer price. As is usual, we solve this game backwards by considering how affiliates set quantities for a given fixed transfer price, and use this information when the headquarters decides on the optimal transfer price.

The maximization procedure has the following sequence of stages: at stage 1 the headquarters sets q; at the second stage, affiliates 1 and 2, and firm 3 (the competitor in country 2) set quantities: $s_1^* = s_1^*(q)$, $s_2^* = s_2^*(q)$, and $s_3^* = s_3^*(q)$.

3.1 Cournot and Zero Taxes

As a benchmark case for both unilateral and bilateral adoption of the DBCFT under Cournot competition, it is instructive to set taxes equal to zero initially in order to highlight the strategic effect under quantity competition.

The game we have described above is solved backwards and we start with the choices made by the affiliates. Both affiliates take the transfer price as exogenous, and maximize their profits as given by

$$\pi_1 = r_1(s_1) - c(s_1 + s_2) + qs_2 \quad \text{and} \quad \pi_2 = r_2(s_2, s_3) - qs_2.$$

The global after-tax profit function of the MNE is the sum of π_1 and π_2,

$$\Pi = r_1(s_1) + r_2(s_2, s_3) - c(s_1 + s_2).$$

In order to arrive at the transfer pricing equation, we totally differentiate the global after-tax profit function with respect to the transfer price, and then insert the first order conditions of affiliates 1 and 2 that follow from maximizing π_1 with respect to s_1 and π_2 with respect to s_2.[9] Doing so, the transfer pricing equation is

$$q - \frac{\partial c}{\partial s_2} = -\frac{\partial r_2}{\partial s_3}\frac{\partial s_3}{\partial s_2} \equiv S^C < 0. \tag{3}$$

The right hand side (RHS) of equation (3) is the pure strategic effect of transfer pricing. Under Cournot competition, for a large class of demand functions, $\partial s_3/\partial s_2 < 0$, so firm 3's optimal response to an increase in affiliate 2's sales is to reduce its own sales. Furthermore, $\partial r_2/\partial s_3 < 0$, since profits by affiliate 2 fall when the competitor (firm 3) increases its sales. Thus, the strategic effect S^C is negative, and we can conclude:

Proposition 3a. *When taxes are zero and quantity is the strategic variable, the MNE sets a transfer price below the marginal cost of production.*

$$q < \frac{\partial c}{\partial s_2}$$

A low transfer price will make the importing affiliate behave aggressively and set a large quantity. The competitor will anticipate this and will set a low quantity. Such a strategy increases profits for the importing affiliate and for the MNE as a whole. Since taxes are zero, Proposition 3a is a benchmark case for both bilateral and unilateral adoption of the DBCFT when quantity is the strategic variable.

3.2 Cournot and Bilateral Adoption of DBCFT

In the presence of taxation, affiliates' profits are given by

$$\pi_1 = (1-t_1)[r_1(s_1) - c(s_1+s_2)] + qs_2 \quad \text{and} \quad \pi_2 = (1-t_2)r_2(s_2,s_3) - qs_2.$$

[9] Detailed calculations are available in Appendix A.1.

The global after-tax profit function of the MNE is the sum of π_1 and π_2,

$$\Pi = (1 - t_1)[r_1(s_1) - c(s_1 + s_2)] + (1 - t_2)r_2(s_2, s_3),$$

and the transfer pricing equation is[10]

$$q - \frac{\partial c}{\partial s_2} = (1 - t_2)S^C - t_1\frac{\partial c}{\partial s_2} = S_B^C + T_B^C < 0, \tag{4}$$

where $S_B^C \equiv (1 - t_2)S^C < 0$ and $T_B^C \equiv -t_1\frac{\partial c}{\partial s_2} < 0$.

S_B^C is negative and indicates, all else equal, a higher transfer price than in the absence of taxation. The reason is that taxation has reduced the value of winning market shares in country 2. T_B^C is a tax term. It is negative. Since production costs of s_2 are tax deductible by affiliate 1, this is a production subsidy that makes it more profitable to win market shares in country 2. It indicates a lower transfer price. Both terms are negative so the transfer price should be set below the marginal cost of production.

The main insight from equation (4) is that universal adoption of the DBCFT may lead to less or more underinvoicing compared to the case when taxes are zero. To see this, notice that if t_2 is sufficiently low and t_1 is sufficiently high, the transfer price is lower than in the case when taxes are zero. In this case, the strategic effect is almost unchanged compared to when taxes are zero, and the production subsidy is large. Taken together, these effects lead to an even lower transfer price than in the absence of taxation. Thus, even when all countries adopt the DBCFT, there is a tax incentive present that affects the profit shifting behaviour of the MNE. We have:

Proposition 3b. *When $t_i > 0$ and quantity is the strategic variable, bilateral adoption of the DBCFT leads the MNE to set a transfer price below the marginal cost of production.*

$$q < \frac{\partial c}{\partial s_2}$$

The transfer price is underinvoiced (overinvoiced) compared to the case when

[10]See Appendix A.1 for the steps that lead to the transfer pricing equation.

taxes are zero for a sufficiently low (high) t_2 and a sufficiently high (low) t_1.

This result goes to show that unilateral adoption of the DBCFT does not eliminate profit shifting incentives when decisions are decentralized. Comparing equation (4) to equation (3), it is clear that a profit shifting motive exists. It arises from the fact that tax deductible production costs related to sales in country 2 face the tax rate of country 1, whereas sales in country 2 face the tax rate of country 2. The transfer price may therefore be higher or lower than when tax rates are zero, but the MNE will always set a transfer price below the marginal cost of production. The profit shifting motive does not change the strategic incentive to set a low transfer price, but may dampen or exacerbate it.

3.3 Cournot and Unilateral Adoption of DBCFT

In this section we consider unilateral adoption of the DBCFT. We start by analysing transfer pricing incentives when the country that hosts the exporting affiliate unilaterally implements the DBCFT.

3.3.1 Exporting country adopts DBCFT

Profits of the two affiliates are given by

$$\pi_1 = (1-t_1)[r_1(s_1) - c(s_1+s_2)] + qs_2 \quad \text{and} \quad \pi_2 = (1-t_2)[r_2(s_2,s_3) - qs_2],$$

and the global after-tax profit function is the sum of these profit functions

$$\Pi = (1-t_1)[r_1(s_1) - c(s_1+s_2)] + qs_2 + (1-t_2)[r_2(s_2,s_3) - qs_2].$$

It is seen from the global after-tax profit function that when the country that hosts the exporting affiliate adopts the DBCFT, export revenue is tax exempt, whereas import costs are tax deductible in the country that hosts the importing affiliate. Thus, the multinational can save tax by overinvoicing exports, since this would reduce taxable revenue for the importing affiliate

without generating tax costs by the exporting affiliate.

By the same procedure as in the previous section, the optimal transfer price is given by[11]

$$q - \frac{\partial c}{\partial s_2} = S_B^C + T_{UE}^C \lesseqgtr 0, \tag{5}$$

where

$$T_{UE}^C \equiv \underbrace{T_B^C}_{-} - \underbrace{\frac{t_2 s_2}{\partial s_2/\partial q}}_{-} \lesseqgtr 0$$

is the tax effect when the exporting country (country 1) adopts the DBCFT. The tax term T_{UE}^C has an additional term compared to the case of bilateral adoption, which is positive since $\partial s_2/\partial q < 0$. All else equal it indicates a transfer price above marginal cost. There are two conflicting tax incentives at play, when signing the tax effect. Production costs are tax deductible in country 1 making it profitable to set a low transfer price. However, country 2 has not adopted the DBCFT, and a high transfer price saves tax, since it reduces taxable profits by affiliate 2 and shifts profits to affiliate 1 where export revenue is untaxed. In sum, these incentives are conflicting and we cannot sign T_{UE}^C. We have:

Proposition 4a. *If the country that hosts the exporting affiliate implements the DBCFT, the MNE sets a transfer price that may be higher or lower than the marginal cost of production.*

$$q \lesseqgtr \frac{\partial c}{\partial s_2}$$

When country 1 adopts the DBCFT, two conflicting tax effects are present. If the profit shifting element dominates the production subsidy, the tax effects, all else equal, warrant a high transfer price. The strategic effect, S_B^C, indicates a low transfer price. It is the relative magnitudes of these two effects that determines whether the transfer price will be set above or below marginal cost. The tax incentive may then lead to that profits are shifted to the country that has adopted the DBCFT if the profit shifting effect is

[11] See Appendix A.1 for the steps that lead to the transfer pricing equation.

strong enough resulting in a high transfer price (above marginal cost).

3.3.2 Importing country adopts DBCFT

In this case, import costs are not tax deductible in country 2, whereas the exporting affiliate in country 1 is subject to tax on export revenue. The after-tax profits by the two affiliates are given by

$$\pi_1 = (1-t_1)[r_1(s_1) - c(s_1+s_2) + qs_2] \quad \text{and} \quad \pi_2 = (1-t_2)[r_2(s_2,s_3)] - qs_2.$$

The global after-tax profit function is

$$\Pi = (1-t_1)[r_1(s_1) - c(s_1+s_2) + qs_2] + (1-t_2)[r_2(s_2,s_3)] - qs_2.$$

The global profit function indicates that the multinational firm can save tax by underinvoicing its sales to the importing affiliate, since export revenue is subject to tax whereas import costs are not tax deductible.

By the same procedure as previously, the optimal transfer price can be derived as[12]

$$q - \frac{\partial c}{\partial s_2} = S_B^C + T_{UI}^C < 0, \tag{6}$$

where

$$T_{UI}^C = \underbrace{T_B^C}_{-} + \underbrace{\frac{t_1 s_2}{\partial s_2/\partial q}}_{-} < 0 \tag{7}$$

is the tax effect under unilateral adoption of DBCFT when the importing country adopts the DBCFT. It is negative since since $\partial s_2/\partial q < 0$. Since $S_B^C < 0$ and $T_{UI}^C < 0$ we may state:

Proposition 4b. *If the country that hosts the importing affiliate implements the DBCFT, the MNE sets a transfer price below the marginal cost of production.*

$$q < \frac{\partial c}{\partial s_2}$$

[12]See Appendix A.1 for the steps that lead to the transfer pricing equation.

In contrast to the case when the exporting country adopted the DBCFT, we can unambiguously sign the tax term T_{UI}^{C}. The reason is that the profit shifting term goes in the same direction as the production subsidy, indicating a low transfer price. Export revenue is subject to tax in country 1, whereas import costs are not tax deductible in country 2 so the MNE saves tax by a low transfer price. Thus, both the strategic effect and the profit shifting effect indicate a low transfer price.

4 Decentralized Decisions under Bertrand

Under Bertrand competition, the affiliate in country 2 faces a local rival, and the two competing firms are price setters. We denote the price set by the rival in country 2 as p_3, and revenue of the affiliate in country 2 as $r_2(p_2, p_3)$. The two firms' products in country 2 are imperfect substitutes.

As under Cournot competition, the MNE chooses q at a central level in order to maximise net global profits, but delegates decisions about price in local markets to its affiliates. The maximisation procedure has the following sequence of stages: at stage 1, a central authority within the MNE sets q; at the second stage, affiliate 1 in country 1, affiliate 2 in country 2, and the local competitor in country 2 set prices: $p_1^* = p_1^*(q)$, $p_2^* = p_2^*(q)$, and $p_3^* = p_3^*(q)$.

We first examine the benchmark case when taxes are zero. We then turn to examine how transfer price should be set under bilateral and unilateral adoption of DBCFT.

4.1 Bertrand and Zero Taxes

When taxes are zero, profits by affiliate 1 and affiliate 2 are given by

$$\pi_1 = r_1(p_1) - c(s_1(p_1) + s_2(p_2)) + q s_2(p_2, p_3) \quad \text{and} \quad \pi_2 = r_2(p_2, p_3) - q s_2(p_2, p_3).$$

The global profit function is the sum of affiliates' profits

$$\Pi = r_1(p_1) - c(s_1(p_1) + s_2(p_2)) + r_2(p_2, p_3).$$

As before, we totally differentiate the global profit function with respect to the transfer price, and then insert the first order conditions of the affiliates 1 and 2. Doing so yields the transfer pricing equation[13]

$$q - \frac{\partial c}{\partial s_2} = (\frac{\partial s_2}{\partial p_2})^{-1} \frac{\partial p_3}{\partial p_2} [\frac{\partial c}{\partial s_2} \frac{\partial s_2}{\partial p_3} - \frac{\partial r_2}{\partial p_3}] \equiv S^B > 0, \tag{8}$$

which is the pure strategic effect under Bertrand competition.

The squared bracket on the right hand side of equation (8) is negative, since an increase in the competitor's price (p_3) increases profits of the MNE. Since the products are strategic substitutes, we have that $\partial p_3/\partial p_2 > 0$. Furthermore, the own price effect is negative, $\partial s_2/\partial p_2 < 0$ so $(\frac{\partial s_2}{\partial p_2})^{-1} \frac{\partial p_3}{\partial p_2} < 0$ and the strategic effect, S^B, is positive. We may state:

Proposition 5a. *When taxes are zero and price is the strategic variable, the MNE sets a transfer price above the marginal cost of production.*

$$q > \frac{\partial c}{\partial s_2}$$

A high transfer price induces the affiliate in country 2 to set a high price on its sales in country 2. The local rival will anticipate this, and its best response is to set a high price as well. Such a non-aggressive response from the local rival maximizes the profits of the affiliate in country 2 and the MNE as a whole.

4.2 Bertrand and Bilateral Adoption of DBCFT

After-tax profits of affiliates 1 and 2 are given by

$$\pi_1 = (1 - t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2))] + q s_2(p_2, p_3),$$

$$\pi_2 = (1 - t_2) r_2(p_2, p_3) - q s_2(p_2, p_3).$$

[13]Detailed calculations are available in Appendix A.2.

The global after-tax profit function is the sum of the after-tax profits

$$\Pi = (1 - t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2))] + (1 - t_2)r_2(p_2, p_3).$$

After deriving the equations to solve for the value of q that maximizes the global after-tax profit function of the MNE, we derive the transfer pricing equation. The transfer pricing equation is given by[14]

$$q - \frac{\partial c}{\partial s_2} = S_B^B + T_B^B \lesseqgtr 0, \tag{9}$$

where

$$S_B^B = (\frac{\partial s_2}{\partial p_2})^{-1} \frac{\partial p_3}{\partial p_2}[(1 - t_1)\frac{\partial c}{\partial s_2}\frac{\partial s_2}{\partial p_3} - (1 - t_2)\frac{\partial r_2}{\partial p_3}] \lesseqgtr 0 \tag{10}$$

is the tax-adjusted strategic effect under bilateral adoption of DBCFT and

$$T_B^B = -t_1 \frac{\partial c}{\partial s_2} < 0 \tag{11}$$

is the tax effect under bilateral adoption of DBCFT, which is equal to the tax effect under Cournot competition.

From our discussion when taxes were zero (confer equation (8)), we showed that $(\frac{\partial s_2}{\partial p_2})^{-1} \frac{\partial p_3}{\partial p_2} < 0$. When taxes are positive, the squared bracket on the RHS in equation (10) may be negative or positive depending on the relative magnitudes of t_1 and t_2. It is clear, then, that we cannot sign the strategic effect S_B^B. The reason is that production costs are tax deductible by the tax rate of country 1, whereas sales revenue by affiliate 2 is subject to tax in country 2. If the tax rate in country 2 is high, after-tax sales revenue may be small compared to after-tax production costs in country 1. If so, the strategic effect S_B^B may become negative. In this case, the right hand side of equation (9) is negative warranting a low transfer price. In general, we have:

Proposition 5b. *When $t_i > 0$, and price is the strategic variable, bilateral adoption of the DBCFT leads the MNE to set a transfer price above or*

[14]See Appendix A.2 for the steps that lead to the transfer pricing equation.

below the marginal cost of production depending on the relative size of t_1 *and* t_2.

$$q \lesseqgtr \frac{\partial c}{\partial s_2}$$

As was the case under bilateral adoption of the DBCFT under Cournot competition, we can conclude that when all countries adopt the DBCFT and price is the strategic variable, profit shifting incentives remain. When price is the strategic variable, the profit shifting effect may overturn the strategic incentive to set a high transfer price. For a sufficiently low t_1 and a sufficiently high t_2, the MNE sets the transfer price below the after-tax marginal cost of production, reversing the strategic incentive. The reason is that costs related to production are tax deductible at the rate of t_1, whereas the corresponding sales revenue is taxed by t_2. Due to these tax incentives, bilateral adoption of the DBCFT does not eliminate abusive transfer pricing.

4.3 Bertrand and Unilateral adoption of DBCFT

We start by investigating transfer pricing incentives when the country that hosts the exporting affiliate adopts the DBCFT.

4.3.1 Exporting country adopts DBCF

After-tax profits of affiliates 1 and 2 are given by

$$\pi_1 = (1 - t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2, p_3)] + qs_2(p_2, p_3),$$

$$\pi_2 = (1 - t_2)[r_2(p_2, p_3) - qs_2(p_2, p_3)].$$

The global after-tax profit of the multinational firm is

$$\begin{aligned}\Pi = (1 - t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2, p_3)] + qs_2(p_2, p_3) \\ +(1 - t_2)[r_2(p_2, p_3) - qs_2(p_2, p_3)].\end{aligned}$$

The transfer pricing equation can be written as[15]

$$q - \frac{\partial c}{\partial s_2} = S^B_{UE} + T^B_{UE} \lesseqgtr 0, \tag{12}$$

where

$$\begin{aligned} S^B_{UE} = (\frac{\partial s_2}{\partial p_2} + t_2 \frac{\partial s_2}{\partial p_3}\frac{\partial p_3}{\partial p_2})^{-1} \cdot \\ [((1-t_1)(1-t_2)\frac{\partial c}{\partial s_2}\frac{\partial s_2}{\partial p_3}\frac{\partial p_3}{\partial p_2} - (1-t_2)\frac{\partial r_2}{\partial p_3})] \lesseqgtr 0 \end{aligned} \tag{13}$$

is the tax-adjusted strategic effect, and

$$T^B_{UE} = T^B_B - (\frac{\partial s_2}{\partial p_2} + t_2 \frac{\partial s_2}{\partial p_3}\frac{\partial p_3}{\partial p_2})^{-1} \frac{t_2 s_2}{\partial p_2 / \partial q} \lesseqgtr 0 \tag{14}$$

is the tax effect under unilateral adoption of DBCFT when the exporting country adopts the DBCFT.

We know that $[\frac{\partial s_2}{\partial p_2} + t_2 \frac{\partial s_2}{\partial p_3}\frac{\partial p_3}{\partial p_2}] < 0$ because the own price effect dominates the cross price effect. Similar to the case of bilateral adoption of DBCFT (confer equation (10)), we cannot sign S^B_{UE}, since it depends on the relative magnitudes of t_1 and t_2.

We also cannot sign the tax effect T^B_{UE}, since the first term on the RHS of equation (14) is negative, while the second term is positive.

Proposition 6a. *If the country that hosts the exporting affiliate adopts the DBCFT and price is the strategic variable, the MNE sets a transfer price that may be above or below the marginal cost of production.*

$$q \lesseqgtr \frac{\partial c}{\partial s_2}$$

In the absence of taxation, the strategic incentive indicates a high transfer price, but the incentive to save tax may go in either direction because production costs are tax deductible in country 1 whereas sales revenue is taxed in country 2. The relative magnitude of the two tax effects determines the

[15]See Appendix A.2 for the steps that lead to the transfer pricing equation.

sign of the strategic effect. If the tax rate in country 1 (t_1) is very low, both strategic effect S^B_{UE} and tax effect T^B_{UE} may lead to a high transfer price. If t_1 is high, the chosen transfer price depends on the relative magnitudes of the two effects.

4.3.2 Importing country adopts DBCFT

After-tax profits by affiliates 1 and 2 are given by

$$\pi_1 = (1-t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2,p_3)) + qs_2(p_2,p_3)],$$

$$\pi_2 = (1-t_2)r_2(p_2,p_3) - qs_2(p_2,p_3).$$

The global profit maximizing function of the multinational firm is

$$\begin{aligned}\Pi = (1-t_1)[r_1(p_1) - c(s_1(p_1) + s_2(p_2,p_3)) + qs_2(p_2,p_3)] \\ +(1-t_2)r_2(p_2,p_3) - qs_2(p_2,p_3).\end{aligned}$$

We see from the global after-tax profit function that import costs are not tax deductible while export income is subject to tax. In order to save tax, a low transfer price is desirable. The transfer pricing equation can be written as

$$q - \frac{\partial c}{\partial s_2} = S^B_{UI} + T^B_{UI}, \tag{15}$$

where we define the tax-adjusted strategic effect as

$$S^B_{UI} = \{(1-t_1)\frac{\partial s_2}{\partial p_2} - t_1\frac{\partial s_2}{\partial p_3}\frac{\partial p_3}{\partial p_2}^{-1}\}\Psi \lesseqgtr 0, \tag{16}$$

where $\Psi \equiv [\frac{\partial p_3}{\partial p_2}(\frac{\partial c}{\partial s_2}\frac{\partial s_2}{\partial p_3} - (1-t_2)\frac{\partial r_2}{\partial p_3})] \lesseqgtr 0$ depending on the size of t_2. Thus, even though we know that the curly bracket on the RHS is negative we can no longer sign the strategic effect. The tax effect is given by

$$T^B_{UI} = [(1-t_1)\frac{\partial s_2}{\partial p_2} - t_1\frac{\partial s_2}{\partial p_3}(\frac{\partial p_3}{\partial p_2})^{-1}]\frac{t_1 s_2}{\partial p_2/\partial q} < 0. \tag{17}$$

Since $\partial s_2/\partial p_3 > 0$, $\partial s_2/\partial p_2 < 0$, and the products are strategic substitutes so that $\partial p_3/\partial p_2 > 0$, the squared bracket is negative. Since $\partial p_2/\partial q > 0$, we have that $T^B_{UI} < 0$. Thus, we may state:

Proposition 6b. *If the country that hosts the importing affiliate adopts the DBCFT under price competition, the MNE sets a transfer price that may be higher or lower than the marginal cost.*

$$q \lessgtr \frac{\partial c}{\partial s_2}$$

To conclude, the incentive to save tax dictates a low transfer price. The reason is that export revenue is subject to tax in country 1, whereas import costs are not tax deductible in country 2 so the MNE saves tax by a low transfer price. However, the strategic effect can be either positive or negative. For a sufficiently large t_2, the strategic effect might be positive, which would mitigate (but not necessarily offset) the tax incentive to set a low transfer price. If t_2 is low, the chosen transfer price depends on the relative magnitudes of the two effects.

5 Concluding Remarks

The main contribution of this paper is to study the profit shifting incentives of MNEs under the DBCFT when the headquarters of the MNE delegates choices about prices or output to its affiliates, but sets the transfer price at a central level. As shown in previous research and discussed in the introduction, delegation is widespread and enhances firm performance.

Contrary to conventional wisdom, we find that when the DBCFT is universally adopted, profit shifting incentives still remain when choices are delegated. Abusive transfer pricing may actually become worse when the DBCFT is universally adopted compared to a conventional source tax system. Our findings are summarized in Table 1. Note that in Table 1, any deviation from marginal cost of production means that the transfer price is either too low or too high.

Table 1: Summary of results under delegation of authority

	Bilateral adoption		EX country adopts		IM country adopts	
	Cournot	Bertrand	Cournot	Bertrand	Cournot	Bertrand
$t = 0$	$q < c'$	$q > c'$	$q < c'$	$q > c'$	$q < c'$	$q > c'$
$t > 0$	$q < c'$	$q \lessgtr c'$	$q \lessgtr c'$	$q \lessgtr c'$	$q < c'$	$q \lessgtr c'$

Table 1 shows that the nature of competition and which country adopts the DBCFT are of vital importance to the transfer pricing strategy of the MNE.

Our study points to policy challenges with the DBCFT related to production costs. In our set-up, production occurs in country 1 and part of the production is sold in country 1, whilst the rest is exported to the affiliate in country 2. Since production costs are tax deductible in country 1, this creates a tax subsidy that affects profit shifting incentives when the DBCFT is universally adopted. In principle one could separate production costs related to exports and not allow the firm to deduct them, but in practice this is a challenge because costs may not be separable.[16]

A second insight that follows from our analysis is that when production occurs in one affiliate and sales in another, corporate tax differentials matter even under universal adoption of the DBCFT. It is not easy to see a quick fix to this problem unless corporate tax rates are harmonized.

Finally, unilateral adoption of the DBCFT creates profit shifting incentives depending on which country adopts the DBCFT, and suggests that universal adoption after all is to be preferred to unilateralism at least from a tax revenue perspective.

[16]Allowing production costs to be tax deductible but at the same time exempting export revenue from taxation may be in violation of the World Trade Organisation rules, see Cui (2017).

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A Appendix

A.1 Cournot and Bilateral Adoption of DBCFT

The first order conditions of the two affiliates are

$$\frac{\partial \pi_1}{\partial s_1} = (1 - t_1)[\frac{\partial r_1}{\partial s_1} - \frac{\partial c}{\partial s_1}] = 0, \tag{18}$$

$$\frac{\partial \pi_2}{\partial s_2} = (1 - t_2)\frac{\partial r_2}{\partial s_2} - q = 0. \tag{19}$$

The first stage of the game is solved by finding the value of q that maximizes the global after-tax profit function of the MNE. A marginal change in q affects the global after-tax profit function as follows

$$\begin{aligned}\frac{\partial \Pi}{\partial q} = (1 - t_1)[(\frac{\partial r_1}{\partial s_1} - \frac{\partial c}{\partial s_1})\frac{\partial s_1}{\partial s_2}\frac{\partial s_2}{\partial q} - (\frac{\partial c}{\partial s_2}\frac{\partial s_2}{\partial q})] \\ +(1 - t_2)[\frac{\partial r_2}{\partial s_2}\frac{\partial s_2}{\partial q} + \frac{\partial r_2}{\partial s_3}\frac{\partial s_3}{\partial q}].\end{aligned} \tag{20}$$

A change in q affects the affiliate's optimal sales and thereby the rival's optimal sales. This means that q affects s_3 indirectly through its effect on s_2. The term $\partial s_3/\partial q$ is the strategic effect of a change in the transfer price. As in Tirole (1988), p. 326, it can be rearranged in the following way:

$$\frac{\partial s_3}{\partial q} = \frac{\partial s_3}{\partial s_2}\frac{\partial s_2}{\partial q} > 0. \tag{21}$$

Under Cournot competition, it is well known that for a large class of demand functions, $\partial s_3/\partial s_2 < 0$, which means that firm 3's optimal response to an increase in firm 2's sales is to reduce its own sales. Since the two products are substitutes, it also follows that $\partial s_2/\partial q < 0$. These terms taken together mean that a high transfer price triggers the competitor to behave more aggressively and expand its sales, that is, $\partial s_3/\partial q > 0$.

Substituting equations (18), (19) and (21) into (20), we obtain the transfer pricing equation.

A.2 Bertrand and Bilateral Adoption of DBCFT

Each affiliate maximizes its local profits and decides on its optimal price. The affiliates' first order conditions for profit maximization are:

$$\frac{\partial \pi_1}{\partial p_1} = (1 - t_1)[\frac{\partial r_1}{\partial p_1} - \frac{\partial c}{\partial s_1}\frac{\partial s_1}{\partial p_1}] = 0, \tag{22}$$

$$\frac{\partial \pi_2}{\partial p_2} = (1 - t_2)\frac{\partial r_2}{\partial p_2} - q\frac{\partial s_2}{\partial p_2} = 0. \tag{23}$$

The effect on global after-tax profits from a change in q is:

$$\begin{aligned}\frac{\partial \Pi}{\partial q} = (1 - t_1)[(\frac{\partial r_1}{\partial p_1} - \frac{\partial c}{\partial s_1}\frac{\partial s_1}{\partial p_1})\frac{\partial p_1}{\partial s_2}\frac{ds_2}{dq} - \frac{\partial c}{\partial s_2}\frac{ds_2}{dq}] \\ +(1 - t_2)[\frac{\partial r_2}{\partial p_2}\frac{\partial p_2}{\partial q} + \frac{\partial r_2}{\partial p_3}\frac{\partial p_3}{\partial q}],\end{aligned} \tag{24}$$

The strategic effect can be expressed in the same manner as under Cournot competition, that is,

$$\frac{\partial p_3}{\partial q} = \frac{\partial p_3}{\partial p_2}\frac{\partial p_2}{\partial q} > 0. \tag{25}$$

Bertrand competition implies that, for a large class of demand and cost functions, the products are strategic substitutes so that $\partial p_3/\partial p_2 > 0$. Then it also follows that $\partial p_2/\partial q > 0$. Adopting this assumption, it follows that $\partial r_2/\partial p_3 > 0$. Furthermore, if demand is downward sloping, the own price effect is negative, that is, $\partial s_2/\partial p_2 < 0$. These terms taken together mean that a high transfer price triggers the competitor to behave non-aggressively and increase its product price, that is, $\partial p_3/\partial q > 0$.

Substituting equations (22), (23) and (25) into equation (24), we obtain the transfer pricing equation.