Transfer Pricing by Multinational Firms: New Evidence from Foreign Firm Ownerships*

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Abstract

Using a firm-level panel dataset covering the universe of Danish exports between 1999 and 2006, we find robust evidence for profit shifting by multinational corporations (MNC) through transfer pricing. Our triple difference estimation method corrects for a downward bias in previous studies. The bias results from MNCs adjusting their arm's length prices to obscure the extent of their transfer price manipulations. Our identification strategy exploits the movement in export prices to a destination in response to: (1) the establishment of a foreign affiliate by an exporter to that destination, and (2) a change in the foreign corporate tax rates. Once owning an affiliate in a country with a corporate tax rate lower than in the home country, Danish multinationals reduce the unit values of their exports there between 5.7 to 9.1 percent, on average. This reduction corresponds to $141 million in underreported export revenues in year 2006, which translates into a loss in tax income equal to 3.24 percent of Danish MNCs' tax returns.

JEL: F23, H25, H32, D23
Keywords: transfer pricing, arm's length principle, corporate tax, triple difference, foreign ownership

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1 Introduction

Large budget deficits and a sluggish world economy have forced governments worldwide to tighten regulations and intensify corporate audits in the hope of raising tax revenues. Among the key targets sought by tax authorities are multinational corporations (MNC). While their rapidly growing global activities generate large operating profits, MNCs avoid paying taxes on a substantial portion of their profits by shifting taxable income to jurisdictions with low corporate tax rates. Concerns over tax avoidance have intensified so much in recent years that international taxation regulation has become a top priority on the agenda of the OECD and G8 country meetings.[1]

There are many ways in which multinational firms shift income across countries to minimize their global tax burden. Among them, a vehicle commonly used by MNCs is the pricing of goods exchanged between related parties – known as transfer pricing.[2] Transfer pricing provides MNCs a tool to allocate incomes across affiliated entities in different tax jurisdictions. By underpricing the exports shipped from a high tax country to a low tax country, an MNC is able to reduce its effective global tax rate. A classic case study of this profit shifting strategy involved the chemical company Du Pont de Nemours. In 1959, Du Pont created a wholly-owned Swiss marketing and sales subsidiary - Du Pont International S.A. ("DISA"), which distributed all Du Pont chemical products outside the USA. According to court documents, Du Pont's "internal memoranda were replete with references to tax advantages, particularly in planning prices on Du Pont goods to be sold to [DISA]. The tax strategy was simple. If Du Pont sold its goods to [DISA] at prices below fair market value, [DISA], upon resale of the goods, would recognize the greater part of the total profit (i.e., manufacturing and selling profits). Since this foreign subsidiary could be located in a country where its profits would be taxed at a much lower level than the parent Du Pont would be taxed here, the enterprise as a whole would minimize its taxes."[3] Given this evidence of profit shifting, the IRS rejected Du Pont's transfer pricing position and adjusted its US income upwards.

In response to income shifting strategies seen in *E. I. Du Pont de Nemours and Company*

[1] At a recent World Economic Forum, the British prime minister expressed the intention to "use the G8 [presidency] to drive a more serious debate on tax evasion and tax avoidance.[...] it is time [...] for governments to act." (Cameron, 2013). Soon after, the OECD (2013) published a report calling for a "comprehensive action plan" to reform tax rules.

[2] Transfer pricing refers to the intra-company pricing of tangible and intangible goods. While this paper focuses on tangibles due to data availability, trade in intangibles such as services or trademarks represents an import tool to transfer income abroad. Another common method of profit shifting is debt financing. Given that the interest on debt is tax deductible, MNCs benefit by having affiliates in low tax locations lend to affiliates in high tax locations. For empirical evidence, see Huizinga, Laeven, and Nicodeme (2008) and Egger et al. (2010) among others.

[3] E. I. Du Pont de Nemours and Company v. the United States., 608 F.2d 445 (Fed. Cir. 1979)

v. the United States, tax authorities around the world have established regulations on recording transfer prices for potential audit purposes. These rules have become known as the arm's length principle of taxation, which requires MNCs to invoice intra-firm transactions at the same price as charged to unaffiliated parties.[4] It "is the standard used globally to resolve transfer pricing disputes" (Doernberg, 2012, p. 282). In practice, however, the principle leaves enough room for companies to strategically choose arm's length prices in order to camouflage intra-firm pricing manipulations. This makes identifying income shifting through transfer pricing a challenge for both tax authorities and empirical researchers.

In this paper we estimate the extent to which MNCs manipulate both (1) transfer prices to *controlled* affiliates and (2) arm's length prices to *uncontrolled* third parties, in order to reduce their global tax burdens. We focus on transactions of tangible goods, given the data and methodological constraints facing intangibles.[5] To guide our empirical analysis we follow Bernard, Jensen, and Schott (2006), and use a partial equilibrium framework to formalize the taxation problem of a multinational corporation in the presence of intra-firm trade and profit shifting incentives via transfer pricing. A known prediction arising from this model is that tax rate differences across countries induce multinational firms to manipulate transfer prices so that income gets cumulated in countries with lower tax rates.

This study examines an overlooked prediction of the standard transfer pricing theory: that firms will also manipulate their arm's length price in the direction of the transfer price as a result of corporate tax differences across locations. This manipulation of prices for goods shipped to uncontrolled third-parties obscures the extent of price manipulations to affiliated parties, allowing MNCs to comply with the arm's length principle of taxation while engaging in income shifting. The total income shifted internationally through the pricing of cross-border transactions is the cumulation of these two manipulations. Previous studies that focused only on movements in transfer prices

[4]Several recent papers argue that the arm's length principle is a distortionary rule because even in the absence of tax differences across countries, profit maximizing MNCs may optimally set intra-firm prices at a different level from arm's length prices. In an offshoring model with financing frictions, Keuschnigg and Devereux (2013) show that even absent tax rate differences across countries, a parent firm may still shift income via transfer pricing in order to relax the financing constraints faced by the foreign affiliate. Raimondos-Moller and Scharf (2002) emphasize the inefficiency of the arm's length principle in the context of a non-cooperative tax competition game among countries. In general, related-party transactions often benefit from synergies that third-party transactions do not enjoy (Rosenthal, 2008). They also may be able to avoid the double-marginalization problem (Hirshleifer, 1956; Baldenius, Melumad, and Reichelstein, 2004). Overall, there are multiple reasons to believe that it is theoretically inconsistent to use uncontrolled third-party transactions to benchmark transfer prices, in spite of the policies in place.

[5]Internal transfers of intangible assets often have no comparable transactions, especially in instances where the intangible asset is part of a bundle or is considered a crown jewel of the business (Eden, 1998, p. 256)

underestimate the full amount of tax revenue lost to manipulative transfer pricing of tangibles.

This study's prediction that MNCs distort arm's length prices for tax-saving purposes has important implications for the validity of such prices as comparable uncontrolled prices (CUPs), used as benchmarks to test whether the transfer price meets the arm's length principle.[6] By using the MNC's own arm's length prices as CUPs, tax authorities and researchers underestimate the extent to which the MNC manipulates prices in order to shift profits. The contribution of our empirical analysis is to mitigate this bias. Specifically, we use a triple difference strategy to estimate the gap between an MNC's export unit value and a true reference CUP that conforms with the arm's length principle. The MNC export unit value comprises both the transfer price and the arm's length price. Its deviation from the true CUP, multiplied by the quantity traded, provides the total revenue shifted by MNCs out of their home country.

The econometric analysis investigates the extent to which differences in tax rates generate transfer pricing manipulations. To identify the magnitude of these manipulations, we exploit two sources of data variation: (1) information on multinational firms that establish new foreign affiliates in markets to which they export and (2) information on changes in foreign corporate tax rates over time. By comparing the export unit values before and after acquiring an affiliate in a foreign country, we identify the effect that foreign ownership has on export unit values. Using a triple difference method, we are able to discern what fraction of the overall changes in export unit values is associated with differences in corporate tax rates across jurisdictions, as opposed to non-tax related factors, such as an internal reorganization of the firm following an affiliate acquisition.

Even absent changes in foreign firm ownership, we can still identify the extent of tax-motivated transfer pricing from variation in corporate tax rates over time. As the prices of export-only firms are unaffected by the corporate tax rate in the export market, they serve as a control group for MNCs after netting out firm heterogeneities. Thus, we can compare the export price of multinationals relative to that of export-only firms before versus after a change in foreign corporate tax rates to infer the extent of transfer pricing by multinational firms.

Our estimation strategy requires detailed firm and transaction level data. We use rich micro level data for Denmark for the period 1999 - 2006. There are several advantages in departing from

[6] "A controlled transaction meets the arm's length standard if the results of the transaction are consistent with the results that would have been realized if uncontrolled taxpayers had engaged in the same transaction under the same circumstances." - IRS 482-1(b)(1).

U.S. data. First, from a global policy perspective, it is useful to investigate and bring empirical evidence for the behavior of multinational firms headquartered in other regions of the world. Second, like most countries (not including the US), Denmark has a territorial taxation system.[7] Thus, our findings may extend to and have policy implications for many economies worldwide. Lastly, Denmark has historically imposed moderate levels of corporate tax rates. This implies that, at each point in time, there exists a sizeable number of important foreign markets that fall into a high tax, or a low tax regime category, defined relative to the tax rate in the home country.[8] We exploit this feature of our data by allowing for the elasticity of transfer prices with respect to corporate tax rates to differ for high tax versus low tax regime countries.[9]

This paper provides significant empirical evidence showing that Danish multinational firms use transfer pricing to shift income to countries with lower tax rates. We find that a 10 percentage point decrease in the tax rate of a low tax regime country results in a 5.7 percent drop in the export unit values of MNCs owning affiliates in that country, compared to non-affiliated exporters. This drop in unit values is more pronounced for differentiated goods (6.5 percent), and even more so for the subsample of firms who establish new affiliates during the sample period (9.1 percent).

Our findings contribute to several areas of on-going research. A large empirical literature documents the profit shifting behavior of MNCs as a response to differences in corporate tax rates across countries.[10] While most studies find that MNCs earn higher profit margins in low corporate tax locations, they do not shed light on the mechanisms by which profit shifting occurs. This is not an easy task to accomplish particularly since, in recent years, MNCs are increasingly using channels of profit shifting that are more difficult to trace, such as transfers of intangible assets, or complex financing schemes. However, from a policy perspective, it is important to understand the

[7] There are two taxation systems in the world: territorial and national. In a territorial system, only income earned from activities performed by residents of that country gets taxed. However, in a national system, nationals are taxed for income earned worldwide.

[8] In this paper, we define a low (high) tax regime as a country with a low*er* (high*er*) tax rate than the home country. This is not to be confused with the terminology from other papers where low tax jurisdictions are considered tax havens (Desai, Foley, and Hines, 2006).

[9] A reason to suspect asymmetric transfer price effects comes from the unbalanced effort of tax authorities to verify profit shifting in the case of an increase, as opposed to a decrease in the domestic tax base.

[10] Grubert and Mutti (1991) use U.S. outward FDI data to show that the after-tax profit rates of foreign affiliates are negatively related to effective income tax rates, and that the net capital investments are larger in countries with lower tax rates. Hines and Rice (1994) focus on U.S. FDI in tax havens, and find even larger elasticities of income and of real activity to tax rates. Bartelsman and Beetsma (2003) use OECD industry level data to show that when income shifting occurs, the inverse of the labor cost share becomes a direct function of the corporate tax rate differences across countries. More recently, Egger, Eggert, and Winner (2010) provide evidence that foreign owned plants make lower tax payments than similar domestic counterparts, attributing most of this tax savings to profit rather than debt shifting. For comprehensive surveys of the literature see Hines (1999) and Devereux (2006).

mechanisms of profit shifting as it provides guidance on the kind of regulation that is needed to secure a country's income tax base.

Few papers provide direct evidence for the transfer pricing of tangible goods as one of the channels MNCs use to shift income to low tax locations. While the empirical strategy generally consists of relating the difference in product unit values between intra-firm and arm's length trade to the gap in corporate tax rates across trade partners, the findings are more heterogeneous. This is partly because earlier studies have relied on trade datasets available at industry or product level (Swenson, 2001; Clausing, 2003).[11] An implication of the data aggregation is that the observed average unit values of traded goods embed compositional effects such as firm heterogeneities within a product category, or product differences within an industry. This has a direct effect on the estimates, potentially biasing them downwards due to attenuation bias, or upwards if comparing product prices from firms heterogeneous in productivity.[12] The paper most closely related to ours that uses U.S. micro level data is Bernard, Jensen, and Schott (2006). By observing MNCs' exports to affiliated and unrelated parties in a market, Bernard, Jensen, and Schott (2006) are able to construct firm specific price wedges between intra-firm and arm's length transactions, and relate them to tax rate differences across countries. However, their findings underestimate the extent of profit shifting via transfer pricing if, as argued in this paper, MNCs act strategically by setting arm's length prices closer to the optimal transfer price. Our contribution provides an econometric strategy that accounts for this behavior.

This paper also relates to the recent work on intra-firm trade. The increasing importance of MNCs and the continuous fragmentation of production across national borders have accelerated the growth of intra-firm trade.[13] Furthermore, the volume and composition of intra-firm transactions have played a key role in explaining the geography of multinational production (Keller and Yeaple, 2013; Irarrazabal, Moxnes, and Opromolla, 2013; Cristea, 2012). By investigating the discrepancies

[11] Swenson (2001) uses U.S. import data to examine the response of average unit values to corporate tax rate differences across countries, controlling for import tariffs. The evidence for income shifting through transfer pricing, while statistically significant, is economically small. Using detailed monthly price data for over 22,000 products traded by the U.S., Clausing (2003) brings evidence for significantly larger transfer price manipulations: a 1 percent drop in the foreign corporate tax rate is associated with 0.94 percent lower intra-firm export prices.

[12] Given the abundant evidence on the selection of firms into foreign markets based on productivity levels (Melitz, 2003; Helpman, Melitz, and Yeaple, 2004), it becomes particularly important to conduct the empirical analysis at firm level. In a recent paper, Bauer and Langenmayr (2013) show how setting transfer prices at values determined by outside firms leads to systematic overpricing as a result of multinational firms' exceptional productivity levels.

[13] In the U.S., the volume of intra-firm trade in goods has increased 2.25 times for exports, and 4.13 times for imports during the period 1992-2008 (source: U.S. Census data on related-party trade). For more descriptive statistics on intra-firm trade see, among others, Lanz and Miroudot (2011).

between the reported and actual trade unit values, this paper documents a generally neglected factor – i.e., corporate taxes – for why intra-firm trade may vary systematically across countries.

The paper proceeds as follows. Section 2 provides a simple theory framework to motivate the empirical analysis. Section 3 describes the estimation strategy, highlighting the sources of identification. The data are detailed in section 4, while the estimation results are discussed in section 5. The main policy implications are summarized in section 6, and section 7 concludes.

2 Theory Framework

This section formalizes the change in the export prices of tangible goods due to profit shifting motives of multinational corporations. Following a framework similar to Bernard, Jensen, and Schott (2006), we show how a tax-savvy multinational firm, when faced with exogenous foreign country tax rates that differ from the home country, will manipulate both arm's length and transfer prices to maximize worldwide post-tax profits.

Our theory extends the transfer pricing literature by exploring a previously undiscussed outcome of the standard model: when facing penalties from failing to comply with the arm's length principle of taxation, an MNC may find it optimal to sacrifice profits on unrelated party transactions by setting an arm's length price closer to the transfer price. This way, when tax authorities use the firm's arm's length price as a CUP, the smaller price gap conceals the full extent of the MNC's profit shifting. By measuring the gap between a firm's arm's length and transfer prices, the existing transfer pricing literature does not reflect the full extent of profit shifting undertaken by MNCs.

2.1 Export Price Manipulations of a Tax-Savvy MNC.

Consider a multinational firm consisting of a parent firm incorporated in the home country, h, and an affiliate incorporated in a foreign country, f. The parent firm produces a final good at unit cost c, and exports it to both uncontrolled third parties, at price p_a, and to its majority-owned affiliate, at internal price p_i. The affiliate re-sells the product to foreign consumers at price p_f.[14] Let q_a

[14]To focus the attention on the price distortions determined by taxation considerations, we eliminate any production allocation decisions from the problem of the MNC, and assume that the final good is produced in the home country, with the foreign affiliate only serving a distribution role. This simplification circumvents the discussion about offshoring decisions that arises with the expansion of multinational production. Recent evidence suggests that a significant share of intra-firm trade is motivated by distribution rather than production purposes. Using data for Germany, Krautheim (2012) and Kleinert and Toubal (2013) document that 46 percent of the foreign affiliates of German multinationals are classified as wholesale. The ratio of sales by wholesale affiliates relative to affiliates in

and q_f denote the quantities demanded in the foreign market, given prices p_a and p_f, respectively. Thus, q_f represents the quantity of intra-firm trade.

The parent firm and its affiliate pay corporate income taxes at rates τ_h and τ_f, respectively. For taxation purposes, they report a transfer price p_t on intra-firm transactions.[15] Given the introduced notation, the after-tax profits of the parent, π_h, and foreign affiliate, π_f, can be written as:

$$\pi_h = \big[p_a q_a + p_i q_f - c(q_a + q_f)\big] - \tau_h \big[p_a q_a + p_t q_f - c(q_a + q_f)\big] \tag{1}$$

$$\pi_f = (p_f - p_i) q_f - \tau_f (p_f - p_t) q_f \tag{2}$$

As can be seen from equations (1) and (2), decreasing p_t will increase foreign profits π_f at the expense of home profits π_h. When the MNC faces a lower tax rate in the foreign country, it has an incentive to lower p_t in order to shift profits overseas. However, tax authorities will enforce the arm's length principle of taxation by auditing a random sample of MNCs to verify if their reported transfer prices p_t differ from comparable uncontrolled prices (CUPs).[16] Given the difficulty of measuring CUPs external to an MNC, the tax authorities use the arm's length price p_a as a CUP for p_t, and levy a fine based on the difference.[17] The expected fine incurred by the MNC is equal to:

$$\frac{\lambda}{2}\big[(p_a - p_t) q_f\big]^2 \tag{3}$$

where the parameter λ captures both the probability of tax audit and the fraction of the misreported income that is assessed as a penalty. The quadratic form of the penalty function reflects higher fines for substantially misreporting export values.[18]

The affiliate firm chooses the price p_f to maximize own profits π_f. The parent firm chooses the export prices p_a, p_i, and p_t to maximize the after-tax worldwide profit, Π, taking into account

the same sector as their parent ranges between 0.3 and 1. We also simplify the exposition by ignoring any frictions affecting international transactions and assuming that the parent can rebrand the variety for arm's length sales to prevent cannibalization of the affiliate's sales.

[15] The transfer price p_t serves a different purpose than the internal price, p_i. The transfer price, set in accordance to the arm's length principle, helps in tax return calculations. The internal price, also known as an 'incentive rate', is chosen by the parent firm to incentivize the manager of the foreign affiliate to make optimal purchase decisions that maximize total corporation profits.

[16] IRS §1.482 − 1(*d*)(1) aims to evaluate transfer prices by comparing them to "results realized by [unrelated parties] engaged in comparable transactions under comparable circumstances."

[17] IRS IRM 4.61.3.6 states that "the search for a comparable should begin with a review of the taxpayers operations. The taxpayer may have engaged in uncontrolled transactions potentially comparable to the controlled transactions. This type of comparable is known as an internal comparable."

[18] This is consistent with the IRS 6662(e) penalty structure, which applies heftier penalties for "substantial or gross misstatements of valuation." Bernard, Jensen, and Schott (2006) and Swenson (2001) use similar penalty functions.

the profit-maximizing behavior of the affiliate and the expected penalty for misreporting the value of intra-firm trade:

$$\Pi \equiv \pi_f + \pi_h - \frac{\lambda}{2}\left[(p_a - p_t)q_f\right]^2 \tag{4}$$

with π_h and π_f defined by equations (1) and (2).

Solving for the first order conditions it follows that in equilibrium the price gap between the transfer price and the arm's length export price charged by the parent firm can be expressed as:

$$p_t - p_a = \frac{-(\tau_h - \tau_f)}{\lambda q_f} \tag{5}$$

Equation (5) shows that the tax wedge $\Delta\tau \equiv (\tau_h - \tau_f)$ directly increases the magnitude of the price gap $(p_t - p_a)$. While the indirect effect of $\Delta\tau$ through q_f cannot be explicitly solved for, the sign of $(p_t - p_a)$ is unaffected by the direction or rate of change in q_f.

As noted in Bernard, Jensen, and Schott (2006), this model does not lend itself to explicit solutions. Nevertheless, the system of price equations given by the resale price chosen by the foreign affiliate, p_f, and the three first order conditions with respect to p_a, p_t and p_i, combined with the two demand equations, $q_i = q(p_i)$ for $i \in \{a, f\}$, are readily solvable numerically. Bernard, Jensen, and Schott (2006) show the results using linear demands while we show in Figure 1 the results using CES demands. As seen in Figure 1, an increase in the tax wedge causes an MNC to increase the price gap between p_t and p_a in order to reduce its global tax burden. The inverse relationship between the tax wedge and the price gap holds true for a wide range of values, and, as expected, we do not see a price ranking reversal due to the indirect effect of $\Delta\tau$ through q_f.[19]

The result in equation (5), illustrated by Figure 1, has been the focus of the literature on transfer pricing. Most of the empirical analyses to date examine the price gap $(p_t - p_a)$ to make inferences about the effect of foreign corporate tax rates on transfer pricing. This is also consistent with the sort of price disparities examined by tax authorities.

2.1.1 Manipulations in Arm's Length Prices to Conceal Income Shifting

We now come to the crux of this study's contribution: the price gap $(p_t - p_a)$ examined by the tax authorities and by the existing literature underestimates the true extent of transfer price ma-

[19] For exposition purposes, we assume $\Delta\tau \equiv \tau_h - \tau_f \in [0, 30\%]$. Given a 30% home tax rate τ_h, which reflects the average Danish tax rate for our sample period, the range considered for $\Delta\tau$ covers an extensive set of values for τ_f.

nipulations. When facing a penalty for profit shifting via transfer prices, the parent firm will set the arm's length price p_a strategically, to conceal the manipulation of the transfer price, p_t, while appearing to tax authorities as complying with the arm's length principle of taxation. In doing so, the MNC sacrifices profits to third parties in order to gain more income by saving on taxes.[20]

To show the manipulation of p_a formally, we place some structure on the demand for the MNC's goods. The quantity demanded q_a by the arm's length customers of the parent firm follows the structure of a standard Dixit and Stiglitz (1977) demand. That is, $q_a \propto p_a^{1-\sigma}$, where σ is the elasticity of substitution among varieties of the same product. The quantity demanded by the affiliate's customers, q_f, follows the same structure.

Given this demand structure, and the assumption of a monopolistically competitive industry, the optimal arm's length export price p_a can be expressed as:

$$p_a = p_x \cdot \frac{1}{1+\kappa(\Delta\tau)} \tag{6}$$

$$\text{where} \quad p_x \equiv \frac{\sigma}{\sigma-1}c, \tag{7}$$

$$\text{and } \kappa(\Delta\tau) \equiv \frac{\Delta\tau}{(1-\tau_h)(\sigma-1)}\left(\frac{q_f}{q_a}\right) \tag{8}$$

Note from equation (7) that p_x is equal to a constant mark-up over the marginal cost; it represents the profit-maximizing price the MNC would charge an unrelated party if it acted as a pure exporter with no incentives to shift profits abroad for tax-saving purposes. As such, p_x represents the appropriate CUP that would be consistent with the arm's length principle of taxation.[21]

Important for this paper, equation (6) shows that p_a differs from p_x by a fraction $\frac{1}{1+\kappa(\Delta\tau)}$, which depends on the tax wedge $\Delta\tau$, among others. Note also that $\kappa(\Delta\tau)$ is increasing in, and has the same sign as $\Delta\tau$.[22] Combining equations (5) and (6), the transfer price p_t can be written as:

$$p_t = p_x \cdot \frac{1}{1+\kappa(\Delta\tau)} - \frac{\Delta\tau}{\lambda q_f} \tag{9}$$

[20] Tax authorities recognize the potential to manipulate arm's length prices to hide corresponding manipulations of transfer prices. To account for this, IRS §1.482−1(*d*)(4)(*iii*) suggests that an MNC's transaction with an uncontrolled third party should be disregarded as a CUP if "one of the principal purposes of the uncontrolled transaction was to establish an arm's length result with respect to the controlled transaction." In practice, however, demonstrating that p_a is manipulated is difficult. Our theory posits that p_a is always manipulated, and so should never be used as CUP.

[21] A way to show that p_x represents the appropriate CUP is note that, under identical circumstances, if the parent firm were unrelated to the affiliate, then it would not realize any sales in f (i.e. $q_f = 0$), and its worldwide profits would condense to $\Pi = (1-\tau_h)(p_a \cdot q_a - c \cdot q_a)$, with a profit-maximizing price equal to p_x.

[22] We could not explicitly sign the derivative $\frac{d\kappa}{d\Delta\tau}$ due to the nonexplicit nature of $\frac{q_f}{q_a}$. However, Figure 2 shows that $\frac{d\kappa}{d(\Delta\tau)}$ is positive for the range of $\Delta\tau$ in our sample.

Thus, both p_t and p_a differ systematically from p_x, and the deviation of each price from p_x grows with $\Delta\tau$. The parameterized solution in Figure 1 illustrates this graphically. As a result, the price gap $(p_t - p_a)$ *underestimates* $(p_t - p_x)$, the full extent to which the MNC manipulates transfer prices for tax-saving purposes. It is only when the tax wedge is equal to zero (i.e., $\tau_h = \tau_f$) that the MNC sets both the arm's length and the transfer prices at the level of the CUP (i.e., $p_t = p_a = p_x = \frac{\sigma}{\sigma-1}c$), an outcome consistent with the MNC having no tax benefits from manipulating export prices.

An implication of our analysis is that MNCs, in addition to shifting income to their foreign affiliates via transfer pricing, also sacrifice revenues when trading with unrelated parties due to arms length pricing, p_a. This is a tradeoff that MNCs incur in order to take advantage of the tax savings obtained from transfer pricing while minimizing their penalty risk.[23] However, this further reduces the income reported to the home tax authorities, in addition to reducing the MNCs' global tax burden. So, in order to measure the total income shifted by MNCs to foreign shores, we need to consider the effect of the tax rate differences on both price gaps: $(p_t - p_x)$ and $(p_a - p_x)$.

2.1.2 From Theoretical Prices to Export Unit Values

So far, we have discussed in theory the strategies that MNCs may follow in setting prices for exported goods. However, these stylized prices are difficult to observe in the data. Many customs transaction-level datasets only report the total value and total weight of a shipment, in which case the best approximation for an export price is the average unit value of an international shipment of a particular product. And, for the great majority of cases, there is no information on the affiliation of the importing partner in a trade transaction. This is the case for our micro level dataset as well. So, for an MNC that exports a particular product to both related and unrelated parties in a foreign market, the export unit value represents a weighted average of the (intra-firm) transfer price, p_t, and the arm's length export price, p_a. For consistency with our empirical analysis, we define the export unit value p_m for an MNC as:

$$p_m = s_f p_t + (1 - s_f)p_a, \quad \text{with} \quad s_f \equiv \frac{q_f}{q_f + q_a} \tag{10}$$

Figure 1 represents p_m graphically as an weighted average of p_t and p_a. Predicting the

[23] While our study focuses on the manipulation of arm's length prices for tangible goods, this channel of tax avoidance may also exist for those intangible assets that are traded both intra-firm and arm's length. However, it may be less applicable in cases when the intangible assets or services are less standardized (i.e., their content varies substantially across transactions and trade partners), and, therefore, not traded both arm's length and intra-firm.

responsiveness of p_m to differences in corporate tax rates across locations is made easier by the fact that both p_a and p_x move in the same direction, although to a different extent. We can formally define the difference $(p_m - p_x)$ to show that it increases with the tax wedge $\Delta\tau$:

$$p_m - p_x = -\left(\frac{\kappa(\Delta\tau)}{1+\kappa(\Delta\tau)} \cdot p_x + \frac{\Delta\tau}{\lambda(q_a+q_f)}\right) \tag{11}$$

Knowing the gap $p_m - p_x$ allows us to estimate the export revenue underreported by the MNC to the home government when trading with a low tax regime country in an attempt to reduce its global tax burden. To see this, notice that the loss of export revenues due to transfer pricing manipulations can be estimated by:

$$LostExpRev = (p_a - p_x)q_a + (p_t - p_x)q_f = (p_m - p_x)(q_a + q_f) \tag{12}$$

where we use the definition of p_m from equation (10) to determine the second equality.

This result shows the importance of measuring the difference $(p_m - p_x)$. Examination of equation (11), illustrated in Figure 1, leads to the following key implication.

Hypothesis 1:
Differences in corporate tax rates across countries determine multinational corporations to set export unit values that are lower(higher) than the true reference prices (i.e., true CUPs) as a result of income shifting to low(high) tax countries. Formally:

1. For $\Delta\tau > 0 \Rightarrow p_x > p_a > p_t$, which implies that $p_m - p_x < 0$.
   For $\Delta\tau < 0 \Rightarrow p_x < p_a < p_t$, which implies that $p_m - p_x > 0$.
2. $\frac{d|p_m - p_x|}{d|\Delta\tau|} < 0$.

The main testable predictions derived from the theory are that the price gap $(p_m - p_x)$ has the opposite sign of the tax wedge between the home and foreign countries, $\Delta\tau$, and the magnitude of this price gap increases with the magnitude of the tax wedge.

One caveat of this partial equilibrium analysis is that the demand for goods traded intra-firm and arm's length is taken as given. In the empirical analysis, we will control for the main determinants of demand. However, an important point to emphasize is that, while the size of q_f and its ratio to q_a affect the price responsiveness to tax rate changes, the direction of change in p_m relative to p_x follows the prediction in Hypothesis 1 irrespective of the assumptions and the

determinants of demand.

3 Estimation Strategy

Prior studies have examined the relationship between the tax wedge $\Delta\tau$ and the price gap $(p_t - p_a)$, calculated using contemporaneous intra-firm and arm's length trade transactions.[24] What we have shown is that the price gap $(p_t - p_a)$ is an incomplete and understated measure of the degree of income shifting undertaken by MNCs. Researchers and tax authorities should instead measure the gap $(p_m - p_x)$. However, an empirical challenge with this metric is that the true CUP, p_x, is not observable for active MNCs. So, we cannot calculate the difference between p_m and p_x directly. Instead, we need to infer from the data what export price an MNC would have charged a third party, if it had behaved as a pure exporter unaffected by tax savings incentives. For that, we exploit information on the unit values of non-MNC firms that export the same product to the same destination across multiple years. And while there are systematic differences between MNC and pure-exporters in the way they set export prices and respond to market-specific shocks, we strip away these additional layers of heterogeneity using a difference-in-difference-in-differences ("DDD") methodology, as detailed below.

3.1 Baseline triple difference methodology

Consider the export of a product k to country j in year t by two types of firms. Firms indexed by x belong to the control group of pure exporters, who only trade in the destination market j with unaffiliated parties. Firms indexed by m belong to the treatment group of emerging MNCs, who set up their first affiliate in country j during the sample period. In each year we observe the export unit values of the pure exporters, p_{xjkt}, as well as the export unit values of the emerging MNCs, p_{mjkt}.[25] The evolution of these unit values over time is illustrated by the solid lines in Figure 3 (when only two periods are considered), and formally defined as follows:

$$p_{ijkt} = \begin{cases} p_x + \alpha_{ijk} + \alpha_{jt} & \text{, if } i = x \text{ (pure exporter)} \quad (13) \\ p_x + \alpha_{ijk} + \alpha_{jt} + [(p_m - p_x) + \delta] * DAff_{ijt} & \text{, if } i = m \text{ (multinational firm)} \quad (14) \end{cases}$$

[24] See, among others, Clausing (2003) and Bernard, Jensen, and Schott (2006).

[25] In this section, the subscript t indexes the year rather than the reported transfer price p_t set by the firm, as used in Section 2. While this is an unfortunate abuse of notation, the use of subscript "t" should not create any confusion (particularly since p_t does not appear in this section; rather, we examine the export unit values p_m and p_x).

with firm $i \in \{x, m\}$.

Focusing on equation (13) first, p_x denotes the profit-maximizing price of a *representative* exporter with no profit shifting incentives, which was introduced in the previous section. Because products' export unit values differ across firms and across foreign markets for numerous reasons, including differences in production technology or market competition, we let α_{ijk} account for attributes that are unique to a firm-product-market transaction (expressed relative to the representative exporter), and we let α_{jt} capture all the time-specific heterogeneities affecting the evolution of export prices in the foreign market j.

The price p_{mjkt} of the emerging MNC is defined in equation (14) similarly to p_{xjkt}, but with a slight extension to accommodate for foreign firm ownership. We define $DAff_{mjt}$ as an indicator variable equal to one if firm m owns an affiliate in market j at time t. When the MNC firm m does not own an affiliate, i.e., $DAff_{mjt} = 0$, its product price differs from that of a pure exporter selling in the same market only because of heterogeneities in firm-specific attributes (i.e., $\alpha_{mjk} \neq \alpha_{xjk}$). This is illustrated by 'φ' in Figure 3, and accounts for things such as differences in production technology, in cost structure, in market power, or in any other firm characteristics that could affect the level of export prices.

Once the multinational firm establishes an affiliate in country j, i.e., $DAff_{mjt} = 1$, its export price changes relative to the price of a true exporter as a result of: (1) tax-motivated transfer pricing manipulations, captured by $(p_m - p_x)$, and (2) non-tax related mechanisms associated with the reorganization of production upon expansion into foreign markets, which are captured by δ.[26]

To connect equations (13) and (14) to the theoretical prediction in equation (11), we model the tax-motivated deviation in export prices as directly proportional to the tax wedge $\Delta\tau$:

$$p_m - p_x \equiv \beta \cdot \Delta\tau \tag{15}$$

where β measures the responsiveness of an MNC's export price to changes in corporate tax rates, relative to the export price of a pure exporter. Plugging equation (15) into equation (14), and using

[26]For example, the firm could move the final stages of production from the headquarters to the affiliate (see, for example, Grossman and Rossi-Hansberg, 2008; Keller and Yeaple, 2013). Since production fragmentation happens irrespective of the corporate tax rate in the foreign market, the parameter δ would capture these effects. In addition, δ could capture the mechanisms highlighted in the tax literature for why intra-firm prices may differ from arm's length prices even when there are no tax rate differences across countries (Keuschnigg and Devereux, 2013; Baldenius, Melumad, and Reichelstein, 2004). In the end, any systematic price change associated with the establishment a new plant in a foreign market and not caused by transfer pricing manipulations should be captured by δ.

the fact that the tax wedge varies across countries and over time, we can re-write the export price equations (13) and (14) into a single expression, as follows:

$$p_{ijkt} = p_x + \alpha_{ijk} + \alpha_{jt} + (\beta \cdot \Delta\tau_{jt} + \delta) * DAff_{ijt} \qquad \text{for} \quad i \in \{x, m\} \tag{16}$$

where we use the fact that $DAff_{ijt} = 0$ whenever $i = x$ for all countries j and times t.

Our goal is to estimate β, while stripping away all the existing heterogeneities between the transaction unit values of pure exporters and of MNCs coming from: 1) firm-specific attributes (accounted by $\alpha_{xjk}, \alpha_{mjk}$), 2) time-varying market characteristics (i.e., α_{jt}), and 3) non-tax related changes in MNCs' export prices associated with their expansion of activity into new markets (i.e., δ).

To see that equation (16) corresponds to a triple difference estimation of β, suppose that between two periods $t \in \{1, 2\}$ a multinational firm m establishes an affiliate in market j switching status from $DAff_{mj1} = 0$ to $DAff_{mj2} = 1$. The evolution of the price p_{mjkt} over the two periods is illustrated in Figure 3. The difference-in-difference (DD) estimator associated with this "treatment", denoted by Λ_j in Figure 3, is given by:

$$\textit{[DD Estimator]:} \qquad \Lambda_j \equiv \left(p_{mjk2} - p_{mjk1}\right) - \left(p_{xjk2} - p_{xjk1}\right) = \beta * \Delta\tau_{j2} + \delta \tag{17}$$

A preliminary look at the data gives support to such a systematic change in export prices. Figure 4 illustrates the average unit value of a product exported by an MNC both before and after establishing foreign ownership in a destination country with a lower tax rate than the home country. The MNC export unit value is expressed relative to the unit value of a pure exporter firm. Relevant for us, the observed direction of change in the MNC export price post-acquisition seems to be correlated with the corporate tax difference between the home and foreign countries in a way that is consistent with equation (17). What remains to be shown is whether tax avoidance is the reason behind the observed price difference.

To separate the price effect triggered by tax-motivated transfer pricing incentives from any other structural changes in export prices, we take advantage of the variation in corporate tax rates across countries. Using another country l with a corporate tax rate different from j, we can write

the corresponding triple difference (DDD) estimator as a difference of two DD estimators as:

$$\textit{[DDD Estimator]:} \qquad \beta = \frac{\Lambda_j - \Lambda_l}{\Delta\tau_{j2} - \Delta\tau_{l2}} \tag{18}$$

It is important to note that the DDD estimator in equation (18) is not the only approach to infer β. To motivate the alternative approach, note that our firm level dataset covers the export activity of all multinational firms. This includes not only emerging MNCs in a given market j, but also firms that owned foreign affiliates there from before the sample period. In notation terms, this means that for a sufficient number of m firms $DAff_{mjt} = 1$ throughout the observed time period. Nevertheless, we can still identify β from the pricing behavior of "continuous" MNCs as long as there is a change over time in the tax wedge in country j, i.e., $\Delta\tau_{jt}$. In fact, in such instances, a tax rate change can be considered as a "treatment" that affects the incentives of MNCs to modify their pricing strategy, but leaves the pure exporters unaffected. To see how this identification method works, note that the variation in $\Delta\tau_{jt}$ over the two periods, $t \in \{1, 2\}$, allows us to estimate β as follows:

$$\Lambda_j \equiv (p_{mjk2} - p_{mjk1}) - (p_{xjk2} - p_{xjk1}) = \beta * (\Delta\tau_{j2} - \Delta\tau_{j1}) \tag{19}$$

which leads to:

$$\beta = \frac{\Lambda_j}{\Delta\tau_{j2} - \Delta\tau_{j1}} \tag{20}$$

To summarize the methodological approach, the export price equation (16) can be used to estimate β by using either (1) changes in foreign firm ownership across countries of different corporate tax rates, or (2) within-country changes in tax rates over time. The advantage of the triple difference estimator from equation (18) is that it allows us to identify and control for unobserved differences in export prices that are associated with foreign firm ownership, but are unrelated to tax rates. On the other hand, the appeal of the estimator pertaining to the continuous MNCs given by equation (20) comes from the use of a country-specific policy shock that is fully exogenous at the firm level. In the empirical analysis, we are going to exploit both sources of variation.

3.2 Implementing the triple difference methodology using the trade data

To implement our DDD methodology using micro level trade data, an important aspect to consider is the dimensionality of the trade dataset and its many levels of heterogeneity. Our panel spans

four dimensions - firm, product, country and time - but for our empirical analysis we reduce it to two dimensions. We define a unit of observation as a trade transaction by firm i to country j in product k at year t, and evaluate the effects of our two treatments – changes in foreign firm ownership and changes in foreign corporate tax rates – on the observed export unit values.

Our starting point is a reduced-form regression model of export prices that is analogous to equation (13). We assume that p_{ijkt} depends on firm and country specific characteristics in a log-linear fashion and that p_{ijkt} is measured with error:

$$\ln p_{ijkt} = \alpha_t + \alpha_{ijk} + X_{jt}'\gamma + X_{it}'\theta + \epsilon_{ijkt} \ , \tag{21}$$

where α_t denotes yearly fixed effects, which absorb the price determinants that are common to all export transactions in year t. These include the representative export price p_x discussed in the theory section and in equation (13), as well as any price determinants that are orthogonal to the model. α_{ijk} denotes firm-country-product fixed effects. Similar to equation (13), α_{ijk} capture any unobservable, time-invariant price determinants that are specific to a given firm-country-product trade transaction. X_{jt} proxies for α_{jt} in equation (13) and denotes a vector of destination country control variables (in logs), which accounts for the size of the foreign market and average income level (as measured by country population and real per capita GDP), for the foreign exchange rate, and for the statutory corporate tax rate.[27] In a similar way, X_{it} denotes a vector of observable time-varying firm-specific variables (in logs), such as total sales and employment level, that covary with the export price. Finally, ϵ denotes the error in measuring and in specifying the unit value of an export transaction. Given the complex pricing-to-market strategies pursued by the exporting firms, as well as the repeated block structure of the country level variables of interest (e. g., the corporate tax policy), we allow for the non-independence of the export price disturbances within a country–year cluster group.

We extend the export price regression model in equation (21) to account for the specific pricing strategies of multinational firms, as discussed in the previous subsection and defined by

[27]The control variables in X_{it} and X_{jt} are important not only because they explain export prices, but also because they influence the decision to establish foreign affiliates (i.e., likelihood that $DAff_{ijt} = 1$). For example, di Giovanni (2005) provides evidence of a significant negative effect of corporate taxes on M&As, while Desai, Foley, and Hines (2006) finds that large, fast growing MNCs are more likely to set tax haven operations, affecting their potential to shift income and reduce the global tax burden.

equation (16):

$$\ln p_{ijkt} = \alpha_t + \alpha_{ijk} + \Big[\delta + \beta \cdot \Delta\tau_{jt}\Big] \times \text{DAff}_{ijt} + X_{jt}'\gamma + X_{it}'\theta + \epsilon_{ijkt} \tag{22}$$

where the indicator variable $DAff_{ijt}$ equals one if firm i owns a foreign affiliate in country j at year t and is zero otherwise. The coefficient δ measures the average price effect associated with establishing a foreign affiliate, while β captures the *additional* price change determined by differences in corporate tax rates across destinations, $\Delta\tau_{jt}$.

Our coefficient of interest is β. It corresponds to: (1) the difference estimator in equation (18) for new MNCs that experience a change in foreign firm ownership (i.e., $DAff_{ijt}$ switches to 1), and (2) the difference estimator in equation (20) for continuous MNCs for whom $DAff_{ijt} = 1$ throughout the sample period. The interaction between owning a foreign affiliate and the tax wedge for low tax regime countries strictly identifies the change in MNC export unit values driven solely by changes in tax rates. Thus, β reveals MNCs' transfer pricing behavior. If the relationship between export unit values and affiliate activity were not dependent on the tax regime of country j, then adding the tax wedge $\Delta\tau_{jt}$ to the regression model would be superfluous. However, Hypothesis 1 suggests that the tax regime of a country is a key omitted variable in the export price regression.

The firm and country specific control variables, and the fixed effects included in the regression model ensure common price trends for all the firms selling a particular good in a foreign market. They also account for the main determinants of the boundaries of the firm. Product characteristics such as the capital intensity and the knowledge intensity of the production technology, or country characteristics such as the factor endowments or contractual environment, are known as important determinants of the decision to contract and trade intra-firm versus arm's length (see, for example, Antras, 2003; Yeaple, 2009). By controlling for such determinants, we minimize the channels through which the unobserved share of intra-firm trade could influence the estimated price effects.

We expand the regression model in equation (22) in two ways. First, we decompose β into β_1 for countries with lower corporate tax rates than the home market, and β_2 for countries with higher corporate tax rates. Although the theory framework does not suggest a differential price response to a change in the absolute value of the tax wedge $|\Delta\tau_{jt}|$ based on the tax regime of the foreign country (i.e., whether country j has a higher tax rate or lower tax rate compared to the

home market), we nevertheless allow for such asymmetries in our estimation model.[28]

Second, we allow the year fixed effects α_t to vary by the tax regime of the foreign country. Thus, we denote by $(\alpha_{t,\text{LowTax}})$ and $(\alpha_{t,\text{HighTax}})$ the interaction terms between the year fixed effects and the corresponding tax regime indicators. In adding these differential time effects, we aim to control for unobservable time-varying factors that affect export prices and may be specific to the group of countries that set higher, respectively lower tax rates.

With these additional control variables, after rearranging, our regression model becomes:

$$\ln p_{ijkt} = \alpha_t + \alpha_{ijk} + \delta \cdot \text{DAff}_{ijt} + \left[\beta_1 \cdot I^{\text{LowTax}} + \beta_2 \cdot I^{\text{HighTax}}\right] \times |\Delta\tau_{jt}| \times \text{DAff}_{ijt} + \\ + X_{jt}{}'\gamma + X_{it}{}'\theta + \alpha_{t,\text{LowTax}} + \alpha_{t,\text{HighTax}} + \epsilon_{ijkt} \tag{23}$$

Equation (23) represents the estimation equation that we take to the data. To account for possible correlations in export prices among all the Danish firms exporting to the same foreign market in a given year, we cluster the standard errors by country-year pairs.[29]

4 Data

Our estimation strategy requires rich firm and transaction level data. To estimate our model, we employ micro level data from Denmark. We combine two data sources on Danish firms, one providing information on all international trade transactions, and the other on firms' ownership of foreign assets.

Our firm level data comes from the administrative records maintained by Statistics Denmark. The Firm Statistics Register covers the universe of private sector Danish firms, with each firm identified by a unique numeric code to facilitate drawing information on firm characteristics and activities from multiple administrative registries. For each firm we observe the employment size

[28] Asymmetries in MNCs' responses to corporate tax rate differences may be explained, for example, by the unequal efforts of the home country tax authorities to inspect and detect transfer pricing in transactions with high tax countries, relative to low tax countries. At the same time, it could be the case that governments in high tax countries may have on average a stronger tax enforcement power, deterring Danish MNCs from engaging in transfer pricing.

[29] A different group of observations that is non-nested in the country-year block structure embedded in the regression disturbances is the firm-year group level. The unit values that a firm sets for the products exported across multiple countries may be correlated, leading to non-independent residuals. If the correlation of within-firm errors is large, dominating that of within-country errors, our estimates could have misleadingly small standard errors. However, by explicitly controlling for time varying firm-specific price determinants, as well as for firm-product-country fixed effects, we hope to mitigate this concern (an unreported error variance decomposition supports this assertion). Our assumptions on the error structure of export unit values are consistent with the existing trade literature (see, for example, Manova and Zhang, 2012).

and level of sales, the industry affiliation (eight digit NACE code) for all its productive activities, and all the international transactions reported to Customs.

For the estimations in this paper, we only focus on the sample of manufacturing exporters operating during the time period 1999–2006. Based on the information on annual exports recorded by value and by weight for each product code and foreign destination market, we determine the average unit values by dividing export values by the quantities shipped at the firm–product–destination level of detail. In constructing the sample, we drop the observations with negative or missing export values, or for which we cannot measure unit values because of zero or missing weight values.[30] We further drop the top and bottom 1 percent of prices to eliminate measurement or keying errors.

To obtain information on foreign direct investments (FDI) involving Danish firms, we use data on foreign firm ownership shares provided by Experian. Experian collects firm level information on foreign ownership from the annual reports published by Danish firms, which are supplemented with information from the transaction records maintained by the National Bank of Denmark.[31] Each firm is reported in the dataset with the same unique numeric firm identifier as employed by Statistics Denmark.

Based on the firm level information available in the Experian database, we construct two indicator variables of foreign ownership. First, we identify the manufacturing firms that operate in Denmark during our sample period and that are foreign owned (i.e., majority shares are owned by foreign nationals). This foreign ownership indicator corresponds to a fraction of the inbound FDI activity in Denmark.[32] In a similar manner, we track Denmark's outward FDI activity by identifying the countries in which a Danish firm holds majority ownership of a local establishment. For the purpose of this study, we focus only on majority-owned foreign affiliates (51% ownership defines control for tax authorities). In the end, the resulting firm level dataset on foreign direct investments reports for each Danish firm information about its foreign ownership status, and its multinational activity, with a complete list of foreign markets in which the firm owns affiliates.

To construct our estimation sample, we merge the firm level information on asset ownership

[30] We lose approximately 4 percent of the data because of such data reporting issues.

[31] The firms reported in the database may not cover the entire population of Danish firms undertaking foreign direct investments. Even so, the data provided by Experian is of very high quality, being widely used by research analysts. In fact, this is the primary data source on Danish firms used in Bureau van Dijk's Orbis and Amadeus databases.

[32] FDI statistics are defined based on a minimum threshold of 10 percent ownership share. By disregarding foreign investment activities that fall short of the 50 percent majority ownership break point, our indicator measure of foreign ownership underestimates the volume of inbound FDI. The same comment applies to outbound FDI, given our interest in majority-owned foreign affiliates of Danish multinational firms.

by foreign country with corresponding customs data on export transactions. The resulting data sample includes 8,074 unique firms exporting almost 10,000 products (8-digit NACE codes) to 71 countries. Of these firms, 820 represent unique multinational corporations (i.e., 10 percent), and 430 of them have established at least one new majority-owned affiliate in a foreign country during our sample period (i.e., 52 percent of MNCs and 5.3 percent of all exporters). On average, multinational firms that expand to new markets by establishing majority-owned affiliates do so multiple times during the observed period. Given a number of 937 unique MNC–country pairs involving new firm ownerships, this implies an average of 2.2 new market entries via FDI per parent firm.

Important for our purposes, the resulting dataset reports for each manufacturing exporter the unit values of every product shipped to a particular foreign country, and whether the firm owns a foreign affiliate in that country.[33] We do not know whether the receiver of a particular export transaction is a controlled affiliate or an uncontrolled third-party. We assume that whenever an exporter owns a firm in a foreign market, at least a fraction of the observed export shipments must be intra-firm. This means that the unit value observed in foreign markets where the firm owns a foreign affiliate represents a weighted average of intra-firm and arm's length prices. This is important for interpreting the results from our estimation exercises.

We augment the Danish firm level dataset with foreign country level information on population, per-capita GDP, real exchange rate and statutory corporate tax rate. All the country level variables are taken from the Penn World Tables version 3.0 except for the corporate tax information, which is collected from the OECD Tax Database and, for non-OECD countries, from the World Tax Database provided by the Office of Tax Policy Research at the University of Michigan.[34] We use the statutory corporate tax rates to compute the difference in absolute value between the tax rate of a foreign country and that of Denmark. In doing so, we track the countries with tax rates above or below Denmark's rate by creating indicator variables equal to one if a country has *High Tax*, respectively *Low Tax*.

To summarize the tax rate dynamics present in our data, Figure 5 illustrates the time trend

[33]For all the firms that establish a foreign affiliate during the sample period, we remove the observation corresponding to the actual year of acquisition. This is done in order to mitigate measurement error in export unit values. This way we can be sure that when $DAff=1$ ($DAff=0$), the pricing strategy of the Danish exporter is characterized 100 percent by its MNC (exporter-only) status.

[34]Based on the OECD countries that appear in both datasets, we calculate a correlation coefficient of 0.89 between the corporate tax rates from the two sources. Of the overlapping observations, 81 percent show less than a one percentage point difference in the reported tax rates. This is suggestive of the consistency between the two datasets.

for the Danish corporate tax rate in comparison to the level of taxes in several top export destination markets. Figure 6 provides a histogram of the corporate tax rate difference between Denmark and its foreign trade partner. Both data plots convey a similar message: the level of the Danish statutory corporate tax rate is conservative, as there are important trade partners that charge significantly higher, or significantly lower tax rates. The dispersion in the foreign corporate tax rates relative to the level in Denmark is very useful for our estimation exercises, as it provides significant variation to the constructed tax wedge variable.

To conclude the discussion on the data sources and sample construction, Table 1 provides the summary statistics for the variables in our final dataset. A unit of observation is a firm-product-country-year quadruplet. Trade transactions carried by Danish multinationals in foreign markets where they have majority-owned affiliates represent 11.4 percent of all observations. Almost 3 percent of all trade transactions correspond to Danish multinationals that establish their first majority-owned affiliate in a country during our sample period. Even though the number of export transactions handled by Danish multinationals is not large by count, in value terms they account for a significant fraction of total Danish exports. Table 2 provides evidence in support of this. The reported summary statistics are constructed by year at firm-country level in order to illustrate the exceptional growth and export performance of Danish multinationals in countries where they establish foreign ownership.

5 Estimation Results

In this section we examine the extent to which Danish multinational firms shift profits to low tax locations via transfer price manipulations. Throughout our analysis we treat firms' foreign direct investment decisions as orthogonal to pricing decisions, conditional on all the firm and country characteristics.[35]

5.1. Baseline Specification

[35] In this paper, we do not consider the ability to shift profits via transfer price manipulations a determining factor in investment location decisions, but rather an opportunistic behavior consequent to investments already made. This is because taxation policy can change quite frequently, making this source of income savings highly uncertain in the future. Furthermore, multinational firms exploit a variety of mechanisms to minimize their global tax burden, so setting up affiliates that undertake real activity may not necessarily be the most cost-effective option. In the end, even if transfer pricing were to be a determinant of investment locations, then the production and transfer of intangibles must weigh in more heavily in this decision. Consistent with these explanations, the evidence in Blonigen and Piger (2012) suggest that foreign plant acquisitions are insensitive to host country tax rates.

Table 3 reports the results from estimating the regression model in equation (23). Overall, we find significant evidence in favor of Hypothesis 1: firms reduce the unit value of exports to low tax countries when they own affiliates there. As column 1 shows, a 10 percentage point decrease in the corporate tax rate of a low tax country corresponds to a 5.7 percent decrease in the export unit value of an MNC relative to a pure exporter shipping the same product to that market. We also find evidence that multinational firms price their exports higher in high tax countries where they own an affiliate, by comparison to pure exporters. However, the results are statistically insignificant. Later we will show subsamples where this difference becomes weakly significant.

The results in column 1 could be biased due to two sources of endogeneity. First, Danish firms that own affiliates in foreign countries could themselves be affiliates of a foreign multinational firm; and, as controlled affiliates, these firms may be involved in the tax avoidance strategies decided by their parent firms, which may differ from our model predictions. Second, a novel source of data variation exploited for model identification comes from the establishment of new foreign affiliates. However, if Danish MNCs set up affiliates in response to a decline in export prices to low tax countries, then the direction of causation between acquisitions and falling prices is ambiguous.

We address these two issues in columns 2 and 3 of Table 3 by adding indicator variables to control for the foreign ownership status of a Danish firm and for the price of that export transaction in the year prior to the establishment of a foreign affiliate. As the results show, foreign ownership and price movements prior to foreign acquisitions have no statistically significant effects on export unit values, nor do they affect our coefficients of interest.

As discussed in section 3, our identification strategy exploits variation in both affiliate acquisitions and the tax wedge. To separately examine each source of data variation, we estimate our model on two distinct subsets of our treatment group. The results are summarized in Table 4, with column 1 replicating the full sample estimates for comparison purposes (i.e., column 1 of Table 3).

For the first subsample, we focus only on the variation in the tax wedge. To do so, we drop all export transactions that occurred before an acquisition or after a divestiture, keeping only those firm-product-country exporting spells that are entirely attributed to pure exporters or to multinational firms. Thus, we eliminate any variation of prices due to affiliate ownership *within* firms, and identify the model solely from changes in the tax wedge. Since any Danish firm in our sample is too small at the international level to influence foreign governments into changing their

corporate tax rates, this variation is entirely exogenous to the firm's behavior. That is, a country's tax policy is taken as given by each multinational corporation making intra-firm trade decisions. As Table 4 column 2 reports, our main results hold true even when using this restricted sample: multinationals selling to a low tax country will reduce the unit value of their exports by 6.36 percent in response to a 10 percentage point drop in that country's tax rate.

For the second subsample, we remove the continuous affiliates previously considered, in order to focus on data variation coming from changes in foreign firm ownership. This allows us to observe the export pricing decisions of firms that act as pure exporters at one point during our sample period before becoming MNCs. The resulting estimates are stronger. Table 4 column 3 shows an increase in the price elasticity: a 10 percentage point decrease in the tax wedge corresponds to an 8.24 percent decrease in the unit value of affiliated exports. The results are even more pronounced when we remove affiliate divestitures, and restrict the treatment group to only those multinationals that acquire a new affiliate. As seen in column 4, these acquisitions correspond to a 9.13 percent decrease in the export unit value for a 10 percentage point decrease in the tax wedge. For this last subsample, the tax wedge in the high tax countries also influences significantly the average unit value of exports: a 10 percentage point increase in the tax wedge corresponds to a 12.6 percent increase in the unit value of exports by multinationals.

The difference between the response of export prices attributable to acquisition and that attributable to tax rate changes could be due to sluggish adjustments in transfer prices. Multinational firms with continuously owned foreign affiliates have a history of transfer prices that can be used by tax authorities to detect profit shifting motives. As a result, transfer price manipulations may happen much more gradually over time for these firms. Trade spells with new affiliates do not have this restriction, allowing for immediate and larger price responses.

Non-measureable product characteristics can also determine the extent to which a firm can shift profits overseas. For commodities sold on organized exchanges, or for products that have a reference price, MNCs may have a harder time justifying price differences. By contrast, price manipulations of differentiated goods can be hidden under the guise of product complexity or quality differentiation. To test this, we restrict the sample to products classified as "differentiated" based on the liberal classification proposed by Rauch (1999). As observed from the results reported in Table 5, price manipulations are more pronounced among differentiated goods. The larger response

can be seen in the full sample, as well as each of the three subsamples previously examined in Table 4, even though the differences in coefficients are not statistically significant. The estimates reported in column 1 suggest that a 10 percentage point increase in the tax wedge determines MNCs owning foreign affiliates in low corporate tax countries to export their goods at unit values 6.48 percent below the arm's length unit values charged by comparable exporters. While not statistically significant, a 10 percentage point increase in the tax rate difference for high tax countries corresponds to a 4.09 percent increase in the unit value of exports by multinationals. These effects are much larger when estimated on the subsample of newly established affiliates.

5.2. Robustness Exercises

We verify the stability of our estimates to: 1) various data sub-samples and 2) a narrower definition of the "treatment" group. The results are summarized in Table 6.

Our first robustness exercise restricts our sample to only countries that signed a tax treaty with Denmark. Bilateral tax treaties facilitate international trade and investments by lowering the tax-related barriers to the cross-border shipment of goods and services. They also prevent the double taxation of firms by resolving any dual residency conflicts and settling the tax jurisdiction of controlled foreign affiliates.[36] So, in theory, tax treaties would not only encourage firms to expand their multinational activities, but also to shift more income to foreign location by eliminating the fear of being double-taxed. At the same time, tax treaties typically involve increased cooperation among partner countries in detecting and penalizing tax evasion, which may reduce manipulative income shifting. As columns 3 and 4 of Table 6 show, the former effect seems to dominate the latter. The responsiveness of export prices to tax incentives is slightly higher in tax treaty countries than in the full sample (0.634 vs. 0.570), although the difference is statistically insignificant. This difference increases in the case of differentiated goods.

In columns 5 and 6 of Table 6, we restrict the estimation sample to countries with judicial

[36]Denmark, like many OECD countries, taxes the profits of resident firms, classifying a firm as resident "*if it is incorporated in Denmark or its day-to-day management is in Denmark*" (Deloitte, 2014). Given these criteria, it is possible for more than one country to assert residency claims for an establishment. To give an example, consider an affiliate firm that is incorporated in Ireland but owned by a parent firm in Denmark. Both Ireland and Denmark have claims on the residency of affiliate, and both tax its corporate income, leading to a double-taxation problem. A tax treaty between Ireland and Denmark alleviates that problem. If the affiliate is managed by the parent firm in Denmark, then the treaty allows the affiliate to credit its taxes in Ireland against its taxes in Denmark. If the affiliate is not managed in Denmark, the tax treaty negates any Danish claims on the Irish affiliate's profits. Through manipulative transfer pricing, the Danish parent can now store its global profits in Ireland's low tax jurisdiction.

systems of poor quality, classified based on Kaufmann, Kraay, and Mastruzzi (2004)'s measure of 'rule of law'. All else equal, these are the locations where the risk of penalty for profit shifting via transfer pricing is low. Conforming to expectations, the estimates from columns 5 and 6 are larger in magnitude than their corresponding baseline counterparts. The results suggest that Danish MNCs lower their unit values by 8.16 percent (8.28 percent for differentiated goods) when exporting to destinations that witness a fall in their corporate tax rate of 10 percentage points below Denmark's tax rate.

Finally, we attempt to overcome our inability to separately identify the transfer price manipulations from the arm's length price manipulations. Our theory suggests that transfer prices are more responsive to tax rate differences than arm's length prices. While we cannot observe the two prices in the data, we can focus instead on specific firms or markets where we have reasons to expect that a larger share of MNCs' exports are intra-firm.

For this exercise, we re-define the treatment variable $DAff_{ijt}$ to equal one if two conditions are simultaneously satisfied: 1) firm i has majority ownership of at least one affiliate in country j at time t, and 2) the average quantity of a good exported to the foreign market increases after establishing a foreign affiliate, as compared to the pre-ownership period. If the quantity increases are driven primarily by growth in intra-firm trade, then the MNC export unit values, as determined by equation (14), will be closer to the level of the unobserved transfer prices. And since transfer prices are more responsive to tax incentives, we should see a larger overall response.

Columns 7 and 8 of Table 6 report the estimation results based on the redefined $DAff_{ijt}$ indicator variable. The results are consistent with our hypothesis. For the trade flows of MNCs that acquire an affiliate and increase export quantities, the unit values are nearly twice as responsive compared to the baseline treatment group (-1.072 vs. -0.570). However, the decrease in the size of the treatment group results in larger standard errors, making the regression coefficients of interest significant only at 10 percent level.

A caveat of our identification strategy, emphasized by this data exercise, concerns the endogeneity of the intra-firm share of exports. It is possible for unobservable country characteristics, which are correlated with corporate tax rates, to determine the relative volumes of intra-firm and arm's length exports, thus inducing a systematic variation in MNCs' export unit values to that market. However, the channels through which this may occur are quite restrictive given the reduced

variation in the regression residual – a consequence of the model specification and set of control variables.[37] Nevertheless, to the extent that our control variables and fixed effects leave for the possibility for a systematic correlation between the omitted intra-firm export share and corporate tax rates, then our results could suffer from omitted variable bias.

6 Policy Implications

This section provides a back-of-the-envelope calculation that quantifies the tax revenue lost by the Danish government due to the profit shifting activities of multinational firms, focusing on transfer price manipulations.

Based on the estimation results from our new affiliate sample that are reported in column 3 of Table 4, a typical Danish multinational firm exporting to a host country with a tax rate that is 6.1 percentage points lower than Denmark's (i.e., our sample average tax wedge for low tax countries) will sell a given product at a price that is 5.6 percent lower than a pure exporter, on average. This drop in export prices reduces the revenue earned from international transactions by the Danish parent firms, diminishing the income tax base in the home country. To determine the total export revenue underreported to the Danish tax authorities in a given year, we use country specific information on the statutory corporate tax rate difference and calculate the following value:[38]

$$LostExpRev = \sum_{j \in \text{LowTax}} \left(\hat{\beta}_1 (tax_{Dk} - tax_j) \cdot X_{MNC,j} \right) \tag{24}$$

where j indexes a destination country with a tax rate lower than Denmark's, β_1 is the coefficient on the interaction term $DAff_{ijt} \times |\Delta\tau_{jt}| \times I^{\text{LowTax}}$ from equation (23), and $X_{MNC,j}$ denotes the total volume of exports by Danish multinationals owning at least one affiliate in country j.

The above calculation is based on the assumption that the quantities and patterns of trade do not respond to the change in trade prices caused by tax rate differences across countries. While the set of countries that an MNC trades with, and the volume of shipments that it chooses to send there are determined by first order factors that are outside of our model – for example, the economic size

[37] For example, if the correlation between export unit values and corporate tax rates triggered by the omitted intra-firm quantity share is largely cross-country, then our fixed effects should mitigate this problem. On the other hand, if the correlation is within country over time, then the variation in the country specific determinants of intra-firm trade share must coincide with the timing of tax rate changes for endogeneity to be a problem.

[38] A similar calculation is done by Bernard, Jensen, and Schott (2006) using estimates based on U.S. data.

of the foreign market and demand conditions there, firm characteristics including technology and costs of production, geography and the international organization of multinational production – it is nevertheless important to acknowledge the limitations behind our back-of-the-envelope calculation.

Using the export data for 2006, the last year of our sample, and the coefficient estimate from our regression specification reported in column 3 of Table 4, we estimate that the Danish multinationals in our sample underreported 141 million USD in export revenues through lower-than-arm's-length transfer prices to affiliates in low tax countries. At a Danish tax rate of 28 percent in 2006, this corresponds to 39.5 million USD in forgone corporate tax revenues, the equivalent of 3.24 percent of the 1.2 billion USD in corporate income taxes collected by the Danish treasury from the multinational corporations in the sample. For comparison, a 3.24 percent decrease in corporate taxes collected by the IRS in 2006 would result in a loss of over 10 billion USD in tax receipts by the US government.

7 Conclusions

Multinational corporations are beholden to their shareholders to maximize global profits. In pursuit of this goal, firms exploit differences in policies and tax rates across countries to minimize their effective global tax burden. A consequence of reallocating profits across jurisdictions within multinational firms is the erosion of countries' reported income tax bases, despite the actual value of production activities that occur in those countries. Concerns over the extent of tax avoidance by multinational firms have risen so much in recent years that international taxation has now become a top priority for OECD and G8 member states.

In drafting action plans to fight the tax avoidance practices of multinational firms, tax authorities need to establish the main mechanisms through which profit shifting occurs. This paper contributes towards that goal by providing evidence for profit shifting via manipulations of both transfer prices and arm's length prices of exported goods. Danish firms that own affiliates in low tax countries are found to underprice their exports to that country.

A contribution of this paper is to highlight a bias in measuring income shifting. We show theoretically that multinationals who trade with both controlled and uncontrolled parties have an incentive to deviate the arm's length price from profit maximizing levels in order to reduce the gap from transfer prices and thus conceal profit shifting. To correct for this attenuation bias, we

propose a triple difference estimation strategy that exploits a novel source of variation coming from the establishment of new plants in foreign markets characterized by various levels of statutory corporate tax rates.

A back-of-the-envelope calculation estimates that the manipulative transfer pricing of physical exports reduces the corporate tax revenues received by the Danish government by approximately 3.24 percent. This calculation relies on the simplifying assumption that the intra-firm share of exports does not change with affiliate acquisition, even though our theory suggests otherwise. Since our estimation is not structural, this disconnect should not affect the reliability of the empirical results. In the end, since we can only observe the change in export quantities for emerging MNCs (i.e., new foreign affiliates), an advantage of the proposed approach is that the increased share of intra-firm trade is likely driven by firm level responses to the change in foreign ownership, rather than by pre-existing country-specific demand characteristics.

As customs data quality improves, we may, in the future, be able to discern between arm's length and intra-firm trade flows. Then, an improved test of our theory would separately identify arm's length and transfer prices.

Future research should also examine transfer pricing strategies for a multinational firm shipping to multiple destinations. In this study, we concentrate only on bilateral trade between firms and countries in which they have an affiliate. However, we can further correct for international tax planning by studying how multinationals might hide profit shifting in one destination country by manipulating prices in another destination.

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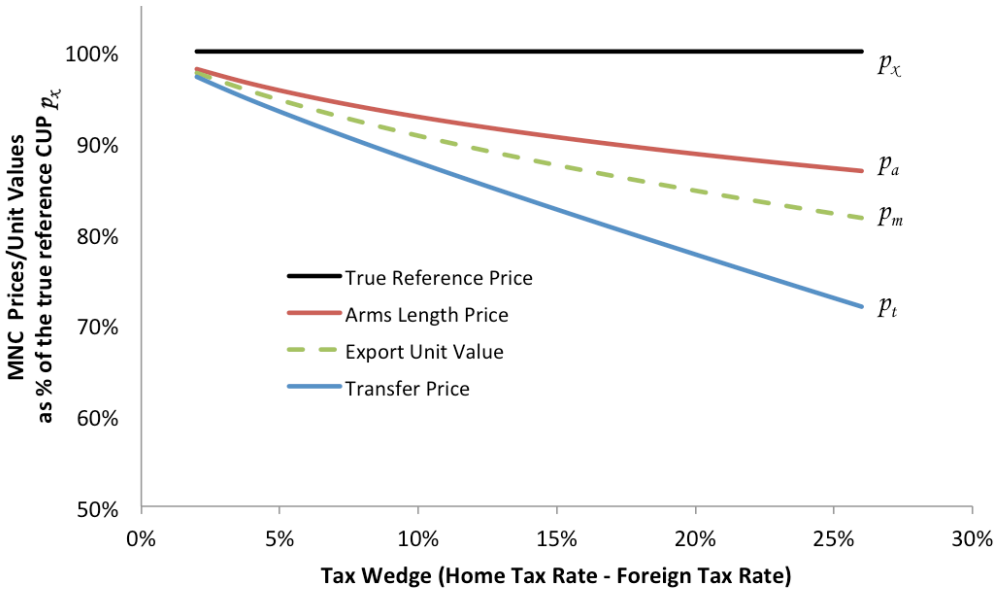

Figure 1: Numerical Solution to the MNC Pricing Decision

Note: The functional forms and parameters used in generating this graph are described in the Appendix.

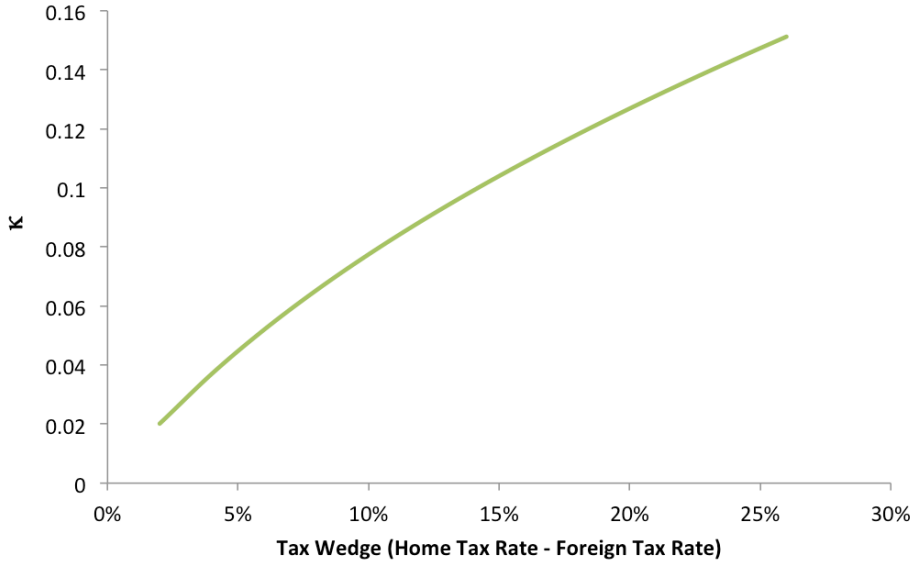

Figure 2: Numerical Solution to the Kappa Function

Note: The functional forms and parameters used in generating this graph are described in the Appendix.

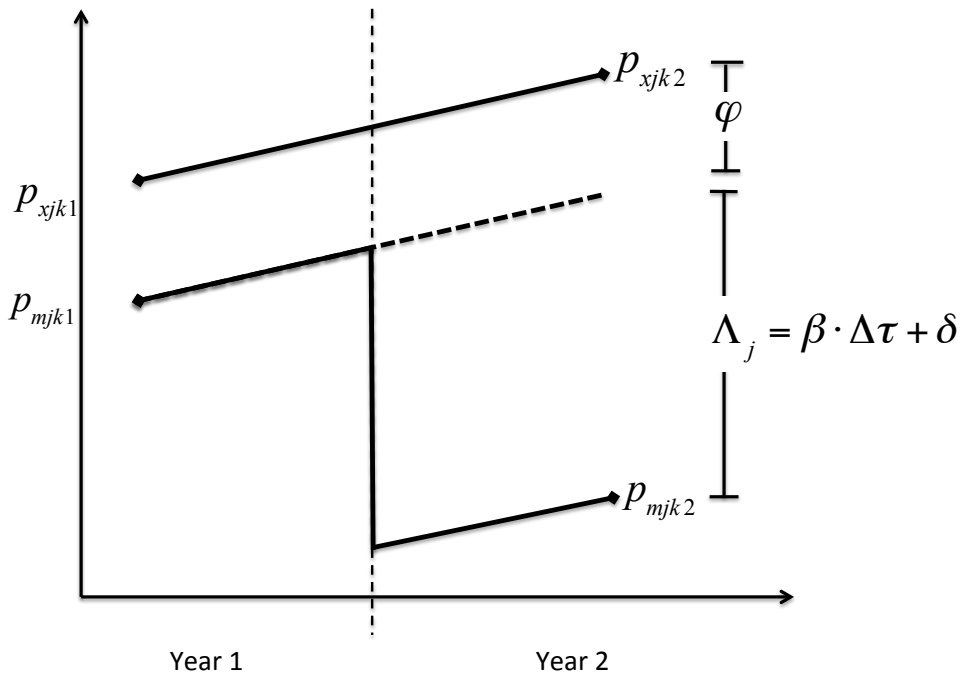

Figure 3: Difference-in-Difference-in-Differences Identification Strategy

Note: The figure above illustrates the movement in export prices for two firms, indexed by x and m, that export product k to country j at time t, with $t \in \{1, 2\}$. The econometrician observes the two export prices p_{xjkt} and p_{mjkt}. Firm m acquires an affiliate between the two periods. φ represents the time-invariant difference in product prices across firms (which may or may not be country-specific), as captured by $\alpha_{mjk} - \alpha_{xjk}$ from equations (13) and (14). Λ_j represents the change in the export price due to firm m's acquisition of an affiliate in country j, as defined by equation (17). Λ_j includes both the MNC's price response to tax saving incentives, as well as any other price responses triggered by the firm m's cross-border expansion of activity.

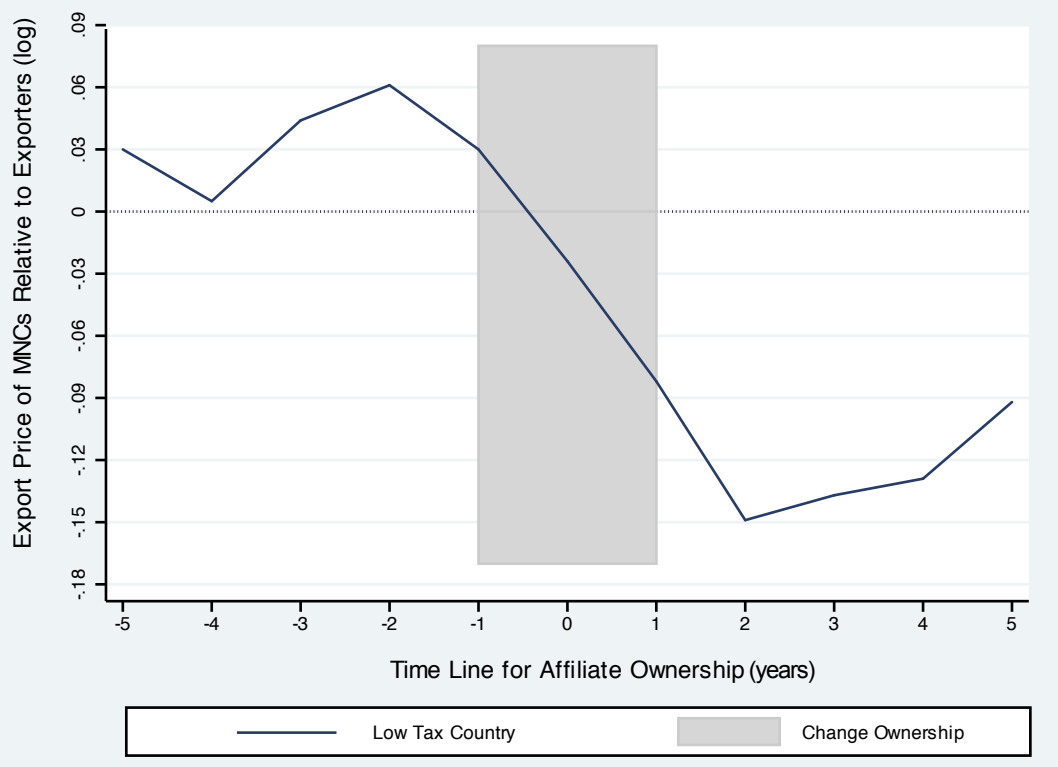

Figure 4: Intra-firm Export Prices relative to Arm's Length by Country Tax Status

Note: The trend lines depicts the average export price charged by a multinational firm relative to an exporting firm for the same product shipped to the same destination market (conditional on time-invariant firm characteristics). The average relative export price is observed for 5 years before and after the multinational establishes its first foreign affiliate in a country, focusing on countries with corporate tax rates below the rate in Denmark.

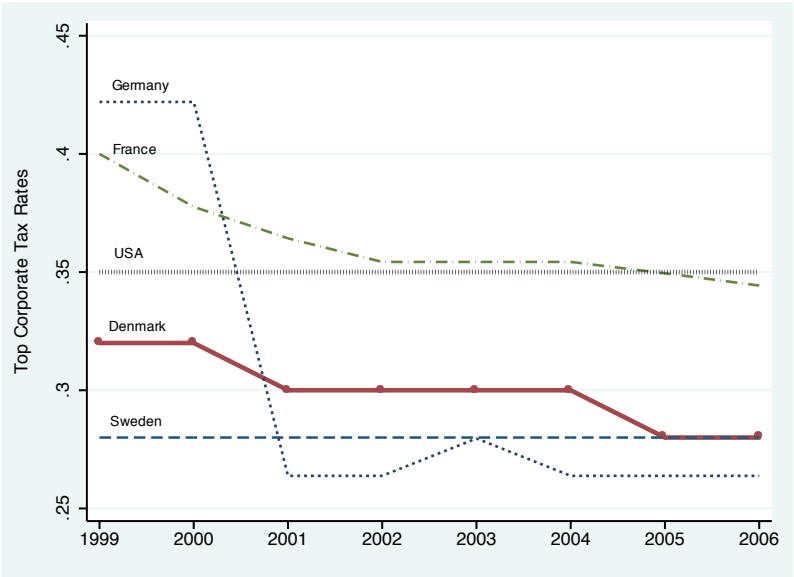

Figure 5: Top Corporate Tax Rates for Denmark and Its Main Trade Partners

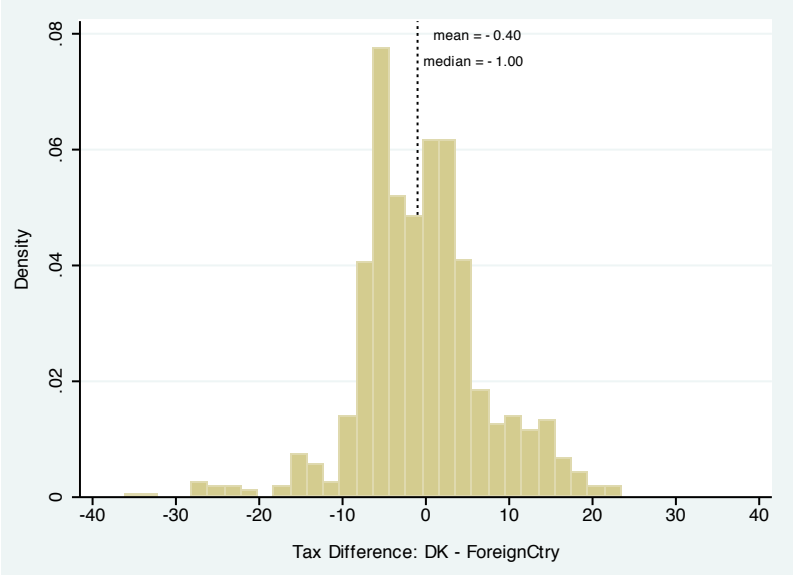

Figure 6: Distribution of Tax Rate Differences among Danish Export Markets

Table 1: Summary Statistics

	Mean	St. Dev.	Min	Max	Obs.
	(1)	(2)	(3)	(4)	(5)
Firm Characteristics					
Log Price (1,000 DKK)	4.982	1.783	0.397	9.552	1203111
Log Quantity (kg)	4.500	2.918	0.000	18.572	1203111
Log Employment	4.556	1.654	-4.605	9.440	1203111
Log Sales (1,000 DKK)	11.886	1.715	0.693	17.045	1203111
Firm Level Indicator Variables					
Non-MNC Exporters	0.483	0.500	0.000	1.000	1203111
Majority-owned Affiliate (DAff)	0.114	0.317	0.000	1.000	1203111
Acquired Affiliates (during sample)	0.027	0.163	0.000	1.000	1203111
Sold Affiliates (during sample)	0.011	0.106	0.000	1.000	1203111
Foreign owned	0.178	0.382	0.000	1.000	1203111
Country Characteristics					
Log real pcGDP (constant 2005 DKK)	11.985	0.598	9.026	13.189	1203111
Log Population (1,000)	9.776	1.577	5.625	14.089	1203111
Log Exchange Rate (2005 DKK per LCU)	0.786	1.765	-7.897	7.882	1203111
Statutory Corporate Tax Rate (%)	0.283	0.069	0.085	0.450	1203111
Low Corporate Tax Rate Dummy	0.544	0.498	0.000	1.000	1203111
High Corporate Tax Rate Dummy	0.349	0.477	0.000	1.000	1203111
Low Tax Wedge: I^{LowTax} x $\lvert\Delta\tau_{jt}\rvert$ (%)	0.061	0.056	0.008	0.235	653951
High Tax Wedge: I^{HighTax} x $\lvert\Delta\tau_{jt}\rvert$ (%)	0.049	0.024	0.010	0.150	420397

Table 2: Representation of Danish Multinational Corporations (MNC) in the Trade Data

	Number Firm-Country Pairs			Export Values (billion DKK)		
Year	Exporters	MNC	% MNC	All firms	Related Party*	% Related Party*
1999	45650	1206	2.64	203.3	40.5	19.92
2000	46725	1309	2.80	224.3	46.4	20.69
2001	47346	1477	3.12	237.7	57.6	24.23
2002	47976	1487	3.10	233.1	66.9	28.70
2003	46230	1586	3.43	230.3	66.0	28.66
2004	44890	1799	4.01	223.6	78.9	35.29
2005	42497	1755	4.13	229.6	77.7	33.84
2006	43030	1907	4.43	241.1	80.2	33.26

* Related-party exports are defined as the value of exports by MNCs to those countrieswhere they own an affiliate.

Note: The unit of observation in the above tabulation is a firm-country pair by year. This means that every time a firm exports to a new market, or every time an MNC opens an affiliate in a new country, these are counted as distinct firm-country observations. The values reported in column (1) and (2) represent simple counts. The export values reported in column (4) and (5) are measured in billion Danish Krone (DKK). Finally, the proportional values reported in columns (3) and (6) are measured in percentages.

Table 3: Export Price Regression, Full Sample

	Dependent Variable: Log $UnitVal_{ijkt}$		
	Basic	Foreign Owned	Pre-MNC Control
	(1)	(2)	(3)
Affiliate	0.019	0.019	0.024
	(0.021)	(0.021)	(0.022)
Affiliate x $\|\Delta\tau_{jt}\|$ x I^{LowTax}	-0.570	-0.571	-0.533
	(0.272)**	(0.272)**	(0.271)**
Affiliate x $\|\Delta\tau_{jt}\|$ x I^{HighTax}	0.275	0.274	0.238
	(0.274)	(0.274)	(0.266)
Log Employment	-0.017	-0.017	-0.017
	(0.005)***	(0.005)***	(0.005)***
Log Sales	0.017	0.017	0.017
	(0.005)***	(0.005)***	(0.005)***
Corporate Tax Rate	-0.275	-0.275	-0.270
	(0.150)*	(0.150)*	(0.150)*
Log Population	-1.034	-1.034	-1.031
	(0.217)***	(0.217)***	(0.217)***
Log real pcGDP	-0.181	-0.181	-0.181
	(0.064)***	(0.064)***	(0.064)***
Log Exchange Rate	-0.003	-0.003	-0.003
	(0.010)	(0.010)	(0.010)
Foreign owned		0.002	0.002
		(0.008)	(0.008)
Pre-MNC Indicator x I^{LowTax}			0.031
			(0.023)
Pre-MNC Indicator x I^{HighTax}			-0.011
			(0.029)
Firm x Country x Product FE	yes	yes	yes
Tax Regime x Year FE	yes	yes	yes
Obs.	1,203,111	1,203,111	1,203,111
R^2	0.898	0.898	0.898

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country-year level in parentheses.

Note: The table examines the effect of statutory corporate tax rates on the export price of Danish MNCs relative to exporter-only firms. The reported estimates correspond to the regression equation (23) in the text. A unit of observation is a firm-destination-product-time quadruple. *Affiliate* is an indicator variable equal to 1 if the Danish exporter has majority ownership in the destination market. The tax wedge $|\Delta\tau_{jt}|$ denotes the absolute difference in corporate taxes rates between Denmark and the foreign country, distinguishing between countries with lower (I^{LowTax}) or higher tax rates (I^{HighTax}). All specifications include a constant, firm-country-product and tax regime specific time effects.

Table 4: Export Price Regression, Continuous versus New Establishments

	Dependent Variable: Log $UnitVal_{ijkt}$			
	All Sample	Continuous	Non-Continuous	New Affiliates
	(1)	(2)	(3)	(4)
Affiliate	0.019		0.022	-0.033
	(0.021)		(0.022)	(0.026)
Affiliate x $\lvert\Delta\tau_{jt}\rvert$ x I^{LowTax}	-0.570	-0.636	-0.824	-0.913
	(0.272)**	(0.318)**	(0.328)**	(0.300)***
Affiliate x $\lvert\Delta\tau_{jt}\rvert$ x I^{HighTax}	0.275	0.027	0.466	1.261
	(0.274)	(0.279)	(0.598)	(0.643)*
Log Employment	-0.017	-0.008	-0.018	-0.021
	(0.005)***	(0.006)	(0.005)***	(0.005)***
Log Sales	0.017	0.010	0.016	0.020
	(0.005)***	(0.006)	(0.006)***	(0.006)***
Corporate Tax Rate	-0.275	-0.326	-0.249	-0.193
	(0.150)*	(0.192)*	(0.146)*	(0.138)
Log Population	-1.034	-1.049	-1.024	-0.889
	(0.217)***	(0.294)***	(0.216)***	(0.205)***
Log real pcGDP	-0.181	-0.156	-0.167	-0.167
	(0.064)***	(0.088)*	(0.062)***	(0.060)***
Log Exchange Rate	-0.003	0.007	-0.003	-0.005
	(0.010)	(0.008)	(0.009)	(0.009)
Firm x Country x Product FE	yes	yes	yes	yes
Tax Regime x Year FE	yes	yes	yes	yes
Obs.	1,203,111	736,228	1111520	1,083,235
R^2	0.898	0.901	0.900	0.901

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country-year level in parentheses.

Note: The table examines the effect of statutory corporate tax rates on the export price of Danish MNCs relative to exporter-only firms. The reported coefficients correspond to the regression equation (23) in the text, estimated across three different subsamples. All subsamples include the (common) reference group of exporter-only firms. In addition, the *Continuous* subsample includes only MNCs that own affiliates in a country throughout the sample period. The *Non-Continuous* subsample includes all MNCs that change their foreign firm ownership in a market. The *New Affiliates* subsample includes only non-continuous MNCs that acquire affiliates in a country during the sample period (rather than sell). The *all Sample* estimates replicate the results reported in column 1 of Table 3. All other explanations from the footnote in Table 3 apply.

Table 5: Export Price Regression, Differentiated Goods Only

	Dependent Variable: Log $UnitVal_{ijkt}$			
	All Sample	Continuous	Non-Continuous	New Affiliates
	(1)	(2)	(3)	(4)
Affiliate	0.018		0.014	-0.040
	(0.027)		(0.030)	(0.036)
Affiliate x $\lvert\Delta\tau_{jt}\rvert$ x I^{LowTax}	-0.648	-0.736	-0.832	-0.967
	(0.323)**	(0.361)**	(0.398)**	(0.353)***
Affiliate x $\lvert\Delta\tau_{jt}\rvert$ x I^{HighTax}	0.409	-0.008	0.875	1.668
	(0.321)	(0.321)	(0.824)	(0.886)*
Log Employment	-0.021	-0.005	-0.020	-0.024
	(0.007)***	(0.008)	(0.007)***	(0.007)***
Log Sales	0.015	0.014	0.012	0.017
	(0.007)**	(0.008)*	(0.008)	(0.008)**
Corporate Tax Rate	-0.368	-0.417	-0.332	-0.266
	(0.166)**	(0.215)*	(0.161)**	(0.155)*
Log Population	-0.949	-0.940	-0.903	-0.724
	(0.246)***	(0.336)***	(0.243)***	(0.236)***
Log real pcGDP	-0.179	-0.131	-0.158	-0.144
	(0.074)**	(0.104)	(0.071)**	(0.070)**
Log Exchange Rate	-0.006	0.006	-0.005	-0.006
	(0.012)	(0.009)	(0.011)	(0.011)
Firm x Country x Product FE	yes	yes	yes	yes
Tax Regime x Year FE	yes	yes	yes	yes
Obs.	790,561	476,194	731,329	712,168
R^2	0.885	0.889	0.888	0.889

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country-year level in parentheses.

Note: The table examines the effect of statutory corporate tax rates on the export price of Danish MNCs relative to exporter-only firms. The reported coefficients correspond to the regression equation (23) in the text, estimated using exports of differentiated goods only (Rauch (1999) classification) and different data samples. Column 1 includes the trade transactions of differentiated goods carried by all firms, while columns 2, 3 and 4 restrict the set of MNCs included in the estimation in the same way as in columns 1 to 3 of Table 4. All other explanations from the footnote in Table 3 apply.

Table 6: Robustness Checks

	Dependent Variable: Log $UnitVal_{ijkt}$							
	Baseline		**Double Tax Treaty**		**Poor Judicial Qual.**		**Intra-firm Q Increase**	
	All Goods	*Diff.*	*All Goods*	*Diff.*	*All Goods*	*Diff.*	*All Goods*	*Diff.*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Affiliate	0.019	0.018	0.024	0.031	0.017	0.025	-0.182	-0.186
	(0.021)	(0.027)	(0.027)	(0.035)	(0.047)	(0.058)	(0.032)***	(0.041)***
Affiliate x $\|\Delta\tau_{jt}\|$ x I^{LowTax}	-0.570	-0.648	-0.634	-0.717	-0.816	-0.828	-1.072	-1.285
	(0.272)**	(0.323)**	(0.291)**	(0.358)**	(0.356)**	(0.462)*	(0.622)*	(0.706)*
Affiliate x $\|\Delta\tau_{jt}\|$ x I^{HighTax}	0.275	0.409	0.304	0.395	1.251	1.450	0.589	0.988
	(0.274)	(0.321)	(0.867)	(0.308)	(0.698)*	(0.941)	(0.867)	(1.037)
Log Employment	-0.017	-0.021	-0.020	-0.029	-0.020	-0.031	-0.017	-0.020
	(0.005)***	(0.007)***	(0.006)***	(0.007)***	(0.009)**	(0.011)***	(0.005)***	(0.007)***
Log Sales	0.017	0.015	0.015	0.018	0.022	0.026	0.017	0.016
	(0.005)***	(0.007)***	(0.007)**	(0.008)**	(0.010)**	(0.010)**	(0.005)***	(0.007)**
Corporate Tax Rate	-0.275	-0.368	-0.376	-0.513	-0.621	-0.779	-0.227	-0.316
	(0.150)*	(0.166)**	(0.149)**	(.169)***	(.170)***	(.181)***	(0.153)	(0.167)*
Log Population	-1.034	-0.949	-1.012	-0.971	-0.820	-0.641	-1.041	-0.952
	(0.217)***	(0.246)***	(0.241)***	(0.278)***	(0.276)***	(0.314)**	(0.216)***	(0.245)***
Log real pcGDP	-0.181	-0.179	-0.169	-0.176	-0.091	-0.087	-0.172	-0.170
	(0.064)***	(0.074)**	(0.068)**	(0.080)**	(0.088)	(0.102)	(0.065)***	(0.074)**
Log Exchange Rate	-0.003	-0.006	-0.004	-0.006	-0.005	-0.008	-0.004	-0.006
	(0.010)	(0.012)	(0.009)	(0.011)	(0.009)	(0.011)	(0.010)	(0.012)
Firm x Country x Product FE	yes	yes	yes	yes	yes	yes	yes	yes
Tax Regime x Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Obs.	1,203,111	790,561	871,457	571,381	550,773	364,352	1,203,111	790,563
R^2	0.898	0.885	0.896	0.883	0.900	0.888	0.898	0.885

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered by country-year in parentheses.

Note: The table examines how robust is the effect of statutory corporate tax rates on the export price of Danish MNCs relative to exporter-only firms. The reported coefficients correspond to the regression equation (23) in the text, estimated across various subsamples. All variable descriptions from the footnote in Table 3 apply. For comparison purposes, columns 1 and 2 reproduce prior estimates from Table 3 column 1 and Table 5 column 1. Columns 3 and 4 are estimated based on a subsample of countries that have a Double Taxation Treaty with Denmark in force. Columns 5 and 6 are obtained based on the bottom half countries ranked in terms of judicial quality (based on Kaufmann, Kraay, and Mastruzzi (2004) measure of 'rule of law'). Finally, columns 7 and 8 are estimated based only on MNCs that establish new affiliates during the sample period and are observed increasing exports to that market post-acquisition.

Appendix

Figures 1 and 2 are generated by solving the model using the local foreign price equation derived from the affiliate's profit maximization problem, the three first order conditions from maximizing global corporate profits in equation (4), and the two demand equations:

$$q_f = p_f^{-\sigma} A_f$$
$$q_a = p_a^{-\sigma} A_a$$

using the following parametrization:

$$\sigma = 2.3$$
$$\tau_h = 0.30$$
$$c = 1$$
$$\lambda = 0.005$$
$$A_f = 1000$$
$$A_a = 1000.$$