

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

Ronald B. Davies<sup>1</sup>, Julien Martin<sup>2</sup>, Mathieu Parenti<sup>3</sup>, and Farid Toubal<sup>4</sup>

<sup>1</sup>*Department of Economics, University College Dublin, Ireland*

<sup>2</sup>*Department of Economics, Université du Québec à Montréal, Canada*

<sup>3</sup>*Université Libre de Bruxelles, Belgium and CEPR*

<sup>4</sup>*Ecole Normale Supérieure de Cachan, Paris School of Economics and CEPII, France*

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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.

**Keywords:** Transfer pricing; Tax haven; Pricing to market

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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.<sup>1</sup> 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.<sup>2</sup> 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 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.<sup>3</sup> 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

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<sup>1</sup>See [Fuest et al. \(2003\)](#) for a survey on the impact of taxation on real MNE activity.

<sup>2</sup>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.

<sup>3</sup>About 25 firms accounts for 50% of intra-firm trade with the tax havens in our sample.

increasing attention in the field of international trade.<sup>4</sup> The model shows that a MNE finds it optimal to deviate from the arm's length price when it exports to countries with a different level of taxes than its home country. 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 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. What is more, 1999 is the last year before which Advanced Pricing Agreements started to be granted by French Tax authorities. Our results are therefore not affected by this kind of agreement.

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.<sup>5</sup> 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 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

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<sup>4</sup>Examples include Bastos & Silva (2010), Manova & Zhang (2012), and Martin (2012).

<sup>5</sup>Bernard et al. (2006) provide a detailed discussion of the complexity of the U.S. tax system.

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 the effect of taxes is non-linear. 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.<sup>6</sup>

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 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.<sup>7</sup> [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

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<sup>6</sup>Consistent with these findings, [Gumpert et al. \(2011\)](#) show that the largest German multinationals are the most likely to use tax havens.

<sup>7</sup>For a recent discussion of the former, see [Huizinga & Laeven \(2008\)](#). [Dharmapala & Riedel \(2013\)](#) discuss the impact of taxes on firm financing.

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.<sup>8</sup>

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, 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 three dimensions. First, and most importantly, we consider the tax haven status as well as tax rates. 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.<sup>9</sup> 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 not doing so may bias the results.<sup>10</sup>

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

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<sup>8</sup>Our results are robust to controlling for the growth or the volatility of bilateral exchange rates. Results are available upon request.

<sup>9</sup>[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.

<sup>10</sup>The results we get 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 in our sample to an increase in the price wedge by 0.6 percent. This effect is non-linear and 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.

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 An Illustrative 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 a constant marginal cost  $c$  and ships it to its affiliate located in  $F$  (Foreign) at a free-on-board price  $p_{MNE}^H$ . 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.<sup>11</sup> Exports incur trade costs that are specific to the destination market  $F$ . Specifically there is an ad-valorem cost  $\tau_v^F p_{MNE}^H$ , such as a tariff or insurance. Last, we assume the production of the final good is costless. The foreign consumer price is denoted by  $p_{MNE}^F$  and the individual demand for that good is

$$d[p_{MNE}^F] := 1 - \beta^F p_{MNE}^F$$

Consumers in  $F$  have a willingness to pay for the first unit of the good equal to  $1/\beta^F$ . Generally,  $\beta^F$  depends on GDP per capita: it 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.<sup>12</sup> In this, the transfer price  $p_{MNE}^H$  can differ from the price  $p^{H*}$  that would be set by an exporter with the same marginal cost  $c$  selling to an unaffiliated party (i.e. at arm's length).<sup>13</sup>

This incurs a cost

$$\Phi \left[ \left| p_{MNE}^H - p^{H*} \right| \right] = \frac{\gamma^F}{2} \left( p_{MNE}^H - p^{H*} \right)^2$$

where  $\gamma^F$  is a parameter which reflects the specificities of the fiscal regime in Foreign. This function is a tax-deductible cost that occurs in the home country.<sup>14</sup> This concealment cost

<sup>11</sup>The good is either an intermediate good or a final good sold to a wholesaler. In any case, it is not imported back to the domestic country.

<sup>12</sup>This approach was initiated by Kant (1988) and is the predominant method to model transfer pricing in theory (Hauffer & Schjelderup 2000, eg.) and the empirics (Huizinga & Laeven 2008, eg.).

<sup>13</sup>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.

<sup>14</sup>This assumption is made for the sake of simplicity and does not change any of the insights from the

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. Note that this might vary across countries; for example, if a tax haven makes this concealment relatively easy (low  $\gamma^F$ ), then this could reduce the total and marginal cost of concealment for a given price wedge.

Below, we use this highly stylized model to study the variations of the price wedge  $\frac{p^{H*}}{p_{MNE}^{H*}}$  with respect to the foreign corporate tariff  $T^F$  and the concealment cost parameter  $\gamma^F$ .

### 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:

$$\pi_{AL} := (p^H - c) d \left[ (1 + \tau_v^F) p^H \right]$$

It is readily verified that the optimal price is

$$p^{H*} = \frac{1}{2\beta^F (1 + \tau_v^F)} + \frac{c}{2}$$

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

$$\begin{aligned} \pi_{MNE} &:= (1 - T^H) \left( (p_{MNE}^H - c) d \left[ p_{MNE}^F \right] - \Phi \left[ \left| p_{MNE}^H - p^{H*} \right| \right] \right) \\ &+ (1 - T^F) \left( p_{MNE}^F - (1 + \tau_v^F) p_{MNE}^H \right) d \left[ p_{MNE}^F \right] \end{aligned} \quad (1)$$

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

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

where

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

If  $\theta^F [T^F] > 0$  then a firm finds it optimal to shift a share of its domestic profits to Foreign and therefore  $p_{MNE}^{H*} < p^{H*}$ . This happens 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

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model.



to stress that the multiplicative trade costs  $\tau_v^F$  (e.g. tariffs) are also a motive for transfer pricing and that the two effects interact with each another. We summarize this result in the following proposition:

**Proposition 2.1.** *The level of corporate taxes and multiplicative trade costs determine the direction of the deviation of intra-firm prices from arm's length prices. Free-on-board intra-firm prices are lower than arm's length prices in destinations with lower corporate taxes or high tariffs.*

Furthermore, equation (2) gives us a clear cut prediction regarding the relation between the volume exported to a destination by a multinational and the price wedge, which are two endogenous variables. Since this equation does not depend on  $c$ , we can conclude right away that any underlying model featuring firm heterogeneity in productivity will generate a positive correlation between those two variables. This occurs because, although a non-zero price wedge increases per-unit after-tax profits, the marginal concealment cost is independent of quantity.<sup>15</sup> The deviation from the arm's length price is increasing in firm size, presuming that, consistent with the data, larger firms export more.

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

A strict reading of the above propositions would imply that a multinational firm finds it optimal to shift profits abroad when taxes differ even marginally. Realistically, it is fair to assume that a fixed component in the concealment cost function is involved, implying that there is an *inaction band*. In other words, we should not expect firms to shift profits abroad when the corporate tax differential (or tariff) is small.

Now, we turn to the pricing strategy of a given MNE across different destination markets  $F$ . Without loss of generality, we normalize its marginal cost to zero to alleviate the equations. Maximizing its profits with respect to  $p_{MNE}^F$  yields the following equation:

$$d[p_{MNE}^{F*}] = 1 + \frac{\beta^{F*}}{2} \left( \frac{1 - T^H}{1 - T^F} - (1 + \tau_v^F) \right) p_{MNE}^{H*}$$

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

$$\frac{p^{H*}}{p_{MNE}^{H*}} = 1 + \frac{\frac{\theta^F[T^F]}{\gamma^F} (1 + \tau_v^F)}{1 - \frac{\theta^F[T^F]}{\gamma^F} (1 + \tau_v^F)} \left( 1 - \frac{\beta^F}{2} \frac{\theta^F[T^F]}{(1 - T^H) + \theta^F[T^F]} \right) \quad (3)$$

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<sup>15</sup>Ernst & Young (2012) suggest that prices are one of the issues which receives "the greatest scrutiny" 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 is more likely to catch attention than a small price gap with large quantities. Formally, if  $\Phi(\cdot)$  is a function of  $[(p_{MNE}^H - p^{H*}) d[p_{MNE}^F]^\alpha]$ , our result holds for  $\alpha < 1/2$ .



Since  $\theta^F[T^F]$  is decreasing in  $T^F$ , taking the first partial derivative of the above expression w.r.t.  $T^F$  shows that the price wedge is larger when  $T^F$  is lower. Similarly, holding  $T^F$  constant, a lower  $\gamma^F$  is associated with lower intra-firm prices. Tax havens provide firms with an additional motive for profit shifting via transfer pricing.

Consistent with proposition 1,  $p_{MNE}^{H*} = p^{H*}$  in the absence of motive for transfer pricing i.e. when  $\theta^F[T^F] = 0$  or when the concealment cost  $\gamma^F$  is infinitely large.

Importantly enough, even in this simple model, *the marginal impact of  $T^F$  and  $\gamma^F$  on the price wedge varies across destinations*. We have already noted in proposition 1 that tariffs impact the motive for profit shifting and therefore it is not surprising that the price wedge depends on  $\tau_v^F$ . However, expression (3) implies also that a higher GDP per capita (i.e. a lower  $\beta^F$ ) impacts positively the price wedge.

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.

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 should be larger for larger firms. Fourth, 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. 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.<sup>16</sup> In addition, advanced pricing agreement (APA) regulations were published in September 1999 to help multinational firms obtain the agreements of the tax authorities on the method to determine their transfer prices.<sup>17</sup> 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.

<sup>16</sup>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.

<sup>17</sup>This 1999 regulation offers the possibility of requesting a bilateral APA, provided that the other country has signed a treaty with France which contains a clause relating to Article 25-3 of the OECD treaty.

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.

**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.<sup>18</sup> 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.

) 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. When the INSEE indicates that an HS4 category has a share of intra-firm exports exceeding 98%, we classify all corresponding CN8 exports by MNEs as intra-firm transactions.<sup>19</sup> If the share is zero, we classify the CN8 codes as arm's length. When the share is positive but below 98%, we drop the observations for this firm for this destination-HS4 dyad,

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<sup>18</sup>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).

<sup>19</sup>Changing this threshold marginally does not change the qualitative results of our empirical analysis.

observations which amount to roughly 12.6% of French exports. Therefore, with our data we do not observe intra-firm *and* arm's length prices 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 208,766 product-destination pairs, we drop 6,441 pairs for which we observe only intra-firm trade prices. They account for 1.6% of French exports and 4.8% of intra-firm exports.<sup>20</sup>

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. 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.<sup>21</sup> We also eliminate the observations of state-owned firms as these firms might have a different price setting mechanism.<sup>22</sup> *LIFI* is also interesting because it provides the countries where the affiliates of firms located in France are located themselves.

This then leaves us with information at the firm, NC8 product, country, and exporting mode level. Once merged with country characteristics, there are 735,064 observations in our unbalanced baseline sample.<sup>23</sup> Our cross section is composed of 67,312 firms, 5,482 products, and 49 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 15.6% 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 this sample, 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 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%.

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<sup>20</sup>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.

<sup>21</sup>We lose 605 firms which amount to dropping 2.5% of the value of French exports.

<sup>22</sup>They account for about 1.7% of French exports.

<sup>23</sup>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.

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.<sup>24</sup> 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, EMTR 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 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.<sup>25</sup> 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. 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

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<sup>24</sup>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.

<sup>25</sup>See the recent paper by [Gumpert et al. \(2011\)](#) who consider this issue for a large sample of German MNEs.

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.<sup>26</sup> 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 [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.<sup>27</sup> 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 (measured in U.S. dollars) 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 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). 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 their omission could bias our 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: we do not identify

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<sup>26</sup>Indeed, as can be seen in [Table 5](#), our sample includes several low-tax countries which do not qualify as tax havens.

<sup>27</sup>In addition, neither Hong Kong nor Singapore are considered at all by the [OECD \(2000\)](#).

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.

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:

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

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  $\tau_c$  being the EMTR in country  $c$ .<sup>28</sup> 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).

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<sup>28</sup>We also use the EATR variable as an alternative definition of the tax rate. The results are comparable and are presented in Tables 6 and 7.



The term  $\mu_{fpm}$  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,  $\epsilon_{fpmc}$  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.

Table 1 gives the summary statistics.

Table 1 – Summary statistics

Variable	Nature	Mean	Std. Dev.
$p_{fpmc}$	(log)	3.09	1.799
$Intra_{fpmc}$	0/1	0.092	0.288
$(1 - \tau_c)$ (EMTR)	(log)	-0.353	0.095
$(1 - \tau_c)$ (EATR)	(log)	-0.383	0.091
$Tax Haven_c$	0/1	0.107	0.308
$Tariff_c$	Continuous	0.270	0.739
$Distance_c$	(log)	6.986	0.865
$Per Capita GDP_c$	(log)	9.976	0.569
<i>Intra<sub>fpmc</sub> ×:</i>			
$(1 - \tau_c)$ (EMTR)		-0.032	0.105
$(1 - \tau_c)$ (EATR)		-0.035	0.113
$TaxHaven_c$		0.007	0.083
$Tariff_c$		0.030	0.262
$Distance_c$		0.653	2.073
$Per Capita GDP_c$		0.905	2.857
Observations		735,064	

## 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 Table 6 in the Appendix.



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

	Dependent variables: export price					
	(1)	(2)	(3)	(4)	(5)	(6)
$(1 - \tau_c)$	0.10 (0.755)	0.12 (0.870)		-0.01 (-0.137)	-0.03 (-0.367)	
$- \times Intra_{fpmc}$	-0.19** (-2.109)	-0.20* (-1.932)		-0.10 (-1.451)	-0.05 (-1.056)	-0.08 (-1.205)
$TaxHaven_c$			0.11 (1.574)	0.12 (1.555)		
$- \times Intra_{fpmc}$			-0.11** (-2.686)	-0.09** (-2.365)		-0.09*** (-2.843)
$Per\ Capita\ GDP_c$		0.06** (2.128)	0.04 (1.544)	0.04 (1.487)	0.04 (1.568)	
$- \times Intra_{fpmc}$		-0.03** (-2.620)	-0.01 (-1.108)	-0.01 (-1.187)	-0.02* (-1.726)	-0.00 (-0.404)
$Distance_c$		0.08*** (2.919)	0.08*** (3.631)	0.08*** (3.652)	0.11*** (4.288)	
$- \times Intra_{fpmc}$		-0.04*** (-2.855)	-0.05*** (-4.811)	-0.05*** (-4.518)	-0.06*** (-4.974)	-0.05*** (-4.178)
$Tariff_c$		0.03 (1.052)	0.03 (1.122)	0.03 (1.158)	0.01 (0.418)	
$- \times Intra_{fpmc}$		-0.03* (-1.995)	-0.03** (-2.617)	-0.03** (-2.426)	-0.02 (-1.616)	-0.03*** (-3.138)
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	756,332	735,064	735,064	735,064	657,117	735,064
Adj. $R^2$	0.862	0.865	0.865	0.865	0.870	0.866

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. In column (5), we restrict the sample to countries which are not classified as tax havens. Robust standard errors clustered by destination are computed. Corresponding t-statistics are reported in parentheses. Significance levels: \* $p < 0.1$ , \*\* $p < 0.05$ , and \*\*\* $p < 0.01$ .

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 1.9% (2.2% using the EATR variable).

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 most of the transactions are observed in countries that are members of the European Union.<sup>29</sup> 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.<sup>30</sup>

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<sup>29</sup>About 90% of observations concern a transaction toward an E.U. country.

<sup>30</sup>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

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 insignificant 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.<sup>31</sup>

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 four 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 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). 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.<sup>32</sup>

**Non-Linear Tax Effects.** 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 non-linearity 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<sup>th</sup> 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.<sup>33</sup> The 10<sup>th</sup> decile includes Argentina, Germany, Japan, and Poland, which are the countries with the highest effective marginal corporate

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dummy variable remains stable. Our main results are robust and the coefficient on tax haven is 0.2 when Switzerland is excluded.

<sup>31</sup>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.

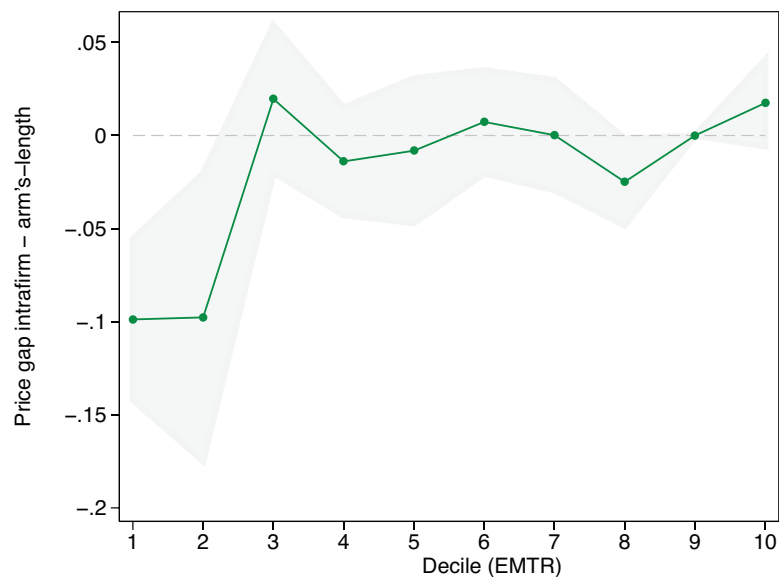
<sup>32</sup>We also investigate whether we find a similar effect using firms that sell both arm’s length and intra-firm and those that do only intra-firm trade. The results are qualitatively similar. They are available upon request.

<sup>33</sup>The sample consists of 49 countries. For this reason, some deciles have 5 countries and others have 4 countries.

tax rates in our sample.

The estimated coefficients of these interaction terms are shown in Figure 1.<sup>34</sup> 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 10% level. The estimated effects are quite heterogeneous. Along the first remark of the theoretical model, we observe an *inaction band* when the tax differential is not too large. 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).

Figure 1 – Non-linear effect of corporate tax rate on transfer pricing



*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. 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. Decile 9 is normalized to zero (countries with the same tax level as France). The gray area corresponds to the confidence interval at 5%.

**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

<sup>34</sup>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.

(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.<sup>35</sup> In the first column, we drop MNEs below the 75<sup>th</sup> percentile of the distribution of multinational firms' size, and thus keep large MNEs and all pure exporters.<sup>36</sup> In column (2), we drop observations of MNEs above the 25<sup>th</sup> 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. 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 a 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 the effective marginal tax rate to have a strong, negative and significant impact on the log level intra-firm export prices. A comparable effect is found for tax havens. These results therefore again suggest that tax havens play a major role in the transfer pricing strategies of French firms. In column (4), although the sign of the tax rate and tax haven variables match those in the French-only sample, the significance of both is much lower, with only the tax haven variable significant at the 5% level. 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.

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<sup>35</sup>Note that as all the estimations in Table 3 include destination fixed effects, only the interaction terms can be estimated.

<sup>36</sup>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)
$\underline{Intra\_firm\ \times}$ :								
$(1 - \tau_c)$	-0.05 (-0.912)	-0.13 (-1.240)	-0.14* (-1.724)	-0.03 (-0.532)	-0.05 (-0.573)	-0.09* (-1.880)	-0.09 (-1.563)	-0.07 (-1.087)
$TaxHavenc$	-0.11*** (-7.597)	-0.01 (-0.171)	-0.08*** (-3.307)	-0.11** (-2.326)	-0.04 (-0.726)	-0.08*** (-3.788)	-0.10*** (-3.877)	-0.10*** (-2.715)
$Per\ Capita\ GDP_c$	-0.01 (-0.632)	-0.00 (-0.061)	-0.02 (-1.474)	0.02 (1.500)	-0.05 (-1.410)	-0.01 (-1.175)	-0.01 (-1.147)	-0.01 (-0.542)
$Distance_c$	-0.05*** (-4.976)	-0.06*** (-3.630)	-0.07*** (-5.308)	-0.04*** (-3.479)	-0.01 (-0.176)	-0.05*** (-4.976)	-0.05*** (-5.388)	-0.06*** (-4.718)
$Tariff_c$	-0.03*** (-4.158)	-0.03 (-1.294)	-0.05*** (-3.497)	-0.02* (-1.776)	0.01 (0.404)	-0.04*** (-3.967)	-0.04*** (-3.686)	-0.03** (-2.537)
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	723,921	697,897	567,071	465,008	11,980	608,535	553,745	742,863
Adj. $R^2$	0.868	0.869	0.876	0.871	0.847	0.885	0.868	0.932

*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. Robust standard errors clustered by destination are computed. Column (8) displays the results with country and sector fixed effects. Corresponding t-statistics are reported in parentheses. Significance levels: \* $p < 0.1$ , \*\* $p < 0.05$ , and \*\*\* $p < 0.01$ .

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.<sup>37</sup> 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.<sup>38</sup> 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. 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 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.

Last, 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. In column (8), we include country  $\times$  HS1-industry fixed effects and show that our main results hold.

In Table 7 of the Appendix, we provide the comparable estimates when using the EATR variable. We find that our results are robust to the use of this alternative definition of the corporate tax rate. In unreported specifications, we examine the effect of exchange rates on our results. We find that our main findings are robust to fluctuations in exchange rates.<sup>39</sup>

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<sup>37</sup>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).

<sup>38</sup>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.

<sup>39</sup>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 available upon request.



**Back-of-the-Envelope Calculation.** To quantify the loss 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.<sup>40</sup>

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.<sup>41</sup> 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 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. Without this under-reporting, French tax authorities would have collected 340 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.<sup>42</sup> 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.

## 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

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<sup>40</sup><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.

<sup>41</sup>We consider all intra-firm exports not only those used in our estimates.

<sup>42</sup>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	590.0
Ireland	0.0083	0.62	129.0
Singapore	0.0072	0.58	105.0
Hong Kong	0.0071	0.54	96.3
Luxembourg	0.0056	0.37	51.3
Malta	0.0019	0.88	42.3
Cyprus	0.0007	0.53	9.9
Bermuda	0.0003	0.85	5.9
Bahamas	0.0002	0.51	2.8
Cayman Islands	0.0001	0.55	0.7

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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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 – Baseline regression Effective Average Tax Rate, all firms

	Dependent variables: export price					
	(1)	(2)	(3)	(4)	(5)	(6)
$(1 - \tau_c)$	0.12 (0.870)	0.12 (0.847)		-0.02 (-0.211)	-0.04 (-0.419)	
$- \times Intra_{fpmc}$	-0.22** (-2.277)	-0.22* (-1.994)		-0.11 (-1.590)	-0.06 (-1.248)	-0.08 (-1.253)
$TaxHaven_c$			0.11 (1.574)	0.12 (1.561)		
$- \times Intra_{fpmc}$			-0.11** (-2.686)	-0.09** (-2.346)		-0.09* (-2.795)
$Per\ Capita\ GDP_c$		-0.03** (-2.636)	-0.01 (-1.108)	-0.01 (-1.178)	-0.02* (-1.715)	-0.00 (-0.390)
$- \times Intra_{fpmc}$		-0.03*** (-3.269)	-0.01 (-1.138)	-0.01 (-1.320)	-0.02* (-2.024)	-0.01 (-0.628)
$Distance_c$		0.08*** (2.849)	0.08*** (3.631)	0.08*** (3.651)	0.11*** (4.301)	
$- \times Intra_{fpmc}$		-0.04*** (-2.806)	-0.05*** (-4.811)	-0.05*** (-4.440)	-0.06*** (-4.961)	-0.05*** (-4.151)
$Tariff_c$		0.03 (1.056)	0.03 (1.122)	0.03 (1.165)	0.01 (0.425)	
$- \times Intra_{fpmc}$		-0.03* (-1.986)	-0.03** (-2.617)	-0.03** (-2.397)	-0.02 (-1.596)	-0.03*** (-3.125)
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	756,332	735,064	735,064	735,064	657,117	735,064
Adj. $R^2$	0.862	0.865	0.865	0.865	0.870	0.866

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. Effective tax rates are transformed as follows:  $(\log(1 - \tau))$ . All regressions include firm-product-exporting mode fixed effects. The last column further includes country fixed effects. In column (5), we restrict the sample to countries not classified as tax havens. Robust standard errors clustered by destination are computed. Corresponding t-statistics are reported in parentheses. Significance levels: \* $p < 0.1$ , \*\* $p < 0.05$ , and \*\*\* $p < 0.01$ .



Table 7 – Additional results, Effective Average Tax Rates

	Dependent variables: export price							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Intra.fpmc</i> ×:								
$(1 - \tau_c)$	-0.05 (-0.950)	-0.13 (-1.174)	-0.14 (-1.614)	-0.04 (-0.567)	-0.01 (-0.097)	-0.10* (-1.972)	-0.10 (-1.677)	-0.07 (-1.112)
<i>TaxHaven<sub>c</sub></i>	-0.11*** (-7.533)	-0.01 (-0.177)	-0.08*** (-3.306)	-0.11** (-2.287)	-0.05 (-0.779)	-0.07*** (-3.706)	-0.09*** (-3.776)	-0.10*** (-2.673)
<i>Per Capita GDP<sub>c</sub></i>	-0.00 (-0.618)	-0.00 (-0.047)	-0.02 (-1.453)	0.02 (1.505)	-0.04 (-1.364)	-0.01 (-1.164)	-0.01 (-1.144)	-0.01 (-0.530)
<i>Distance<sub>c</sub></i>	-0.05*** (-4.971)	-0.06*** (-3.586)	-0.07*** (-5.170)	-0.04*** (-3.473)	-0.01 (-0.166)	-0.05*** (-4.925)	-0.05*** (-5.356)	-0.06*** (-4.695)
<i>Tariff<sub>c</sub></i>	-0.03*** (-4.141)	-0.03 (-1.305)	-0.05*** (-3.462)	-0.02* (-1.768)	0.01 (0.371)	-0.04*** (-3.944)	-0.04*** (-3.664)	-0.03** (-2.527)
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	716,158	686,580	571,872	458,998	11,659	603,575	558,313	735,064
Adj. $R^2$	0.868	0.869	0.876	0.871	0.847	0.885	0.868	0.932

*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 the products classified as homogeneous in the Rauch nomenclature. Column (6) only contains the products classified as differentiated in the Rauch nomenclature. Column (7) excludes MNEs whose main activity abroad is wholesale. Robust standard errors clustered by destination are computed. Column (8) displays the results with country and sector fixed effects. Corresponding t-statistics are reported in parentheses. Significance levels: \* $p < 0.1$ , \*\* $p < 0.05$ , and \*\*\* $p < 0.01$ .