The instruments of profit shifting *

Kevin Parra-Ramirez† Vincent Vicard‡

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Abstract

While multinational enterprises (MNEs) shift hundreds of billions in profits to low-tax jurisdictions annually, *how* they do remains disputed. Using firm-level data for France in 2018, we provide the first joint quantification of the three main profit-shifting channels: (1) transfer mispricing in goods trade, (2) intangible assets and services traded with tax havens, and (3) intra-group debt. We find empirical evidence for all three instruments, but transfer mispricing dominates quantitatively (€10 billion, 0.4% of GDP), followed by services (€6 billion) and debt (€2 billion). However, these direct estimates account for only half of France's total missing profits. We document two key blind spots likely to close this gap: cross-border digital payments and understudied debt instruments (e.g., securities).

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†Sciences-Po, Banque de France, e-mail: kevin.parraramirez@banque-france.fr
‡CEPII, e-mail: vincent.vicard@cepii.fr

1 Introduction

Multinational enterprises (MNEs) shift hundreds of billions in profits to low-tax jurisdictions each year, eroding corporate tax bases worldwide and prompting a global policy response with the 2021 OECD tax deal endorsed by over 130 countries.[1] However, while macro-level studies have established the scale of profit shifting, the micro-level mechanisms through which MNEs shift profits remain disputed. This ambiguity undermines the design of targeted anti-avoidance policies, as optimal responses depend critically on the dominant channels in a given economy.

MNEs engage in profit shifting through three main strategies, each relying on cross-border transactions within corporate groups. First, they may manipulate transfer prices in goods trade, under-invoicing exports or over-invoicing imports to allocate profits to low-tax affiliates. Second, they can locate intangible assets such as patents or trademarks in tax havens, then charge affiliates in high-tax jurisdictions for their use through export of services. Third, MNEs may load subsidiaries in high-tax countries with intra-group debt, exploiting the tax deductibility of interest payments to reduce taxable income. Each channel reallocates profits from high-tax to low-tax jurisdictions, reducing MNE consolidated tax liabilities.

Though each of these instruments – transfer mispricing, imports of service from tax havens, and debt shifting – has been documented in isolation, their relative importance remains unclear. Existing studies typically focus on only one instrument at a time, making it impossible to compare their quantitative importance within the same economic context. Moreover, cross-country comparisons are complicated by differences in tax systems and economic structures, including the relative prevalence of tech, finance or manufacturing sectors. Finally, the literature spans different time periods, masking trends like the growing international footprint of MNEs or the digitization of the economy.[2] By focusing on France in 2018 and leveraging firm-level data, this paper provides the first joint quantification of all three channels while also identifying previously overlooked sources of profit shifting that contribute to the discrepancy between micro and macro estimates.

Understanding how MNEs shift profits has direct implications for anti-avoidance

[1] See in particular Clausing (2016), Cobham and Jansky (2017), Torslov et al. (2023), Blouin and Robinson (2019) and Hugger et al. (2023).

[2] Wier and Zucman (2022) show that profits shifted globally have risen sharply over the last two decades.

policies and international tax reforms. For tax authorities, knowing which channel of profit shifting dominates allows for more targeted audits, concentrating resources for tax policy enforcement on transactions generating the largest revenue losses among the thousands of intra-firm transactions. Our analysis also reveals a geography of profit shifting by origin and destination that the mere location of profits in low tax countries or tax havens fail to identify.[3] Additionally, by quantifying distortions in balance of payments data caused by profit shifting, this work informs efforts to improve national accounting statistics in a changing globalization context.[4]

We assemble confidential firm-level information on trade in goods, trade in services and debt stocks to provide direct evidence of each channel of profit shifting for France in 2018. We apply established identification strategies and derive semi-elasticities from French micro-data to compare the relative magnitudes of the three instruments. We then benchmark these micro-based estimates against indirect measures of total profit shifting derived from foreign direct investment income data. This comparison reveals a substantial gap, pointing to blind spots in the literature.

We find empirical evidence for the three channels of profit shifting. MNEs located in France use transfer prices in trade in goods, intra-firm service imports from tax havens and debt to shift profit to low tax jurisdictions. Regarding the latter, our results show that both non-financial corporations and banks strategically locate intra-firm debt in tax havens.

Interestingly, the channels of profit shifting differ for French and foreign MNEs. In particular, foreign MNEs primarily use Intellectual property, Information and communication services, and Transport services for service-based profit shifting, whereas French MNEs use Other business services (including Headquarter services) and Financial services. Similarly, all banks engage in debt shifting but only foreign non-financial corporations strategically locate intra-firm debt in tax havens. In addition, the geographic pattern of profit shifting depends on the instruments considered: transfer mispricing occurs with all low-tax countries while imports of services and debt shifting are concentrated in tax havens.

Our micro-based quantifications reveal that transfer mispricing on trade in goods

[3] Assumptions on the channels of profit shifting are instrumental to the allocation of profits located in tax havens to source countries; e.g., Torslov et al. (2023) assumes that the strategic location of intangibles is the main channel of profit shifting in allocating profits shifted to tax havens.

[4] Klemm et al. (2021) detail how profit shifting affects the balance of payments and provide some aggregate cross-country evidence. See also Guvenen et al. (2022).

dominates profit shifting, accounting for €10 billion of missing profits in France in 2018, followed by trade in services (up to €6 billion) and debt shifting (€2 billion). These findings call into question the prevailing view that intangibles drive profit shifting, in line with the predominance of digital companies in global profits and tax scandals. They however align with prior studies showing limited evidence of tax avoidance through trade in services (Hebous and Johannesen, 2021; Garcia, 2022).[5] This discrepancy may reflect structural differences between the United States and a continental European country like France, where technology companies are less prominent.

The direct quantifications show significant profit shifting, totalling €18 billion or 0.7% of French GDP in 2018 across the three channels. In this respect, our paper challenges the micro-to-macro puzzle that emphasizes that estimated profit shifted based on transaction data are limited (Wier, 2020; Hebous and Johannesen, 2021; Crivelli et al., 2021). In comparison to indirect estimates derived from FDI income data, direct estimates however account for only half of the total missing profits in France. This discrepancy underscores unexplored blind spots in the literature on profit shifting.

We discuss potential sources of discrepancies and identify two missing information in existing direct estimates of profit shifted that could account for significant profit shifting. First, households imports of services from tax havens are not registered in trade in services data used in prior studies. Using cross-border credit card payment data, we show that those payments are large (more than €50 billion for France in 2022) and disproportionately concentrated on tax havens. Second, the literature on debt shifting focuses on inter-bank loans and intra-firm loans to non-financial corporations, overlooking other debt instruments and counterparties – such as bank loans to related non-financial corporations and debt securities – that exhibit significant liabilities toward tax havens. Incorporating these additional channels could partially reconcile direct and indirect estimates of profit shifting. Our results highlight the need to broaden the scope of transaction-level data analyzed to address this gap.

The paper is organized as follows. Section 2 reviews the takeaways from the literature on direct evidence of profit shifting. Sections 3, 4 and 5 present the empirical methodology, data, empirical evidence and quantification for the three main instruments of profit shifting: transfer prices in trade in goods, the location of intangibles and imports of services from tax havens, and debt shifting respectively. Section 6 provides an indirect

[5]See Section 2 for more details.

quantification of total profit shifted based on FDI income and stock data. Section 7 discusses potential blind spots of the literature and Section 8 concludes.

2 Literature review: direct evidence on instruments of profit shifting

Prior works provide evidence for all three instruments of profit shifting – transfer mispricing, intangible asset location and trade in services, and debt shifting –, but estimated magnitudes vary widely across countries and instruments. This section reviews direct empirical evidence on these three profit-shifting channels. For broader surveys, see Riedel (2018), Beer et al. (2020) or Dharmapala (2014).

The manipulation of transfer prices in intra-firm trade in goods has attracted the most attention. Table 1 lists the existing papers and their main results. It shows wide variation in estimated profit shifting across countries. These differences do not reflect differences in estimated semi-elasticities, which range from 0.22 and 0.65 except for Liu et al. (2017) and are not correlated with the estimated tax losses, but rather from country-specific characteristics. All but Davies et al. (2018) also find that all destinations are affected by transfer pricing and not only tax havens.

Table 1: Literature on transfer pricing in trade in goods

	Country	Year	Flow	Semi-elasticity	Estimated tax loss (% CIT)	Tax differential (pp)	Exports/GDP
Bernard and Jensen (2004)	USA	2004	Exports	0.65	0.3%	8.1	7.3%
Liu et al. (2017)	UK	2010	Exports	2.7	0.4%	-0.8	16.6%
Cristea and Nguyen (2015)	Denmark	2006	Exports	0.57	0.5%	-3.2	30.8%
Wier (2020)	South Africa	2014	Imports	0.51	0.5%	-5.0	39.2%
Davies et al. (2018)	France	1999	Exports	0.26	0.9%	2.4	19.4%
Vicard (2015)	France	2008	Exports	0.22	2.7%	5.3	20.5%
			Imports	0.24	2.2%		

Source: Wier (2020) and reference cited. Semi-elasticities are authors' preferred) semi-elasticities. Corporate tax differential vis-a-vis trading partners, weighted by exports. CIT: corporate income tax.

All papers are single-country studies using data for different countries at different periods. The major difference relates to the level of corporate tax rate: all countries but the US (Bernard and Jensen, 2004) and France (Davies et al., 2018; Vicard, 2015) are average tax countries. The export-weighted corporate tax differential is negative for South Africa in 2014 (-5.0 percentage points) and Denmark in 2006 (-3.2 pp), and close to zero for the UK in 2010 (-0.8 pp). These limited tax differentials constrain profit shifting through transfer pricing, resulting in lower estimated tax losses. The

US is specific: despite its high corporate tax rate, Bernard and Jensen (2004) find limited profit shifting through the manipulation of transfer prices, likely due to its trade openness compared to other economies.

The French case is particularly informative, as two papers estimate tax losses from transfer pricing at different points in time: Davies et al. (2018) find moderate losses as a percentage of total corporate income tax (CIT) in 1999, while Vicard (2015) finds substantially larger tax losses in 2008. To assess the contribution of transfer pricing to total profit shifting, these estimates must be considered in relation to total profits shifted over time. Wier and Zucman (2022) indeed underline that both global foreign MNE profits and profit shifted to tax havens have increased sharply since the late 1990s. For France, Vicard (2023) estimates that total profit shifted increased from €1 billion early 2000s to €36 billion in 2015. Consequently, the moderate tax losses in euro estimated by Davies et al. (2018) represent a large share of total profit shifted in 1999. Those differences across countries and over time underline the importance to jointly estimate different dimensions of profit shifting for a single country and at a specific point in time.

Topical evidence further underscores the role of transfer pricing as an instrument of tax avoidance. (Choi et al., 2020) report that "inspections by the Vietnamese tax authorities have found that 'the most common trick played by FDI enterprises to evade taxes was hiking up prices of input materials and lowering export prices to make losses or reduce profits in books'." In France, Cariou and Cordier (2019, p.70) document tax adjustments of more than €3 billion in 2017 under Article 57 of the General Tax Code relating to transfer pricing (out of €6 billion of total adjustments).

The strategic location of intangibles in tax havens and the associated exports of services to affiliates in high tax countries have received less attention. Dischinger and Riedel (2011) shows that MNEs disproportionately locate intangibles in lower-tax EU subsidiaries over the period 1995?2005, a pattern consistent with service-based profit shifting. The tax response of intangible asset location varies across countries (Griffith et al., 2014) and types of intangibles (Dudar and Voget, 2016).

More recently, Hebous and Johannesen (2021) use firm-level trade in services data for Germany in 2011 and show that firms are more likely to import intra-firm from tax havens in several categories of services (Intellectual property, Headquarter services, Information services and Financial services). The associated tax revenue losses are

however limited, in the order of 1 billion per year. Applying the same methodology to Portugal, Garcia (2022) finds no evidence of profit shifting through trade in services by multinational located in Portugal. She explains this finding through the extensive anti-avoidance policies enacted by the Portuguese tax authorities.

The existing literature therefore provides limited direct evidence of substantial profit shifted through the location of intangibles in tax havens and associated export of services to other affiliates of the MNE. This conclusion contrasts with the numerous high-profile media reports of tax avoidance schemes involving royalty payments on intellectual property.[6]

A substantial body of literature has investigated debt shifting, showing that internal debt varies systematically with the host-country tax rate or tax differential (e.g., Overesch and Wamser (2010), Buettner and Wamser (2013) and Egger et al. (2014) on German data, Altshuler and Grubert (2003); Desai et al. (2004) on US data and (Huizinga et al., 2008) on European firms). Estimated elasticities are however heterogeneous across papers (Egger et al., 2014). In a meta-analysis, Feld et al. (2011) find a semi-elasticity of 0.31 of the total debt ratio to corporate tax rate. Beer et al. (2020) however point out that the significant tax responsiveness found in studies investigating directly debt shifting does not translate into larger indirect estimates of profit shifted when using profit measures including interest expenses than excluding them, as would be expected. Additionally, these studies do not quantify the magnitude of profit shifted through the debt shifting channel.

Most of the literature has focused on non-financial corporations and loans as a debt instrument. Reiter (2021), however, investigates debt shifting in the banking sector and provides evidence of profit shifting through intra-firm loans. Cagala and Wabitsch (2023) focus on securities portfolios and find that banks provide their low-tax subsidiaries with capital at below market rate, thereby reducing their overall tax liabilities.

Finally, several papers assess the role of debt shifting through indirect evidence based on the location of MNE profits comparing results based on earnings before interests and taxation (EBIT) and profit before taxation (including in particular interest expenses). Heckemeyer and Overesch (2013) estimate that debt shifting accounts for one third of total profit shifting in a meta-analysis. In a more recent meta-analysis, Beer et al. (2020)

[6]See e.g., Samarakoon (2023) on the importance of the Double Irish in U.S. multinational companies' tax strategies.

find mixed results regarding the relevance of debt shifting, ranging from 0% to a quarter of total profit shifting response. Using British multinationals tax return data, Bilicka (2019) finds that 40% of the profit ratio gap can be explained by differences in leverage.

This paper contributes to the literature by providing a comprehensive, direct-evidence-based analysis of profit shifting instruments. Using firm-level data, we jointly investigate all three main instruments of profit shifting emphasized in the literature and quantify their relative magnitude. We also leverage data on the location of MNE profits to compare estimated profit shifted through direct and indirect evidence and discuss previously overlooked blind spots of the literature that could reconcile these estimates.

3 Manipulation of transfer pricing in intra-group trade in goods

This section focuses on trade in goods and investigates how prices on intra-firm trade varies systematically depending on the difference in corporate tax between the exporting and importing countries as evidence of tax-motivated mis-pricing in related party trade.

3.1 Methodology

Our methodology follows Cristea and Nguyen (2015), Vicard (2015) and Liu et al. (2017) in using detailed transaction level data on export by firm/product/destination together with information on the network of affiliates to identify intra-firm trade. Our identification strategy does not rely on the price level but on the price wedge between related party and arm's length exports on a destination-product market and its correlation with the corporate income tax rate of each partner country compared to France.

For a firm i exporting good k to destination country j at time t, we estimate the following equation:

$$\ln UV_{ijkt} = \beta_1 Intra_{ij} + \beta_2 Intra_{ij} \times TaxPos_{jt} + \beta_3 Intra_{ij} \times TaxNeg_{jt} + \theta_{ikt} + \theta_{jkt} + \epsilon_{ijkt}, \tag{1}$$

where UV_{ijkt} is the unit value as a measure of export prices, $Intra_{ij}$ is a dummy variable equal to one when trade is intra-firm. $TaxNeg_{jt}$ and $TaxPos_{jt}$ are the absolute values of the corporate tax rate differential between France and destination country j for negative

and positive tax differentials respectively. We include fixed effects in two dimensions: firm×product×year fixed effects control for all firm/product specific determinants of export such as product specific productivity; and the destination×product×year fixed effects account for all characteristics of destination market likely to affect the price wedge between intra-firm and arm's length trade.

β_2 and β_3 are our coefficients of interest. β_2 measures transfer mis-pricing on exports towards low-tax countries and is expected to be negative. β_3 measures transfer mis-pricing on exports towards high-tax countries; since France is already a high tax country (first to second among OECD countries over the period) and firms are less likely to shift profit to other high tax countries, we expect β_3 to be insignificant.

We restrict the sample to trade by affiliates and parents of multinationals because independent firms are a poor control group for multinational firms, which are on average larger, more productive and more export oriented than other firms. Since we aim at quantifying aggregate impacts of profit shifting through transfer prices, we estimate Equation 1 using weighted OLS. Standard errors are clustered at the country-year level.

3.2 Data

We use on detailed (administrative) firm level trade data from the French Customs matched with information on ownership of firms from Orbis and LiFi (see Appendix A for more details). The trade dataset produced by the French Customs (*Direction générale des douanes et des droits indirects*, DGDDI) provide information on export and import flows to/from all destinations at the Combined nomenclature 8 digit level for all firms located on the French territory.[7] For each flow, we have information on the annual value and quantities, so that we can compute unit values at the detailed product level. Quantities are reported in kilograms, but some products have additional measures of quantities (pairs, dozens, etc.) that we use when available.

3.3 Empirical results

Results are reported in Table 2. Column (1) does not distinguish between positive and negative tax differential and finds a semi-elasticity of 0.24, meaning that a 10 percentage

[7]Reporting is subject to different threshold for intra and extra EU origin / destination (see F. Bergounhon and Mejean (2018)).

point lower tax rate at destination compared to France reduces export prices in intra-firm trade compared to arm's length trade of similar products by 2.4%. Distinguishing positive and negative tax differential, column (2) shows that transfer mispricing occurs only to destination country with lower corporate tax rates than France, with a semi-elasticity of 0.32.

Column (3) shows that the results holds when excluding tax haven from the sample, confirming that transfer mispricing is not specific to tax havens. Column (4) introduces an interaction term between the intra-firm indicator variable, $Intra_{ij}$ and a tax haven dummy for the country of destination and finds no specificity of transfer prices in export to tax havens compared to other countries.

In column (5), we additionally control for log GDP per capita interacted, that may affect differently the pricing behavior in intra-firm and arm's length trade. Its interaction with the intra-firm indicator variable show a positive coefficient in line with Davies et al. (2018). Our benchmark results remain similar in this specification.

In column (6), we differentiate French and foreign multinationals, defined by the location of their ultimate owner. We add interaction terms between an indicator variable equal to one for French MNEs and the intra-firm indicator variable and its interactions with positive and negative tax differentials. The results show no differentiated behaviours in terms of transfer pricing for French MNEs: while intra-firm French prices are larger on average, the interaction term with the positive tax differential is close to zero and insignificant. Regarding negative tax differentials, note that the sum of the coefficients on $Intra_{ij} \times TaxPos_{jt}$ and its interaction with the French dummy is not statistically different from zero. Our results therefore do not support the existence of differences in transfer pricing between French and foreign MNEs.

Finally, column (7) introduces tax differentials non linearly using 6 groups: a group of negative tax differentials (i.e., destination countries with larger tax rate than France)[8] and 5 groups by quintile of positive tax differential. The results reported in Figure 1 show that transfer prices are significantly lower than arm's length prices for similar products for countries with significantly lower corporate tax rate (group 2 and lower), and the price wedge is increasing for countries with large tax differentials (group 4 and 5).

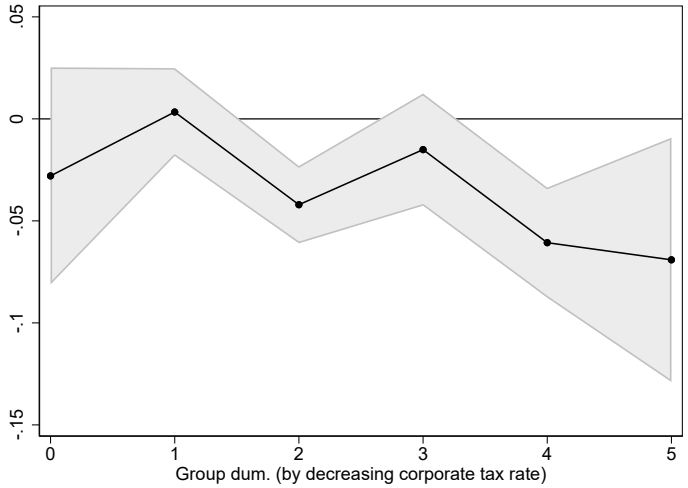
[8]Note that given the high level of corporate tax rate in France compared to OECD countries, most of French exports are towards low tax countries.

Table 2: Transfer mispricing on trade in goods

	(1)	(2)	(3)	(4)	(5)
Intra-firm	-0.010	-0.001	0.008	-0.035***	-0.229**
	(0.010)	(0.011)	(0.012)	(0.007)	(0.097)
Intra-firm × tax rate diff. < 0		-0.052	-0.010		-0.023
		(0.263)	(0.271)		(0.269)
Intra-firm × tax rate diff. > 0		-0.316***	-0.392***		-0.299***
		(0.099)	(0.116)		(0.094)
Intra-firm × tax rate diff.	0.242***				
	(0.086)				
Intra-firm × TH dum.				0.010	
				(0.016)	
Intra-firm × log GDP per capita					0.021**
					(0.009)
Intra-firm × EU dummy					0.024
					(0.017)
Constant	4.769***	4.767***	4.731***	4.772***	4.761***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sample	All	All	No tax havens	All	All
Observations	5,519,952	5,519,952	4,827,063	5,519,952	5,454,889
R-squared	0.997	0.997	0.997	0.997	0.997
FE Country*Product*Year	Yes	Yes	Yes	Yes	Yes
FE Firm*Product*Year	Yes	Yes	Yes	Yes	Yes

Note: Standard errors clustered for intra-group correlation at the country-year level in parentheses, with significance levels indicated with ^{c} for 10%, ^{b} for 5%, ^{a} for 1%.

Figure 1: Transfer mispricing on trade in goods by quintile



Note: by quintile of statutory tax differential (1 = lowest, i.e larger statutory tax rates). Group 0 stands for negative tax differentials (i.e., countries with larger tax rate than France). Coefficients are reported in column (1) of Table 17.

3.4 Quantification

The quantification is based on estimates from column (2) in Table 2 for both exports and imports. It assumes that quantity traded are fixed and only import and export prices respond to changes in tax differentials. Profit shifted are computed from the difference in predicted exports with and without tax differential included. The concentration of firm-level imports on a single source for a given product prevents estimating Equation 1, whose identification requires observing a firm trading the same product with multiple countries, on import flows. We therefore use the coefficient estimated on exports and apply them to observed import flows by firm/product/destination/mode.

Results are reported in Table 3. It shows that transfer mispricing reduces the value of total exports by 2.3% in 2018 and increases the value of total imports by 2.2%. Taken together, these quantifications suggest that 10 billion euros of profits are shifted out of France to low tax countries through transfer mispricing on trade in goods.

Table 3: Quantification: trade in goods

	Exports		Imports		Total
	value billion €	% of exports	value billion €	% of imports	value billion €
2018	-4.8	-2.3%	5.6	2.2%	-10.3

Note: Quantification based on column (2) in Table 2.

4 Trade in services with tax havens

We now turn to trade in services to identify the amount of profit shifted through the location of intangibles in tax havens and their associated cross-border transactions with affiliates. We assess at the firm level to which extent intra-firm imports from tax havens, compared to arm's length trade, are disproportionately large compared to imports from other countries. Two differences stand out compared to trade in goods. First, trade in service does not entail transport costs as the actual transport of goods does. Profit shifting through the location of intangibles in tax havens and charging affiliates for their services may therefore generate flows with no real substance or fictitious flows. Second, we cannot use unit values as a proxy of the unit price because services are by their very nature uncountable so that meaningful quantities cannot be collected. Following Hebous and Johannesen (2021), our empirical strategy therefore focus on the propensity of French firms to import services from affiliates located in tax havens, compared to trade with non-related parties, and identifies which categories of service are 'at risk' of tax avoidance. Equipped with those firm level estimations, we then quantify the aggregate profit shifted through trade in services.[9]

4.1 Methodology

We apply the framework developed by Hebous and Johannesen (2021) and estimate the following equation for a firm i importing from country j in year t:

$$T_{ijt} = \beta_0 + \beta_1 Intra_{ijt} + \beta_2 Intra_{ijt} \times TH_j + \gamma GDP_{jt} + \theta_i + \theta_j + \theta_t + \epsilon_{ijt} \ , \qquad (2)$$

where T_{ijt} is an indicator variable measuring either export or imports of services of firm i to/from country j. $Intra_{ijt}$ is a dummy variable indicating intra-firm trade at the firm-destination level. TH_j is a tax haven dummy. θ_i are fixed effects by firm, controlling for any firm specific determinants of trade, such as productivity. θ_j are fixed effects by partner country j that accounts for basic gravity type determinant of trade (distance, common language, regional trade agreement membership). And θ_t are year fixed effects. We additionally control for the GDP of the origin country j.

[9] We focus here on the standard form of profit shifting investigated in the literature involving intra-firm trade in services. Other business organizations, such as those that avoid permanent establishment status but sell services directly to firms or individuals in France from a subsidiary located in a tax haven, would not enter our estimates. We come back to this issue in section 7.

Our empirical strategy compares intra-firm trade and arm's length trade with tax havens and other countries, respectively, to identify tax induced trade in services. We control for the average propensity to trade intra-firm (via $Intra_{ijt}$) as well as the average propensity to trade with tax havens (through country fixed effects), and focus on the interaction between $Intra_{ijt}$ and TH_j. In case of profit shifting through the location of intangibles in tax havens, we expect a larger propensity to import intra-firm from affiliates located in tax haven countries, hence positive β_2.

We estimate Equation 2 separately for each category of services to identify 'at risk' services used in profit shifting schemes.

4.2 Data

We use micro-data from a survey conducted by Banque de France (*Enquête Complémentaire sur les Échanges Internationaux de Services*, ECEIS). The survey includes all '*Déclarants directs généaux*' (DDG) defined as firms exporting or importing more than €30 millions in a given year for a broad service category. When crossing this threshold, firms are required to report all their export and import flows of services with no minimum threshold of declaration. Data are for years 2013-2018.[10]

We merge information on service trade flows with information on trade credit provided by a dedicated survey, *Enquête sur l'état des créances et des dettes financières vis-à-vis des non-résidents* (EFI). This survey reports all trade credit stocks at the quarterly level for firms included in the 'Declarants directs généraux', distinguishing between trade credit with related parties and independent firms. Almost all trade transactions generate trade finance operations between the importer and the exporter, either through open account, cash in advance or letter of credit.[11] In the case of intra-firm trade, open account transactions are more likely and should appear in the EFI survey as trade receivables and payables from/to related parties. We therefore use instances of trade credit with related parties in a given country a given year as our indicator of intra-firm trade.

Table 4 reports descriptive statistics on trade in services, distinguishing between tax havens and other destination countries and intra-firm vs arm's length trade. We

[10] Note that imports and exports of services by individuals are not included in trade in services data. Any tax avoidance scheme involving direct cross-border payments for services by consumers is therefore not included in our estimates (we come back to this issue in Section 7).

[11] Antràs and Foley (2015) underlines that most common financing terms are cash in advance and open account, letter of credit accounting for 10% of transactions.

differentiate 7 categories of services: Intellectual property, R&D and IT, Information and Communication, Technical services, Other business services (including headquarter services), and Transport services. Total imports of services in our sample amounts to €58 bn. Tax havens represents a disproportionately large share of French imports of services compared to their economic size: they account for 17% of imports on average, ranging from 14% in transport to 24% in information and telecommunication. Close to two-thirds of these imports are with a related party according to our measure of intra-firm trade, and particularly in R&D and IT services (82%), Other business services (81%) and Intellectual property services (71%).

4.3 Empirical results

The results of the estimation of Equation 2, presented in Table 5, show an excess propensity to import intra-firm from tax havens in 4 out of the 7 service categories analyzed, namely Intellectual Property, Information and Communication, Financial services and Other business services. Our results therefore yield support for a number of services flows serving tax avoidance schemes. Note that the 'at risk' services identified on French data are similar to those identified by Hebous and Johannesen (2021) on German data, except for transport services for which they find significant excess imports on maritime and road transport services.

The generous tax credit on R&D spending in France ('Crédit Impôt recherche', CIR) may explain the limited incentive for French firms to locate their research activities abroad and import R&D services. Under the CIR, French firms are entitled to a 30% tax credit on their R&D spendings, up to 100 millions euros (at the firm level), and 5% above. In 2020, France had the second most generous tax support for business R&D as a percentage of GDP among OECD countries.[12]

Comparing the coefficients on $Intra_{ijt} \times TH_j$ to $Intra_{ijt}$ shows a significant excess propensity to import intra-firm from tax haven. Excess import ranges from 17% of the baseline in Other business services to 50% in Intellectual Property, 75% in Information and Communication, and 173% in Financial services.

We do not find similar results for exports (see Table B in appendix B), except for

[12]OECD R&D Tax Incentives database, April 2023. France also offers a patent box regime that provides for a lower 15% corporate tax rate on incomes from IP assets (for firms that carry out R&D activities in France), instead of the 33.3% statutory tax rate prevaling in 2018.

Table 4: Import of services by category and origin (2018)

		Intellectual property	R&D and IT	Information Communication	Technical services	Other business services	Financial services	Transport
Tax Havens	Total	1 212	2 012	646	2 270	822	697	2 397
Tax Havens	of which intragroup	863	1 629	343	1 205	666	561	1 249
Tax Havens	of which with third party	349	383	302	1 065	156	136	1 148
Others	Total	4 836	8 178	2 147	11 889	3 110	2 883	14 838
Others	of which intragroup	4 353	7 342	1 502	8 651	2 403	2 612	5 419
Others	of which with third party	483	835	645	3 238	707	272	9 418
Total (sample)		6 048	10 190	2 793	14 160	3 932	3 580	17 234
Total (BoP)		12 142	27 629	7 255	43 262	15 897	6 376	45 743

Table 5: Regression results on imports of services

	IP	R&D and IT	Info. & Com.	Technical Serv.	Other business	Financial Serv.	Transport
Intragroup	0.064***	0.163***	0.036***	0.233***	0.206***	0.049***	0.185***
	(0.014)	(0.017)	(0.011)	(0.022)	(0.019)	(0.015)	(0.023)
Intragroup × TH	0.032*	0.018	0.027**	−0.029**	0.035*	0.085***	0.012
	(0.018)	(0.016)	(0.012)	(0.014)	(0.018)	(0.021)	(0.019)
GDP	−0.002	0.002	0.003	0.003	0.003	0.004*	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Num.Obs.	177 406	317 001	191 080	464 329	297 888	149 548	319 288
R2	0.204	0.303	0.315	0.321	0.283	0.378	0.322
FE country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE time	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

financial services, for which we find a positive and significant coefficient but of lower magnitude than for imports. The absence of significant excess exports of services to affiliates in tax havens supports the profit shifting interpretation of excess imports from affiliates in tax havens.

Table 18 in appendix C underlines that French and foreign MNEs use trade in services as an instrument of profit shifting in different service categories. French MNEs exhibit a significant excess propensity to import from tax haven affiliates only on Other business services and Financial services. On the other hand, we find a positive coefficient on the interaction term between Intra-firm trade and Tax haven in Intellectual property, Information and communication services, and Transport services for foreign multinationals.

4.4 Quantification

The quantification of the aggregate impact of profit shifting through trade in services draws on the at-risk-services identified in Table 5. We take an upper bound and consider all intra-firm imports in at-risk-services from tax havens as profit shifting. Since our firm-level dataset covers 40% of these service categories (Table 4), we also compute an out-of-sample prediction by adjusting each service import flow by the share of the survey sample in total French imports. Since the survey covers the largest service traders, multinational firms are more likely to be included so that profit shifting is likely over-represented in our firm level sample compared to total French exports, so that we again consider an upper bound. The results are reported in Table 6.

On our sample, profit shifted through imports of services from tax haven affiliates are estimated to €2.4 billion. This quantification underlines that only up to a limited share of imports of services from tax havens (24%) can be attributed to profit shifting. Finaly, when applying the out-of-sample adjustment, we find that profit shifting through intra-firm trade in services is estimated to up to €6.3 billion.

5 Debt shifting

The third main instrument of profit shifting is debt shifting and the associated interest payments to related party. Since interests are generally tax deductible, the strategic location of intra-group debt may therefore be used to reduce the tax load at the MNE

Table 6: Quantification: total at risk service imports from tax havens

Sample:	(1) In-sample: % of trade	(2) DDG billion €	(3) Total billion €
2018	4.1%	2.4	6.3

Note: Out-of-sample adjustment based on the sample by service category (as reported in last rows of Table 4). At risk services include all intra-firm imports from tax havens identified in Table 5.

level.[13] We focus in this section on intra-firm loans within MNEs and compare the debt position of French affiliates with respect to affiliates located in tax havens. We then use interest rates to convert excess debt position to related parties in tax haven into profit shifted.

5.1 Methodology

Our identification strategy exploits the bilateral dimension of debt positions between affiliates within MNE to identify excess borrowing from affiliates located in tax havens.[14] More specifically, we follow Reiter (2021) and estimate the following equation for any MNE affiliate i and foreign country j in year t:

$$\frac{IntNetDebt_{ijt}}{TA_{it}} = \beta_0 + \beta_1 TH_j + \beta_2 X_{jt} + \theta_i + \theta_t + \epsilon_{ijt}. \tag{3}$$

TH_j is a tax haven dummy for counterparty affiliates located in a tax haven. We alternatively use the corporate tax rate of country j as a measure of the tax incentives to shift profit to country j. X_{jt} are a set of country specific and bilateral determinants of cross-border borrowing, including domestic credit as a share of GDP, as a proxy for the development of the credit market in country j, and an indicator of rule of law measuring the quality of domestic institutions. (Log) GDP and (log) distance are standard gravity variables which have been shown to affect international banking finance (Brei and von Peter, 2018). Year fixed effects, θ_t, control for all common national and international

[13] Thin capitalization rules cap the amount of debt for which the interest remain tax deductible. France was an early adopter of thin capitalization rule in 1979 (Blouin et al., 2014).

[14] Following Huizinga et al. (2008), several papers rely on affiliate level data that do not feature the bilateral dimension of debt shifting. Overesch and Wamser (2014), Egger et al. (2014) and Reiter (2021) exploit the bilateral information on internal debt of the German data.

shocks affecting economic and borrowing conditions. Finally, firm fixed effects, θ_i, control for all firm and group characteristics.

The internal debt position is measured as intra-firm liabilities net of intra-firm claims borrowed by affiliate i from related affiliates in country j, to take into account the role of conduit entities within MNE that solely pass-through debt liabilities between affiliates located in different countries (Reiter, 2021). When net claims or larger than net liabilities, no profit can be shifted for a given interest rate so that we define net debt as: $IntNetDebt_{ijt} = max(InternalLiabilities_{ijt} - InternalClaims_{ijt}; 0)$. Bilateral net debt is divided by total assets to account for firm size.

We therefore compare bilateral internal net borrowing from affiliates in tax havens to borrowing from affiliates located in other countries for a given French affiliate i. In case of profit shifting to low tax affiliates through tax shifting, we expect a positive estimated β_1, i.e., excess borrowing from tax haven affiliates. Given structural differences in the role of debt in the banking sector and the rest of the economy, we estimate Equation 3 separately for non-financial corporations and banks. Standard errors are clustered by firm i.

5.2 Data

We use two distinct data sources collected by Banque de France to investigate debt shifting: one for non-financial corporations and another for credit institutions and investment firms, which we will refer to as banks for convenience.

For banks, we use microdata constructed from the Devi-Situ and Situation collections in a format consistent with the Locational Banking Statistics (LBS) of the Bank for International Settlements (BIS). For each bank in our sample, we can track its domestic and cross-border lending and borrowing activities on a quarterly basis.[15] The dataset reports outstanding debt stocks and provides information on the counterparties' countries in cross-border activities. For bank-to-bank cross-border lending and borrowing, we can distinguish intra-group activities from non-group activities.[16] We focus on intra-group information and use data at the bank×country level for the period 2014-2018.

For non-financial corporations, we use data from the EFI survey, which reports financial positions with foreign counterparties. The structure and composition of the

[15]The data exclude securities and derivative activities; we discuss this in greater detail in Section 7.
[16]This information is not available for non-banking counterparties

EFI data are similar to the banking data, with two key differences. First, EFI applies a reporting threshold, and includes all firms with total foreign positions – both assets and liabilities combined – exceeding €10 million. Second, EFI data combine quarterly reports from large firms (*Déclarants Direct Généraux*) and annual reports from smaller firms obtained through surveys. However, the survey design provides limited information on counterparty countries - they report only their top three counterparties - and is therefore insufficiently detailed for our identification strategy. We therefore disregard the survey data; our final dataset includes 84% to 91% of the total foreign financial positions recorded in the EFI database.

For non-financial firms, we additionnaly use information on total assets from the FARE database produced by INSEE and the French Ministry of Finance (DGFiP) that provides financial information from tax reports. This information is not available for banks; we use as proxy for total assets the sum of their outstanding loans, as recorded in the LBS.

5.3 Empirical results

Results are reported in Table 5.3. Columns (1)-(3) report results for non-financial corporations and columns (4)-(6) for banks. Our results show significant debt shifting to affiliates located in tax havens for both sectors of the economy.

Comparing alternative measures of incentives to shift profit, only the tax haven dummy is significant and positive as expected (column (1)) while the tax differential is not significant (column (2)). This suggest that debt shifting occurs mainly to tax haven and not other low tax countries. We then differentiate large European tax havens (Ireland, Luxembourg and Switzerland) and other tax havens, and find only the coefficient on European tax haven to be significant for non-financial corporations (column (3)).

Results for banks show similarly significant debt shifting to tax havens (column (4)).[17] While the coefficient on European tax havens is larger than for other tax havens, we still find significant debt shifting to other tax havens contrary to the case of non-financial corporations.

The semi-elasticity on the tax haven dummy estimated in column (2) of Table 5.3 for non-financial corporations imply that intra-group net debt is 0.002 percentage points

[17] Note that the significant coefficient on tax differential in column (5) is no longer significant when controlling for bank×year fixed effects; see below and Table B .

Table 7: Regression results on debt shifting
Table 8:

	(1)	(2)	(3)	(4)	(5)	(6)
Corporate Tax Rate		0.000			0.011***	
		(0.000)			(0.003)	
TH dummy	0.002**		0.000	0.671***		0.535***
	(0.001)		(0.000)	(0.105)		(0.091)
TH Europe			0.004**			0.505**
			(0.002)			(0.238)
Domestic credit	0.000	0.000	0.000	0.000	0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Rule of Law	0.001***	0.001***	0.001***	0.057***	0.119***	0.053***
	(0.000)	(0.000)	(0.000)	(0.020)	(0.028)	(0.019)
Log GDP	0.000	0.000**	0.000	0.213***	0.133***	0.204***
	(0.000)	(0.000)	(0.000)	(0.033)	(0.022)	(0.032)
Log distance	0.000	0.000	0.000	−0.564***	−0.558***	−0.531***
	(0.000)	(0.000)	(0.000)	(0.077)	(0.077)	(0.075)
Num.Obs.	144 504	144 504	144 504	258 636	258 636	258 636
R2	0.914	0.914	0.914	0.153	0.151	0.153
FE time	Yes	Yes	Yes	Yes	Yes	Yes
FE firm/bank	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Errors	Firm	Firm	Firm	Bank	Bank	Bank

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

higher vis-à-vis subsidiaries located in tax havens than those located in other countries. Given the mean net debt ratio of 0.004, it corresponds to a 50% higher intra-firm net debt with tax haven subsidiaries. The corresponding figure for banks is 0.67 percentage points (column 5 of Table 5.3), for a mean net debt ratio of 0.57, corresponding to a 117% increase.

In Appendix Section B, we provide robustness analysis using the intra-firm liability instead of intra-firm net liability as dependent variable (columns (1)-(6) of Table B). For banks, we additionally include bank×year fixed effects to control for all time variant characteristics of bank i, and in particular total assets than we cannot control as for non-financial corporations (columns (7)-(9) of Table B). Our results remain qualitatively and quantitatively similar, except for the coefficient on corporate tax rate for banks that is no longer significant when including bank×year fixed effects.

We also test for different behavior by French and foreign MNEs regarding their use debt shifting. Results are provides in Table C in Appendix Section C. We find in particular that, unlike foreign non-financial corporations, French non-financial corporations do not use the location of intra-firm debt in tax haven as an instrument of profit shifting. The tax haven coefficient is however positive and significant for both French and foreign banks, the later using more intensively the large European tax havens as debt location (column (4)).

5.4 Quantification

The quantification of profit shifted through debt shifting follows two steps. First we quantify excess intra-firm debt stock in tax haven from specifications (1) and (4) in Table 5.3 for non-financial corporations and banks respectively. Second, we convert excess intra-firm debt stock into interest payments to assess their impact on profits declared by French affiliates. We use as interest rate the average effective interest rate on new cash loans granted to NFC (from Banque de France) and the average interbank rate for banks.

The results reported in Table 9 show limited amount of profits shifted to tax havens by non-financial corporation due to both a limited estimated excess debt and low interest rates. For banks, our quantification show estimated profit shifted at €1.4 bn in line with the larger estimated excess intra-firm debt in tax havens.

Table 9: Debt shifting: quantification

	Non financial corporations			Financial corporations		
	Excess debt in tax havens (bn EUR)	Interest rate %	Profit shifted (bn EUR)	Excess debt in tax havens (bn EUR)	Interest rate %	Profit shifted (bn EUR)
2018	11.1	1.7	0.2	114.9	1.2	1.4

Note: Quantification based on columns (1) and (4) in Table 5.3.

6 FDI income: estimated profit shifted based on indirect evidence

This section estimates the total amount of profits shifted out of France using indirect evidence from the location of profits of French parent multinationals and their affiliates

to benchmark our direct estimates from channels of profit shifting to total profit shifted.

6.1 Methodology

We follow Vicard (2023) and estimate how the return on assets of affiliates within an MNE varies systematically with the corporate tax rate of their host country. In a global capital market equilibrium, returns on assets across affiliates of a given multinational company are expected to be equalized since the multinational arbitrage across different FDI locations depending on their expected after-tax return. In this framework, systematic higher tax return on FDI in affiliates located in high tax countries can be interpreted as evidence of profit shifting. Total profit shifted can then be recovered from micro-data on FDI yield and stocks for all French parents and foreign affiliates.

More specifically, we estimate the following equation for parent j holding affiliates in country i in year t:

$$i_{ijt} = \beta_0 + \beta_1 TaxDiff_{it} + FE_{jt} + \epsilon_{ijt}. \tag{4}$$

i_{ijt} is the yield of affiliates located in country i held by parent j. It is computed as the ratio of FDI income from affiliates located in country i in year t (which includes both dividends and reinvested earnings) to the stock of FDI in year $t-1$.

$TaxDiff_{it}$ is the difference between the corporate tax rate in France and in country i. Alternatively, tax incentives to locate profits in affiliates located in i are measured using a variable equal to one when country i is a tax haven (TH_i). FE_{jt} are fixed effects in the parent×year dimension that control for the average level of profitability at the multinational firm level (productivity, mark-up, intangible assets, etc.). Standard errors are clustered at the country level.

Tax-motivated profit shifting would generate deviations in after-tax yields related to tax differentials between France and the country where subsidiaries are located, while arbitrage opportunities in international investments equalize after-tax yields on investments across locations for a given MNE. We expect $\beta_1 > 0$ in the case of profit shifting by parent firms locate in France.

6.2 Data

Data are from confidential firm level data on FDI stocks and FDI income from foreign affiliates collected by the Banque de France in the making of the balance of payment statistics. The dataset used merges information from three sources: the survey of direct investment abroad, which collect information on resident multinational firms and their investment abroad, the FIBEN database (*FIchier Bancaire des ENtreprises*) and balance sheet data fom ESANE provided by INSEE, the French statistical institute. Data are supplemented by information from the ACPR on the banking sector. The dataset includes information on foreign affiliates directly held by the parent company located in France. Information on affiliates indirectly held through other foreign affiliates is not reported but the chain of direct investment relationships shall appear in FDI flows and stocks of the first affiliate.

The dataset includes detailed information on a yearly basis on the stock of FDI assets and liabilities and the associated flows of FDI income for each parent-affiliate pair for all parents and affiliates resident in France. Information is aggregated at the parent-country-year level because no identifier enables matching stock and income flow data of affiliates from the same parent located in the same country. We use data for the period 2012-2018. In the balance of payment definition, FDI income is after tax income and includes both dividends distributed to the parent company and reinvested earnings, defined as undistributed after-tax operating income of the foreign subsidiaries and equity interests attributable to the parent company (i.e., depending on the ownership share).

6.3 Empirical results

Table 10 reports the results from estimating Equation 4. It shows a positive and significant coefficient on the tax differential. A 1 percentage point larger tax differential leads to a 0.27 (column (1)) increase in the return on FDI on affiliates located in this country. Results in columns (2) and (3) do not show any additional impact of tax haven status above and beyond tax differentials. The rest of Table 10 confirms that the positive and significant coefficient on tax differential is robust to controling for gravity determinants (column (4)), country fixed effects (column (5)) and country risk (column (6)).

Figure 2 additionally allow for non linear effect of tax on return on FDI. It presents tax differential depending on the decile of statutory corporate tax rate. Return on assets

Table 10: Corporate tax differential and return on FDI

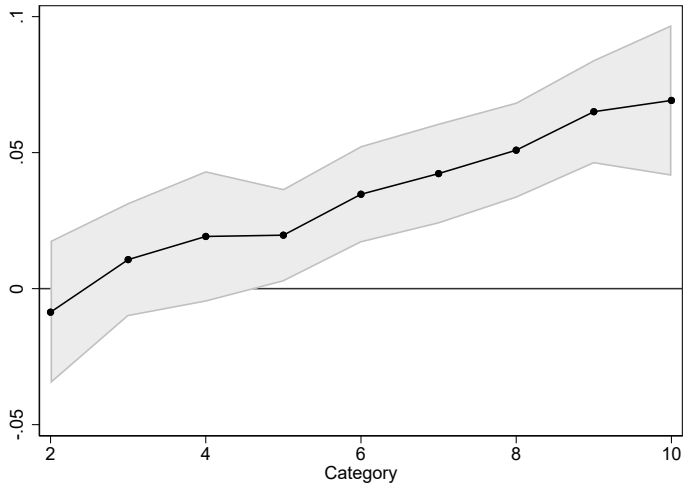
	(1)	(2)	(3)	(4)	(5)	(6)
Corporate tax rate diff.	0.27^a	0.26^a	0.25^a	0.24^a	0.23^c	0.25^c
	(0.04)	(0.04)	(0.04)	(0.06)	(0.13)	(0.13)
Tax haven dummy		0.02	0.01	0.00		
		(0.02)	(0.01)	(0.01)		
Corporate rate diff. × Tax haven dum.		-0.08				
		(0.10)				
(log) distance				-0.02^b		
				(0.01)		
Contiguity dummy				-0.01		
				(0.01)		
Common language dummy				0.01		
				(0.01)		
Time difference dummy				0.00		
				(0.00)		
EU dummy				-0.02^c		
				(0.01)		
RTA dummy				-0.01		
				(0.01)		
(log) country risk						0.01
						(0.02)
Constant	0.09^a	0.09^a	0.09^a	0.24^a	0.10^a	0.09^a
	(0.00)	(0.00)	(0.00)	(0.07)	(0.01)	(0.02)
Observations	24,873	24,873	24,873	17,243	24,863	24,673
R-squared	0.31	0.31	0.31	0.31	0.33	0.33
FE MNE × years	Yes	Yes	Yes	Yes	Yes	Yes
FE country	-	-	-	-	Yes	Yes

Note: Standard errors clustered for intra-group correlation at the country level in parentheses, with significance levels indicated with ^{c} for 10%, ^{b} for 5%, ^{a} for 1%.

increases when affiliates are located in countries in bins with lower corporate tax rate (right of the horizontal axis). The confidence interval includes 0 up to the fifth decile, suggesting that multinationals shift profits to countries with large enough differential only. Returns of FDI then increases up to 6 percentage points for affiliates located in countries in the lowest decile of corporate tax rates.

Finally, columns (2) and (3) in Table 16 in Appendix C differentiate between French and foreign MNEs and do not find significant differences regarding the geography of their return on FDI.

Figure 2: Tax differential and return on FDI: by decile of statutory tax rate



Note: by decile of tax differential (1 = lowest, i.e larger statutory tax rates). Coefficients reported in column (4) of Appendix C Table 16.

6.4 Quantification

Total missing profits in France are quantified using the results from column (1) in Table 10. We compute the aggregate FDI income with and without profit shifting by predicting yields on FDI in Equation 4 with and without tax differential and multiplying by the observed FDI stock in $t-1$. The difference in aggregate flows from the two predictions gives missing after tax profits in France due to profit shifting. To get missing before tax profit, we need to add taxes paid abroad (and not paid in France on the liability side). Missing (before tax) profits are an indirect estimation of profit shifting that can be compared to direct evidence on specific instruments.

Table 11 reports the results separately for the asset and liability sides. For 2018, it

Table 11: Profit shifting and missing profits in France

	Missing profits		
	Assets	Liabilities	Total
Benchmark	26.0	-14.6	40.6
Fixed effects	22.8	-12.8	35.5
Non linear	31.5	-17.5	49.0

Note: Quantification based on column (1) in Table 10.

shows total missing profit of €40.6 bn. In line with positive French FDI position, the majority of estimated profit shifted come from the asset side, i.e., foreign subsidiaries of French parents located in lower tax countries. Table 11 also reports estimated missing profits in France using two alternatives specifications for quantification. Using the country fixed effects specification of column (5) in Table 10 yield lower estimated missing profits at €35 billion. Using the non linear specification in column (4) of Appendix C Table 16 yield estimated missing profits of €49 bn.

Our 35-49 €bn estimation range for missing profits in France in 2018 is close to macro based estimates. Torslov et al. (2023) propose an estimate of missing profits worldwide and their distribution by country, based on national accounting data for tax havens, i.e., countries at the other end of tax avoidance. Their updated figures (Torslov et al., 2021) estimate at €41 billion shifted profits for France in 2018, in line with estimates based on firm level data in Table 11.

7 Discussion and limitations: blind spots

Direct estimates of profit shifting for the three channels (€17.9 billion total) are significant but account for only half of the indirect estimates from Section 6 6. Transfer mispricing in goods trade (€10 billion) is the dominant channel, followed by services (€6.3 billion) and debt (€1.6 billion). This section discusses the sensitivity of these estimates to alternative specifications and explores potential blind spots in the literature.

7.1 Alternative quantifications

We present sensitivity analysis of our quantifications along two dimensions: using specifications differentiating French and foreign MNEs when their uses of specific instrument diverge and using different definition of tax havens. Empirical results for each instrument

are reported in Appendix C and D, and quantification results in Table 12.

When differentiating French and foreign MNEs in their use of different instruments of profit shifting, we do not find any difference in their use of transfer pricing in trade in goods (column (6) of Table 2). They however differ in their use of imports of services from tax havens and debt shifting. Table 18 shows that French MNEs have excess intra-firm imports of Other business services and Financial services from tax havens, while foreign MNEs use import transaction on Intellectual property, Information and Communication and Transport. Regarding debt, we find that both French and foreign banks are disproportionately indebted to their tax haven affiliates, but to a larger extent for foreign banks. On the contrary, only foreign non-financial corporations are found to use intra-firm debt as an instrument of profit shifting (Table C).

Table 12 reports the quantification of profit shifted through each instrument based on specifications differentiating French and foreign MNEs. Compared to the baseline estimates (first row), the estimate does not change for transfer mispricing but is reduced for both imports of services and indebtedness to affiliates in tax havens. Total profits shifted are 21% lower in this alternative specification but remain significant at €14 billion or 0.6% of GDP.

Second, we test the sensitivity of our results to the definition of tax havens. We use an alternative list of tax havens proposed by Torslov et al. (2023), including in particular Belgium and the Netherlands which were not listed in Hines (2010). Results are reported in Table D and D of Appendix D. Transfer mispricing remains driven by tax differential instead of tax haven status when controlling for additional variables as in our main regressions (columns (3)-(5) in Table 17). For trade in services, we find a reduced number of categories at risk of profit shifting, namely Intellectual property and Financial services. On the contrary, we find more widespread debt shifting for non-financial corporation and qualitatively similar effect on banks.

Turning to quantifications presented in the third row of Table 12, we find similar amounts for transfer pricing in trade in goods and smaller amounts shifted through imports of services from tax haven affiliates. The estimated amount of profit shifted through the location of intra-firm debt in tax haven is however slightly larger than in the benchmark case but still rank third behind other channels of profit shifting. Total profit shifted are in-between the benchmark case and the case differentiating French and

foreign MNES.

This sensitivity analysis shows that, if anything, alternative quantifications reinforce the dominant role of transfer mispricing in total profit shifted identified through indirect evidence. The total amount of profit shifted is slightly lower in the two sensitivity analysis presented in Table 12, but they remain significant overall at €14-15 billion.

Table 12: Alternative quantifications

	Goods	Services		Debt			Total
		In-sample	Total	Banks	NFCs	Total	
Baseline	10.0	2.4	6.3	1.4	0.2	1.6	17.9
French / foreign MNEs	10.0	1.3	3.2	1.0	0.0	1.0	14.2
Alternative TH list	10.0	1.4	2.7	1.5	0.3	1.8	14.5

Note: Quantifications are based on column (1) of Tables 2 for trade in goods, Tables 18 and D for imports of services respectively, and columns (1) and (3) in Tables C and D for debt.

7.2 Blind spots

Several blind spots of the literature could help closing the gap between direct and indirect estimates of profit shifting. We discuss two of them and provide descriptive evidence showing that they are likely to be quantitatively relevant: import of services by households and other debt assets not usually included in previous work.[18]

Digital imports of services from tax havens: The digitization of the economy has allowed increasing digital trade, by households in particular, which in not captured in trade in services import statistics collected by central banks nor in trade in goods data collected by customs due to reporting thresholds. Such trade flows may be substantial, and give rise to profit shifting by locating sales in a tax haven or a low tax country and avoiding the creation of a permanent establishment and taxation by the source country (Laffitte and Toubal, 2022). By focusing on intra-firm imports of services from tax havens, following Hebous and Johannesen (2021), Section 4 does not cover this channel of profit shifting through digital imports from tax havens.

We use credit card payments to provide an order of magnitude of digital imports for France in 2022, and their potential for profit shifting to tax havens. Data are from

[18]The literature points to other channels of tax avoidance by MNEs, including the use of hybrid financial instruments (Johannesen, 2014; Hardeck and Wittenstein, 2018) and treaty shopping (Van't Riet and Lejour, 2018; Hong, 2021), for which empirical evidence remain scarce.

the PID database collected by Banque de France from bank declarations for all origin countries (see Appendix A.2 for more details on the database). The data are broken down by merchant category code (MCC), describing the primary business of the merchant involved in the transaction. It shows that services account for close to three quarter of the value of cross-border digital transactions (Gigout and Lavenant, 2025). The database includes all cross-border transactions made online by French credit cards holders, including professional cards, but the sectoral composition largely correspond to households consumption. For digital platforms, the payment includes all the payment and not only the commission of the platform (including e.g., flat rental that will be transferred to the owner for a rental platform).

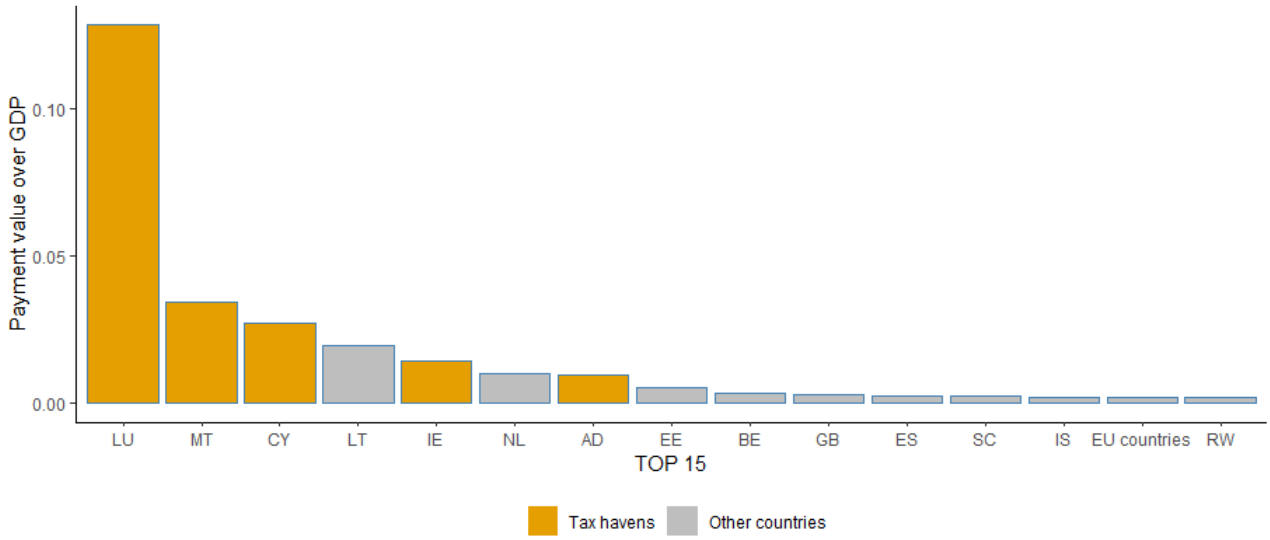
Figure 7.2 plots total payments by French credit card holders divided by the GDP of the counterparty country for the first 15 countries. It shows that the geography of French digital payments is biased towards tax havens, and in particular Luxembourg, Malta, Cyprus and Ireland. Payments to tax havens amount to €20.5 billion, against €36 billion for the rest of the world (of which €9.8 billion for the Netherlands).

For the sake of comparison, we compute a raw measure of 'excess' payments to tax havens, defined as the excess digital payments compared to a 'standard' country as measured by the ratio of the value of digital transactions by French credit card holders divided by GDP. Note that excess payment measured here correspond to gross turnover, and not profits. Excess payments to tax havens equal to €18.9 billion when using as benchmark the average over all countries worldwide excluding tax havens, and €16.1 billion when using the average across EU countries excluding tax havens.

Restricted information on debt: A second source of discrepancy between direct and indirect evidence of profit shifted relates to the scope of analysis on debt shifting. Most of the literature (and the analysis presented in Section 5) focuses on loans of non-financial corporations or within the banking sector. Doing so, it restricts both the sample of counterparties and asset classes considered. Such restricted focus largely reflects the availability of information on the nature, intra-firm or arm's length, of international debt instruments.

Table 13 lists the counterparty and asset types missing from our quantifications presented in Section 5 and in the literature in general. It also present the corresponding liability stocks abroad and in tax havens as a measure of the order of magnitude of the

The geography of digital imports: top 15 countries of origin



Note: cross-border digital payments by French credit card holders by country of counterparty divided by GDP. Data are from the PID database for year 2022.

potential for profit shifting through each debt instrument and counterparty.

Starting with the banking sector, the first row of Table 13 provides the corresponding figures for inter-bank loans investigated in Section 5 for comparison. Loans by banks to non-banks counterparties (row 2) are also large and the stock borrowed from tax havens is of similar magnitude as bank-to-bank loans (€131 billon vs. €166 billion). For these transactions, we can recover information to allocate liabilities to intra-group and arm's length stocks from the Devi-Situ database (used in Section 5) but only starting in 2023. We report in the last column of Table 13 the share of intra-group liabilities from banks to non-banks in tax havens computed using the corresponding share of intra-firm loan stocks in 2022. It shows a larger share of intra-firm liabilities in tax havens for bank loans to non-banks (81%) than to banks (72%).

Debt securities are also an important financing vehicle for banks, including intra-firm, which can be used to shift profit to low tax countries (Cagala and Wabitsch, 2023). The stock of debt equity liabilities with respect to tax haven stands at €139 billion for banks, an amount similar to inter-bank loans, which represents 23% of the total debt equity liabilities of French banks. The intra-firm or arm's length nature of debt securities is however not available. Including additional counterparty and assets could therefore more than double the estimated profit shifted by banks through debt shifting compared to Section 5.

For non-financial corporations, estimated profit shifted through debt in Section 5

is limited despite a large share of intra-group loans from affiliates in tax havens (row 4). Debt securities, however, appears as an important financing tool for them: the outstanding debt securities liabilities is larger than their total loans (€ 573 vs. € 304 billion), but the French data do not provide information on their nature and counterparty country.

Finally, non-bank financial corporations (row 6) also issue large amounts of debt securities that could increase estimated profit shifted through the location of intra-firm debt in tax havens.

Table 13: Blind spots: debt assets

	Counterparty	**Instrument**	**Liabilities**		
			Total	**TH**	**Intra-group in TH**
			€ billion		
Banks	Banks	loans	786	166	72%
Banks	Non banks	loans	456	131	81%*
Banks	All	debt securities	612	139	-
NFC	All	loans	304	86	91%
NFC	All	debt securities	573	-	-
Non-bank financial	All	debt securities	259	-	-

* allocation based on 2023 data featuring intra-group and arm's length information.
Source: Devi-Situ database.

8 Conclusion

This paper addressed three questions: (i) the relative importance of the main profit-shifting channels, (ii) whether direct micro-level estimates align with indirect macro-level evidence, and (iii) the remaining blind spots in the literature.

We find econometric evidence in favor all three instruments of profit shifting using micro-data on cross-border transactions for France. Quantitatively, transfer mispricing in trade in goods with related parties emerges as the dominant channel of profit shifting in the case of France in 2018, followed by imports of services from tax havens and debt shifting.

Quantifications based on direct evidence from micro-data do yield significant amount of profit shifted but fall short of estimated profit shifted from indirect evidence based on MNE profits. We identify two blind spots of the literature – digital imports from tax havens and other debt assets and counterparty not considered in the literature – likely

to broaden the coverage of profit shifting and that could partly bridge the gap between micro and macro estimates.

Our work underlines the importance of providing a broad assessment of profit shifting. While the instruments investigated in the literature already provide evidence of sizeable amounts of tax avoidance by MNEs, other types of cross-border transactions may also contribute significantly. We provide descriptive evidence for some transactions likely to serve profit shifting, but leave the study of these alternative channels for future work. Our results also underline the importance of comparing results across countries: different tax systems and economic structure may give rise to different channels of profit shifting in different countries.

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A Data

A.1 Ownership data

Ownership data from Liaison Financière (LiFi) matched with Orbis. LiFi is used to identify affiliates and parent in the population of French firms and their ultimate parent in France or abroad. We then use Orbis to link ultimate parents to their network of affiliates worldwide.

Orbis data used to construct the multinational group structure is a snapshot available for 2019 (same as Liu et al. (2017) or Johannesen et al. (2016)). Information on ultimate ownership for affiliates up to 10 levels... May miss some affiliates in tax havens (Johansson et al. (2017) report that 184 out of a sample of 266 US multinationals with tax haven affiliates are identified; but on data over 2000-2010, the coverage of the ownership data having improved since then).

Our matching algorithm allows us to trace the ultimate parent of French affiliates and link it to the intra-group network of affiliates worldwide. We start from the information on affiliate status and ultimate owner reported in LIFI (deemed more reliable since it is constructed from various sources, including administrative data and Diane, the French part of Orbis).

The matching algorithm has 3 steps: ....

In our analysis, by restricting the sample to affiliate only, we also drop affiliates for which we do cannot trace the ultimate owner in Orbis.

A.2 Digital Payments data: Paiements Internationaux à Distance

The data comes from the PID database (Paiements Internationaux à Distance), compiled by the Banque de France using information reported by commercial banks operating in France. It covers all transactions – both online and in-person – made by French cardholders (including professional cards) worldwide, including within France. While all card types are included, most transactions originate from households, according to the sectors of transactions.

In 2022, the PID database recorded 2.2 million observations, representing 3.24 billion unique transactions conducted with cards issued by French banks, regardless of destina-

tion (Gigout and Lavenant, 2025). These transactions are categorized into 308 sectors using Merchant Category Codes (MCCs, standardized under ISO 18245). The assigned MCC must reflect the merchant?s primary good or service sold. Additionally, payment network rules (Visa, Mastercard, etc.) require that the country of the payment terminal match the country where the business primarily operates.

A.3 Other data

The lists of tax havens are taken from Hines (2010) and Torslov et al. (2023). Gravity variables are from the CEPII gravity dataset Conte et al. (2022). Country risk is computed from the OECD Country Risk Classification, which allocates countries in 8 categories depending on their credit risk and likelihood of servicing their external debt. Our country risk variable is the logarithm of one plus the country risk category.

B Additional results: robustness

This section provide additional results on the manipulation of transfer prices in trade in goods (Table 17), trade in services (Table B), debt shifting (Table B) and FDI income (Table 16).

Table 14: Regression results on exports of services

	IP	R&D and IT	Info. & Com.	Technical Serv.	Other business	Financial Serv.	Transport
Intragroup	0.122***	0.157***	0.042**	0.209***	0.227***	0.047***	0.113***
	(0.023)	(0.019)	(0.016)	(0.018)	(0.022)	(0.017)	(0.020)
Intragroup × TH	−0.003	0.009	0.004	−0.013	0.017	0.069***	−0.018
	(0.017)	(0.012)	(0.009)	(0.012)	(0.018)	(0.019)	(0.014)
GDP	−0.002	0.001	0.001	0.000	0.003*	0.002	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Num.Obs.	177 406	317 001	191 080	464 329	297 888	149 548	319 288
R2	0.222	0.249	0.299	0.271	0.268	0.458	0.287
FE country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE time	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

Table 15: Regression results on debt shifting: robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Corporate Tax Rate		0.000			0.015***			−0.002	
		(0.000)			(0.004)			(0.002)	
TH dummy	0.002**		0.000	0.794***		0.673***	0.734***		0.665***
	(0.001)		(0.000)	(0.114)		(0.095)	(0.059)		(0.055)
TH Europe			0.004**			0.451			0.255***
			(0.002)			(0.283)			(0.094)
Domestic credit	0.000	0.000	0.000	0.001	0.003***	0.001	0.002***	0.004***	0.002***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Rule of Law	0.001***	0.001***	0.001***	0.049*	0.124***	0.046*	−0.027	0.033	−0.029
	(0.000)	(0.000)	(0.000)	(0.025)	(0.033)	(0.025)	(0.020)	(0.021)	(0.020)
Log GDP	0.000	0.000	0.000	0.272***	0.176***	0.264***	0.190***	0.119***	0.186***
	(0.000)	(0.000)	(0.000)	(0.034)	(0.023)	(0.034)	(0.020)	(0.016)	(0.020)
Log distance	0.000*	0.000*	0.000	−0.726***	−0.720***	−0.697***	−0.538***	−0.516***	−0.521***
	(0.000)	(0.000)	(0.000)	(0.083)	(0.083)	(0.082)	(0.039)	(0.038)	(0.038)
Num.Obs.	144 501	144 501	144 501	258 619	258 619	258 619	266 735	266 735	266 735
R2	0.912	0.912	0.912	0.153	0.151	0.153	0.507	0.500	0.507
FE time	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
FE firm/bank	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
FE time*bank	No	No	No	No	No	No	Yes	Yes	Yes
Clustered Errors	Firm	Firm	Firm	Bank	Bank	Bank	Bank	Bank	Bank

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

Table 16: Corporate tax differential and return on FDI: robustness

	(1)	(2)	(3)	(4)
Corporate tax rate diff.	0.41^a	0.28^a	0.22^a	
	(0.08)	(0.04)	(0.05)	
Tax rate diff. × French MNE dum.			0.06	
			(0.05)	
Corporate tax rate decile 2				-0.01
				(0.01)
Corporate tax rate decile 3				0.01
				(0.01)
Corporate tax rate decile 4				0.02
				(0.01)
Corporate tax rate decile 5				0.02^b
				(0.01)
Corporate tax rate decile 6				0.03^a
				(0.01)
Corporate tax rate decile 7				0.04^a
				(0.01)
Corporate tax rate decile 8				0.05^a
				(0.01)
Corporate tax rate decile 9				0.07^a
				(0.01)
Corporate tax rate decile 10				0.07^a
				(0.01)
Constant	0.15^a	0.09^a	0.09^a	0.09^a
	(0.01)	(0.00)	(0.00)	(0.01)
Observations	24,629	19,049	24,873	24,873
R-squared	0.56	0.30	0.31	0.31
FE MNE × year	Yes	Yes	Yes	Yes

Note: Standard errors clustered for intra-group correlation at the country level in parentheses, with significance levels indicated with ^{c} for 10%, ^{b} for 5%, ^{a} for 1%.

C Additional results: French vs foreign MNEs

This section reports results for each instrument of profit shifting when differential French and foreign MNEs. Results for trade in goods are reported in column (2) of Table 17. Table 18 presents results for imports of services and Table C for intra-firm debt.

Table 17: Transfer mispricing on trade in goods

	(1) non linear	(2) MNE FR	(3) No TH	(4)	(5)
Dum 0 - Intra-firm × tax rate diff.	-0.028				
	(0.027)				
Dum 1 - Intra-firm × tax rate diff.	0.003				
	(0.011)				
Dum 2 - Intra-firm × tax rate diff.	-0.042***				
	(0.010)				
Dum 3 - Intra-firm × tax rate diff.	-0.015				
	(0.014)				
Dum 4 - Intra-firm × tax rate diff.	-0.061***				
	(0.014)				
Dum 5 - Intra-firm × tax rate diff.	-0.069**				
	(0.031)				
Intra-firm		-0.058***	0.003	-0.039***	-0.202*
		(0.016)	(0.015)	(0.008)	(0.104)
Intra-firm × tax rate diff. < 0		-0.649	0.038		0.016
		(0.422)	(0.283)		(0.272)
Intra-firm × tax rate diff. > 0		-0.319**	-0.331***		-0.305***
		(0.136)	(0.127)		(0.093)
Intra-firm × tax rate diff. < 0 × French		0.989**			
		(0.401)			
Intra-firm × tax rate diff. > 0 × French		-0.001			
		(0.158)			
Intra-firm × French		0.088***			
		(0.020)			
Intra-firm × TH dum. (Torslov et al., 2023)				0.027***	0.015
				(0.011)	(0.010)
Intra-firm × log GDP per capita					0.018*
					(0.010)
Intra-firm × EU dummy					0.026
					(0.017)
Constant	4.768***	4.781***	5.093***	4.772***	4.762***
	(0.005)	(0.005)	(0.007)	(0.006)	(0.005)
Sample	All	All	No tax havens	All	All
Observations	5,519,952	5,519,952	4,117,297	5,519,952	5,454,889
R-squared	0.997	0.997	0.997	0.997	0.997
FE Country*Product*Year	Yes	Yes	Yes	Yes	Yes
FE Firm*Product*Year	Yes	Yes	Yes	Yes	Yes

Note: Standard errors clustered for intra-group correlation at the country-year level in parentheses, with significance levels indicated with ^{c} for 10%, ^{b} for 5%, ^{a} for 1%.

Table 18: Regression results on imports of services: French vs. foreign MNEs

	IP	R&D and IT	Info. & Com.	Technical Serv.	Other business	Financial Serv.	Transport
Intragroup × French Firm	0.109***	0.179***	0.046***	0.258***	0.218***	0.067***	0.166***
	(0.020)	(0.022)	(0.014)	(0.030)	(0.022)	(0.020)	(0.027)
Intragroup × Foreign Firm	−0.005	0.132***	0.012	0.193***	0.187***	0.000	0.213***
	(0.014)	(0.027)	(0.013)	(0.028)	(0.034)	(0.017)	(0.039)
Intragroup × TH × French Firm	−0.005	0.028	0.018	−0.033*	0.058**	0.114***	−0.015
	(0.022)	(0.018)	(0.013)	(0.017)	(0.023)	(0.023)	(0.026)
Intragroup × TH × Foreign Firm	0.084***	−0.009	0.050*	−0.022	−0.004	0.006	0.053***
	(0.028)	(0.028)	(0.027)	(0.018)	(0.024)	(0.019)	(0.020)
GDP	−0.006*	−0.001	0.006**	0.001	−0.001	0.008*	0.000
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Num.Obs.	177 406	317 001	191 080	464 329	297 888	149 548	319 288
R2	0.210	0.304	0.315	0.321	0.284	0.381	0.322
FE country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

Table 19: Regression results on debt shifting: French vs. foreign MNEs

	(1)	(2)	(3)	(4)
TH × French firm	0.001	0.000	0.475***	0.642***
	(0.001)	(0.000)	(0.108)	(0.119)
TH × foreign firm	0.004**	0.000	0.808***	0.458***
	(0.002)	(0.001)	(0.126)	(0.085)
European TH × French firm		0.002		−0.755**
		(0.002)		(0.328)
European TH × foreign firm		0.006**		1.664***
		(0.002)		(0.469)
Domestic credit	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Rule of Law	0.001***	0.001***	0.056***	0.052***
	(0.000)	(0.000)	(0.020)	(0.019)
Log GDP	0.000	0.000	0.213***	0.201***
	(0.000)	(0.000)	(0.033)	(0.032)
Log distance	0.000	0.000	−0.565***	−0.529***
	(0.000)	(0.000)	(0.077)	(0.075)
Num.Obs.	144 504	144 504	258 636	258 636
R2	0.914	0.914	0.153	0.155
FE time	Yes	Yes	Yes	Yes
FE firm/bank	Yes	Yes	Yes	Yes
Clustered Errors	Firm	Firm	Bank	Bank

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

D Additional results: alternative tax haven list

This section reports sensitivity analysis to an alternative definition of tax havens, using that tax haven list of Torslov et al. (2023): Table 18 for imports of services and Table C for debt. Results for trade in goods are reported in columns (3)-(4) of Table 17.

Table 20: Regression results on imports of services: alternative Tax Haven list

	IP	R&D and IT	Info. & Com.	Technical Serv.	Other business	Financial Serv.	Transport
Intragroup	0.062***	0.162***	0.037***	0.229***	0.207***	0.046***	0.184***
	(0.014)	(0.017)	(0.012)	(0.023)	(0.020)	(0.014)	(0.024)
Intragroup × TH	0.034**	0.018	0.016	−0.001	0.017	0.089***	0.019
	(0.017)	(0.017)	(0.014)	(0.012)	(0.018)	(0.022)	(0.018)
GDP	−0.005*	0.000	0.006**	0.001	0.000	0.008*	0.000
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Num.Obs.	177 406	317 001	191 080	464 329	297 888	149 548	319 288
R2	0.204	0.303	0.315	0.321	0.283	0.378	0.322
FE country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.

Table 21: Regression results on debt shifting: alternative Tax Haven list

	(1)	(2)	(3)	(4)
TH dummy	0.003***	0.002***	0.495***	0.347***
	(0.001)	(0.000)	(0.117)	(0.109)
TH Europe		0.003*		0.732***
		(0.001)		(0.231)
Domestic credit	0.000	0.000	0.001	0.001*
	(0.000)	(0.000)	(0.001)	(0.001)
Rule of Law	0.000*	0.000*	0.065***	0.057***
	(0.000)	(0.000)	(0.019)	(0.018)
Log GDP	0.000	0.000	0.186***	0.180***
	(0.000)	(0.000)	(0.032)	(0.031)
Log distance	0.000	0.000	−0.532***	−0.494***
	(0.000)	(0.000)	(0.072)	(0.070)
Num.Obs.	144 504	144 504	258 636	258 636
R2	0.914	0.914	0.152	0.153
FE time	Yes	Yes	Yes	Yes
FE firm/bank	Yes	Yes	Yes	Yes
Clustered Errors	Firm	Firm	Bank	Bank

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with significance levels indicated with * for 10%, ** for 5%, *** for 1%.