Abusive Transfer Pricing and Economic Activity*

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WORK IN PROGRESS

January 09, 2014

Abstract

This paper investigates how concealments costs of transfer pricing and the probability of detection affect transfer pricing and firm behavior. We find that transfer pricing in intermediate production factors does not affect real activity of a multinational firm if the firm’s concealment effort as well as the probability to be audited by tax authorities is conditioned on the amount of shifted profits. If tax authorities rely on the standard OECD arm’s-length principle instead, the multinational will adjust its production structure for tax reasons. A policy implication of the paper is that it could be better to condition audits on the amount of income shifted rather than on the deviation from the market price (that is, the OECD’s arm’s length principle). Another policy finding is that a proper quality of tax law is preferable to higher detection effort. The former reduces profit shifting and concealment effort, whereas the latter leads to a more wasteful use of resources on concealment and has an ambiguous effect on profits shifted.

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*We are grateful to Tom Gresik, Chris Heady, Agnar Sandmo and participants at the Norwegian Research Forum on Taxation in Åsgårdstrand as well as the Norwegian-German Seminar on Public Economics in Munich for very helpful comments.

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1 Introduction

In the wake of the financial crisis there has been a debate over corporate tax revenue and the fact that many multinational corporations pay very little tax in high-tax countries. The use of sophisticated tax-planning schemes and transfer pricing have been at the forefront of this discussion. One example is the Reuters report on Starbucks (Bergin, 2012). Despite having almost one-third of the UK coffee shop market, Starbucks has paid corporation tax only once in the past 15 years. Yet, transcripts of investor and analyst calls over 12 years show Starbucks officials regularly talked about the UK business as “profitable,” said they were very pleased with it, or even cited it as an example to follow for operations back home in the United States. In response to the Reuters report on Starbucks, a Starbucks spokeswoman said by email to Reuters that (Bergin, 2012, p. 2): “We seek to be good taxpayers and to pay our fair share of taxes ... We don’t write this tax code; we are obligated to comply with it. And we do.”

In the public debate, policymakers and international organizations such as the OECD have voiced concern that tax planning and tax evasion by multinationals through transfer pricing and profit shifting generate unintended competitive advantages over domestic companies, which could lead to the distortion of investment decisions as well as posing issues of fairness. The OECD in a report on “base erosion and profit shifting” even argues that a failure to take action against profit shifting by multinationals would put “the integrity of the corporate income tax” at stake (OECD, 2013).

Our objective in this paper is to analyze how the multinational firm behaves if it maximizes expected global after-tax profit, taking into account that abusive transfer pricing may be detected and punished. We show that the choice of the transfer price and its effect on intra-firm trade and investment depends on the probability of detection and on what measure tax authorities base an audit on. Conditioning either on shifted profit income (i.e., evaded tax bases) or on total tax savings (i.e., evaded tax payments) will leave investment and production decisions unaffected. While in the literature on personal income evasion, results depend on whether one draws on evaded income (e.g., Allingham and Sandmo, 1972) or on evaded taxes (e.g., Yitzhaki, 1974), the latter being more in line with real-world tax codes, this distinction does not matter for our result. Putting more emphasis on the deviation from the correct arm’s-length price, however, will trigger distortive responses in the real activity (i.e., investment and production) of the multinational. A main implication of the paper is that it could be better to condition audits on the amount of income shifted rather than on the deviation from the market price (that is the OECD’s arm’s length principle). The former leaves firms’ investment

1Actually, another worry is that transfer pricing in production factors also triggers inefficiencies in the production structure within multinationals. That most transfer-price manipulation takes place in intangibles is therefore often explained by saying that multinationals would like to avoid distortions in production.
behavior undistorted, whilst the latter may imply an efficiency loss.

A second set of results comes from analyzing the effect of government action against profit shifting. We point out that increasing detection effort by the tax authorities has an ambiguous effect on profit shifting. Higher detection effort directly increases the detection probability, but also fosters firms’ concealment effort. The latter counteracts the effect of a higher detection effort. Furthermore, higher concealment effort implies a larger waste of resources from a society’s point of view. Therefore, it is preferable to enhance the quality of tax law, that is to provide less tax loopholes. A higher tax-law quality makes concealment more expensive, thus reduces concealment effort, and therefore leads to less profit shifting and to less waste of resources (on concealment).

A large literature has studied tax evasion and tax enforcement from both the theoretical and empirical perspective related to the personal income tax. This literature builds on the Allingham and Sandmo (1972) model in which taxpayers report income to the tax authorities to maximize expected utility taking into account a probability of audit and a penalty for cheating. It is well known that the results that follow from the Allingham and Sandmo model predict substantial noncompliance, which is in stark contrast with the observation that compliance levels are high in modern tax systems despite low audit rates and fairly modest penalties (see Kleven et al., 2011). As a matter of fact, the Allingham and Sandmo model seems more in line with observations related to compliance by multinational firms where the lack of social norms, cultural and psychological aspects could explain the low compliance rate.

Different from a taxpayer who must decide on how much income to report, multinationals report income indirectly when they chose the price on intra-firm trade. By choosing to overinvoice sales to affiliates in high-tax countries, multinationals can shift profits to low-tax countries in order to save taxes. In particular, royalties for using a brand name or a patent, say, do not have an obvious market parallel; so multinationals have considerable discretion in setting prices on such transactions. Although there clearly is a grey area between strictly legal tax planning and illegal tax evasion, multinationals also calculate and are willing to take the risk of being caught and fined for trade mispricing.

A standard assumption in the literature on multinationals and profit shifting is that misdeclaration of the transfer price is costly. Two different modelling approaches have been adopted. In the first approach, following the tradition of Allingham and Sandmo, the firm maximizes expected profits taking into account a probability of audit and a penalty for cheating. The issue then is whether the probability of a fine depends on the difference between the true price and the deviation from the true price (see, e.g., Kant, 1988) or on total profits shifted (e.g., OECD’s comparable profit method; Allingham and Sandmo, 1972. In both variants, the probability of detection is endogenous. In our model, we add to this that the detection probability positively depends on detection effort exerted by the tax authorities, but decreases with concealment effort of firms. The
alternative approach is to let the firm incur costly concealment efforts related to the use of accountants and lawyers to hide misdeclaration. We capture this effect by adding a cost function that depends on the level of firm’s concealment effort.\(^2\)

In section 2 of our paper, we present our model and study how a multinational firm behaves if it must exert effort to conceal tax evasion by transfer pricing and when there is a probability of an audit and a fine related to abusive transfer pricing. We derive a condition under which transfer pricing will not affect firm’s investments and the use of intermediate inputs.

In section 3, it is analyzed how different measures that tax authorities apply to contingent an audit on, affect firm behavior. We point out that a firm’s real activities remain unchanged if the probability of detection depends on evaded taxes or on undeclared tax bases, but that there are real differences if the probability of an audit depends on deviation from the true price of the traded good. The latter is driven by the fact that efficiency costs from tax-adjusting the production structure are now (over-) compensated by reduced concealment costs of transfer pricing.

A comparative-static analysis is conducted in section 4. Though increasing detection effort by the tax authorities has a direct negative effect on profit shifting because the detection probability increases all else equal. The total effect is still ambiguous as higher detection effort also fosters the marginal return of concealment effort so that firms will invest more into concealment. The total effect is ambiguous in principle, but from a society’s point of view, higher concealment effort for sure implies a higher waste of resources on an unproductive activity. Therefore, we argue that it is preferable to improve the quality of tax law, that is to reduce inconsistencies in the law and to shut down loopholes. Doing so makes concealment more tedious and expensive so that concealment effort reduces. Less concealment effort, however, implies an increase in the detection probability, less profit shifting and a less wasteful use of resources on concealment. Section 5 offers some conclusions.

## 2 The model

Consider a multinational corporation (MNC) with two affiliates, one located in a high-tax country \(B\) (affiliate \(B\)) and one in a low-tax country \(A\) (affiliate \(A\)). Tax rates are defined as \(t_A < t_B\) so that the MNC would like to shift profit from affiliate \(B\) to affiliate \(A\). The affiliate in country \(A\) produces an intermediate input good \(S\) at marginal costs \(q\) using a linear production technology, and ships the intermediate good at price \(G + q\) to the

\(^2\)In the literature, these costs often also dependent on the amount of misdeclaration as given by the deviation between the true price and the declared price on intra-firm trade (see, e.g., Haufler and Schjelderup, 2000; and Nielsen et al., 2010). It is partially tedious, but straightforward to show that adding the amount of misdeclaration in either variant respective to the definition of the detection probability to our effort cost function will not affect any of the results to come.
affiliate in country $B$.\footnote{Alternatively, affiliate $A$ could be interpreted as a vendor that buys the intermediate good from an unrelated third party at price $q$ and re-sells it (without adding any value to the good) to affiliate $B$ with a surcharge $G$ at price $G + q$.} Firm $B$ wants to conceal the true cost of the input good $S$ and can do so by incurring costly concealment effort $c$. Tax authorities try to reveal the true nature of the transaction by exerting detection effort $d$. If the tax authorities in country $B$ detect that the intermediate good is over invoiced to shift income, firm $B$ is fined. We define the fine as $\Phi = \Phi(G, S)$ and let $p = p(G, S, c, d) \in [0; 1]$ be the probability of detection. $p$ is increasing in mispricing $G$, the detection effort $d$ of the tax authorities, and the level of the intermediate good $S$, whereas we assume it to be decreasing in the firm’s concealment effort $c$. Thus, we have $p_G, p_S, p_d > 0$ and $p_c < 0$. We shall without consequence for any of the results assume that both the concealment costs and the fine are tax deductible in order to simplify the analysis.

It is costly for the firm to exert effort $c$ to conceal transfer pricing and we denote the concealment function by $e = e(c, l)$, where $l$ is a parameter for the quality of the tax code so that a high $l$ increases the effort-related costs of concealing mispricing.\footnote{An example of how a firm can utilize low quality in the tax code is that of Apple Inc. It runs a profit center in Ireland which is registered in Ireland, but managed at board level in California. As the profit center is registered in Ireland, the US tax law views this profit center as an Irish company that needs to pay taxes in Ireland. However, under Irish tax law, the profit center is liable to tax in the US, because the board resides in California. Hence, the Apple profit center escapes taxation in both countries. See, e.g., Levin and McCain (2013).} Thus, $e_{cl} > 0$. We also make the reasonable assumption that concealment costs are convex in concealment effort, i.e., $e_c, e_{cc} > 0$.

The affiliate in country $B$ uses the imported intermediate input good $S$ jointly with capital $K$ to produce a final good $y$, which is sold in a competitive market in country $B$ at a constant selling price that is normalized to one. In order to ensure inner solutions, we assume a standard neoclassical production function $y = F^B(K, S)$ with $F^B_K, F^B_S, -F^B_{KK}, -F^B_{SS} > 0$ and impose the Inada conditions, i.e., $\lim_{K \to 0}, \lim_{S \to 0} \to \infty$ and $\lim_{K \to \infty} = \lim_{S \to \infty} = 0$.

We shall in line with most of the literature on (multinational) firms (see, e.g., Ethier, 1986; Tirole, 1988), assume that the MNC is risk neutral and maximizes expected global after-tax profits. In order to comply with standard OECD corporate income tax codes, we assume that costs of equity are not tax deductible, and for simplicity, we assume that the firm is financed by equity only. These assumptions are not restrictive and do not affect our results, because the incentive to shift profits is present whether the firm is debt or equity financed.

In our analysis, we shall assume that all decisions of the MNC are centralized. It has been shown in the literature that a MNC may benefit from delegating decisions to a de-centralized authority level say by allowing subsidiaries to set prices in local markets
under oligopoly. The theoretical underpinnings of this is the delegation principle in the industrial organization (IO) literature, where a principal may benefit from hiring an agent and giving him/her the incentive to maximize something other than the welfare of the principal. As shown by Nielsen et al. (2008), if tax differentials across countries are large, centralized decision making is better than a decentralised structure even under oligopoly. In our setting, we have assumed perfect competition in order to focus purely on the tax incentives. This means that there are no strategic gains from delegating decisions. Yet, even if we had assumed oligopoly, there is no reason for why MNCs cannot use multiple transfer prices for different roles. As a matter of fact, most countries do not have rules that ban the use of two books – precisely because of the multiple roles transfer prices may have.

We can express after-tax profit in affiliate $A$ as

$$\pi^A = (1 - t_A)[(G + q)S - qS] = (1 - t_A)GS.$$  

If abusive transfer pricing is not detected by the tax authorities, the after-tax profit $\pi^B_n$ in affiliate $B$ is

$$\pi^B_n = (1 - t_B)[F^B(K, S) - (G + q)S - e(c, l)] - RK,$$

where $R$ is the constant world-market interest rate.

In the case that tax authorities detect that the transfer price deviates from the arm’s length price (market price), affiliate $B$’s after-tax profit ($\pi^B_d$) is given by

$$\pi^B_d = (1 - t_B)[F^B(K, S) - (G + q)S - e(c, l) - \Phi(G, S)] - RK.$$  

The risk neutral MNC maximizes global expected net-of-tax income, that is,

$$\max_{K, G, S} E[\Pi] = \pi^A + \left[1 - p(G, S, c, d)\right] \pi^B_n + p(G, S, c, d) \pi^B_d = (1 - t_B)[F^B(K, S) - qS] - RK + (t_B - t_A)GS - (1 - t_B)C(G, S, c, d, l)$$

where we have defined $C(G, S, c, d, l) \equiv e(c, l) + p(G, S, c, d)\Phi(G, S)$ as the sum of the concealment effort cost and the expected fine, and where the term $(t_B - t_A)GS$ is the net tax gain from shifting profit to country $A$.

Optimal concealment effort $c$ is determined by

$$\frac{(1 - t_B)}{\partial c} \frac{\partial C}{\partial c} = 0 \iff e_c(c, l) = -p_c(G, S, c, d) \cdot \Phi(G, S).$$

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5 See Schjelderup and Sørgard (1997) for an analysis.

6 Cf., for example, Nielsen and Raimondos-Møller (2012).
The firm balances marginal effort costs of its investment into concealing (left hand side) to the marginal return from reducing expected fines on abusive transfer pricing, that is to the decrease in the detection probability times the fine payment; see the right hand side of equation (2) (and note that \( p_c < 0 \)).

The first-order condition for capital investment \( K \) can be written as

\[
F_B^K(K, S) = \frac{R}{1 - t_B}. \tag{3}
\]

The right-hand side is the marginal productivity of capital \((F_B^K)\), while the left-hand side is the effective marginal cost of capital. Since equity is not tax deductible, the marginal cost of capital is higher than the interest rate \( R \). From equation (3), it can be seen that trade mispricing \((G \neq 0)\) only affects the demand for capital via the use of the intermediate good \( S \) in the production function.

Maximizing expected profit \( \mathbb{E}[\Pi] \) w.r.t. the optimal transfer price \((G)\) yields

\[
(t_B - t_A)S = (1 - t_B) \frac{\partial C}{\partial G}, \tag{4}
\]

which shows that the transfer price should be increased until the marginal tax savings from transfer pricing (left-hand side) is equal to the after-tax marginal concealment costs (right-hand side).

The first-order condition for \( S \) is given by

\[
(1 - t_B)F_S^B = (1 - t_B) \left[ q - \frac{(t_B - t_A)G}{1 - t_B} + \frac{\partial C}{\partial S} \right]. \tag{5}
\]

In optimum, the firm balances the marginal after-tax income from sales of the final good in country \( B \) (left-hand side) to the net effective after-tax marginal costs of using the intermediate input \( S \). The marginal costs of \( S \) consist of the three terms in the squared bracket. The first is the true resource costs \( q \) of the input good \( S \). The two last terms in the squared bracket give the net after-tax cost of using \( S \) to shift profit. The first of these terms, \((t_B - t_A)G/(1 - t_B)\), is the net tax savings of a marginal increase in the import of the intermediate good \( S \). The last term is the increase in concealment costs that follows from a marginal increase in \( S \) (that is, \( \partial C/\partial S \)).

Making use of equation (4) to substitute for \((t_B - t_A)/(1 - t_B)\), we can rewrite the first-order condition (5) as

\[
F_S^B = q + \left[ \frac{\partial C}{\partial S} - \frac{G \partial C}{S \partial G} \right] = q - \frac{C(G, S, c, d, l)}{S} \cdot (\varepsilon_{CS} - \varepsilon_{CG}), \tag{6}
\]

where we defined the concealment-cost elasticities of input manipulation and trade mis-pricing as \( \varepsilon_{CS} = \frac{\partial C}{\partial S} \frac{S}{C} \) and \( \varepsilon_{CG} = \frac{\partial C}{\partial G} \frac{G}{C} \).
The two last terms in squared brackets on the (near) right-hand side are the net effective after-tax marginal costs of using the intermediate input $S$ to shift profit. If they cancel each other, the first-order condition reduces to $F^B_S = q$, and the use of the intermediate input $S$ is not affected by profit shifting due to differences in international tax rates. For this to happen, the weighted increase in concealment costs that follows from generating more tax savings by a higher transfer price $(G \cdot \frac{\partial C}{\partial G})$ must be equal the weighted increase in concealment costs from employing more units of the intermediate production factor $(S \cdot \frac{\partial C}{\partial S})$. Put differently, transfer pricing has real effects on firm behavior if and only if the concealment-cost elasticities of input manipulation and trade mispricing differ from each other:

$$- \frac{G \partial C}{S \partial G} + \frac{\partial C}{\partial S} \neq 0 \iff \varepsilon_{CS} \neq \varepsilon_{CG}.$$  \hspace{1cm} (7)

We conclude

**Proposition 1** Transfer pricing does not affect investment and real activity of multinational firms if the total concealment costs of transfer pricing imply that the concealment-cost elasticities of input manipulation and trade mispricing are identical.

Proposition 1 has an analogy to the Atkinson-Stiglitz theorem, which states that a tax on capital should be zero under certain conditions because the capital tax just exactly reproduces the labor tax, but distorts intertemporal consumption (see Atkinson and Stiglitz, 1976). In our case, the parallel is that the MNC should never manipulate its factor demand in order to shift profit income if the concealment-cost elasticities of input and trade mispricing are identical. The reason is that such manipulation would trigger the same concealment costs as pure mispricing, but in addition lead to production inefficiencies.

In the next section, we explore the relationship between the two terms in equation (7) in depth and begin in section 3.1 with a case for which Proposition 1 is fulfilled.

### 3 Variable concealment costs and firms’ real activity

In the literature on personal income taxation, for example, Allingham and Sandmo (1972), Yitzhaki (1987) and more recently Kleven et al. (2011), the probability of detection is an increasing function of undeclared income.\(^7\) That approach corresponds to that fines and the probability of being detected in our setting depend on the amount of profits shifted, i.e., $P = G \cdot S$. Implementing a structure such as in Yitzhaki (1974) would imply that

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\(^7\)In Allingham and Sandmo (1972), the probability of an audit is actually modeled as a decreasing function of declared income. For given pre-tax income (as in their model), this setup fully corresponds to the modelling in the other papers.
the detection probability should depend on evaded tax payments. In our model, this will not change any of our results as can be seen immediately from adjusting the definition of \( P \) to \( P = t_B \cdot G \cdot S \) and recalculating equations (9) and (10).

An alternative would, however, be to base detection on the OECD arm’s length principle so that the detection is an increasing function of the deviation from the true price of the good. This approach was used by Kant (1988) and is standard in the literature focusing on concealment effort instead of expected fines (cf. Haufler and Schjelderup, 2000; Grubert, 2003; and Nielsen et al., 2010).

### 3.1 Concealment costs based on the amount of profits shifted

If the cost of concealing transfer pricing depends on the amount of profits shifted, the concealment-cost function can be written as

\[
C(G, S, c, d, l) = C(P, c, d, l) = e(c, l) + p(P, c, d)\Phi(P),
\]

where \( C(P, c, d, l) \) is convex in profits shifted and \( P = G \cdot S \).

Inserting for \( P \) in equation (8), taking derivatives, we obtain

\[
\frac{\partial C}{\partial G} = [p_P(P, c, d)\Phi(P) + p(P, c, d)\Phi'(P)]S,
\]

\[
\frac{\partial C}{\partial S} = [p_P(P, c, d)\Phi(P) + p(P, c, d)\Phi'(P)]G.
\]

Substituting these derivatives into equation (7), we find that the two terms cancel each other, that is,

\[
\frac{\partial C}{\partial S} = G \frac{\partial C}{S \partial G}.
\]

The reason why the two terms cancel is that both the tax savings and the effective marginal concealment costs from manipulating either the intermediate good (\( S \)) or the transfer price (\( G \)) are identical. However, using \( S \) to shift profit causes an additional efficiency loss in production that makes it optimal to only use \( G \) for profit shifting.

We may now state:

**Proposition 2** When the cost of concealing transfer pricing depends on the amount of undeclared tax bases (or tax payments evaded), the transfer price neither affects the use

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8This cost structure also corresponds (or comes very close, at least) to the so-called ‘comparable-profit method’ proposed by the OECD (cf. OECD, 2010; Gresik and Osmundsen, 2008) if we, for instance, rely on a comparison of the profitability ratio (before taxes and fines) between the upstream and the downstream affiliates (that is, \( \frac{A}{T} = \frac{f(K, S) - (q + G)S - RK - cL}{f(K, S) - (q + G)S - RK - cL} \)) to the ratio between unrelated firms in these markets. Note that due to our assumption of linear production technology in the upstream market, unrelated firms will have zero profits and the detection probability will read \( p = p((f(K, S) - (q + G)S - RK - cL) \cdot c, d) \). Taking derivatives, applying the definition of concealment costs \( C \) and inserting into condition (6) for optimal \( S \) implies \( F_S = q \).
of the intermediate input $S$ nor capital investments $K_B$.

The proof of this proposition is to use (11) in (6), where it is seen that the transfer price does not affect economic activity of the MNC.

### 3.2 Concealment costs based on the deviation from the arm’s-length price

In the subsection above, we have assumed the probability of detection and concealment effort to depend on the amount of profits shifted. An alternative would be to let the sum of concealment costs (fine and effort) depend on the difference between the declared price and the true price (or market price). According to the OECD guidelines, the true price is the price that would have been negotiated between unrelated parties.\(^9\) As a proxy, it is equal to $q$ in our model (assuming perfect competition). The implication of this approach is that a large price deviation from the true transfer price can be very costly for the firm even if the total amount of profit shifted may be small, whereas a small price deviation is not costly even if a large amount of profit is shifted.

In order to facilitate an analysis based on the arm’s length principle, we assume that the probability of being detected depends on the deviation from the true price, that is, $G$, but that the fine depends on total profits shifted $P$.

Given these assumptions, the concealment function $C$ is given by

$$C(G, S, c, d, l) = e(c, l) + p(G, c, d)\Phi(P),$$

(12)

where $P = GS$ as before.\(^{10}\) The marginal concealment costs are now given by

$$\frac{\partial C}{\partial G} = p_G(G, c, d)\Phi(P) + p(G, c, d)\Phi'(P)G,$$

(13)

$$\frac{\partial C}{\partial S} = p(G, c, d)\Phi'(P)G.$$  

(14)

Substituting these derivatives into equation (7), we find

$$-\frac{G}{S} \frac{\partial C}{\partial G} + \frac{\partial C}{\partial S} = -\frac{G}{S}p_G(G, c, d)\Phi(P) < 0.$$

(15)

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\(^9\)Among several characteristics for such a comparison, the most prominent one is the ‘comparable uncontrolled price’ (CUP) method that implies observing and drawing on the price charged on equivalent trades with non-related third parties. See OECD (2010). Gresik and Osmundsen (2008) provide institutional details and an economic analysis.

\(^{10}\)Our result will be even strengthened (in the sense that, for constant $P$, an increased use of $S$ leads to even more concealment-cost savings from reducing the surcharge $G$ if concealment costs are defined over the price deviation (and effort) only, that is, $C(G, c, d, l) = e(c, l) + p(G, c, d)\Phi(G)$ and $\partial C/\partial S = 0$. Note as well that defining costs of concealment effort $e = e(c, l)$ also over $GS$ or $G$ will have no qualitative effect on any of the results in sections 3.1 and 3.2.
Using equation (15) in the first-order condition for the optimal use of $S$, we obtain

$$F^B_S = q - \frac{G}{S} p_G(G, c, d) \Phi(P) < q. \quad (16)$$

We have:

**Proposition 3** When the probability of detection focuses on deviations from the true arm’s-length price and places no emphasis on profits shifted, abusive transfer pricing has real effects on the use of the input good ($S$) and investments ($K$).

Inspection of equation (16) shows that transfer pricing leads to that more of the intermediate good $S$ is shipped, since concealment costs are lower than when the probability of detection is based on the amount of undeclared tax bases. Since transfer pricing changes the use of $S$, it is clear that transfer pricing also affects $K$, because marginal productivity of capital depends on the level of $S$, see equation (3).

When concealment costs predominantly depend on the deviation from the arm’s-length price, it is profitable for the MNC to use both $G$ and $S$ to shift profit to the tax haven affiliate. The reason is that increasing $S$ allows the MNC to reduce concealment costs by lowering $G$ (all else equal). Together with an increased use of the intermediate good $S$, demand for capital goes up and production increases in the high-tax country if inputs $K$ and $S$ are complements, i.e., if $\frac{\partial^2 F(K, S)}{\partial K \partial S} > 0$. If, in contrast, inputs are substitutes, $\frac{\partial^2 F(K, S)}{\partial K \partial S} < 0$, the effect on firm activity is ambiguous, since $K$ would fall, but production could rise or fall depending on the size of $S$.

When we have complementarity, the increase in the use of $S$ mitigates the under-utilization of capital that follows from the lack of tax deductibility of equity (confer eq. (3)). This is an effect that reduces the tax wedge on capital investments, but it should be interpreted with caution. It is too hasty to conclude that transfer pricing implies that economic efficiency is improved. The reason is that the use of the intermediate factor $S$ to shift profits carries both concealment and efficiency costs that mitigate the rise in production.

To see this, consider the case of a tax on economic profits only (i.e., full deductibility of all capital costs) or assume that all capital would be fully financed with tax deductible debt. The incentive to shift profits implies an increase in $S$ that only triggers overinvestment and concealment costs. Manipulating the transfer price now clearly leads to inefficient production.
4 Effects of higher detection effort and increased tax-law quality

In this section, we focus on the case of concealment costs being based on the amount of profits shifted (cf. section 3.1). First, the comparative-static analysis confirms the findings on non-affected economic activity, because we receive

\[
\frac{dS}{dt_A} = \frac{dS}{dl} = \frac{dS}{dd} = \frac{dS}{dt_B} = \frac{F_{KS}}{F_{KK}} = 0, \quad \text{and} \quad \frac{dS}{dt_B} = -\left[\frac{F_{KS}}{F_{KK}}\right] \frac{R}{v \cdot (1 - t_B)^2},
\]

where \( v = F_{SS} - X_{SS} - \frac{F_{KS}}{F_{KK}} + \frac{1}{u} \left( t_B - t_A - X_{GS} + \frac{X_{Gc}}{X_{cc}} X_{cs}\right)^2 + \frac{X_{Gc}}{X_{cc}} < 0 \). Neither detection effort \( d \) nor tax-law quality \( l \) or the tax rate \( t_A \) in the tax haven affect the optimal demand for the intermediate good. The domestic tax rate \( t_B \) affects the intermediate good only via the capital tax distortion from denying tax deductibility for costs of equity. Since production is not affected by transfer pricing, any government measures to reduce transfer pricing will not reduce output. Hence, governments can fight against profit shifting without experiencing (negative) investment effects.

However, fighting against profit shifting via increased detection effort by the tax authorities cuts both ways and the final effect on profits shifted is ambiguous since \( dS/dd = 0 \) and

\[
\frac{dG}{dd} = -\frac{C_{Pd} - \frac{C_{Pc}}{C_{cc}} C_{cd}}{S \cdot \left( C_{PP} - \frac{C_{Pc}}{C_{cc}} C_{Pc}\right)} \geq 0,
\]

\[
\frac{dc}{dd} = -\frac{1}{C_{cc}} \left[ C_{Pc} \cdot S \cdot \frac{dG}{dd} + C_{cd} \right] = -\frac{1}{C_{cc}} \frac{C_{cd} C_{PP} - C_{Pc} C_{Pd}}{C_{PP} - \frac{C_{Pc}}{C_{cc}} C_{Pc}} \geq 0,
\]

where \( C_{cd}, C_{Pc} < 0 \), but \( C_{PP}, C_{Pd} > 0 \). A higher detection effort ceteris paribus makes it more attractive to investment into concealing since the reduction in expected fines increases. At the same time, the higher detection effort has a negative direct effect on overpricing \( G \). If \( G \) reduces, that gives a negative incentive for concealment effort \( c \); however, if \( c \) increases that gives a boost to overpricing. Hence, both effects are ambiguous and it is likely that the final outcome of higher detection effort is a larger waste of resources on increased concealment effort while the intended reduction in profit shifting is moderated at least.

Therefore, the preferable choice is to write a consistent tax law without loopholes. A higher tax-law quality makes concealment more difficult and expensive and by that reduces concealment effort. Less concealment effort will increase the effective detection

\[11\]See the appendix for an explicit derivation of all expressions to come in this section.
probability and via this effect reduce overpricing and profit shifting. Formally, we find
\[
\frac{dG}{dl} = \frac{SC_{Pc}}{u C_{cc}} e_d < 0, \tag{19}
\]
because \(u = X_{GG} - \frac{C_{Pc}}{C_{cc}} = X_{GG} > 0, C_{Pc} < 0\) and \(C_{cc}, e_d > 0\). The effect of the law quality on concealment effort can be signed as
\[
\frac{dc}{dl} = -\frac{1}{C_{cc}} \left[ C_{Pc} \cdot S \cdot \frac{dG}{dl} + e_d \right] < 0, \tag{20}
\]
as again \(C_{Pc} < 0\) and \(C_{cc}, e_d > 0\) and \(\frac{dG}{dl} < 0\). Consequently, a better quality of tax law unambiguously reduces both transfer pricing and the (unproductive) activity of concealing the mispricing of the intermediate good.

We summarize

Proposition 4 Among the profit-shifting reducing options of increased detection effort and a higher quality of tax law, the latter is the dominant choice because better quality unambiguously reduces transfer pricing and it dampens wasteful activity in concealing. Fostering detection effort, instead, cuts both ways and can induce unintended effects, particularly more waste of resources on concealment.

5 Some concluding remarks

Transactions between related parties require a price to be set. In general, governments require this to be consistent with the price that would be paid by unrelated firms, that is, the arm’s length price. As shown here, an affiliate in a low-tax jurisdiction has an incentive to charge an artificially high price on sales to its sister entity in a high-tax country. The OECD guidelines, along with those tax jurisdictions that have adopted the same principles, permit multinationals to choose from several approaches in determining reasonable transfer prices. Among the most common approaches are: (i) The comparable uncontrolled price method (CUP); (ii) The resale price method; and (iii) the cost plus method. Under CUP, the tax authorities compare the transaction with identical or similar transactions between independent trading parties. The resale price method is often used if a product sold between related parties is resold to an unrelated party. Finally, the cost plus method adds a profit mark-up to the cost of producing a good.

In this paper, we have examined how various ways of making the probability of detection of profit shifting by transfer pricing affect multinational firm behavior. We have shown that if the probability of an audit depends on the size of the deviation from the arm’s-length price, often referred to as the ‘comparable uncontrolled price’ (CUP) method, the firm’s use of production factors is distorted. In contrast, if the basis for
control and the probability of an audit depend on the amount evaded (profit shifted) and is oriented at the ‘comparable profit method,’ the use of production factors remains unaffected by transfer pricing and differences in national tax system. For tax authorities, it will be less expensive to fight against profit shifting.

Furthermore, we have shown that fighting against profit shifting is preferably done by writing a proper tax law that does not provide inconsistency and tax loopholes. Such better tax-law quality unambiguously reduces profit shifting and wasteful concealment effort. More investment in detection effort by the tax authorities, instead, fosters concealment effort, has an (theoretically) ambiguous effect on profit shifting and leads to a more wasteful use of resources.

The policy recommendations that follow from our analysis are therefore, first, to ensure a proper quality of tax law in order to shut down loopholes and, second, to make audits contingent on how much profit is shifted because this imposes less of a distortion on production efficiency.

One caveat applies, however: If decision making in multinationals is highly decentralized, overinvoicing the intermediate good by the headquarters should trigger negative effects on the investment decision on affiliate level. Even though theory to date predicts that multinationals should be centralized when taxes matter, there is some evidence that ‘two books’ are not always used and that transfer pricing might collide with decentralized decision making in some firms (see, e.g., Smith, 2002; Nielsen and Raimondos-Møller, 2012). In such cases, implementing the CUP method could be advantageous, because it could mitigate the decentralization-related underinvestment effect.\footnote{We are grateful to Chris Heady for drawing our attention to this issue.}

\section{A Comparative statics}

To avoid confusion in the notation to come, let us define the concealment cost function as $C = X(G,S,c,d,l)$ and label the second derivative taken for variables $i$ and $j$ as $X_{ij} = \frac{\partial^{2} X}{\partial i \partial j}$. The first-order conditions for optimal firm behavior can be summarized and transformed into

\begin{align}
F_K(K,S) - \frac{R}{1-t_B} &= 0, \quad (21) \\
F_S(K,S) - q + \frac{t_B - t_A}{1-t_B} \cdot G - \frac{\partial X(G,S,c,d,l)}{\partial S} &= 0, \quad (22) \\
\frac{t_B - t_A}{1-t_B} \cdot S - \frac{\partial X(G,S,c,d,l)}{\partial G} &= 0, \quad (23) \\
\frac{\partial X(G,S,c,d,l)}{\partial c} &= 0. \quad (24)
\end{align}
Totally differentiating the first-order conditions leads to

\[
F_{KK}dK + F_{KS}dS - \frac{dR}{1-t_B} - \frac{R}{(1-t_B)^2}dt_B = 0, \tag{25}
\]

\[
F_{KS}dK + (F_{SS} - X_{SS})dS + \left(\frac{t_B - t_A}{1-t_B} - X_{SG}\right)dG - X_{Sc}dc
\]

\[-dq + \frac{G}{(1-t_B)^2}dt_B - \frac{G}{1-t_B}dt_A - X_{Sd}dd - X_{Sd}dl = 0, \tag{26}
\]

\[
\left(\frac{t_B - t_A}{1-t_B} - X_{GS}\right)dS - X_{GG}GdG - X_{Gc}dc
\]

\[+ \frac{S}{(1-t_B)^2}dt_B - \frac{S}{1-t_B}dt_A - X_{Gd}dd - X_{Gd}dl = 0 \tag{27}
\]

\[X_{Sd}dS + X_{Gd}dG + X_{cc}dc + X_{cd}dd + X_{cd}dl = 0. \tag{28}
\]

From equation (28), we can infer

\[dc = -\frac{1}{X_{cc}} [X_{Sd}dS + X_{Gd}dG + X_{cd}dd + X_{cd}dl]. \tag{29}\]

Substituting that expression into equation (27) delivers after some rearrangements

\[dG = \frac{1}{u} \left[\left(\frac{t_B - t_A}{1-t_B} - X_{GS} + \frac{X_{Ge}}{X_{cc}}X_{cc}\right)dS + \frac{S}{(1-t_B)^2}dt_B - \frac{S}{1-t_B}dt_A\right]
\]

\[-\left(X_{Gd} - \frac{X_{Ge}}{X_{cc}}X_{cd}\right)dd - \left(X_{Gl} - \frac{X_{Ge}}{X_{cc}}X_{dl}\right)dt], \tag{30}\]

where \(u = X_{GG} - \frac{X_{Ge}}{X_{cc}}X_{Gd}\). Moreover, by manipulating equation (25), we can extract

\[dK = -\frac{F_{KS}}{F_{KK}}dS + \frac{1}{F_{KK}} \frac{dR}{1-t_B} + \frac{1}{F_{KK}} \frac{R}{(1-t_B)^2}dt_B. \tag{31}\]

Inserting now the terms in equations (29), (30) and (31) into equation (26) and using \(X_{ij} = X_{ji}\), we obtain an explicit solution for the comparative-static effects on the use of the intermediate good \(S\):

\[
\left[F_{SS} - X_{SS} - \frac{F_{KS}^2}{F_{KK}} + \frac{1}{u} \left(\frac{t_B - t_A}{1-t_B} - X_{GS} + \frac{X_{Ge}}{X_{cc}}X_{cc}\right)^2 + \frac{X_{Sc}^2}{X_{cc}}\right]dS = v \cdot dS =
\]

\[-\frac{F_{KS}}{F_{KK}} \frac{dR}{1-t_B} + dq - \frac{1}{(1-t_B)^2} \left[F_{KS}R \frac{F_{KK}}{F_{KK}} + G + \frac{S}{u} \left(\frac{t_B - t_A}{1-t_B} - X_{SG} + \frac{X_{Ge}}{X_{cc}}X_{Sc}\right)\right]dt_B
\]

\[+ \frac{1}{1-t_B} \left[G + \frac{S}{u} \left(\frac{t_B - t_A}{1-t_B} - X_{SG} + \frac{X_{Ge}}{X_{cc}}X_{Sc}\right)\right]dt_A \tag{32}
\]

\[+ \left[X_{Sd} + \frac{1}{u} \left(X_{Gd} - \frac{X_{Ge}}{X_{cc}}X_{cd}\right) \left(\frac{t_B - t_A}{1-t_B} - X_{SG} + \frac{X_{Ge}}{X_{cc}}X_{Sc}\right) - X_{Sc}X_{cd}\right]dd
\]

\[+ \left[X_{Sl} + \frac{1}{u} \left(X_{Gl} - \frac{X_{Ge}}{X_{cc}}X_{cd}\right) \left(\frac{t_B - t_A}{1-t_B} - X_{SG} + \frac{X_{Ge}}{X_{cc}}X_{Sc}\right) - X_{Sc}X_{cd}\right]dl,
\]
where \( v = F_{SS} - X_{SS} - \frac{F_{KS}^2}{F_{KK}} + \frac{1}{2} \left( \frac{t_B}{1-t_B} - X_{GS} + \frac{X_{cc}}{X_{cc}} X_{cG} \right)^2 + \frac{X_{cc}}{X_{cc}} < 0 \) (from second-order conditions). Furthermore, it must be \( u = X_{GG} - \frac{X_{cc}}{X_{cc}} X_{cG} > 0 \).

A.1 The case of shifted profits as basis for detection

Assume in this subsection that \( C = X(G, S, c, d, l) = X(P, c, d, l) \) with \( P = G \cdot S \). We have then

\[
X_G = X_P \cdot S \quad \Rightarrow \quad X_{GG} = X_{PP} \cdot S^2, \quad X_{GS} = X_{PP} \cdot GS + X_P = X_{SG}, \quad X_{Gc} = X_{Pc} \cdot S,
\]

\[
X_S = X_P \cdot G \quad \Rightarrow \quad X_{SS} = X_{PP} \cdot G^2, \quad X_{Sc} = X_{Pc} \cdot G.
\]

Inserting these expressions into equation (32) and collecting terms delivers

\[
v \cdot dS = -\frac{F_{KS}}{F_{KK}} \frac{dR}{1-t_B} + dq - \left[ \frac{F_{KS}}{F_{KK}} \right] \frac{R \cdot dt_B}{(1-t_B)^2} + \frac{S}{u} \left[ \frac{t_B - t_A - X_P}{1-t_B} \right] \frac{dt_A}{1-t_B}
\]

\[
+ \frac{GS^2}{u} \left( X_{Pd} - \frac{X_{Pd}}{X_{cc}} X_{cd} \right) \left[ X_{PP} - \frac{X_{cc}}{X_{cc}} + \frac{X_{cc}}{X_{cc}} - X_{PP} \right] dd
\]

\[
+ \frac{GS^2}{u} \left( X_{Pl} - \frac{X_{Pl}}{X_{cc}} X_{cl} \right) \left[ X_{PP} - \frac{X_{cc}}{X_{cc}} - \frac{X_{cc}}{X_{cc}} - X_{PP} \right] dl
\]

\[
= -\frac{F_{KS}}{F_{KK}} \frac{dR}{1-t_B} + dq - \left[ \frac{F_{KS}}{F_{KK}} \right] \frac{R \cdot dt_B}{(1-t_B)^2}.
\] \hspace{1cm} (33)

Equation (33) shows again that transfer pricing does not affect factor allocation and economic activity. The use of the intermediate input good is independent of the tax rate \( t_A \) in the tax haven as well as of detection effort by tax authorities \( d \) and the quality of tax law \( l \). The domestic tax rate \( t_B \) affects the intermediate good only via the capital tax distortion from denying tax deductibility for costs of equity.

Let us specify the concealment cost now as \( C = X(P, c, d, l) = e(c, l) + p(P, d) \cdot \Phi(P) \) so that we have \( X_{Pl} = 0 \) and remember that \( X_{cl} = e_{cl} > 0 \). Applying these specifications together with \( \frac{dS}{dl} = 0 \) in equation (30), we can show that

\[
\frac{dG}{dl} = \frac{S}{u} X_{Pc} X_{cl} X_{cG} < 0, \quad (34)
\]

because \( X_{Pc} < 0 \) and \( X_{cc}, X_{cl} > 0 \). Making use of (34) in equation (29), we can sign the effect of law quality on concealment effort as

\[
\frac{dc}{dl} = -\frac{1}{X_{cc}} \left[ X_{Pc} \cdot S \cdot \frac{dG}{dl} + X_{cl} \right] < 0, \quad (35)
\]

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as again $X_{Pc} < 0$ and $X_{cc}, X_{cd} > 0$ and $\frac{dG}{dc} < 0$. Consequently, a better quality of tax law unambiguously reducing transfer pricing and the (unproductive) activity of concealing the mispricing of the intermediate good.

For an increase in the detection effort of tax authorities, we do not find a clear-cut result and specifying the concealment cost function doesn’t help much. A compact presentation of results, collecting effects from equations (30) and (29) would be

\[
\frac{dG}{dd} = - \frac{X_{Pd} - \frac{X_{Pc}}{X_{cc}} X_{cd}}{S \cdot \left( X_{PP} - \frac{X_{Pc}}{X_{cc}} X_{Pc} \right)} \geq 0, \quad (36)
\]

\[
\frac{dc}{dd} = - \frac{1}{X_{cc}} \left[ X_{Pc} \cdot S \cdot \frac{dG}{dd} + X_{cd} \right] = - \frac{1}{X_{cc}} \frac{X_{cd} X_{PP} - X_{Pc} X_{Pd}}{X_{Pc} - X_{cc} X_{Pc}} \geq 0, \quad (37)
\]

where $X_{cd}, X_{Pc} < 0$ but $X_{PP}, X_{Pd} > 0$. Higher detection effort ceteris paribus makes it more attractive to investment into concealing since the reduction in expected fines increases. At the same time, higher detection effort has a negative direct effect on overpricing $G$. If $G$ reduces, that gives a negative incentive for concealment effort $c$; however, if $c$ increases that gives a boost to overpricing. Hence, both effects are ambiguous.

References


