# The instruments of profit shifting *

Kevin Parra-Ramirez† Vincent Vicard‡

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**Abstract**

While the extent of tax avoidance by multinational enterprises has been convincingly documented, how firms shift profits to low tax affiliates remains unclear. This paper uses transaction level data to assess the quantitative importance of the three main instruments of profit shifting – the manipulation of transfer prices in trade in goods, the location of intangibles and export of services from tax havens and the strategic location of intra-group debt. It finds evidence of profit shifting through each instrument. Quantitatively, transfer mispricing accounts for a significant share of profit shifting, while trade in services and intra-group debt have a lower impact. We also document potential blind spots of the literature, highlighting in particular the role of cross-border digital payments.

**Keywords**: Tax avoidance, Multinational firms, Profit shifting, FDI, Trade.
**JEL Classification**: H26, H25, H32, F14, F23

*to be added.

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

# 1 Introduction

The importance of tax avoidance by multinational enterprises (MNEs) is now firmly established globally. Several recent papers show large amounts of missing profits in high tax countries causing losses of tax revenues, even-though the global numbers remain debated.[1] Such quantifications have underpinned the current international tax reform endorsed in October 2021 by more than 130 countries and being implemented in several countries starting in 2024.

The channels of tax avoidance however remain poorly understood. MNEs can reduce their overall tax liabilities by shifting profit from high to low tax affiliates using three main instruments: (i) the manipulation of transfer prices in international trade in goods; (ii) the strategic location of intangibles in tax havens and export of associated services; and (iii) debt shifting since interests on debt is tax deductible. In each case, cross-border intra-firm transactions are the vehicles for tax schemes aimed at reducing profits booked in high-tax countries and increasing them in low-tax countries.

This paper quantifies the role of all channels of profit shifting using micro-data to assess their relative importance. While the literature has provided empirical evidence for each instrument, it has done so separately for different countries and at different points in time.[2] This prevent comparing quantifications based on heterogeneous countries in terms of tax system and level of corporate tax rate. Doing so for a single country also allows us to identify blind spots of the literature.

Understanding how MNEs actually shift profits matters for the design of anti-avoidance policies and ongoing reforms of international tax rules. It also provides necessary information for the targeting of controls by tax administrations, by focusing attention on specific transactions among the multitude of intra-firm transactions. Finally, it gives information on the geography of profit shifting that the mere location of profits in low tax countries or tax havens fail to identify.[3] Identifying channels of profits hsifting also allow for a better understanding of the impatc of tax avoidance on national account and balance of payment statistics.[4].

[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 profit shifted globally have risen sharply over the last two decades.

[3] Assumptions on the channels of profit shifting are instrumental to the allocation of profits located in tax haven 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 payment and provide some

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. Our aim in this paper is to document all channels of profit shifting for a single country at a given point in time and provide micro-based estimation of profit shifted through each of them. Our contribution is not in proposing new identification strategies: we apply those used in the literature and assess to which extent they yield consistent estimates of profit shifted for France. Quantifications systematically use the semi-elasticities estimated on French micro-data for consistency. We also use data on foreign profits of MNEs to assess total profit shifted estimated indirectly from the location of MNE profits, and use it to benchmark our quantifications based on direct evidence.

We find empirical evidence for each of the three channels of profit shifting. MNEs located in France do use transfer mispricing in related party trade and the location of intangibles and debt to shift profit to low tax jurisdictions. Interestingly, the channels of profit shifting differ for national and foreign MNEs: at risk services, which are disproportionately traded intra-firm with tax havens, are concentrated in intellectual property and information and communication services for foreign firms, and other business services (including headquarter services) for French MNEs.

Micro-based quantifications show that transfer mispricing on trade in goods accounts for 10 bn euros of shifted profits for France in 2018, trade in services for up to 5 bn, and debt shifting close to 2 bn for non-financial corporation and banks together. These results go against the widely held view that intangibles are the dominant channel of profit shifting in line with the prevalence of digital companies in worldwide profits and tax scandals. Our results are however consistent with limited evidence of tax avoidance through trade in services in the existing literature (Hebous and Johannesen, 2021; Garcia, 2022).[5] Such perceptions may reflect US-centric evidence that are different in a continental European country like France, where tech companies are less prevalent than in the US economy.

Comparing to total profit shifted estimated from firm level data on FDI income, our estimates taken together account for close to half of profit shifted. Our direct evidence therefore show significant profit shifted. In this respect, our paper challenges the micro to macro puzzle that emphasizes that estimated profit shifted based on transaction data

aggregate cross-country evidence. See also Guvenen et al. (2022).

[5]See Section 2 for more details.

are limited (Wier, 2020; Hebous and Johannesen, 2021; Crivelli et al., 2021). Missing profits estimated from direct evidence however fall short of indirect estimates based on the location of MNEs profits, begging the question of the blind spots of the literature.

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 import of services from tax havens are not registered in trade in services data collected by central banks and used in the literature. Cross-border credit card payment data show that those payments are large (more than 50 bn euros for France in 2022) and disproportionately concentrated on tax havens. Second, debt instruments investigated in the literature are usually restricted to inter-bank loans and intra-firm loans for non-financial corporations. Other debt instruments – bank loans to non-financial corporations and debt securities – also show large outstanding liability positions towards tax havens, potentially intra-firm. Including such channels would partially close the gap between micro and macro estimates of profit shifting.

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 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

The literature has shown evidence of the use of transfer prices, the location of intangibles and debt shifting to shift profits from high-tax to low-tax subsidiaries, but provide diverging magnitudes depending on the instrument and country considered. We focus here on direct evidence of instruments of profit shifting to discuss the main takeaways from the literature, and refer to Riedel (2018), Beer et al. (2020) or Dharmapala (2014) for more extensive surveys.

The manipulation of transfer prices in intra-firm trade in goods has attracted the

most attention in the literature. Table 1 lists the existing literature and their main results. It shows that estimations of profit shifted differ widely across paper. These differences however do not reflect differences in estimated semi-elasticities: except for Liu et al. (2017), all papers find preferred semi-elasticities in-between 0.22 and 0.65, which are not correlated with the estimated tax losses as a persentage of GDP. All but Davies et al. (2018) also find that all destinations are concerned with transfer pricing and not only tax havens. Differences in estimated profit shifted through transfer pricing are therefore related to characteristics of countries under study.

Table 1: Literature on transfer pricing in trade in goods

| | Country | Year | Flow | Semi-elasticity | Estimated tax loss (% CIT) | Corporate 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.

All papers are single-country studies that use data for different countries at different period of time. The major difference relates to the level of corporate tax rate: all countries but the US (Bernard and Jensen, 2004) and France (Vicard, 2015) are average tax countries: the export weighted differential in statutory tax rate 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). This gives little room for using transfer prices in intra-firm exports to shift profit to low tax jurisdictions, which translates into low estimated profit shifted. The US is specific in that Bernard and Jensen (2004) find limited profit shifting through the manipulation of transfer prices despite the US being a high-tax country, but its trade openness remain limited compared to other smaller economies.

The French case is interesting since two papers estimate tax losses from transfer pricing on trade in goods at different points in time finding medium tax losses in percentage of total corporate income tax (CIT) in 1999 (Davies et al., 2018) to more substantial tax losses in 2008 (Vicard, 2015). To assess the contribution of transfer pricing to total profit shifting, such estimates should however be related to estimated total profits shifted at different points in time. Wier and Zucman (2022) indeed underline that both global foreign profits of MNEs and profit shifted to tax havens have risen sharply sin the late 1990s. In the French case, Vicard (2023) estimates that total profit shifted

increased from 1 billion euros early 2000s to 36 bn euros in 2015. Limited estimated tax losses in euro in 1999 from Davies et al. (2018) may therefore represent a large share of total profit shifted. Such differences across countries and over time underlie the need to estimate jointly different dimensions of profit shifting for a single country at a given point in time.

Topical evidence also underline the relevance 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) report tax adjustments of more than 3 billion euros in 2017 under Article 57 of the General Tax Code relating to transfer pricing (out of 6 billion euros of total adjustments).

The strategic location of intangibles in tax havens and export of services to affiliates in high tax countries have received comparatively less attention. An early literature has focused on the location of intangible assets within MNEs, Dischinger and Riedel (2011) find that intangible asset investment is larger in lower tax subsidiaries on a panel of multinational affiliates within the EU over 1995-2005. Such distortion in intangible location is consistent with profit shifting through trade in services. The tax response of intangible asset location has been found to vary across countries (Griffith et al., 2014) and type 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). Their results however imply limited tax revenue losses, in the order of 1 billion per year. Garcia (2022) applies the same methodology to Portugal and finds no 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 large amount of profit shifted through the location of intangibles in tax havens and associated export of services to other affiliates of the MNE. This conclusion stands in contrast to the numerous tax schemes exposed in the press using involving royalty payments on intellectual

property.[6]

A substantial 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. These studies additionally do not provide quantification of the magnitude of profit shifted through the debt shifting channel.

Most of the literature has focused on non financial companies 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, reducing their overall tax bill.

Finally, several papers draw on indirect evidence of profit shifting based on the location of MNE profits to distinguish the role of debt shifting comparing results based on EBIT and profit before taxation (including in particular interest expenses). Heckemeyer and Overesch (2013) estimate debt shifting at one third of total profit shifting based on a meta-analysis. In a more recent meta-analysis, Beer et al. (2020) find mixed results regarding the relevance of debt shifting, which represent in-between zero and a quarter of total profit shifting response. Bilicka (2019) uses tax returns for UK multinational firms and shows that 40% of the profit ratio gap can be explained by differences in leverage.

Compared to these strands of the literature, we are the first to our knowledge to jointly investigate all the main profit shifting instruments and provide a quantification of their respective magnitude based on micro-data estimates. We also leverage data

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

on the location of MNE profits to compare estimated profit shifted through direct and indirect evidence and discuss blind spots in 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 rrelated 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:

$$\ln UV_{ijkt} = \beta_1 Net_{ij} + \beta_2 Net_{ij} \times TaxPos_{jt} + \beta_3 Net_{ij} \times TaxNeg_{jt} + \theta_{ikt} + \theta_{jkt} + \epsilon_{ijkt}. \quad (1)$$

where $UV_{ijkt}$ is the unit value as a measure of export prices, $Net_{ij}$ is a dummy variable equal to one when trade is intra-firm. $TaxNeg_{jt}$ and $TaxPos_{jt}$ are the absolute value of the statutory tax rate differential between France and destination country $j$ for negative and positive tax rate differentials respectively. We include fixed effects in two dimensions: the firm×product×year dimension to control for all firm/product specific determinants of export such as product specific productivity; and in the destination×product×year to account for all characteristics of destination market likely to affect the price wedge between intra-firm and arm's length trade. Since we aim at quantifying aggregate im-

pacts of profit shifting through transfer prices, we estimate Equation 1 using weighted OLS. Standard errors are clustered at the country-year level.

We restrict the sample to trade by affiliates and parents of multinationals, since independent firms are a poor control group for multinational firms which are on average larger, more productive and more export oriented than other firms.

$\beta_2$ and $\beta_3$ are our coefficients of interest. $\beta_2$ measures transfer mis-pricing on exports towards low-tax countries and is expected to be negative. $\beta_3$ 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 $\beta_3$ to be insignificant.

## 3.2 Data

We rely 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 customs data produced by the French Customs (DGDDI) provide information on export and import flows to/from all destinations at the Combined nomenclature 8 digit level for all firm located on the French territory.[7] For each flow, we have information on the annual value and quantities exported and imported, so that we can compute unit values at the detailed product level. Quantities are reported in kilograms, but some products have an 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 corporate tax differential and find a semi-elasticity of 0.24, meaning that a 10 percentage 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.

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

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, $Net_{ij}$ 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 rate 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 corporate tax differential is close to zero and insignificant. Regarding negative tax differentials, note that the sum of the coefficients on $Net_{ij} \times TaxPos_{jt}$ 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 corporate 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 corporate 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 corporate tax differentials (group 4 and 5).

## 3.4 Quantification

The quantification are 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 corporate tax differentials. Profit shifted are computed from the

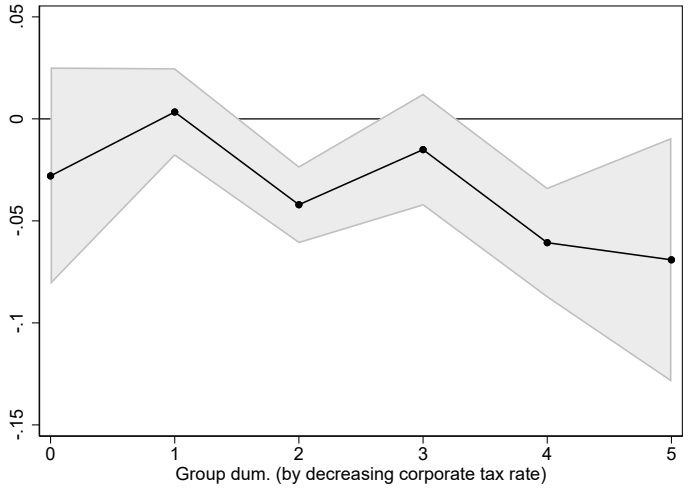
[8]Note that given the high level of corporate tax rate in France compared to OECD countries, most of French exports are towards low tax countries.

Table 2: Transfer mispricing on trade in goods

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | | | No Tax haven | | | French vs. foreign | Non-linear |
| Intra-firm | -0.010 | -0.001 | 0.007 | -0.034*** | -0.229** | -0.058*** | |
| | (0.010) | (0.011) | (0.012) | (0.007) | (0.097) | (0.016) | |
| Intra-firm × tax rate diff. | 0.242*** | | | | | | |
| | (0.086) | | | | | | |
| Intra-firm × tax rate diff. < 0 | | -0.052 | -0.002 | | -0.023 | -0.649 | |
| | | (0.263) | (0.272) | | (0.269) | (0.422) | |
| Intra-firm × tax rate diff. > 0 | | -0.316*** | -0.380*** | | -0.299*** | -0.319** | |
| | | (0.099) | (0.116) | | (0.094) | (0.136) | |
| Intra-firm × Tax haven dum. | | | | 0.006 | | | |
| | | | | (0.016) | | | |
| Intra-firm × log GDP per capita | | | | | 0.021** | | |
| | | | | | (0.009) | | |
| Intra-firm × EU dum. | | | | | 0.024 | | |
| | | | | | (0.017) | | |
| 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) | |
| 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) |
| Observations | 5,519,952 | 5,519,952 | 4,872,903 | 5,519,952 | 5,454,889 | 5,519,952 | 5,519,952 |
| R-squared | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 |
| FE Country*Product*Year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| FE Firm*Product*Year | Yes | Yes | 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 rate 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).

difference in predicted exports with and without tax differential included. Since firm level imports are highly concentrated on a single source, we cannot estimate Equation 1 whose identification requires observing a firm trading the same product with multiple countries. 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 mis-pricing reduces the value of total exports by 2.3% in 2018 and increases the value of total imports by 2.2%. Taken together, theses 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 (bn Eur) | % of exports | value (bn Eur) | % of imports | Value (bn Eur) |
| 2018 | -4.8 | -2.3% | 5.6 | 2.2% | -10 |

# 4 Trade in services with tax havens

In this section, we focus on trade in services and identify the amount of profit shifted through the location of intangibles in tax havens and their associated cross-border transactions with their affiliates. To do so, 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

Using firm level data, we estimate the following equation for a firm $i$ importing from country $j$:

$$T_{ij} = \beta_0 + \beta_1 Intra_{ij} + \beta_2 Intra_{ij} \times TH_j + \gamma GDP_j + \theta_i + \theta_j + \epsilon_{ij}, \tag{2}$$

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

Our empirical strategy relies on comparing intra-firm with arm's length trade with tax havens vs. other countries, to identify tax induced trade in services. We therefore control for the average propensity to trade intra-firm (picked by the $Intra_{ij}$ variables separately for French and foreign MNEs) as well as the average propensity to trade with

[9]Our identification strategy focuses on the standard form of profit shifting involving intra-firm trade in services as done in the literature. 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.

tax havens (through country fixed effects), and focus on the interaction between $Intra_{ij}$ 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 $\beta_3$ and $\beta_4$.

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. The survey includes all 'Déclarants directs généaux' defined as firms exporting or importing more than 30 millions euros 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 2013-2019. 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 of services by consumers is therefore not included in our estimates (we come back to this issue in Section 7).

We merge information on service trade flows with information on trade credit provided by a dedicated survey ECEIS. This survey report all trade credit stocks at the quarterly level for firms included in the 'Declarants directs gï¿½nï¿½raux', distinguishing between trade credit with related parties or 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.[10] 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. 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 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€ 51 bn. Tax havens represents a disproportionately large share of French imports of

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

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-third 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%).

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

| | | Intellectual property | R&D and IT | Information Communication | Technical services | Other business | Financial services | Transport |
|---|---|---|---|---|---|---|---|---|
| Tax Havens | Total | 1 212 | 1 863 | 629 | 1 818 | 822 | 28 | 2 397 |
| Tax Havens | of w/ third party | 349 | 331 | 302 | 1 033 | 156 | 22 | 1 148 |
| Tax Havens | of w/ intragroup | 863 | 1 532 | 327 | 786 | 666 | 6 | 1 249 |
| Others | Total | 4 836 | 7 466 | 1 964 | 10 371 | 3 110 | 288 | 14 838 |
| Others | of w/ third party | 483 | 755 | 637 | 2 839 | 707 | 58 | 9 418 |
| Others | of w/ intragroup | 4 353 | 6 710 | 1 327 | 7 532 | 2 403 | 230 | 5 419 |
| Total (sample) | | 6 048 | 9 329 | 2 593 | 12 190 | 3 932 | 315 | 17 234 |
| Total (BoP) | | 12 142 | 27 629 | 7 255 | 43 262 | 15 897 | 6376 | 45 743 |

## 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 3 out of the 7 services categories analyzed, namely intellectual property, Information and Communication and other business services (including headquarter services). Our results therefore yield support for a number of services flows serving tax avoidance schemes. Note that those 'at risk' services we identify 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.

We do not find similar results on exports (see Table 12 in appendix B), supporting the profit shifting interpretation of excess imports from affiliates in tax havens.

The generous tax credit for R&D spendings in France ('Crï¿½dit Impï¿½t recherche', CIR) may partly explain the limited incentive for French firms to locate their research activities abroad and import R&D service. 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.[11] France also proposes a patent box regime that provides for a lower 15% corporate tax rate on incomes from IP assets

[11] OECD R&D Tax Incentives database, April 2023.

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*** | 0.193*** | 0.045*** | 0.275*** | 0.206*** | 0.020** | 0.185*** |
| | (0.014) | (0.018) | (0.014) | (0.017) | (0.019) | (0.008) | (0.023) |
| Intragroup * TH | 0.032* | −0.004 | 0.029* | −0.008 | 0.035* | 0.020 | 0.012 |
| | (0.018) | (0.020) | (0.016) | (0.016) | (0.018) | (0.018) | (0.019) |
| GDP | −0.005* | −0.001 | 0.003 | 0.000 | 0.000 | 0.001 | 0.000 |
| | (0.003) | (0.002) | (0.002) | (0.002) | (0.003) | (0.001) | (0.003) |
| Num.Obs. | 177 406 | 292 966 | 172 270 | 453 252 | 297 888 | 121 124 | 319 288 |
| R2 | 0.204 | 0.302 | 0.320 | 0.329 | 0.283 | 0.127 | 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%.

(for firms that carry out R&D activities in France), instead of the 33.3% statutory tax rate prevaling in 2018.[12]

Table **??** further underline that French and foreign MNEs appear to use trade in services differently as an instrument of profit shifting. French MNEs exhibit a significant excess propensity to import from tax haven affiliates only on other business 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 air and road 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.

The results are provided in Table 6. We compute an out-of-sample predicted trade 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 overrepresented in our firm level sample compared to total French exports, so that we again consider an upper bound.

[12]The reform of the French patent box regime in 2019 included a nexus for qualifying IP assets, expanded its benefit to other IP income such as from software and lowered its rate to 10%.

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

| Sample: | (1) DDG % of trade | (2) DDG bn EUR | (3) Adjusted bn EUR |
|---|---|---|---|
| 2018 | 3.7% | 1.9 | 5.3 |

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.

# 5 Debt shifting

This section looks at profit shifting through 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 level.[13] We focus here on intra-firm loans within MNEs and compare the debt position of French affiliates with respect to affiliates located in tax havens.

## 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:

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

$TH_j$ 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, $\theta_t$, 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, $\theta_i$, control for all firm and group characteristics.

The internal debt position is measure 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 $\beta_1$, 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 bu 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 years 2014 to 2018.

For non-financial corporatoins, we use data from the "Enquête sur l'état des créances

[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

et des dettes financières vis-à-vis des non-résidents" (EFI), which reports financial positions with foreign counterparties. The structure and composition of the 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 ("Declarants 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 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 **??**. 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 (2)) while the corporate tax rate differential is not significant (column (1)). This suggest that debt shifting occurs mainly to tax haven and not other low tax countries. We then differentiate European and other tax havens and find only the coefficient on European tax haven to be significant for non financial corporations.

Results for banks show similarly significant debt shifting to tax havens (column (5)).[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 **??**

[17] Note that the significant coefficient on corporate tax differential in column (6) is no longer significant when controlling for bank×year fixed effects; see below.

Table 7: Regression results on debt shifting

| | (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%.

for non-financial corporations imply that intra-group net debt is 0.002 percentage points 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 **??**), 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 **??**). 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 **??**). 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 **??** in Appendix Section C

### 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 (2) and (5) in Table **??** 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 8 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 €1.6 bn in line with the larger estimated excess intra-firm debt in tax havens.

Table 8: 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 | 8.5 | 1.7 | 0.1 | 127.8 | 1.2 | 1.6 |

## 6 FDI income: estimated profit shifted based on indirect evidence

In this section, we estimate the total amount of profits shifted out of France using indirect evidence from micro-data on FDI income and stock for French parent multinationals and their affiliates to benchmark our direct evidence from each of the three 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 locations of their FDI 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.

We estimate the following equation:

$$i_{ijt} = \beta_0 + \beta_1 TaxDiff_{it} + \beta_2 TH_i + FE_{jt} + \epsilon_{ijt} \tag{4}$$

where $i_{ijt} = \frac{FDIinc_{ijt}}{FDIstock_{ijt-1}}$ is the yield a French parent $j$ earn from affiliates located in country $i$. $TaxDiff_{it}$ is the difference between the corporate tax rate in France and in country $i$ and $TH_i$ is a variable equal to one when the host country $i$ is a tax haven. $FE_{jt}$ 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.

## 6.2 Data

Data are from confidential firm level data on FDI stocks and dividends and reinvested earnings 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 dat 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).

The corporate tax differential is the difference between the French and foreign statutory corporate tax rate.

## 6.3 Empirical results

Table 9 reports the results from estimating equation 4. It shows a positive and significant coefficient on the tax rate differential. A 1 percentage point larger corporate tax differential leads to a 0.25 (column (3)) increase in the return on FDI on affiliates located in this country. XXX more on no TH specificity and FE XXX

Finally, columns (2) and (3) in Table 17 in Appendix C do not show any difference between French and foreign MNEs regarding the geography of their return on FDI.

Figure 2 additionally allow for non linear effect of tax on return on FDI. It presents corporate tax differential depending on the decile of statutory corporate tax rate. Return on assets 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. Return of FDI then increases up to 6 percentage points for affiliates located in countries in the lowest decile of corporate tax rate.

## 6.4 Quantification

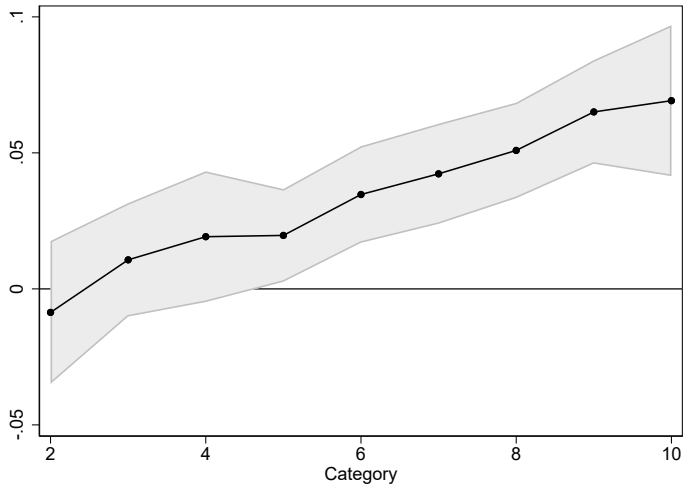
Total missing profits in France are quantified from results of column (1) in Table 9. We compute the aggregate FDI income with and without profit shifting by predicting returns on FDI in Equation 4 with and without statutory tax rate differential. The difference in aggregate flows from the two predictions 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

Table 9: 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%.

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




Note: by decile of statutory tax rate differential (1 = lowest, i.e larger statutory tax rates). Coefficients reported in column (4) of Appendix C Table 17.

specific instruments.

Table 10: 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 |

Table 10 reports the results separately for the asset and liability sides. For 2018, it 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 10 also reports estimated missing profits in France using two alternatives specifications for quantification. Using the country fixed effects specification of column (5) in Table 9 yield lower estimated missing profits at €35 bn. Using the non linear specification in column (4) of Appendix C Table 17 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 shifted profits for France in 2018, closely in line with estimates based

on firm level data in Table 10.

# 7 Discussion and limitations: blind spots

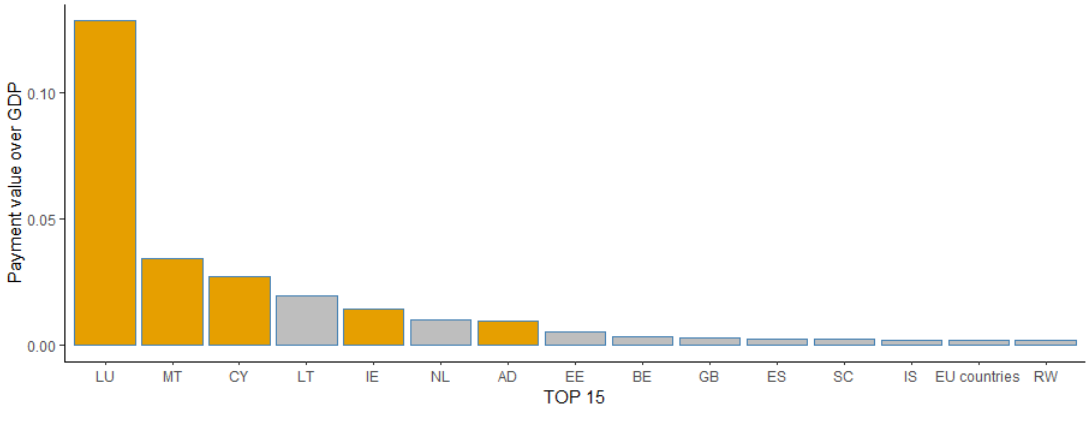
Taken together, the direct estimates of profit shifting for the three instruments of profit shifting fall short of the indirect estimates shown in section 6. At €10 bn, transfer mispricing in trade in goods is the main instrument of profit shifting and accounts for a quarter of total profit shifting. The location of intangibles in tax havens and associated exports of services add up to €5.3 bn and debt shifting less than €2 bn. Together, our direct estimates show significant profit shifting but account for only half of total profit shifting estimated using indirect evidence on the location of profits.

ROBUSTNESS: foreign vs French MNEs, different lists of tax havens

In this section, we discuss blind spots of the literature that could close the gap between direct and indirect estimates of profit shifting. Two of them seem quantitatively relevant for the instruments investigated in the paper: import of services by households and other debt assets not included.

BtoC imports 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). Following Hebous and Johannesen (2021), section 4 focuses on imports of services from tax havens by firms that do not cover such channel.

We use credit card payments by households in 2022 to provide an order of magnitude of imports by households and their potential for profit shifting to tax havens. Data are from the International Digital Payments database collected by Banque de France from bank declarations for all origin countries. The data are broken down by merchant category code, 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. The database includes all cross-border transactions made online by French credit cards holders, and is a measurement of digital trade by households. Note




Notes: XXX

however that 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 such as AirBnB).

Figure 7 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 payments by French households is biased towards tax havens, and in particular Luxembourg, Malta Cyprus or Ireland. Payments to tax havens amount to €20.5 bn, against €36 bn for the rest of the world (of which €9.8 bn for 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. Excess payments to tax havens equal to €18.9 bn when using as benchmark the average over all countries worldwide excluding tax havens, and €16.1 bn 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 shited relates to the scope of analysis on debt shifting. Most of the literature (and the analysis presented in Section 5) focuses on loans for non-financial corporations or within the banking sector. Doing so, it restricts both the sample of counterparties and instruments/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 11 lists the counterparty and asset types missing from our quantifications presented in Section 5 and in the literature in general, and provides the liability stocks

of French affiliates in tax havens as a measure an order of the potential magnitude of profit shifting through each debt instrument.

First, loans by banks to non-banks counterparties are large and the stock borrowed from tax havens is of similar magnitude as bank-to-bank loans (€ 131 bn vs. € 166 bn). Using information from a new survey for 2022 to allocate liabilities to intra-group vs arm's length stocks shows a larger share of intra-firm liabilities in tax havens for bank loans to non-banks (81%) than for banks (72%). Including those additional counterparty could double estimated profit shifted compared to Section 5.

Second, debt securities ar also an important financing vehicle, 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 bn for banks, an amout similar to inter-bank loans, which represents 23% of the total debt equity liabilities of French banks. For NFC, the outstanding debt securities liabilities is larger than their total loans (573 vs. 304 bn €), but the French data do not provide information on the counterparty country of such transactions.

Table 11: Blind spots: debt assets

| | **Counterparty** | **Instrument** | **Liabilities** | | |
|---|---|---|---|---|---|
| | | | **Total** | **TH** | **Intra-group in TH** |
| **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: Protide, CSDB

# 8 Conclusion

This paper has addressed two questions. First, what is the relative importance of the main channels of profit shifting – transfer prices in trade in goods, trade in services and debt shifting? And second, do quantifications based on direct evidence from micro-data match estimated profit shifted based on indirect evidence from the location of MNE profits?

We find that transfer mispricing in trade in goods with related party appears as a significant channel of profit shifting and account for one third of total profit shifted in the case of France. 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 FDI income data.

We identify two blind spots of the literature that could match the micro to macro disconnect. Cross-border credit card transaction by households show large transactions of services from tax havens that are not registered in trade in services data in high tax countries. Other debt instruments, namely debt securities and bank loans to non-financial corporations, also show large outstanding liability position to tax havens consistent with tax avoidance through these instruments.

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# A Data

## A.1 Ownership data

Ownership data from Liaison Financiï¿½re (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 ECEIS survey

## A.3 Trade in goods

Descriptive statistics on share of intra-firm trade in total trade.

## A.4 Trade in services

Combining Customs data with our ownership data, Figure **??** shows the share of total exports and imports conducted multinationals and the share of intra-firm trade. Intra-firm trade represents 46% of exports and 48% of imports.

## A.5 Debt

XXX

## A.6 International Digital Payments database

XXX

credit card payments by firm vs. households

define MCC

Goods vs. services (with reference to the bulletin by Timothée when published)

## A.7 Other data

The lists of tax havens are taken from Hines and Rice (1994) 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.

Table 12: Regression results on exports of services

| | IP | R&D and IT | Info. & Com. | Technical Serv. | Other business | Financial Serv. | Transport |
|---|---|---|---|---|---|---|---|
| Intragroup | 0.122*** | 0.176*** | 0.053*** | 0.226*** | 0.227*** | 0.039*** | 0.113*** |
| | (0.023) | (0.020) | (0.019) | (0.018) | (0.022) | (0.014) | (0.020) |
| Intragroup * TH | −0.003 | 0.010 | 0.005 | 0.001 | 0.017 | 0.007 | −0.018 |
| | (0.017) | (0.015) | (0.012) | (0.015) | (0.018) | (0.011) | (0.014) |
| GDP | −0.002 | −0.001 | 0.000 | 0.000 | −0.001 | −0.003 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.003) | (0.002) |
| Num.Obs. | 177 406 | 292 966 | 172 270 | 453 252 | 297 888 | 121 124 | 319 288 |
| R2 | 0.222 | 0.253 | 0.304 | 0.275 | 0.268 | 0.148 | 0.287 |
| 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%.

# B Additional results

Table 13: Regression results on debt shifting

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Corporate Tax Rate | | 0.000 | | | 0.015*** | |
| | | (0.000) | | | (0.004) | |
| TH dummy | 0.002** | | 0.000 | 0.794*** | | 0.673*** |
| | (0.001) | | (0.000) | (0.114) | | (0.095) |
| TH Europe | | | 0.004** | | | 0.451 |
| | | | (0.002) | | | (0.283) |
| Domestic credit | 0.000 | 0.000 | 0.000 | 0.001 | 0.003*** | 0.001 |
| | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) |
| Rule of Law | 0.001*** | 0.001*** | 0.001*** | 0.049* | 0.124*** | 0.046* |
| | (0.000) | (0.000) | (0.000) | (0.025) | (0.033) | (0.025) |
| Log GDP | 0.000 | 0.000 | 0.000 | 0.272*** | 0.176*** | 0.264*** |
| | (0.000) | (0.000) | (0.000) | (0.034) | (0.023) | (0.034) |
| Log distance | 0.000* | 0.000* | 0.000 | −0.726*** | −0.720*** | −0.697*** |
| | (0.000) | (0.000) | (0.000) | (0.083) | (0.083) | (0.082) |
| Num.Obs. | 144 501 | 144 501 | 144 501 | 258 619 | 258 619 | 258 619 |
| R2 | 0.912 | 0.912 | 0.912 | 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%.

Table 14: Regression results on debt shifting

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Corporate Tax Rate | | 0.011*** | | | | |
| | | (0.003) | | | | |
| TH dummy | 0.708*** | | 0.548*** | | | |
| | (0.110) | | (0.099) | | | |
| TH Europe | | | 0.601** | | | |
| | | | (0.239) | | | |
| Domestic credit | 0.000 | 0.002*** | 0.000 | 0.000 | 0.002*** | 0.00 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.00 |
| Rule of Law | 0.059*** | 0.124*** | 0.054*** | 0.058*** | 0.123*** | 0.053* |
| | (0.019) | (0.027) | (0.018) | (0.019) | (0.027) | (0.01 |
| Log GDP | 0.220*** | 0.136*** | 0.209*** | 0.220*** | 0.137*** | 0.207* |
| | (0.036) | (0.025) | (0.036) | (0.036) | (0.025) | (0.03 |
| Log distance | −0.552*** | −0.544*** | −0.513*** | −0.553*** | −0.545*** | −0.511 |
| | (0.077) | (0.077) | (0.076) | (0.078) | (0.077) | (0.07 |
| CTR - French firm | | | | | 0.006 | |
| | | | | | (0.004) | |
| CTR - foreign firm | | | | | 0.015*** | |
| | | | | | (0.004) | |
| TH - French firm | | | | 0.543*** | | 0.650* |
| | | | | (0.117) | | (0.12 |
| TH - foreign firm | | | | 0.823*** | | 0.475* |
| | | | | (0.128) | | (0.09 |
| European TH - French firm | | | | | | −0.55 |
| | | | | | | (0.33 |
| European TH - foreign firm | | | | | | 1.647* |
| | | | | | | (0.46 |
| Num.Obs. | 258 636 | 258 636 | 258 636 | 258 636 | 258 636 | 258 6 |
| R2 | 0.300 | 0.298 | 0.300 | 0.300 | 0.298 | 0.30 |
| FE bank*time | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered Errors | Bank | Bank | Bank | Bank | Bank | Ban |

Note : Standard errors clustered for intra-group correlation at the firm level in parentheses, with sig

Table 15: Regression results on imports of services

| | Intellectual property | R&D and IT | Info. & Com. | Technical Services | Other business | Financial Services | Transpo |
|---|---|---|---|---|---|---|---|
| Intragroup * French Firm | 0.109*** | 0.224*** | 0.060*** | 0.319*** | 0.218*** | 0.021** | 0.166** |
| | (0.020) | (0.025) | (0.018) | (0.021) | (0.022) | (0.009) | (0.027) |
| Intragroup * Foreign Firm | −0.005 | 0.147*** | 0.019 | 0.213*** | 0.187*** | 0.018 | 0.213** |
| | (0.014) | (0.028) | (0.014) | (0.028) | (0.034) | (0.013) | (0.039) |
| Intragroup * TH * French Firm | −0.005 | −0.005 | 0.013 | −0.003 | 0.058** | 0.026 | −0.015 |
| | (0.022) | (0.025) | (0.018) | (0.019) | (0.023) | (0.023) | (0.026) |
| Intragroup * TH * Foreign Firm | 0.084*** | −0.004 | 0.058** | −0.019 | −0.004 | 0.007 | 0.053** |
| | (0.028) | (0.029) | (0.028) | (0.024) | (0.024) | (0.029) | (0.020) |
| GDP | −0.006* | −0.001 | 0.003 | 0.000 | −0.001 | 0.001 | 0.000 |
| | (0.003) | (0.002) | (0.002) | (0.002) | (0.003) | (0.001) | (0.003) |
| Num.Obs. | 177 406 | 292 966 | 172 270 | 453 252 | 297 888 | 121 124 | 319 288 |
| R2 | 0.210 | 0.304 | 0.321 | 0.331 | 0.284 | 0.128 | 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%.

# C Additional results: French vs foreign MNEs

Table 16: Regression results on debt shifting

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| CTR - French firm | | 0.000*** | | | 0.006 | |
| | | (0.000) | | | (0.004) | |
| CTR - foreign firm | | 0.000 | | | 0.015*** | |
| | | (0.000) | | | (0.004) | |
| 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 | | | −0.756** |
| | | | (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 | 0.002*** | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) |
| Rule of Law | 0.001*** | 0.001*** | 0.001*** | 0.056*** | 0.119*** | 0.052*** |
| | (0.000) | (0.000) | (0.000) | (0.020) | (0.028) | (0.019) |
| Log GDP | 0.000 | 0.000** | 0.000 | 0.212*** | 0.133*** | 0.201*** |
| | (0.000) | (0.000) | (0.000) | (0.033) | (0.022) | (0.032) |
| Log distance | 0.000 | 0.000 | 0.000 | −0.565*** | −0.559*** | −0.529*** |
| | (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 | 0.155 |
| 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%.

Table 17: Corporate tax differential and return on FDI

| | (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%.