Knocking on Tax Haven's Door: Multinational Firms and Transfer Pricing *

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Abstract

This paper analyzes the transfer pricing of multinational firms. Intra-firm prices may systematically deviate from arm's length prices for two motives: pricing to market and tax avoidance. Using French firm-level data on arm's length and intra-firm export prices, we find that the sensitivity of intra-firm prices to foreign taxes is reinforced once we control for pricing-to-market determinants. Most importantly, we find no evidence of tax avoidance if we disregard tax haven destinations. Tax avoidance through transfer pricing is economically sizable. The bulk of this loss is driven by the exports of 450 firms to ten tax havens.

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1 Introduction

A wealth of empirical evidence finds that, within a multinational enterprise (MNE), reported profits vary systematically with local corporate tax rates.[1] This may be due to several types of efforts within the firm, including transfer pricing. From the perspective of the tax authorities, internal transactions between related parties should be valued at their market price: this is the arm's length principle (see OECD 2012, for details). That being said, as described in OECD (2010), there are numerous ways to determine the arm's length price, including the use of comparable prices and cost-plus methods, among others. Thus, the flexibility in these rules allows firms to choose transfer pricing methodologies which support the use of internal prices, shifting profits from high- to low-tax countries.[2] This is in addition to the potential for outright tax evasion via transfer pricing.

Direct empirical evidence of tax-induced transfer pricing however is scarce. Identifying such a strategy faces two major difficulties. While multinationals' exports are directly observable, detailed information on the prices of products and their modes of transaction – whether it is arm's length or intra-firm – is generally not available. Moreover, it is impossible to observe the counterfactual arm's length prices of an intra-firm transaction (see Diewert et al. 2006, for details). Since the arm's length price is not observed, tax authorities have to determine the market price, which raises obvious definitional and methodological issues.

In this paper, we overcome both difficulties. We observe the export prices under each mode (arm's length or intra-firm) at the level of firms, countries, and products. Moreover, our econometric methodology allows us to compare the intra-firm price used between a

[1] See Fuest et al. (2003) for a survey on the impact of taxation on real MNE activity.

[2] An OECD survey of tax authorities reaches the conclusion that "tax administrations see transfer pricing as one of the most significant tax risks they have to manage" (OECD 2012, p.15). Gresik (2001) provides a survey with an emphasis on the transfer pricing literature. A recent meta-analysis by Heckemeyer & Overesch (2013) shows that transfer pricing and licensing are two important means of shifting profits abroad. Recent theoretical contributions on tax-induced transfer pricing include Behrens et al. (2009), Bernard et al. (2006), and Keuschnigg & Devereux (2013) who provide a recent model of non-tax-induced transfer pricing, one motivated instead by manipulating managerial incentives. Diewert et al. (2006) give an overview of the different rationales for manipulating internal prices.

multinational and its affiliate with the corresponding arm's length price charged by a firm shipping to an unrelated party. We show that the bulk of tax avoidance comes from a few large firms through exports to a relatively limited number of "tax havens", where the baseline estimates find that intra-firm prices are on average 11% lower than arm's length prices. This suggests that, by targeting enforcement efforts, tax authorities may be able to mitigate transfer pricing and raise tax revenues, while keeping enforcement costs low. The granular dimension of tax avoidance should facilitate the implementation of global enforcement such as the one proposed by Zucman (2014).

In order to frame our empirical analysis, we discuss the theoretical determinants of arm's length and intra-firm prices using a highly stylized model. This simple model captures both tax-induced transfer pricing and pricing-to-market strategies. The latter has been receiving increasing attention in the field of international trade.[3] The model shows that, were transfer pricing costless, an MNE would systematically find it optimal to deviate from the armŠs length price when exporting to a country with a different corporate tax. However, the presence of a fixed component in the concealment cost generates a band of inaction. The deviation is profitable when the tax differential between the home and the host countries is sufficiently important and when the firm exports sufficiently large volumes. The wedge between the intra-firm price and the arm's length price is a decreasing function of the host tax. We also show that arm's length and intra-firm prices are likely to have a different sensitivity to transport costs, tariffs, and GDP per capita, i.e. variables governing pricing to market. These results suggest that one should be mindful of this difference in sensitivity in the empirical analysis. If one of these variables is significantly correlated with the level of corporate tax rates (something which is true in our data), not allowing coefficients to differ across pricing modes would bias the estimated coefficients.

On the empirical side, we rely on a unique dataset that has fine-grained information on

[3]Examples include Bastos & Silva (2010), Manova & Zhang (2012), and Martin (2012).

the intra-firm and arm's length quantities and prices of exported products at the firm-level for almost all exporting firms in France in 1999. The richness of this dataset allows us to provide a clear-cut identification of transfer pricing in the cross-section.

The case of France is particularly well suited to analyzing the transfer pricing strategies of MNEs as it exempts foreign income from taxation. Compared with the U.S. and other countries where foreign tax credits, income baskets, and deferral complicate a firm's tax planning problem, the relatively streamlined French system provides a cleaner mapping between tax differences and firm incentives.[4] Roughly speaking, when a U.S. firm earns profits overseas, it adds up its worldwide income into a single income basket and calculates the U.S. tax owed on this amount when it repatriates these foreign earnings. The U.S. tax authorities then grant a credit against this liability which is equal to the taxes already paid to foreign governments on the firm's overseas income. If the firm has paid more taxes overseas than what is owed to the U.S., it is in an excess credit position and owes no taxes to the U.S. If not, it is in an excess limit case and it must pay the remainder to the U.S. tax authorities. Thus, even when there are two U.S. firms with an affiliate in a tax haven, the incentive to shift profits to the tax haven depends on where else the firm pays taxes. Complicating the issue further, the U.S. tax liability is not triggered until profits are repatriated or used inactively (i.e. it is no longer Subpart F income) and excess credits in a year can be carried into the future or applied retroactively, introducing a dynamic aspect to the firm's profit shifting problem. In an exemption system such as France's, none of these considerations arise, meaning that a much simpler comparison of the French and destination tax rates describes the profit shifting motives.

We exploit the rich structure of the dataset to identify the impact of foreign taxes on the transfer pricing behavior of multinational firms. We propose a difference-in-difference-like strategy which allows us to compare the *intra-firm* prices charged by a particular firm for

[4] Bernard et al. (2006) provide a detailed discussion of the complexity of the U.S. tax system.

a particular product across markets with the *arm's length prices* of exports for the same product exported in the same markets. Indeed in our analysis, the arm's length price of a product is firm-market-specific. In addition, we include several pricing-to-market variables which the trade literature identifies as important (income, distance, and tariffs) and allow the sensitivity of f.o.b. prices to these variables to differ across modes. Controlling for a set of triadic fixed effects at the firm, product, and export mode levels, our strategy captures any difference between intra-firm prices and their arm's length counterparts which is systematically related to the corporate tax in the destination country.

In line with the main theoretical prediction, our estimates suggest that export prices drop with the destination corporate tax rate only for intra-firm transactions. This result is robust once we control for pricing to market. We then show that above a certain threshold, differences in the corporate tax rates have no effect. Transfer pricing is essentially directed to countries with very low tax rates. Interestingly, low taxes are not the entire story. The bulk of tax avoidance is attributable to the transfer pricing of exports to tax havens. Tax havens not only have low corporate tax rates, but they also provide an overall tax environment that facilitates profit shifting. According to the classification of Hines & Rice (1994), in addition to a low tax rate, a tax haven must have a legal system allowing banking secrecy, a good communication infrastructure, and must seek to promote itself as a center for financial offshoring. Thus, as the OECD (2013)'s *Action Plan on Base Erosion and Profit Shifting* strives to clarify, a tax haven is not simply a low-tax country but one that facilitates tax avoidance for firms by "artificially segregating taxable income from the activities that generate it" (p. 13). Extending our investigation finds that profit shifting through transfer pricing is primarily done by large multinational firms.[5]

A simple exercise suggests that the tax losses driven by the profit shifting of multinational firms to the ten tax havens in our sample amount to about 1% of total corporate tax revenues

[5]Consistent with these findings, Gumpert et al. (2011) show that the largest German multinationals are the most likely to use tax havens.

in France. We further show that 450 MNEs account for over 90% of intra-firm exports to these ten tax havens, implying that a large share of transfer pricing may be curbed by focusing enforcement on a small number of firms.

Although there is an extensive literature on the impact of international tax differences on the location of profits and firms, the results of which are suggestive of transfer pricing, there is little evidence of the impact of taxes on transfer prices themselves.[6] Bartelsman & Beetsma (2003) use aggregated data on value added across manufacturing sectors in the OECD. They estimate a value added function depending on corporate tax rates and other factors, finding results suggestive of profit shifting via transfer pricing. Clausing (2003) uses price indices for U.S. exports and imports which include separate indices for intra- and extra-firm prices, finding a strong and significant impact of taxes consistent with transfer pricing. Using an approximation of intra-firm trade from firm-level balance sheet data, Overesch (2006) finds that the value of German MNEs' intra-firm trade varies with the difference between the German tax rate and that of the foreign parent/affiliate's location. Using firm-product level data, Swenson (2001) finds that prices react to taxes and tariffs. Using U.S. transaction data, Neiman (2010) shows that intra-firm prices are less sticky and exhibit more pass-through than arm's length prices. He also documents that the specific pass-through of exchange rates into intra-firm prices is not affected by the tax level in the origin country. This suggests that the dynamic of intra-firm prices is not primarily driven by the desire to shift taxable income to low-tax countries. It is worth noting that the analysis treats tax havens and other countries with a lower corporate tax rate than the U.S. symmetrically.[7]

Two recent papers, Vicard (2014) and Cristea & Nguyen (2014), exploit the panel dimension of firm-level data on French and Danish firms respectively. Both papers tend to provide evidence of transfer pricing. However, they do not observe intra-firm and arm's length prices,

[6] For a recent discussion of the former, see Huizinga & Laeven (2008). Dharmapala & Riedel (2013) discuss the impact of taxes on firm financing.

[7] Our results are robust to controlling for the growth or the volatility of bilateral exchange rates. Results are available upon request.

but assume intra-firm prices for transactions with countries where a related party is located. As mentioned by Ramondo et al. (2011) and Atalay et al. (2014), most firms with an affiliate in a country do not trade with this affiliate. Furthermore, a firm that exports a product to its affiliates might also well export another product to a third firm in the same country. In our sample of firm-country pairs where we observe positive intra-firm trade, the share of intra-firm trade in a firm's total trade is below 40% for one-fourth of the observations. Our empirical tests rely on precise firm-level data on intra-firm and arm's length prices.

Finally, our paper is related to the work of Bernard et al. (2006) who examine how internal prices depend on taxes and tariffs using U.S. firm-level data. Similarly to the papers mentioned above and to our own results, their estimates are consistent with transfer pricing. We depart from this paper along several dimensions. First, and most importantly, we consider the tax haven status as well as tax rates. In addition to providing low-tax rates, tax havens further offer multinationals with a tax-friendly environment. Since our estimates indicate that internal and arm's length prices deviate most when the destination is a tax haven, this is critical. Second, we examine whether all multinational firms are likely to use transfer pricing to shift profits abroad.[8] Our findings indicate that the intensity of profit shifting is systematically greater for larger firms. Lastly, our methodology is different: we use French rather than U.S. data, we run price regressions including firm-product-mode fixed effects rather than working with price gaps, and we allow intra-firm and arm's length prices to differ for other reasons than fiscal motives. By using French rather than U.S. data, we avoid the complications in taxation introduced by the U.S. foreign tax credit system. The price regression with individual fixed effects offers a flexible framework to measure whether intra-firm and arm's length prices differ. Finally, accounting for differences in pricing to market between pure exporters and intra-firm exporters is consistent with the theory, and

[8] Bernard et al. (2006) show that the price wedge between intra-firm and arm's length transactions depends on the size of exporters and the differentiation of products. However, they do not study whether the sensitivity of the price wedge to corporate taxes depends on these characteristics.

not doing so may bias the results.[9]

The rest of the paper is organized as follows. In Section 2, we discuss the theoretical determinants of transfer pricing in order to guide the the empirical analysis. In Section 3, we carefully present the data and the estimation sample construction. In Section 4, we present the baseline estimation, extend the results, and provide a quantification exercise estimating the revenue loss for France due to transfer pricing. We conclude in Section 5.

2 Model

We present a simple model that illustrates how taxes and other factors, such as trade costs or GDP per capita, influence the pricing strategy of a multinational firm (MNE) and compare it to the pricing strategy of an exporter. Throughout this section, we denote with a "*" the variables which are the outcome of firms' profit maximization.

The MNE produces a good in country H (Home) at zero cost and ships it to its affiliate located in F (Foreign) at a free-on-board price p^H_{MNE}. Both countries levy taxes on a territorial basis, where the home tax is T^H and the foreign tax is T^F, which is consistent with the tax-exemption rule for the income earned abroad by French MNEs.

For the sake of simplicity, we assume the domestic and foreign sales are separable. Exports incur trade costs that are specific to the destination market F. Specifically there is an ad-valorem cost $\tau^F_v p^H_{MNE}$, such as a tariff or insurance. Last, we assume the production of the final good is costless. The foreign consumer price is denoted by p^F_{MNE} and the individual demand for that good is

$$d\left[p^F_{MNE}\right] := \alpha\left(1 - \beta^F p^F_{MNE}\right)$$

[9]Our results are not directly comparable with Bernard et al. (2006). They regress the price gap on the logarithm of the tax rate. We regress the logarithm of prices on an intra-firm dummy, the logarithm of one minus the tax rate, and their interaction. The impact of a one percentage point decrease in tax rate in the median country leads to an increase in the price wedge by 0.6 percent in our sample. This effect varies with the initial tax rates. By contrast, Bernard et al. (2006) estimate that a one percentage point decrease in the tax rate is associated with an increase in the price wedge ranging from 1.6 to 4.2 percent.

There is a unit mass of consumers in F.[10] Each of them has a willingness to pay for the first unit of the good equal to $1/\alpha\beta^F$. The parameter α is a demand-shifter which is firm-specific, e.g. the appeal for that firm's product. It is described by a distribution with support $[0,\bar{\alpha}]$. On the contrary, β^F is common to all firms in destination F. For instance, β^F is lower in countries with a higher GDP per capita.

To determine the transfer price set by a multinational, we use the popular "concealment cost" approach to modeling transfer pricing.[11] In this, the transfer price p^H_{MNE} can differ from the price p^{H*} that would be set by an exporter with the same marginal cost (equal to zero) selling to an unaffiliated party (i.e. at arm's length).[12]
This incurs a cost

$$\Phi\left[\left|p^H_{MNE}-p^{H*}\right|\right] := \begin{cases} \frac{\gamma^F}{2}\left(p^H_{MNE}-p^{H*}\right)^2+f & \text{if} \quad p^H_{MNE}\neq p^{H*} \\ 0 & \text{if} \quad p^H_{MNE}=p^{H*} \end{cases}$$

where γ^F is a parameter which reflects the specificity of the fiscal regime in Foreign. This function is a tax-deductible cost that occurs in the home country.[13] This concealment cost is generally interpreted in transfer pricing models as the cost of hiring accountants to "cook the books" and/or the fines that the firm would pay if it were caught. We allow these costs to entail both a fixed component denoted by f and a quadratic variable cost that is a function of the price gap.[14]. Note that this might vary across countries; for example, if a

[10] This rules out differences in market size across countries. Since these differences could matter for pricing-to-market strategies, they are controlled for in the empirical section.

[11] This approach was initiated by Kant (1988) and is the predominant method to model transfer pricing, see (Haufler & Schjelderup 2000, eg.) and (Huizinga & Laeven 2008, eg.).

[12] It is worth stressing that p^H is our definition of the arm's length price which is taken as given by the firm. Importantly, this price need not be equal to the arm's length price set by a multinational firm which would sell both intra-firm and arm's length in a given destination. As pointed out by Cristea & Nguyen (2014), MNEs tend to manipulate their arm's length prices, as well as internal prices. This is particularly true if doing so affects the cost of transfer pricing. From the perspective of a fiscal authority, the MNE's arm's length price should therefore not be considered as a relevant benchmark.

[13] This assumption is made for the sake of simplicity and does not change any of the insights from the model.

[14] Ernst & Young (2012) suggest that prices are one of the issues which receives "the greatest scrutiny"

tax haven makes this concealment relatively easy (low γ^F), then this could reduce the total and marginal cost of concealment for a given price wedge. By simplicity and without loss of generality, we assume that the fixed component does not depend on the characteristics of F.

Below, we use this stylized model to study the variations of the price wedge $\frac{p^{H*}}{p^{H*}_{MNE}}$ within a market across firms and within a firm across markets with a different corporate tax T^F and concealment cost parameter γ^F. In order to guarantee that firms never find it optimal to set a negative intra-firm price, we assume throughout that γ^F is large enough.[15]

Pricing-to-market

We start out by solving the optimal price p^{H*} set by an arm's length exporter. The profits in Foreign are given by:

$$\pi^F_{AL} := \; p^H \cdot d\left[(1+\tau^F_v)p^H\right]$$

It is readily verified that the optimal price is

$$p^{H*} = \frac{1}{2\beta^F\left(1+\tau^F_v\right)}$$

As expected, the free-on-board price set by the firm depends on the characteristics of the foreign market, such as GDP per capita, tariffs, and more generally trade costs. The arm's length price of a given product is therefore country specific.

Transfer pricing

Under a territorial tax system, the after-tax profits of a multinational are given by

while volumes are not mentioned (p. 63). Of course, if a firm ever pays a penalty and adjusts its price, it will have to pay taxes accordingly, which are a function of the quantities sold. Nevertheless, our result only requires that a large price gap with small quantities be more likely to catch attention than a small price gap with large quantities. Formally, if $\Phi(.)$ is a function of $\left[\left(p^H_{MNE}-p^{H*}\right)d\left[p^F_{MNE}\right]^\delta\right]$, our result holds for $\delta < 1/2$.

[15] Specifically, this condition reads as $\gamma^F > \bar{\alpha}\cdot\beta^F(1+\tau^F_v)\left(\frac{1-T^F}{1-T^H}\left(1+\tau^F_v\right)-1\right)$

$$\begin{aligned}\pi^F_{MNE} &:= \left(1-T^H\right)\left(p^H_{MNE}d\left[p^F_{MNE}\right]-\Phi\left[\left|p^H_{MNE}-p^{H*}\right|\right]\right) \\ &+ \left(1-T^F\right)\left(p^F_{MNE}-\left(1+\tau^F_v\right)p^H_{MNE}\right)d\left[p^F_{MNE}\right]\end{aligned} \tag{1}$$

Profits are maximized by choosing the transfer price p^H_{MNE} and the price of the final good p^F_{MNE}. The maximization of (2) w.r.t. to the transfer price leads to the first-order condition:

$$d\left[p^F_{MNE}\right]=\frac{\gamma^F}{\theta^F[T^F]}\left(p^{H*}-p^H_{MNE}\right) \tag{2}$$

where

$$\theta^F[T^F]:=\theta\left[T^F;\left\{T^H,\tau^F_v\right\}\right]:=\frac{1-T^F}{1-T^H}\left(1+\tau^F_v\right)-1$$

A firm finds it optimal to shift a share of its domestic profits to Foreign only if $\theta^F[T^F]>0$. When it does, it sets its price $p^{H*}_{MNE}<p^{H*}$. Note that $\theta^F[T^F]>0$ whenever the corporate tax abroad is lower than at home ($T^F<T^H$). This is a standard result in the transfer pricing literature. We want to stress that multiplicative trade costs τ^F_v (e.g. tariffs) are also a motive for transfer pricing and that the two effects interact with each other.
Importantly however, $\theta^F[T^F]>0$ is a necessary but not a sufficient condition. Engaging in profit shifting is costly: depending on the magnitude of the corporate tax gap between its home and destination countries, a firm may not find it profitable to do so. Furthermore, even when the conditions are favorable (low T^F, low γ^F), all firms need not engage in profit shifting as we shall see below.

Considering the second first-order condition of an MNE with respect to p^F_{MNE} yields the following equation:

$$d\left[p^{F*}_{MNE}\right]=\alpha\left(\frac{1}{2}+\frac{\beta^{F*}}{2}\left(\frac{1-T^H}{1-T^F}-\left(1+\tau^F_v\right)\right)p^{H*}_{MNE}\right)$$

Plugging (2) into the above equation and rearranging the expression leads to the optimal price wedge:

$$\frac{p^{H*}}{p^{H}_{MNE}} = 1 + \frac{\beta^F}{2} \cdot \frac{\theta + 2}{\theta + 1} \cdot \frac{(1 + \tau^F_v) \cdot \frac{\alpha \cdot \theta^F(T^F)}{\gamma^F}}{1 - \beta^F(1 + \tau^F_v) \cdot \frac{\alpha \cdot \theta^F(T^F)}{\gamma^F}} \tag{3}$$

Since $\theta^F[T^F]$ is decreasing in T^F, taking the first partial derivative of (3) w.r.t. T^F shows that the price wedge is larger when T^F is lower. Similarly, holding T^F constant, a lower γ^F is associated with lower intra-firm prices. Tax havens provide firms with an additional motive for profit shifting via transfer pricing. In the absence of a motive for transfer pricing, i.e. when $\theta^F[T^F] = 0$ or when the concealment cost γ^F is infinitely large, intra-firm prices are equal to arm's length prices $p^{H*}_{MNE} = p^{H*}$.

Firm heterogeneity and the inaction band

For equation (2) to hold however, it must be the case that firms actually choose to engage in profit-shifting activities. Now, since shifting profits through transfer pricing involves a fixed cost, only a subset of firms find it profitable to do so. Formally we have $\frac{\partial \pi^{F*}_{MNE}[\alpha]}{\partial \alpha} > \frac{\partial \pi^{F*}_{AL}[\alpha]}{\partial \alpha}$ as soon as $\alpha > 0$ so there is a unique cutoff such that $\pi^{F*}_{MNE}[\hat{\alpha}^F] = \pi^{F*}_{AL}[\hat{\alpha}^F]$. This cutoff is destination specific and higher when the foreign corporate tax rate is higher (see the Online Appendix for details). It delimits an *inaction band:* there is no profit shifting towards destinations with a high cutoff (formally $\hat{\alpha}^F > \bar{\alpha}$) e.g. destinations with a small corporate tax differential. To sum up:

Proposition 2.1. *The deviation of intra-firm prices from arm's length prices is larger in destinations with a lower corporate tax rate. When a fixed cost must be incurred to engage in profit shifting, there is an inaction band: multinational firms choose arm's length pricing when the corporate tax differential (or tariff) with the destination country is small.*

Importantly enough, even in this simple model, *the marginal impact of* T^F *and* γ^F *on*

the price wedge varies across destinations. Expression (3) implies also that a higher GDP per capita (i.e. a lower β^F) impacts the price wedge positively.

In other words, the sensitivity of arm's length and intra-firm prices with respect to trade costs and GDP per capita generally differs. Failure to account for this can potentially result in misleading estimates of the impact of taxes on the difference between intra- and extra-firm prices.

Now, considering a destination such that $\bar{\alpha} > \hat{\alpha}^F$, all firms with a type above the threshold set their price below the arm's length price according to (3). Thus, conditional upon profit shifting, firms facing a higher demand curve abroad (high α) exhibit larger deviations from the arm's length price. Since equation (2) implies a positive correlation relation between the volume exported to a destination by a multinational and the price wedge, we can conclude that firms with a higher α also export higher volumes.

Proposition 2.2. *In a given destination, larger intra-firm trade flows come with larger deviations of intra-firm prices with respect to arm's length prices.*

Thus, the deviation from the arm's length price is increasing in firm size, presuming that, consistent with the data, larger firms export more.

This exercise yields a set of predictions for us to take to the data. First, a lower destination tax rate should lower the intra-firm price, but should not have any effect on arm's length prices. Second, for a given corporate tax rate in the destination country, a lower concealment cost should be associated with lower intra-firm prices. In other words, we expect profit shifting via transfer pricing towards tax havens. Third, the price wedge is a function of destination-specific income and trade costs, so there should be differences in the impact of these market-specific characteristics (transport costs, tariffs, and GDP per capita) on arm's length prices and transfer prices. Fourth, the price wedge should be larger for larger firms.

In the next section, we describe the data and methodology used to test these predictions.

3 Data and Identification Strategy

3.1 Data Description

To investigate the factors driving transfer pricing, we use detailed cross-sectional information on intra-firm and arm's length export prices for a set of French firms in 1999. France issued its first tax rule with respect to transfer pricing documentation requirements in 1996.[16] What is more, 1999 is the last year before which Advanced Pricing Agreements (APAs) started to be granted by French Tax authorities. Such an agreement allow a multinational firm to negotiate an understanding with one or more tax authorities that approves a transfer pricing methodology for a given period, resolving the uncertainty about its acceptability and reducing audit risk.[17] These agreements do not however concern the firms in our sample as the French tax authorities did not grant any APAs in 1999. In other words, the year 1999 is ideal to identify transfer prices practices.[18]

In order to construct our estimation sample, using a unique firm identifier, we combined three datasets which have detailed information on the firm-level export values and quantities of 8-digit product categories by destination, data on MNE status. These datasets also provide information on whether a transaction is intra-firm or arm's length. We merge these datasets with information on country-level characteristics such as the level of the corporate tax rate, distance, tariffs, and per-capita income.

[16] Article 57 of the French tax code contains the main French legal provisions on transfer pricing. It states that in assessing the income tax owed by French taxable entities which are controlled by or which control entities outside France, any profits indirectly transferred to the latter, whether by an increase or decrease in purchase or sales prices or by any other means, shall be added back to the taxable income.

[17] See Borkowski (2000) for a description of the APAs' program in France in 1999.

[18] One might however be concerned by the prices adjustments made by firms prior to the agreement in September 1999. A firm that shifted profit via transfer prices prior to 1999, may have reduced the difference between the transfer and the arm's length prices in order to credibly negotiate the APA for subsequent years. In the case of profit shifting firms, an adjustment in prices prior to the APA, would reduce the likelihood to observe tax based transfer pricing strategies in our data. In the case of a firm that is not shifting profit but apply to an APA because it is uncertain about the relevant arm's length price, her observed 1999 price gap should be noisier than in subsequent years– the firm was indeed setting a price equal to the arm's length price with some error. This case should limit the possibility to find significant estimated coefficients.

Firm-Level Data. Our first dataset comes from the French Customs which report the yearly free-on-board values and quantities of exports by firm, 8-digit CN product category, and destination. The dataset is quasi exhaustive as a declaration threshold of 1,000 euros for annual exports applies to any given destination. Extra-European shipments under 1,000 euros are subject to a simplified declaration procedure and do not appear in our data. Within the Single European Market, firms are not required to submit the regular customs form. The reporting threshold is based on each firm's cumulated yearly export value (all destinations within the E.U.). The declaration threshold for European countries' export flows is higher, at around 150,000 euros in 1999. We use the value and the quantity of firms' exports of a given product (CN8) to a given destination in order to construct the destination- and firm-specific free-on-board unit values which are our proxy for the price which a firm charges for that product in a given market.

This dataset, however, does not provide information on the export mode, that is whether a transaction is intra-firm or arm's length. We obtain this information from a confidential INSEE firm-level survey on the foreign activities of French multinational firms. For budget reasons, the survey was taken only in 1999 for all French firms with trade worth more than 1 million euros.[19] In the survey, a firm is part of or is itself a group which controls at least 50% of the voting rights of a firm outside of France. Hence, all the firms have at least one related party abroad and can be considered as MNEs. A French intra-group transaction is thus defined as trade with a – directly or indirectly affiliated – related party controlled by the group. Intra-firm trade does not include trade with firms which share a licensing agreement or other non-ownership arm's length arrangement. The INSEE survey provides a detailed geographical breakdown of French MNEs' export values and quantities at the product level (HS4) and of their exporting modes – through outside suppliers and/or related parties. The

[19]The one million threshold reduces the number of respondents, but the survey still covers 96% of French international trade (imports and exports). While 8,239 firms were surveyed, only 53% of them responded. However, they cover 84% of French total exports (Bovar et al. (2003), Table 1).

database does not have information on the foreign affiliates. We then merge the Customs data with the INSEE survey. This is a straightforward process because firms are identified by the same ID number (siren) in the two datasets and there is a direct mapping between French CN8 product categories and HS4 product categories.[20]

Finally, we use information from *LIFI*, a French firm-level dataset on financial linkages between firms. This is used to determine whether a firm in the French Customs data is an MNE and, if so, its nationality and the country locations of its related parties. LIFI is also interesting because it provides the countries where the affiliates of firms located in France are located themselves. As this identifies some firms in the French Customs data as MNEs for which we do not have the INSEE data, we drop the corresponding observations as we cannot know whether the transaction is intra-firm or arm's length.[21] We also eliminate the observations of state-owned firms as these firms might have a different price setting mechanism.[22]

Eventually, the data allow us to tag trade flows as intra-firm or arm's lenght. When the INSEE survey indicates that an HS4 category has a share of intra-firm exports exceeding 99%, we classify all corresponding CN8 exports by MNEs as intra-firm transactions. If the share is less than 1%, we classify the CN8 codes as arm's length. When the share is positive but below 99% and above 1%, we drop the observations for this firm for this destination-HS4 dyad. We drop 3% of observations accounting for roughly 11.5% of the total value of French exports.[23] Therefore, with our data we do not observe intra-firm *and* arm's length prices

[20] We drop 6,417 observations (2% of exports) for which the value of exports reported in the Customs data is 1% higher or 1% lower than the the value of exports reported in the survey.

[21] We lose 606 firms which amount to dropping 2.8% of the value of French exports. We also drop observations that *LIFI* reports as being independent while reporting positive intrafirm flows in the INSEE data (1.6% of exports).

[22] They account for about 1.6% of French exports.

[23] In a previous version we had similar results while using 0%-98% thresholds (which allowed us to keep 98% of exports in value). Considering 0%-100% thresholds or 2%-98% thresholds does not affect the results as shown in the Online Appendix. The number of observations in the regressions based on the 0%-100% thresholds is divided by 5 because a substantial number of transactions have a share of intra-firm trade between 99% and 100%.

charged by a firm in a single destination.

Furthermore, in some destinations, we only observe the intra-firm prices of a product. Our strategy relies on the comparison of arm's length and intra-firm prices, we thus have to exclude these product-destination pairs. Out of 208,904 product-destination pairs, we drop 6,302 pairs for which we observe only intra-firm trade prices. They account for 1.2% of French exports and 4.8% of intra-firm exports.[24]

This then leaves us with information at the firm, NC8 product, country, and exporting mode level. Once merged with country characteristics, there are 729,737 observations in our unbalanced baseline sample.[25] Our cross section is composed of 64,633 firms, 5,457 products, and 45 countries. About 9.2% of the total number of observations are intra-firm prices.

It is worth emphasizing that most of the prices set by MNEs are not intra-firm prices. In this sample, only 15.7% of the prices set by MNEs are intra-firm prices. Another interesting fact is that, in our data, one third of multinational firms do not report intra-firm trade in countries where they have affiliates (or headquarters) according to *LIFI*. A last fact pertains to the likelihood that we observe both arm's length and intra-firm trade for a multinational firm exporting to a given country. To study this point, we restrict the sample of firm-destination pairs to those which feature intra-firm exports. Since firms make part of their exports to these countries intra-firm, we can be certain that the firm has a related party in the destination country. Among these pairs, there are firms selling all their exports intra-firm, while other firms may export to the country through both modes. In the data, the median share of intra-firm trade is 98%. This means that conditional on exporting intra-firm to a country, the median firms export almost entirely intra-firm. This figure, however, hides

[24]The probability that we only observe intra-firm transactions is negatively associated with the tax rate of the destination country. The selection effect tends to underestimate the effect of taxes on intra-firm prices. Of course, we also drop all the product-destination pairs where there is no intra-firm transaction (these pairs account for about half of French exports).

[25]We lose information on about 10% of the French export value when merging the dataset with the tax rate data. We also lose an additional 2.3% of the export value when merging the data with information on tariffs. The tariff data are not available for 20 countries in the original sample of 65 countries. Reproducing the estimations without the tariff variable leads to qualitatively similar results.

large variations. In particular, we find that for one fourth of product-country pairs, the share of intra-firm trade is at most 40%. To put it differently, even if a firm exports intra-firm to a country, in 25% of cases, the share of intra-firm exports to the country is below 40%. These facts confirm the usefulness of having information on intra-firm and arm's length transactions. They also show the caveats of databases which only report information on the presence of related parties in the destination country.

Tax and Tax Haven Data. In our model, equilibrium is where the marginal savings from reducing tariff and tax payments equal the marginal cost of transfer pricing. Thus, the most appropriate tax measure is the effective marginal tax rate (EMTR) on income as this represents the tax savings from shifting one euro of income. If taxes are flat, then the EMTR equals the effective average tax rate (EATR). However, if taxes are progressive (as is typically the case), then the EATR will understate the tax savings from transfer pricing. In our baseline results, we use the EMTR from Loretz (2008). In robustness checks, we use the EATR and the top statutory corporate tax rate instead (both from Loretz (2008)) and find qualitatively identical results. In the baseline estimation, we used the EMTR reported in 1998 or 1997 (whichever was closer) when the data for 1999 were missing.[26] An important aspect of these tax rate measures is that they are constructed from statutory tax policies, but unlike the headline tax rate, account for factors such as the tax offsets from capital expenditures for a hypothetical firm (see Loretz (2008) for details). As such, EMRT and EATR are exogenous to firm decisions, something which would not be the case if we used firm accounting data to construct firm-specific taxes.

As seen in Table 5 in the Appendix, the effective average and marginal tax rates vary considerably across countries. In our estimation sample, the EMTR ranges from 0% in the

[26]Notice that the 38 out of 49 countries in our sample share a Bilateral Tax Treaty with France. Controlling for the existence of treaties (and interacting with the intra-firm dummy) does not change the results and indeed, we find little impact of tax treaties on transfer pricing.

Bahamas to about 46% in the Russian Federation. Of great concern in policy circles is the use of investment in tax havens for aggressive tax planning. This is particularly true for countries such as France and Germany which exempt foreign income from taxation.[27] We therefore use additional information on tax havens. Our definition follows the one in Hines & Rice (1994) which has been used recently by Dharmapala & Hines (2009). This gives us ten tax havens in our estimation sample: the Bahamas, Bermuda, the Cayman Islands, Cyprus, Hong Kong, Ireland, Luxembourg, Malta, Singapore, and Switzerland. Approximately 41% of firms export to these countries and these exports account for roughly 11% of the total number of observations.[28] As discussed in Hines & Rice (1994), this classification begins with a list provided by the U.S. Internal Revenue Service (see Glautier & Bassinger (1987)), which they modify by requiring four attributes of a tax haven: a low tax rate, legislation enabling business and banking secrecy, a good communication infrastructure, and self-promotion as an offshore financial center. It is important to recognize that their definition requires all of these and relies both on a low tax rate and on features that would aid a firm in undertaking transfer pricing (which can be interpreted as reflecting a lower cost of transfer pricing in our model). As such, some countries appearing in the IRS list (and in our data) are excluded from tax haven status. Specifically, Austria (which, although it satisfies the latter three has a relatively high tax rate), Korea, Argentina, and Ecuador (three low-tax countries which do not claim to be offshore financial centers are not generally regarded as tax havens) are not classified as such.[29] By contrast, Malta is added since, although Loretz (2008) lists it as having a fairly high tax rate, given the low taxes paid by U.S. firms, Hines & Rice (1994) include it. Other lists use similar notions to identify tax havens, although the specifics differ. For example, the

[27] See the recent paper by Gumpert et al. (2011) who consider this issue for a large sample of German MNEs.

[28] The correlation between tax haven status and EMTR is -0.54 and is significantly different from zero at the 1% level of significance. The correlation between the tax haven dummy variable and the explanatory variable $log(1 - EMTR)$ is 0.51.

[29] Indeed, as can be seen in Table 5, our sample includes several low-tax countries which do not qualify as tax havens.

OECD (2000)'s list requires a comparable lack of transparency and practices which promote secrecy, but tightens the tax rate criterion to "no or only nominal taxes". Thus, whereas the approach of Hines & Rice (1994) identifies Ireland, Luxembourg, and Switzerland as tax havens, the OECD's does not.[30] Other lists, such as those compiled by Financial Stability Board (2000) or Tax Justice Network (2007) do include these three countries. Nevertheless, given the disagreement in the literature, we will explore the sensitivity of our results to this set of tax haven countries.

Pricing to Market Data. As discussed above, firms adjust their prices to the characteristics of the destination market. The empirical literature has identified two main regularities in firms' pricing to market behavior, namely, firms charge higher prices when the destination is further away and when the destination is wealthier (eg. Bastos & Silva 2010, Manova & Zhang 2012, Martin 2012). Berman et al. (2012) have shown that small and large firms may react differently to trade costs depending on their size and productivity. In our model, we show that these factors may impact intra-firm prices differently from arm's length prices. Furthermore, as these market characteristics are correlated to the level of the corporate tax rate, it is crucial to control for them. We therefore use data on per capita GDP (in logarithms) from the Internal Financial Statistics of the IMF to control for the level of country-specific income. As measures of trade costs, we use the logarithm of the bilateral distance variable (which is the population-weighted average distance between countries' main cities in kilometers) which is taken from the CEPII database (Mayer & Zignago 2006) and also use information from TRAINS on tariffs faced by French exporters developed by the WITS (UNCTAD).[31] In our data, distance and per capita GDP are both significantly and negatively correlated with both the effective tax rates and tax haven status, suggesting that

[30] In addition, neither Hong Kong nor Singapore are considered at all by the OECD (2000).

[31] We use the logarithm of one plus the tariff rate in our specifications as in Hummels & Skiba (2004). The estimates on the tariff coefficient are sensitive to the log transformation of the variable. We show in the Online Appendix that the transformation does not affect the point estimates of other variables.

their omission could bias our results. Per capita GDP, distance or tariff are consistent with our theoretical framework. In the Online Appendix, we extend the baseline results to other factors that might also be relevant. For example, luxury-good exporters are likely to take into consideration the amount of inequality in a country in setting prices. Manova & Zhang (2012) find moreover that country size matters as does remoteness. Controlling for these additional factors does not alter our main results.

3.2 Identification Strategy

Our identification strategy is based on the comparison of intra-firm prices charged by MNEs and with arm's length prices for a given product across countries. It is important to note that this arm's length comparison includes pure exporters, MNEs without affiliates in a given destination, and those with affiliates in this destination which nevertheless sell the product *only* to non-affiliates.

Before detailing our strategy, we would like to clarify the following points. First, we do not identify transfer pricing by comparing intra-firm *and* arm's length prices charged by a given firm in a single destination for a particular product. As explained in the description of the data, we are not able to track both the arm's length price and the intra-firm price charged by a single firm in a market for a particular product. Furthermore, as pointed out by Cristea & Nguyen (2014), MNEs tend to manipulate their arm's length prices as well as their internal prices. Thus, comparing the arm's length and intra-firm prices charged by the same MNE would not allow us to cleanly identify the extent of transfer pricing. Second, as detailed below, our strategy requires information of firms that are trading. While we can identify exporters located in France, we cannot identify the firms exporting their product to France. Any comparisons between intra-firm and arm-length import prices might therefore be driven by foreign exporters' attributes such as their productivity that are not related to transfer pricing strategies. For that reason, our analysis focuses on export prices.

In our empirical estimation, we make use of an interaction term between the tax variables and an indicator of the exporting mode that is equal to 1 if the transaction is intra-firm and 0 if it is arm's length. This interaction term allows us to compare the arm's length and intra-firm prices of MNEs and exporters for a given product. Moreover, our empirical model includes a set of triadic fixed effects at the firm, product, and export mode levels. The use of triadic fixed effects accounts for a broad set of attributes of the transactions at the firm, product, and exporting mode levels which might also account for the levels of the price differential (Bernard et al. 2006). More importantly, the use of triadic fixed effects along with the interaction term allows us to compare the export prices for different modes (arm's length and intra-firm) for a given product across countries. Given the set of controls which we discuss below, the estimated interaction coefficients give an indication of the price differential due to transfer pricing.

Our identification strategy implies that the deviation from the arm's length price in itself is not evidence of transfer pricing, rather it is the systematic and significant relationship between this deviation and the tax differential across countries that is indicative of transfer pricing. As we will show later on, we use destination fixed effects in some specifications to control for destination-specific heterogeneity. The empirical strategy involves estimating the following model:

$$\begin{aligned} p_{fpmc} &= \alpha_1 Intra_{fpmc} + \alpha_2 Tax_c + \alpha_3 Tax_c \times Intra_{fpmc} \\ &+ \alpha_4 TaxHaven_c + \alpha_5 TaxHaven_c \times Intra_{fpmc} \\ &+ \gamma_1 X_c + \gamma_2 X_c \times Intra_{fpmc} + \mu_{fpm} + \epsilon_{fpmc} \end{aligned} \tag{4}$$

where p_{fpmc} is the export price charged by firm f for product p in country c under the export mode m. Tax is a variable that captures the tax level in the destination country. Our primary measure is based on the EMTR, defined as $Tax_c = log(1 - \tau_c)$, with τ_c being

the EMTR in country c.[32] Our second measure, $TaxHaven_c$, is a dummy variable that takes the value one if the country is on the tax haven list of Hines & Rice (1994). These are both also interacted with $Intra_{fpmc}$, a dummy variable that takes the value of one if the export mode is intra-firm and zero otherwise. Since we expect the price wedge to be increasing in the amount of profits retained by the firm (i.e. $Tax_c = log(1 - \tau_c)$ is larger or the country is a tax haven), we anticipate both of these interactions to be negative (i.e. a larger absolute value difference between the intra-firm and arm's length prices).

The term μ_{fpm} is a comprehensive set of firm-product-mode fixed effects. Notice that it is no longer possible to estimate the direct effect of the export mode because of the triadic fixed effects. X_c is a vector of country-specific variables which includes the logarithm of distance, tariffs, and the logarithm of GDP per capita. We interact these variables with the intra-firm transaction dummy, as the pricing behavior of firms is also affected by bilateral trade costs and income in the destination market, and might also vary across export modes. Since prices might also be influenced by the market structure and the intensity of competition in the foreign market, and since these characteristics are unobservable, we introduce a set of country fixed effects in some specifications. Finally, ϵ_{fpmc} is the disturbance term. The standard errors are allowed to be adjusted for clustering at the country level to account for heteroskedasticity and non-independence across repeated observations within countries.[33]

Table 1 gives the summary statistics of the main explanatory variables. The distribution of intra and arm's length prices is reported in Figure 2 of the Appendix.

[32] We also use the EATR variable as an alternative definition of the tax rate. The results are comparable and are presented in the Online Appendix.

[33] Clustering at the product or product-mode level leads to smaller standard errors than when we cluster at the country level. The results are shown in the Online Appendix. As shown by Cameron & Miller (2015), the use of bigger and more aggregate cluster as the country-level in our case is the most conservative cluster dimension and should avoid bias.

Table 1 – Summary statistics

Variable	Nature	Mean	Std. Dev.
$Intra_{fpmc}$	0/1	0.090	0.286
$(1-\tau_c)$ (EMTR)	(log)	-0.353	0.095
$(1-\tau_c)$ (EATR)	(log)	-0.383	0.091
$Tax\ Haven_c$	0/1	0.106	0.308
$1+Tariff_c$	(log)	0.011	0.041
$Distance_c$	(log)	6.986	0.864
$Per\ Capita\ GDP_c$	(log)	9.978	0.567
$Intra_{fpmc}\times$:			
$(1-\tau_c)$ (EMTR)		-0.031	0.104
$(1-\tau_c)$ (EATR)		-0.034	0.112
$TaxHaven_c$		0.007	0.082
$Tariff_c$		0.001	0.015
$Distance_c$		0.641	2.065
$Per\ Capita\ GDP_c$		0.889	2.833
Observations		729,737	

4 Results

Baseline Results. According to the theoretical predictions, the average internal price should be lower than the arm's length price in a country with a lower marginal effective tax rate. The estimates are reported in Table 2. Overall, the specifications explain about 87% of the variation of the log level of export prices as suggested by the adjusted R^2. The estimates using the EATR variable are reported in the Online Appendix. In all specifications, standard errors are clustered in the country dimension.

In column (1), we do not find a statistically significant effect of the effective marginal tax rate on the level of arm's length prices. We do, however, find a negative and significant interaction coefficient between the corporate tax and the intra-firm dummy, i.e. internal export prices are relatively lower than arm's length prices in destinations with a lower corporate tax rate. A ten percent decrease in the effective marginal tax rate leads to a reduction of intra-firm prices by 1.18% (2.1% using the EATR variable).

Table 2 – Baseline regression Effective Marginal Tax Rate, all firms

	Dependent variables: export price					
	(1)	(2)	(3)	(4)	(5)	(6)
$(1-\tau_c)$	0.09	0.13		-0.00	-0.03	
	(0.146)	(0.144)		(0.100)	(0.098)	
$-\times Intra_{fpmc}$	-0.18*	-0.22**		-0.12*	-0.08	-0.10*
	(0.091)	(0.106)		(0.067)	(0.053)	(0.054)
$TaxHaven_c$			0.11	0.11		
			(0.073)	(0.074)		
$-\times Intra_{fpmc}$			-0.11**	-0.09**		-0.08***
			(0.040)	(0.036)		(0.025)
$Per\ Capita\ GDP_c$		0.06**	0.04*	0.04	0.04*	
		(0.025)	(0.022)	(0.022)	(0.023)	
$-\times Intra_{fpmc}$		-0.03***	-0.01	-0.01	-0.02*	-0.00
		(0.011)	(0.010)	(0.010)	(0.010)	(0.008)
$Distance_c$		0.08***	0.09***	0.09***	0.11***	
		(0.025)	(0.022)	(0.022)	(0.022)	
$-\times Intra_{fpmc}$		-0.05***	-0.05***	-0.05***	-0.07***	-0.06***
		(0.013)	(0.010)	(0.010)	(0.011)	(0.009)
$Tariff_c$		0.40	0.32	0.32	0.14	
		(0.324)	(0.268)	(0.268)	(0.274)	
$-\times Intra_{fpmc}$		-0.40*	-0.33*	-0.34*	-0.21	-0.36***
		(0.213)	(0.170)	(0.174)	(0.160)	(0.123)
Sample	Full	Full	Full	Full	w.o Tax H.	Full
Country FE	No	No	No	No	No	Yes
Firm-Prod.-Mode FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	729,737	729,737	729,737	729,737	652,548	729,737
Adj. R^2	0.863	0.864	0.865	0.865	0.869	0.853

Note: This table investigates the impact of the effective tax rate, GDP per capita, distance, tariffs, and of the tax haven dummy on intra-firm and arm's length export prices. The effective tax rate is transformed as follows: $(log(1-\tau))$. We use the effective marginal tax rate here. All regressions include firm-product-exporting mode fixed effects. The last column further includes country fixed effects and adjust the number of observations for singletons. In column (5), we restrict the sample to countries which are not classified as tax havens. Robust standard errors clustered by destination are reported in parentheses. Significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

In column (2), we control for other country characteristics that might influence a firm's pricing behavior. Nevertheless, we continue to find comparable results, namely that taxes influence internal prices but not those between unrelated parties. If anything, the estimated

impact is slightly larger, suggesting a slight bias when they are excluded. In line with the prediction of our model, we find a positive impact of per capita GDP on the level of prices. A ten percent increase in per capita GDP raises the export prices by 0.6%. However, we find a negative and statistically significant interaction coefficient between the per capita GDP and the intra-firm mode variables. This suggests a slightly lower impact of per capita GDP on internal prices. Although a firm has an incentive to mark up prices over costs when selling to unrelated parties in order to extract rents, this incentive is not present when selling to itself. As such, if internal trade includes a larger share of intermediate goods which are not directly sold to overseas customers, this result makes sense. Turning to the trade cost variables, we find a positive effect of distance on export prices in line with the literature. A ten percent increase in distance raises export prices by 0.8%. As an example, given the distances between France and the countries in our sample, the export prices are on average 0.8% higher in the Netherlands as compared to Belgium. The effect of distance on internal export prices is lower, which is also consistent with smaller markups for internal trade. Concerning the tariff variable, the effect on arm's length prices is not significant. In other words, there is no evidence of dumping by French arm's length exporters. This might be due to the low cross-country variation in the tariff variable, as 90% of observations concern a transaction toward countries that are members of the European Union. However, intra-firm prices are significantly lower than arm's length prices in high-tariff countries, suggesting that firms choose to undervalue their exports to pay lower tariffs.

In column (3), we replace our EMTR variable with a dummy variable equal to one if the destination is a tax haven. As tax havens not only have low taxes but often provide other mechanisms that facilitate profit shifting (such as the limited exchange of information between tax authorities), one might expect that internal prices differ markedly in these nations. The results are striking. The coefficient of the interaction between the tax haven dummy variable and the intra-firm export mode is highly significant. We do not find a

significant effect of the tax haven dummy variable on the arm's length price. This result suggests that arm's length export prices are the same regardless of whether or not the destination is a tax haven. The interaction between the tax haven and the export mode dummy variables is significantly negative, indicating that the average internal export price for a tax haven is about 11% lower than the comparable arm's length price. This suggests that tax havens are playing a major role in the transfer pricing strategies of firms.[34]

This finding remains robust in column (4) when we reintroduce the effective marginal tax rate and its interaction term with the export mode, where we find the intra-firm export prices to be about 9% lower than arm's length prices in tax haven destinations even when tax rates do not differ. Notice that the coefficient of the interaction term that involves the EMTR is smaller and loses statistical significance once we control for tax havens. As tax havens tend to have low taxes, this suggests that the results in column (2) were biased due to a failure to control for the tax haven status. Further, it highlights the important difference between having low taxes and having low taxes together with other policies that make tax planning easier. Indeed, the OECD (2013) makes precisely such a distinction.[35]

In column (5), we investigate the importance of tax havens further by excluding them from the analysis. Compared to column (2), the coefficient of the interaction term which involves the effective tax rate is about three times lower and becomes insignificant, again suggesting that the bulk of the impact in column (2) comes from tax havens.

Finally, column (6) includes a set of destination-specific dummy variables. Introducing

[34]Notice that the coefficient on the tax haven dummy is high (0.11) but not significant. While the coefficient of the tax haven dummy does not change the interpretation of our results, it suggests higher arm's length prices in tax havens. A careful examination of the data shows that the magnitude of this particular coefficient is entirely driven by the high prices charged by arm's length exporters in Switzerland. Including a dummy for Switzerland pushes the coefficient on the tax haven dummy to zero - but the interaction with the intra-firm dummy variable remains stable. Our main results are robust and the coefficient on tax haven is 0.2 when Switzerland is excluded.

[35]The firms might also operate in tax havens and non-tax haven countries. We also drop the firms that export to tax havens internally. We do not find a significant tax effect. This suggests that there is no substitution effect. The transfer pricing strategy is not used by firms that do not export to tax havens, while firms that export to tax havens have lower prices in countries with lower tax rates.

country fixed effects does not allow us to estimate the direct effect of the country-specific variables (including the tax rate and tax haven status).[36] This, however, comes with the benefit of controlling for other destination characteristics. As can be seen, the tax rate interaction remains insignificant. Nevertheless, the tax haven interaction is virtually unchanged in magnitude and becomes even more significant. Thus, even after including destination fixed effects, we find evidence of tax-induced transfer pricing which is most evident in tax haven countries.

Transfer Pricing in Low Tax Jurisdictions Until now, we have investigated the average effect of tax rates on the export price differential. We find evidence of transfer pricing, but only in tax haven countries which are characterized by very low tax rates. Our results therefore suggest a threshold effect of the tax rates on the price differential. We examine this effect further by running a regression using, instead of the EMTR, a set of dummy variables indicating the decile in which a country's EMTR falls. We choose the 9^{th} decile as our benchmark. This decile is composed of 5 countries which have roughly the same effective marginal tax rate as France and where, in theory, internal and arm's length prices should be the same. The first decile includes countries with the lowest effective marginal corporate tax rates: the Bahamas, Hong Kong, Ireland, Slovenia, and South Africa.[37] The 10^{th} decile includes Argentina, Germany, Japan, and Poland, which are the countries with the highest effective marginal corporate tax rates in our sample.

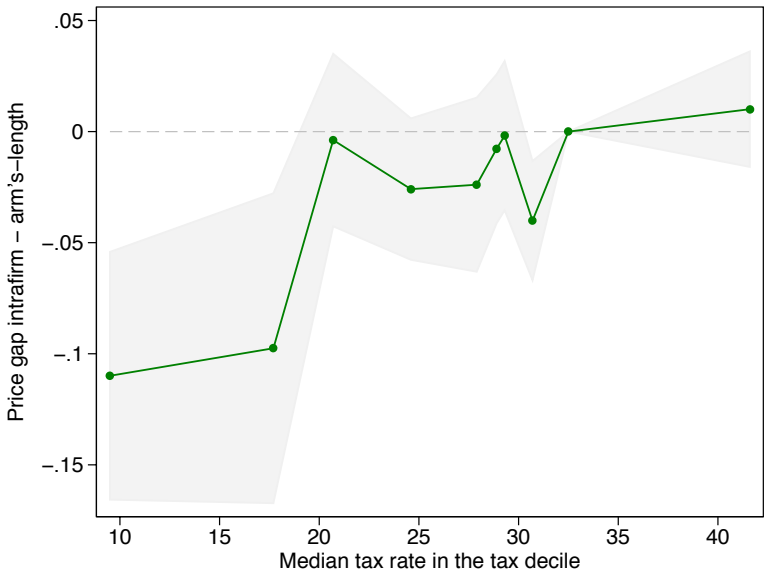
The estimated coefficients of these interaction terms are shown in Figure 1.[38] We report the median tax rate in each decile and show that the results are not driven by important

[36] The sample becomes slightly smaller as well as we adjust the number of observations for singletons.

[37] The sample consists of 45 countries. For this reason, some deciles have 5 countries and others have 4 countries.

[38] The estimated coefficients are obtained from a regression of export prices on the tax decile of the destination country and its interaction with a dummy equal to one if the price is intra-firm. The regression also includes firm-product-exporting mode fixed effects, and distance, GDP per capita, and tariffs, and their interaction with the intra-firm dummy.

Figure 1 – Corporate tax rate on transfer pricing across tax deciles



Note: This graph displays the price wedge between intra-firm and arm's length prices by decile of the destination country corporate tax rate. The price wedge is measured by the coefficients on the interaction between tax deciles and an intra-firm dummy in a regression of the logarithm of export prices on firm-product-exporting mode fixed effects, tax decile of the destination country, GDP per capita, distance, and tariff, and their interaction with a dummy equal to one if the exports are between related parties. Each dot reports the coefficient associated to the interaction between the intra-firm dummy and a dummy for the tax decile of the destination country. The first decile is the decile of countries with the lowest corporate tax rates. The tenth decile is the decile with the highest corporate tax rates. The coefficient for the decile 9 is normalized to zero (countries with the same tax level as France). The x-axis reports the median tax rate within each tax decile. The gray area corresponds to the confidence interval at 5%.

jumps in EMTRs between deciles. The pattern described in Figure 1 is consistent with the presence of an inaction band driven by the fixed component of the concealment costs as shown by the theory. Each dot corresponds to the interaction coefficient between the effective average tax rate and the intra-firm export mode dummy variable. We also display the confidence intervals at the 5% level. The estimated effects are quite heterogeneous. The point estimate of the interaction effect is however negative and significant only for countries in the first two deciles. This indicates that our results are heavily driven by the nine lowest-tax countries, five of which are also classified as tax havens (see Table 5). As explained in section

2, our simple model can easily accommodate such inaction band when the concealment cost function includes a fixed cost.

Additional Results. A relevant concern that has been raised in the literature studying the effects of transfer pricing is the differing abilities of firms to engage in transfer pricing (Bernard, et al. 2006). In our model, larger firms are expected to have larger price differentials. In columns (1) and (2) of Table 3, we split the sample according to the size of the MNEs measured by their total exports.[39] In the first column, we drop MNEs below the 75^{th} percentile of the distribution of multinational firms' size, and thus keep large MNEs and all pure exporters.[40] In column (2), we drop observations of MNEs above the 25^{th} percentile, keeping only small MNEs and all pure exporters. Looking at the corporate tax and the tax haven interactions with the intra-firm trade dummy, we find significance for tax havens only for the large firms, which is consistent with the inaction band emphasized in the model. This indicates that the manipulation of internal prices for tax reasons is primarily a phenomenon for large firms in tax havens. Further, we find that the relationship between pricing to market and internal prices is more prevalent in large firms.

In columns (3) and (4), we analyze another source of heterogeneity by operating a distinction across the nationality of ownership of an MNE. In column (3), we include MNEs that are French residents or are majority-owned by a French group (as well as all non-MNEs). In column (4), we include MNEs that are majority-owned by a foreign group and all exporters. Comparing the two, we find that the coefficients are estimated more precisely in the sample of French firms. In particular, we find significance for tax havens only for the French firms. These results therefore again suggest that tax havens play a major role in the transfer pricing strategies of French firms.

[39]Note that as all the estimations in Table 3 include destination fixed effects, only the interaction terms can be estimated.

[40]Note that since all exporters appear in both columns (1) and (2), the combined number of observations across these two regressions is greater than in the baseline specification.

Table 3 – Additional results, Effective Marginal Tax Rate

	Dependent variables: export price							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Intra_{fpmc}\times$:								
$(1-\tau_c)$	-0.08	-0.13	-0.19	-0.04	-0.06	-0.12*	-0.13*	-0.09
	(0.086)	(0.149)	(0.128)	(0.089)	(0.140)	(0.069)	(0.069)	(0.067)
$TaxHaven_c$	-0.11***	-0.00	-0.07*	-0.11	-0.04	-0.07**	-0.07***	-0.08**
	(0.022)	(0.069)	(0.039)	(0.067)	(0.087)	(0.027)	(0.024)	(0.036)
$Per\ Capita\ GDP_c$	-0.00	-0.01	-0.02	0.01	-0.04	-0.01	-0.01	-0.01
	(0.010)	(0.031)	(0.023)	(0.015)	(0.050)	(0.011)	(0.011)	(0.010)
$Distance_c$	-0.05***	-0.07***	-0.09***	-0.04***	-0.01	-0.05***	-0.05***	-0.06***
	(0.012)	(0.023)	(0.018)	(0.015)	(0.055)	(0.012)	(0.009)	(0.011)
$Tariff_c$	-0.41**	-0.24	-0.44*	-0.28*	0.17	-0.55***	-0.34**	-0.25
	(0.182)	(0.276)	(0.248)	(0.163)	(0.147)	(0.184)	(0.145)	(0.161)
Sample	Big firms	Small firms	French firms	Foreign MNEs	Homog. goods	Diff. goods	w/o wholesale	All
Firm-Prod.-Mode FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Cty-Sect. FE	No	No	No	No	No	No	No	Yes
Observations	710,924	682,887	567,652	455,508	11,592	599,792	276,451	729,737
Adj. R^2	0.928	0.931	0.934	0.933	0.969	0.915	0.907	0.929

Note: This table investigates the impact of the effective tax rate, GDP per capita, distance, tariffs, and of the tax haven dummy on intra-firm and arm's length export prices. All regressions include firm-product-exporting mode fixed effects. Column (1) focuses on MNEs whose export sales are above the P75. Column (2) focuses on MNEs whose export sales are below the P25. Column (3) excludes affiliates of foreign MNEs located in France. Column (4) excludes French MNEs. Column (5) only contains products classified as homogeneous in the Rauch nomenclature. Column (6) only contains products classified as differentiated in the Rauch nomenclature. Column (7) excludes MNEs whose main activity abroad is wholesale. Column (8) displays the results with country and HS2-sector fixed effects. Robust standard errors clustered by destination are reported in parentheses. Significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

In column (4), although the sign of the tax rate and tax haven variables match those in the French-only sample, they are not statistically significant. This suggests that similar forces are at play for this sample as well, although there may be greater noise due to the variety of parent countries in this sample as compared to that in column (3). In particular, if MNEs from other countries face worldwide taxation (as U.S. firms do in Bernard et al. (2006)), this may illustrate the cleaner tax effects to be found by using data on FDI from a tax-exempting country.

In France, as in most countries, the tax authorities' expectation is that firms set the price of their internal transactions according to the arm's length principle.[41]

The main force at play in the above model is that deviations from this price come at a cost. This cost includes penalties incurred if a firm is caught out. When the appropriate arm's length price is easily determined, as is the case for homogeneous goods that are traded in organized markets, transfer pricing should therefore be minimal. By contrast, differentiated products that are by definition specific to the relationship lack such comparable arm's length transactions (Blonigen et al. 2014). Thus, MNEs which export differentiated products might more easily reduce taxes via transfer pricing.[42] In columns (5) and (6), we use the Rauch (1999) classification and document the effect of taxes and tax havens on both the homogenous and the differentiated goods category.[43] There is no difference between intra- and extra-firm transactions for goods that are exchanged on organized markets, i.e. where appropriate prices are easily verified by tax authorities. Differentiated products, on the other hand, do show evidence of such pricing practices. Notice that the estimated coefficients reported in

[41]The French tax legislation is based on the comparable uncontrolled price method (CUP). This means applying prices that independent companies would set in identical transactions (B.O.I. 1999).

[42]Bernard et al. (2006) find that the difference between intra- and extra-firm prices is greater for differentiated goods than for homogenous ones, however, they do not estimate how the effect of taxes impacts the price wedge across groups.

[43]In the Online Appendix, we go beyond the binary product classification proposed by Rauch (1999) by using alternative measures of differentiation proposed by Khandelwal (2010) or Nunn (2007). The estimated coefficients are less precise but suggest that transfer pricing strategies are more pronounced in industries that exhibit more vertical differentiation or that require relationship-specific inputs.

column (6) are in line with the ones found in the baseline estimation (Column (6) of Table 2).

In column (7), we show that our baseline results are robust to the exclusion of the observations of firms active in the wholesale sector, as the pricing behavior of such firms may differ from that of others. As can be seen, the results are robust to their exclusion.

In the last column of Table 3, we deal with the self-selection of firms into the multinational status. As emphasized by Helpman et al. (2004), the selection of firms into multinationals depends upon a set of firm characteristics and on barriers to entry and other destination market characteristics such as the level of competition. These characteristics may well be influenced by the corporate tax rate or the tax haven status of the destination market. Our specification allows for the possibility that market characteristics vary across industries and across countries. We include country $\times$ HS2-industry fixed effects in column (8) and show that our main results hold.

One may worry that the specific behavior of transfer pricing to tax havens is due to the very specific nature of transactions between firms and their affiliates in these jurisdictions. In the Online Appendix, we show that the nature of intra-firm transactions to tax havens is very similar to intra-firm exports towards other destinations. Specifically, about 70% of intra-firm exports are resold directly by the affiliates while about 30% of intra-firm exports are used by the affiliates in their production process.[44] We also examine whether the volumes exported by firms are systematically different between tax havens and other countries. We use the same empirical strategy as the one that we implemented for the analysis of export prices. The estimation of quantities at the level of firm-product and destination require to augment the former specifications by the size of the destination market. We therefore include the destination market GDP as larger destination markets import more volumes. The results are reported in Table 6. In columns (1) and (2), we restrict the sample to the intra-firm

[44]Note that we only have information on the use of the products by the affiliates for 45% of intra-firm transactions, accounting for 77% of intra-firm exports.

trade flows only. In columns (3) and (4), we report the results based on estimations using the full sample. In either sample, we do not find any quantity differential between arm's length and intra-firm exports in tax havens. These findings suggest that low intra-firm prices in tax haven are not directly related to the exported quantities.

In the Online Appendix, we provide a set of additional robustness checks. We show that our results are robust to additional determinant of pricing-to-market, alternative definitions of the variables of interest (tax rates, tariffs, and product differentiation), and different thresholds' definitions of the export mode.[45]

Back-of-the-Envelope Calculation. To quantify the losses for tax authorities due to transfer pricing, we use the estimates of the baseline estimation, column (4). In our quantification exercise, we compute the loss of exports due to lower pricing in tax havens. In 1999, the French effective corporate tax rate was 31.77 percent and brought in about 36 billion euros of corporate tax receipts.[46]

In column (3) of Table 2, we find that intra-firm prices are 10.4% (exp(-0.11)-1) lower than the market price in tax havens.[47] Table 4 reports the share of exports and the share of these exports which were intra-firm for the ten tax havens. As can be seen, three of these countries are important export destinations. Furthermore, the shares of intra-firm exports to Switzerland or Ireland are very high (around 60%). One can see strong heterogeneity in

[45]Since the export prices might be affected by the fluctuations in exchange rates, we also examine the effect of exchange rates on our results. We analyze the correlation between the tax haven dummy or the tax rate variables with the change in bilateral exchange rates (ER) between 1998 and 1999. We reproduce the analysis with the three-year change in ER (1999-1996) and with ER volatility (standard deviation of the last 5 yearly changes in ER). The correlation between the corporate tax rate variables and the 1999-1998 change in ER is negative and significant. The franc (euro) depreciated in 1999 with respect to the currencies of high-tax countries. Introducing the change in ER and its interaction with the intra-firm dummy does not affect our results. The coefficient on the change in ER and the interaction term with the intra-firm dummy variable are statistically insignificant. Our results are upon requests.

[46]http://www.performance-publique.budget.gouv.fr/farandole/archives/1999/lftab99.htm. Taxes are charged on the *taxable income* which consists of operational and financial profits minus charges.

[47]We consider all intra-firm exports not only those used in our estimates. Note that using the information on the location of foreign affiliate would overestimate the losses for the tax authorities due to transfer pricing as some multinationals do not export internally to these locations.

the importance of the different tax havens. Conduit tax havens like Switzerland, Ireland, Singapore or Hong Kong account for the lion's share of profit shifting. By contrast, profit shifting through the transfer pricing of physical products is very modest for financial tax havens like the Bahamas or the Cayman Islands. Recognizing this distinction between types of tax havens can further improve the effectiveness of tax enforcement.

Using the intra-firm trade values in the data, the final column gives the value of under-priced intra-firm exports, the sum of which amounts to more than one billion euros.[48] Without this under-reporting, French tax authorities would have collected 333 million euros more. This figure can be compared to the 36 billion euros collected in 1999 (which includes both services and manufacturing), meaning that total tax revenues that year would have been roughly 1% greater, were it not for transfer pricing by manufacturing firms in these ten tax havens.[49] Interestingly, only 2,495 firms make intra-firm exports to these countries, with a scant 450 firms accounting for 90% of intra-firm exports to these ten countries. What is more, almost 50% of intra-firm exports to these tax haven destinations come from 25 firms. This suggests that a small number of firms are avoiding a large tax payment. This is an important factor to acknowledge as the OECD's (2012) survey of tax authorities finds that the cost of pursuing transfer pricing MNEs is of major concern.

Our results suggest that the lion's share of transfer pricing practiced in France is concentrated in the exports to at most ten countries by about 7% of multinationals. Targeting exports by these firms to tax havens would make enforcement of the arm's length price principle more efficient.

[48] These are estimated figures. We report confidence intervals for these figures computed from the standard errors of the coefficients obtained with clustering either in the country or in the product dimension.

[49] Note that this number does not consider any transfer pricing in the service sector for these countries.

Table 4 – Under-reporting to tax havens

Country	Sh. French exports	Sh. exports intra-firm	Value not reported (million euros)
Switzerland	0.0407	0.58	597.0
			$[241, 932]^{'}$
			$[390, 797]^{''}$
Ireland	0.0083	0.62	131.0
			$[53, 204]^{'}$
			$[85, 74]^{''}$
Singapore	0.0072	0.58	107.0
			$[43, 166]^{'}$
			$[70, 142]^{''}$
Hong Kong	0.0071	0.54	97.5
			$[39, 152]^{'}$
			$[64, 130]^{''}$
Luxembourg	0.0056	0.37	51.9
			$[21, 81]^{'}$
			$[34, 69]^{''}$
Malta	0.0019	0.88	42.8
			$[17, 67]^{'}$
			$[28, 57]^{''}$
Cyprus	0.0007	0.53	10.0
			$[4, 16]^{'}$
			$[7, 13]^{''}$
Bermuda	0.0003	0.85	6.0
			$[2, 9]^{'}$
			$[4, 8]^{''}$
Bahamas	0.0002	0.51	2.8
			$[1, 4]^{'}$
			$[2, 4]^{''}$
Cayman Islands	0.0001	0.55	0.7
			$[0.3, 1]^{'}$
			$[0.5, 1]^{''}$

Note: This table presents the weight of tax havens in French exports, the share of intra-firm trade within these destinations, and estimated value of intra-firm exports not reported due to transfer pricing. Estimates are built from the coefficient estimated in specification of Col. 3, Table 2. Confidence intervals are reported under parenthesis. $[,]^{'}$ are confidence intervals based on standard errors of ecoefficients clustered in the country dimension. $[,]^{''}$ are confidence intervals based on standard errors of coefficients clustered in the product dimension.

5 Conclusion

Despite the clear incentive firms have to shift profits through transfer pricing and the widespread concern over its implications, direct and systematic evidence of this practice remains scarce. This is due to a general lack of data on the prices used within a multinational and the prices for comparable arm's length transactions. Thus, the question of transfer pricing practices in terms of their monetary value and of the number of firms and countries involved remains largely unanswered.

We have built a unique dataset that overcomes this problem. These data contain prices at the firm-product-destination level for both intra-firm and arm's length exports. Having such detailed data is important for three key reasons. First, it allows us to control for other determinants of prices across firms, such as the relative productivity of multinationals as compared to exporters. Second, it allows us to control for the destination country's characteristics, such as income and trade costs, which are potentially correlated with tax variables yet impact intra-firm and arm's length prices in different ways. Third, the richness of the data allows us to consider not only the effect of foreign corporate taxes on pricing behavior, but also the role of tax havens, and how this behavior varies with firm and product characteristics.

We find that internal prices are lower in destinations with lower tax rates and most importantly in tax havens. Furthermore, transfer pricing is primarily found within large MNEs. These results are crucial for two reasons. First, they support the OECD's (2013) assertion that there is a difference between low-tax countries and tax havens which provide a tax environment which is particularly amenable to tax avoidance. Second, it shows that although transfer pricing may result in significant revenue losses, such losses are primarily due to a small number of firms. Given that our estimates are for 1999 alone, the cumulative tax losses from such transfer pricing should be quite large. This implies that by appropriately

targeting enforcement, a significant increase in revenues may be achieved at a small cost. Moreover, since our data is only for manufacturing, and not services, this tax loss is likely just the tip of the iceberg.

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Figure 2 – Distribution of intra and arm's length prices

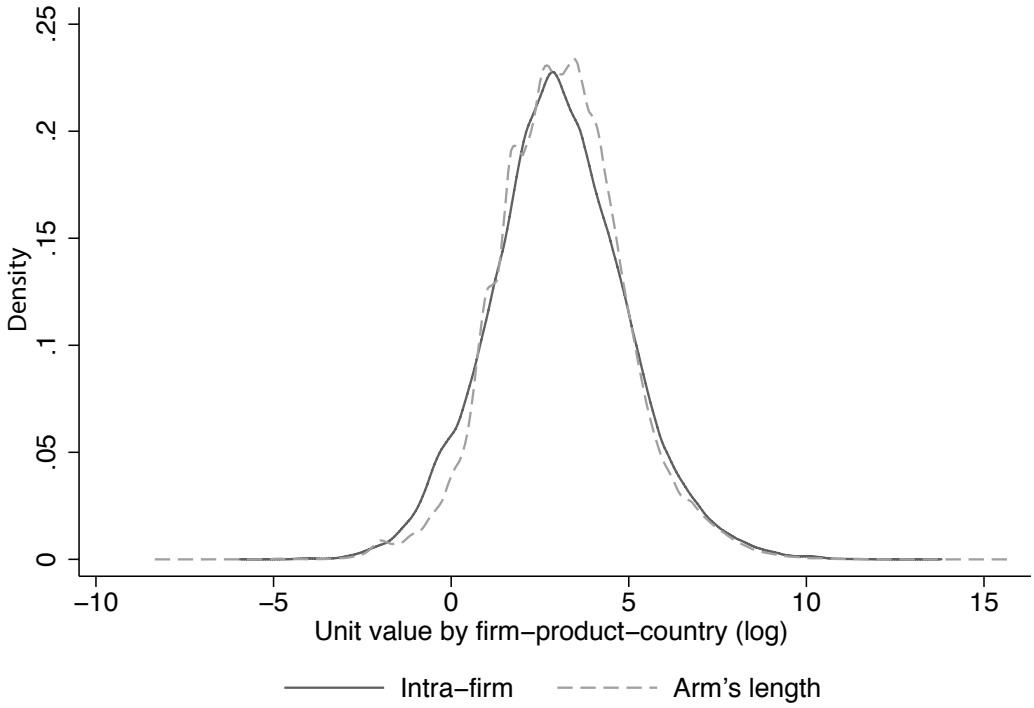

Table 5 – Countries, EATR, EMTR and Tax Havens in 1999

Country	EATR	EMTR	Country	EATR	EMTR	Country	EATR	EMTR
Bahamas**	0.00	0.00	Ecuador	0.22	0.23	China	0.30	0.31
Bermuda**	0.00	0.00	Bulgaria	0.24	0.27	Uruguay	0.30	0.30
Cayman Isl.**	0.00	0.00	Norway	0.25	0.26	Spain	0.31	0.32
Ireland**	0.08	0.09	Great Britain	0.25	0.26	New Zealand	0.31	0.31
Hong Kong**	0.09	0.12	Cyprus**	0.25	0.25	Brazil	0.31	0.32
Slovenia	0.12	0.18	Denmark	0.25	0.28	Canada	0.31	0.32
South Africa	0.15	0.21	India	0.26	0.29	Australia	0.31	0.33
Estonia	0.17	0.20	Trinidad and Tobago	0.26	0.29	Colombia	0.32	0.33
Chile	0.17	0.16	Luxembourg**	0.28	0.30	Italy	0.33	0.35
Turkey	0.17	0.23	Portugal	0.28	0.31	Malta**	0.33	0.32
Switzerland**	0.18	0.21	Indonesia	0.29	0.29	United States of America	0.33	0.34
Singapore**	0.19	0.15	Greece	0.29	0.32	Poland	0.34	0.34
Korea	0.20	0.24	Netherlands	0.29	0.31	Argentina	0.35	0.35
Guatemala	0.21	0.23	Austria	0.29	0.31	Japan	0.41	0.41
Sweden	0.21	0.23	Peru	0.29	0.29	Germany	0.42	0.43
Mexico	0.22	0.26	Belgium	0.29	0.33			
Finland	0.22	0.24	Czech Republic	0.30	0.31			

Note: ** Tax Havens as defined by Hines & Rice (1994).

Table 6 – Quantities and tax havens

	Dependent variables: log of quantity			
	(1)	(2)	(3)	(4)
$TaxHaven_c$	-0.92*	-0.10	-0.56	-0.07
	(0.492)	(0.274)	(0.354)	(0.361)
$- \times Intra_{fpmc}$			-0.26	-0.03
			(0.208)	(0.206)
$(1 - \tau_c)$		-0.19		-0.28
		(0.603)		(0.398)
$- \times Intra_{fpmc}$				0.09
				(0.449)
$Per\ Capita\ GDP_c$		-0.21		-0.16
		(0.145)		(0.121)
$- \times Intra_{fpmc}$				-0.05
				(0.117)
$Distance_c$		-0.46***		-0.38***
		(0.091)		(0.115)
$- \times Intra_{fpmc}$				-0.07
				(0.079)
$Tariff_c$		-1.49		-0.83
		(1.208)		(1.100)
$- \times Intra_{fpmc}$				-0.66
				(1.137)
GDP_c		0.54***		0.31***
		(0.072)		(0.068)
$- \times Intra_{fpmc}$				0.23***
				(0.054)
Sample	Intra	Intra	Full	Full
Firm-Prod.-Mode FE	Yes	Yes	Yes	Yes
Observations	65,655	65,655	729,737	729,737
Adj. R^2	0.680	0.694	0.657	0.669

Note: This table investigates the impact of the effective tax rate, GDP per capita, distance, tariffs, GDPs and of the tax haven dummy on intra-firm and arm's length export quantities. The effective tax rate is transformed as follows: $(log(1 - \tau))$. We use the effective marginal tax rate here. All regressions include firm-product-exporting mode fixed effects. In columns (1) & (2), we focus on intra-firm trade flows only. The results using the full sample are reported in columns (3) & (4) Robust standard errors clustered by destination are reported in parentheses. Significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.