Anatomy of Profit Shifting, Revenue Implications and Distributional Effects *

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PRELIMINARY, DO NOT CIRCULATE

Abstract

This paper uses newly available microdata from country-by-country reporting (CbCR) to study the profit-shifting behavior of large French multinational firms. We provide a robust methodology to correct CbCR for double-counting of intra-group dividends, which we show inflates observed pre-tax profits by about 12%. Using corrected data, we show that at least 22% of foreign profits generated between 2016 and 2022 cannot be explained by real activity, 40% of which in only six financial hubs. Our upper bound estimates suggest that up to €31 billion of profits are decorrelated of any real activity, leading to significant tax revenue losses. We provide evidence on the concentration of profit shifting in the hands of a few large firms: 10% of MNEs account for about 70% of total profit shifting. Finally, we provide insights into the distributional consequences of profit shifting.

JEL codes: F23, H25, H26
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1 Introduction

Tax avoidance by multinational enterprises (MNEs) has emerged as a key challenge for public finance, with significant implications for government revenue, redistribution and economic efficiency. By strategically reporting profits in low-tax jurisdictions, MNEs can substantially reduce their tax liability despite conducting real economic activity in high-tax countries. According to Tørsløv et al. (2023b), nearly 40% of the profits generated by multinationals abroad in 2015 were reported in tax havens.[1] Until recently, however, comprehensive microdata on profits earned abroad by non-US multinationals have been unavailable, making it difficult for researchers to draw conclusions about the distribution of profit shifting across firms.

We take advantage of novel comprehensive data covering the worldwide distribution of profits of large French MNEs to tackle four fundamental questions about profit shifting. First, what is the magnitude of profit shifting by large French MNEs? Second, what are the tax revenue implications across countries? Third, how concentrated is profit shifting across firms, and what does this imply for optimal tax enforcement thresholds? Fourth, what are the distributional consequences of profit shifting?

To answer these questions, we exploit newly available Country-by-Country Reporting (CbCR) data, which provides detailed information on the global activities of MNEs with global revenues exceeding €750 million. The CbCR data provides information on profits, revenues, assets and employees in each country where the multinational firm is located. This breakdown of information is very valuable for investigating profit shifting as it enables an examination of how MNEs allocate their profits and activity. We combine these reports with comprehensive French administrative and tax records data to construct a unique dataset that tracks the allocation of profits, employment, assets, and tax payments across all subsidiaries of French multinationals with a global turnover greater than €750 million.

The €750 million threshold is somehow arbitrary and aims to include "large multinational firms". It not only serves as the basis for participation in country-by-country reporting but also for the inclusion in the Global Minimum Tax (GMT) framework. The threshold may be too high as smaller firms also engage in profit shifting. It would entail that countries could raise additional tax revenues by including them, and it would also enhance the fairness of the tax system by fading the dichotomy in the tax treatment of MNEs. But it could also be that it is too low and that only a few MNEs above this threshold do engage in aggressive tax avoidance. In that case, given the compliance costs associated with providing a CbCR and complying with the GMT, this threshold could lead to inefficiencies and decrease the overall welfare.

Our analysis yields four main findings. First, we estimate that large French multinationals shift €24-31 billion in profits annually, representing 21-26% of their foreign profits. Second, this profit shifting results in substantial missing profits in high-tax

[1] Throughout the paper, we include 41 countries in our list of tax havens, following Tørsløv et al. (2023b). The list of countries is in Appendix A.1.

countries, around €11 billion per year in France, or 17% of the profits reported domestically. As a result, the 321 MNEs in our sample are responsible for a substantial loss of tax revenues in France, estimated at around €2.5 billion each year, equivalent to 7% of total corporate tax revenues. Third, we document strong concentration in profit-shifting behavior: the largest 10% of CbCR-eligible firms account for 70% of total shifted profits, though we find evidence of profit shifting across the firm size distribution. Fourth, we find evidence of significant distributional effects associated with profit shifting, with effects on within firm and within country inequality.

Our contribution is four-fold. Our first contribution is methodological. Although CbCR provide a new resource to understand the allocation of activity of multinational firms, they are also flawed and must be dealt with carefully. The main issue with CbCR is the double counting of dividends where dividends flowing through a company could be considered twice, both in the source and in the destination countries. We provide a methodology to estimate and redistribute those double-counted profits. It relies on comparing profits reported in CbCR to consolidated profits reported in other sources. We remove the "excess profits" reported in CbCR using information on anomalies in subsidiaries' profitability and effective tax rates. We find that 12% of total profits reported in CbCR are double counted, which means that our paper considerably improves the precision of previous estimations based on CbCR microdata (for other papers using CbCR to estimate profit shifting, see Fuest et al. 2022a,b; Bratta et al. 2021; Boukal et al. 2024). As expected, most double-counted dividends are received by French headquarters and subsidiaries located in tax havens, which provide a preferential tax treatment of received foreign dividends. Not accounting for this inclusion of intra-group dividends would largely inflate profits in tax havens, thereby biasing profit shifting estimates (Blouin and Robinson, 2023).

Second, we provide the first comprehensive analysis of profit shifting by large French multinationals using micro-data. Current estimates of profit shifting based on micro data mainly focus on US multinationals due to lack of comprehensive information in other countries. We build on our observation that there exist large discrepancies between the location of real activity (such as employment and assets) and the location of profits, with tax havens making up less than 10% of total foreign employees and assets but 20% of foreign profits. We develop a theoretical model to derive a set of conditions to estimate the profit shifting behavior of multinational firms. We employ a formulary apportionment approach that compares subsidiary profitability to group-wide profitability, building on the intuition that, absent profit shifting, subsidiary profits should be proportional to real economic activity (Guvenen et al., 2022). This methodology improves upon existing approaches by accounting for firm-specific characteristics that may affect subsidiary profitability. Leveraging these profitability differentials, we estimate the amounts of profits shifted by multinationals in each country. We find that about €24-31 billion (or 21-26% of foreign profits) cannot be explained by real activity. We do not make any a priori assumptions about the destination of profit shifting nor

do we focus on profit shifting toward tax havens. We find, however, that most of the shifted profits are directed toward low-tax jurisdictions. More than half of this profit shifting goes to six financial hubs, namely Switzerland, Singapore, Luxembourg, the Netherlands, Hong Kong, and the United Kingdom. This leads to large tax revenue losses in France of about €2.5 billion per year, which represents about 7% of total corporate tax revenue in France.

Third, we contribute to the ongoing policy debate about optimal thresholds for international tax regulations. Our paper provides supportive evidence that a few large firms make up most of the shifted profits, in line with Wier and Erasmus (2022) and Davies et al. (2018). According to our estimates, 47% of total shifted profits are due to the largest 15 firms in terms of worldwide revenue, or 5% of the MNEs subject to CbCR and 10% of the MNEs make up 70% of total shifted profits. We also show evidence that profit shifting is not restricted to the largest firms only. We find that all firms in our sample seem to engage in profit shifting, irrespective of their size, but the contribution to total profit shifting of the smallest firms is negligible. Since most profit shifting is concentrated at the top of the distribution, anti-shifting policies should focus on these firms. These policies often impose non-negligible compliance and administrative costs on firms and may lead to unintended distortions (Bjørkheim and Scheuerer, 2023). Leaving smaller firms out of these policies could be optimal, consistent with the OECD Inclusive Framework.

Finally, our paper contributes to a better understanding of the distributional effects of profit shifting. We first investigate the distortions induced by profit shifting. Because firms need to have some real activity in tax havens to fulfill some nexus requirements, some of their input costs may be inflated. We find that the wage premium in tax haven is about €29,000 a year on average, which correspond to a 50% higher wage relative to workers in non haven countries. It therefore appears that profit shifting may exacerbate inequality within the firm across countries. We also investigate a more direct effect of profit shifting on workers through rent-sharing mechanisms. As profit shifting enables firms to reduce their tax liability, it implies a higher after-tax profit, which can be in part distributed to workers. However, since the high profits tend to be reported in low-tax countries, where there is less real activity, workers in high-tax countries may be negatively affected. Focusing on the rent-sharing implication of profit shifting in the context of France where profit sharing is mandatory, we find that absent profit shifting, workers would benefit of an increase of 1.7% of their gross wage through profit sharing. Finally, we study the revenue potential of introducing a global minimum tax aimed to increase tax fairness within and across countries. We find that there is a substantial revenue potential with large French MNEs facing an increase in their global tax liability of up to €5bn per year.

Our work relates to several strands of the literature. We first relate to the literature estimating profit shifting magnitudes. Micro estimates of profit shifting usually focus on the incentives to shift profit, measured as the tax wedge between a given subsidiary

and other subsidiaries of the MNE (see e.g. Huizinga and Laeven 2008; Johannesen et al. 2020; Heckemeyer and Overesch 2017 for a literature review). We add to this literature by estimating the amount of profit shifting by French multinational firms using a formulary apportionment approach (Guvenen et al., 2022) and providing evidence of heterogeneity in their tax avoidance behavior. Our results also provide evidence of the type of firms engaging in profit shifting. As Davies et al. (2018) and Wier and Erasmus (2022), we emphasize that, just as profits are highly concentrated at the top of the distribution, most of profit shifting is due to a handful of very large firms.

We also relate to the literature using country-by-country reports data. Some papers using macro CbCR data have tried to quantify the amount of profit shifted (Clausing 2020; de Mooij and Prihardini 2019; Garcia-Bernardo et al. 2021, 2022), although they mostly focus on the US, to the exception of Garcia-Bernardo and Janský (2024). To our knowledge, only a few number of papers use micro-level CbCR, for MNEs operating in Italy (Bratta et al., 2021), in the United States (Nessa et al., 2022), German MNEs (Fuest et al., 2022b), and, most recently, all MNEs operating in Germany (Fuest et al., 2022a) and in Slovakia (Boukal et al., 2024). However, we are the first to properly estimate double-counted profits and to provide a more reliable estimate of profit shifting using this data source.

We also contribute to the nascent literature investigating the consequences of profit shifting. Profit shifting has consequences on measuring key economic outcomes such as GDP or productivity (Guvenen et al., 2022; Bricongne et al., 2023). It also has implications on inequality (Alstadsæter et al. (2022) and Souillard (2022)) show that profit shifting benefits executives and high-income earners. Finally, profit shifting also affects the redistributive capacity of the government, by reducing tax revenue in high-tax countries. We contribute to a better understanding of the consequences of profit shifting by studying different margins. We first study how profit shifting distorts the wage distribution within firms across countries and how this also affects our own understanding of profit shifting magnitudes. We estimate the revenue potential of the Global Minimum Tax and we provide some evidence on the effect of profit shifting on rent-sharing.

The paper is organized as follows. Section 2 describes the data. Section 3 sheds some light on what can be inferred from CbCR data. Section 4 proposes a conceptual framework to estimate profit shifting. Section 5 develops the methodology and provides the estimates of profit shifting. In section 6, we investigate the concentration of profit shifting. Section 7 presents some results on the distributional impact of profit shifting. Finally, section 8 concludes.

2 Country-by-Country reports data

Our main data source comes from CbCR. Country-by-country reporting was implemented as part of Action 13 of the OECD/G20 BEPS Project to give tax adminis-

trations the information needed to detect transfer pricing and other base erosion and profit shifting (BEPS) related risks. Reporting is mandatory for multinational companies with consolidated revenues of more than €750 million (or local currency equivalent) in the previous year. Currently, reporting does not entail public disclosure and CbCRs are only submitted to the respective tax authority and made available to researchers on a confidential basis.

OECD's Action 13 final report provides a template for multinationals to disclose information for each tax jurisdiction in which they operate. This includes country-level data on related party revenues[2], unrelated party revenues, total revenues, profits before income taxes, income tax paid, income tax accrued, stated capital, accumulated earnings, number of employees, and tangible assets other than cash and cash equivalents (see Aliprandi and von Zedlitz (2023) for a description of each variable). MNEs also have to provide qualitative information on the business activities performed in each country, along with the list of constituent entities present.

2.1 Coverage

Our final sample covers the universe of country-by-country reports submitted by French MNEs with annual global revenues exceeding €750 million, for the fiscal years 2016 to 2022. It covers 321 French MNEs, collectively representing 65,000 subsidiaries spanning 219 countries.[3] Over 2016-2022, these firms generated a worldwide consolidated revenue of €2,178 billion in yearly average, equivalent to the average of French GDP across these years (€2,246 billion).[4] They reported a total profit of approximately €194 billion in yearly average, of which 63% are booked outside France. Table 1 presents the aggregated figures reported in the French CbCR dataset.

Table 1: Summary statistics

Year	Nb of MNE	Nb of countries	Nb of subsidiaries (in thousand)		Total unrelated revenues (in bn €)		Total profits (in bn €)		Number of employees (in th)	
			France	Abroad	France	Abroad	France	Abroad	France	Abroad
2016	208	208	25	31	814	1,088	58	95	2,764	4,664
2017	248	212	29	35	891	1,210	74	108	3,092	5,676
2018	248	212	31	36	879	1,288	67	113	3,013	6,036
2019	253	213	32	37	943	1,362	67	126	3,100	6,156
2020	254	214	31	38	844	1,209	33	70	3,033	5,905
2021	259	213	31	39	935	1,311	99	139	3,017	5,931
2022	224	211	26	36	959	1,511	85	183	2,690	5,776
2016-2022	321	219	29	36	895	1,283	69	119	2,958	5,735

Note: Profits are corrected for the double-counting of dividends. Except for the number of MNEs and countries, the last line displays the average across all years.

According to Wier and Zucman (2022), foreign multinational profits worldwide amounted to €2,286 billion in total yearly average between 2016 and 2019, indicating that our sample of French MNEs foreign profits accounted for approximately 4.8% of

[2]Revenue generated from intra-firm trade.
[3]We exclude five state-owned firms and 29 firms with no activity in France from the original sample.
[4]Source: INSEE National Accounts

global foreign MNE profits.

Table 2 displays the shares of activity covered in our sample in all activity of MNEs in France and worldwide. We cover a small share of MNEs present in France (around 1%) but a substantial share of their activity (27% of revenues made by all MNEs in France). Compared to the global CbCR macro data published by the OECD,[5] French MNEs make up 3.7% of all CbCR reports between 2016 and 2021. They account for about 2.6% of global revenues and 3.9% of employees of MNEs filing a CbCR report.[6]

Table 2: Coverage of French CbCR in France and worldwide (in %)

Year	Activity in France						Worldwide activity		
	Among French MNEs			Among all MNEs			Among all MNEs[1]		
	MNEs	Revenues[2]	Employees	MNEs	Revenues[2]	Employees	MNEs	Revenues[3]	Employees
2017	3.9	42.7	35.9	1.2	29.5	26.6	4.2	3.0	4.4
2018	3.6	38.5	33.7	1.2	27.1	25.2	3.7	2.7	4.0
2019	3.6	39.3	29.7	1.2	27.8	21.2	3.6	2.7	3.9
2020	3.4	40.0	28.1	1.1	28.1	20.6	3.4	2.3	3.7
2021	3.4	37.1	27.7	1.1	26.2	20.2	3.4	2.3	3.3
2022	2.9	33.4	24.4	1.0	22.8	17.5	-	-	-
Average	3.5	38.5	29.9	1.1	26.9	21.9	3.7	2.6	3.9

[1] all MNEs that file a CbCR
[2] unconsolidated revenues
[3] consolidated revenues
Source: CbCR is compared to French administrative data (FARE) for activity in France by subsidiaries of both French and foreign MNEs, and to aggregated CbCR data (OECD) for worldwide activity.
Lecture: In 2017, our sample covers 3.9% of French MNEs, 42.7% of revenues generated by French MNEs in France and 35.9% of their employees, 1.2% of all MNEs operating in France, 29.5% of revenues generated by all MNEs in France and 26.6% of their employees. In the same year, our sample covers 4.2% of all MNEs reporting a CbCR, 3% of their worldwide revenues and 4.4% of their employees.

2.2 Double counting issues

In CbCR, data is aggregated at the subgroup level, meaning that we only have one observation for an MNE-country pair. This implies that intra-company transactions are not always eliminated. Therefore, income from affiliate B distributed to affiliate A could be counted both in the profit measure of affiliate B and affiliate A. We need to correct this double-counting of equity income, which might be particularly present for fiscal years before 2020 as there was no specific instruction on how to include intra-group payment of dividends in the profit variables (Delpeuch et al., 2019; Horst and Curatolo, 2020; Blouin and Robinson, 2023).

One key implication of double-counting is the effect it may have on computing effective tax rates. Since effective tax rates are computed by dividing the tax expense by corporate income, using an inflated profit measure will lead to downward bias ETRs. If firms only report the taxes paid for the Coporate Income Tax, then there is no reason to believe that the tax expense provided in the CbCR is affected by the double counting. If firms include withholding taxes on dividend payments, then this will increase the tax expense, leading to potentially less biased ETRs, but given that passive income is

[5] See OECD Data Explorer
[6] Aggregated CbCR data are only available until 2021.

either not taxed or taxed at lower rates, in particular through bilateral tax treaties, ETRs will still be underestimated. Double counting will also bias other ratios such as profitability ratios which are used to estimate profit shifting. As multinational firms can have immensely complex ownership structures (Francois and Vicard, 2023), the double counting of intra-group dividends can lead to severe overestimation of profits. Within a multinational, this issue might be more pronounced for the ultimate parent entity or investment holding companies. Given that they are at the top of the ownership structure, they potentially receive large amounts of dividends from their subsidiaries (ETBF, 2022).

We therefore develop a methodology to clean country-by-country reports from double counting.[7] We detect profit multiple counting by comparing CbCR data with consolidated accounts either from the Orbis database or from hand-collected information found in companies' financial statements. In consolidated accounts, the multinational is treated as a single entity, and all intra-company transactions are eliminated which means that there is no double counting. To identify firms that double-count dividends, we compare the consolidated profits and revenues in both CbCR and Orbis. We consider that there is a double-counting issue when we have a good match on the revenue variable, which is not supposed to be affected by the misleading guidelines, but lower profits in Orbis compared to CbCR.

We then remove the double-counted dividends using the following methodology. We assume that the inclusion of dividends will result in observations with very high profitability and low ETRs. Based on this assumption, we select problematic countries within each multinational to correct for double-counted dividends. Specifically, within each multinational, we flag subsidiaries in the bottom 30^{th} percentile of ETRs and the top 30^{th} percentile of profitability (calculated as profit over total revenue). For these selected jurisdictions plus the ultimate parent France, we treat the double-counted dividends as distributed income, allocating amounts pro-rata based on reported profit.

Table B.3 in the appendix shows the overall amount of double-counted profits. On average, a multinational for which we observe double counting of profits double counts 37% of its consolidated profits. For multinationals with well-matched revenue data, double-counted profits represent 12% of all reported profits in CbCR, amounting to approximately €19 billion in total per year on average. We observe a significant reduction in the amounts of double counting across years, which is explained by the fact that OECD guidances on the inclusion of dividends have become clearer. We correct profits mainly in some low-tax countries and tax havens such as Great Britain, Netherlands, Switzerland, and Luxembourg.

2.3 Additional data

CbCR data provides detailed information on multinational enterprises in the jurisdictions where they operate, such as the value of tangible assets and the number of

[7] See Appendix B for further detail on our other cleaning procedures.

employees. However, to obtain a more accurate picture of production activities in each country, it is important to estimate labor costs by country, which are more informative than the number of employees alone. To estimate these labor costs by country, we rely on French administrative data (FARE) for French subsidiaries, and Outward Foreign Affiliates Statistics (OFATS) for foreign ones, at the year and country level.

OFATS collects information from the heads of French multinational groups about their subsidiaries abroad for firms in all sectors.[8] The OFATS sample includes an exhaustive stratum of groups with four or more subsidiaries (around 1,600 groups).[9] Out of the 321 MNEs in total for the years 2016-2021, we were able to match 296 with OFATS. For non-matched observations, we use the number of employees provided by CbCR, that we multiply by the median wage at the country-year level computed using OFATS on matched observations.

We use the same information for subsidiaries in France using two sources of data. *Liaisons Financières entre Sociétés* (LIFI) allows us to recover the French subsidiaries of each group since CbCR does not provide a standardized identifier for half of the subsidiaries. We complete this data with FARE, which is a nearly exhaustive administrative dataset built from the corporate tax returns and the social security declaration of the universe of firms in the non-financial corporate sector. We recover more than 50,000 of the 62,000 French subsidiaries covered by our CbCR data.

Our matching procedure is detailed in the appendix section A.2.

3 Global distribution of activity and tax haven prevalence

3.1 Misalignment between real and reported activities

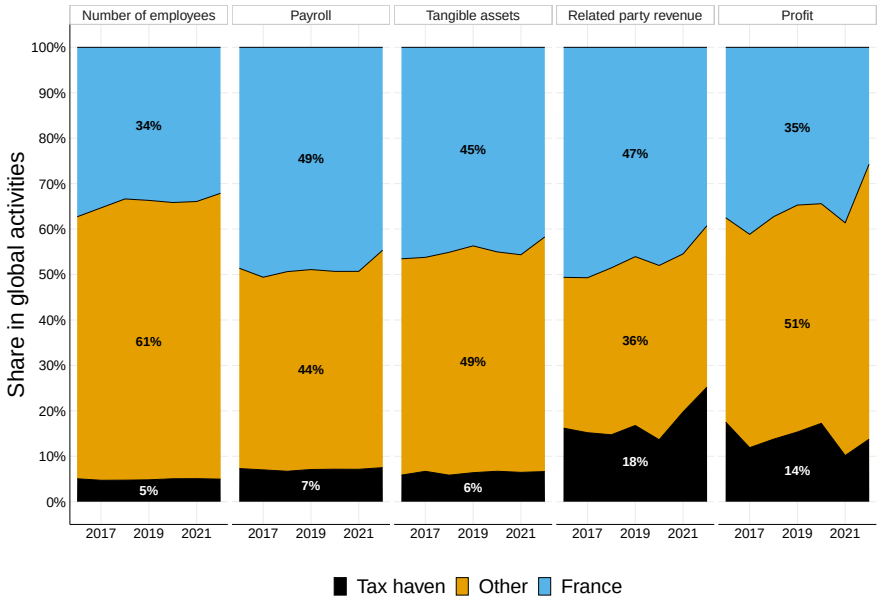
CbCR data provide valuable insights into the location of activities of multinational enterprises, including in tax havens. Figure 1 shows the distribution of activities carried out by French multinationals around the world. One of the first observations is that a significant proportion of their activities are concentrated in France. On average over the period 2016-2022, 34% of employees, around 45% of payroll, tangible assets and 45% of related party revenue, and 37% of profits are located there.

When focusing on foreign activities, most foreign profits are located in large economies such as the United States, the United Kingdom, China, and EU countries (see Figure C.1 in the appendix), which is consistent with the logic of market potential and proximity. Apart from these countries, a few tax havens seem to harbor substantial amounts of profits, such as Switzerland, Singapore and the Netherlands. As shown in Figure 1, 23% of foreign profits are booked in tax havens (15% of global profits). However, less than 10% of foreign production factors (such as tangible assets and employment)

[8] Multinational firms have to report all companies in which the group exercises control, directly or indirectly. All MNEs whose main decision-making center is located in France and controlling at least one company based outside France are surveyed. The survey is sent to the parent company or "decision center", or to the company responsible for consolidating data from subsidiaries throughout the group.

[9] See CNIS.

Figure 1: Worldwide breakdown of activities



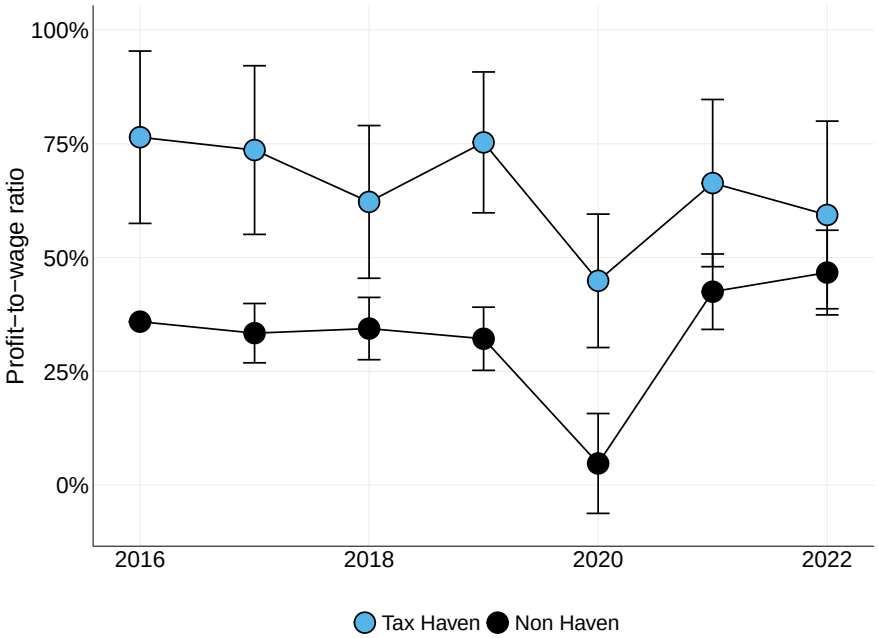
Note: This graph depicts the share of MNE activity in France, tax havens and other countries across key variables. *Lecture*: in 2017, tax havens accounted for 15% of all related party revenues.

are located in tax havens. This is a first suggestive evidence of a clear misalignment between profits and economic activities in tax havens. We also observe that related party revenues are over-represented in tax havens compared to real economic indicators. This type of revenue is likely to be influenced by profit shifting, in particular by transfer pricing manipulation. More precisely, we find that around 32% of related party revenues generated outside of France are reported in tax havens over the period.

Running the same exercise as Tørsløv et al. (2023b), we find that the profit-to-wage ratio is substantially higher in tax havens compared to non-haven countries. Figure 2 shows the excess profitability in tax havens, relative to the profitability in non-tax haven countries. We find that the profit-to-wage ratio in tax havens fluctuates around 60-75%, while it is below 40% in non-haven countries. However, the profitability discrepancy between subsidiaries in tax havens and non-haven countries seems less pronounced for French MNEs than for US MNEs. Indeed, while Tørsløv et al. (2023b) find also a 50% profit-to-wage ratio for US MNEs in non-haven countries, it reaches 346% in tax havens. This is consistent with the findings of Wright and Zucman (2018) where they show that US MNEs report about 15% of their foreign assets and 10% of their foreign payroll in tax havens, but book almost 50% of their foreign profits there. This is suggestive evidence that US MNEs are on average more aggressive than French ones in their tax avoidance behavior.

Despite recent papers pointing toward a reduction in tax haven profit shifting and a reallocation of real activity toward low-tax jurisdictions following the implementation of the CbCR requirement (De Simone and Olbert, 2022; Hugger, 2024; Joshi, 2020),

Figure 2: Profit-to-wage ratio in tax haven and non-haven countries



Note: Figure 2 shows our coefficients of interest β_{1t} and β_{2t} of the following model:

$$\frac{\pi_{cit}}{w_{cit}} = \beta_{1t}\alpha_t + \beta_{2t}\alpha_t Haven + \beta_3 ln(k_{mct}) + \beta_4 ln(l_{mct}) + \gamma X_{ct} + \mu_i + \epsilon_{mct}$$

with π_{cit} the profit at the country-MNE-time level, α_t time fixed effects, μ_i MNE fixed effects, k_{cit} the amount of tangible capital, and X_{ct} a vector of country controls which include the log of population, indicator of the market conditions of the country. We winsorize profit-to-wage ratios at the 5% level to remove outliers. Standard errors are clustered at the MNE level. We show the 95% confidence intervals.

our descriptive evidence shows that their sill exists a significant disconnect between real activity and reported profits in tax havens. We also find that presence in a tax haven is a very common feature among large French multinationals, with 89% of them having at least one subsidiary in a tax haven despite apparent evidence that multinational firms reduced their presence in tax havens (De Simone and Olbert, 2022). As illustrated in Figure C.2 (in the appendix), subsidiaries located in tax havens predominantly engage in activities associated with profit shifting, such as holding, financial, and insurance operations. These activities are often disconnected from real economic activities, as they require minimal physical presence and are highly mobile. Notably, 25% of insurance subsidiaries are based in tax havens, compared to only 7% of manufacturing subsidiaries.

3.2 Large range of effective tax rates

CbCR data also reveal the wide range of tax rates faced by multinational companies worldwide. We compute effective tax rates (ETRs) at year and country level by

summing all taxes accrued reported in a given country during the year, divided by the sum of all profits reported in that country in the same year.[10]

We observe that French multinationals face very different ETRs depending on where they book their profits (Figure 3). In France, we observe that multinationals face a significantly lower ETR than the statutory rate. Additionally, the decline in the corporate income tax rate has led to a sharp reduction in the ETR. At the beginning of the period, the ETR was 24%, compared to a statutory rate of 33.3%. By 2022, the ETR had dropped to 15%, a decline even steeper than the reduction in the statutory rate to 25% (Figure C.3 in the appendix). Bach et al. (2019) show that the gap between statutory and effective tax rates in France is mainly due to three factors: the deductibility of interest from the tax base (that explains 39% of the gap), the employment competitiveness tax credit (27%) and the R&D tax credit (13%). The authors also showed that these three factors mainly impact large firms, leading to a lower ETR than for smaller firms.

In addition, we observe that French MNEs face lower effective tax rates in tax havens such as Singapore, Luxembourg, Hong Kong and Switzerland, with ETRs well below the statutory rates. Overall, French MNEs face an average effective tax rate of 20% on their global profits (Figure C.4 in the appendix).

Complementing the misalignment evidence of the previous section, Figure 4 shows the distribution of MNEs' foreign activities according to the ETR faced by their subsidiaries. We divide our sample of subsidiaries into four groups: ETR below 10%, between 10 and 15%, between 15 and 25% and above 25%. We again observe a misalignment between profits and real activity: 23% of foreign profits are reported in subsidiaries with ETR below 10% while only 13% of employment can be found there. Also, a larger share of related party revenue compared to revenue from external trade is reported in low-tax subsidiaries, again suggestive of the strategic location of subsidiaries in low-tax jurisdictions to potentially engage in profit shifting.

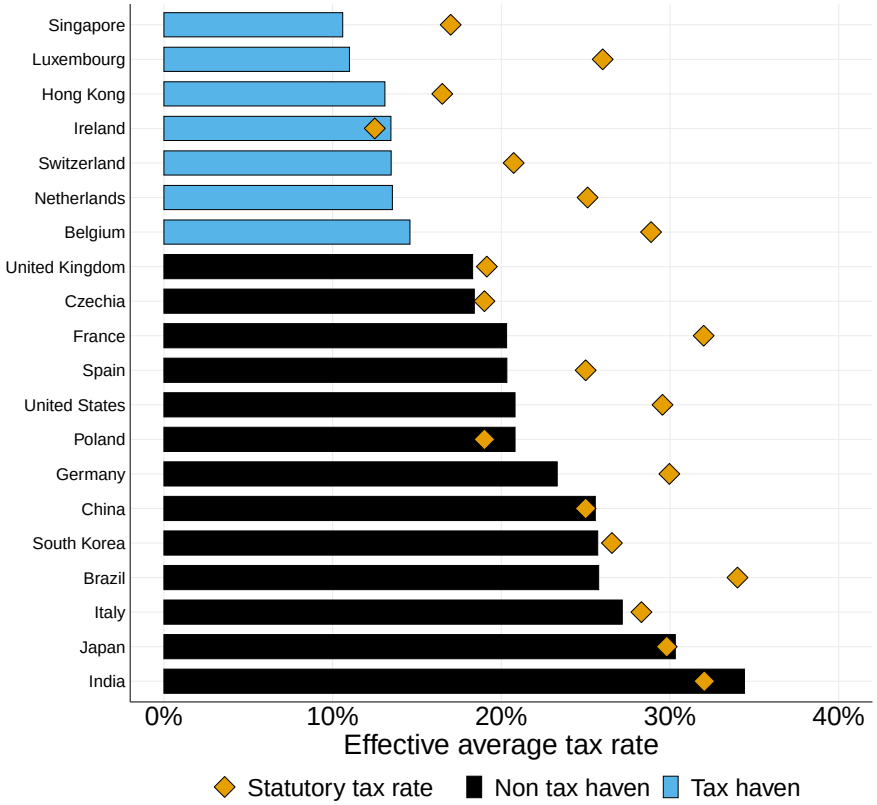
3.3 Concentration of activities among very large firms

We document the heterogeneity across firms subject to country-by-country reporting. Although all these companies have revenues exceeding the €750 million threshold, we observe substantial differences between them. Figure C.5 in appendix shows that the distribution of MNEs according to their revenue is clearly concentrated towards the €750 million threshold. However, we also observe some very large MNEs. Similarly, we can see in Figures C.6 in the appendix that there exists a large heterogeneity within our sample along different key aspects such as profits, number of employees, assets and payroll.

Focusing on the concentration of profits, and in particular profits in tax havens,

[10] We only include in the calculation the subsidiaries reporting positive profits and a positive tax liability that does not exceed the amount of profits (they account for 64% of our sample, and 92% of observations with positive profits).

Figure 3: Average Effective Tax Rate by country



Note: This graph shows the effective tax rates and statutory tax rates of the 20 countries where the French MNEs report largest profits. The values correspond to the average over the period 2016-2022. ETRs are computed at the year and country level as the sum of tax accrued reported there, divided by the sum of profits, including only subsidiaries that report positive profits and positive accrued tax amount, and a tax amount lower than reported profit. Statutory tax rates come from Tax Foundation. *Lecture*: between 2016 and 2022, the average effective tax rate in Singapore is 9%, while the statutory tax rate is 17%.

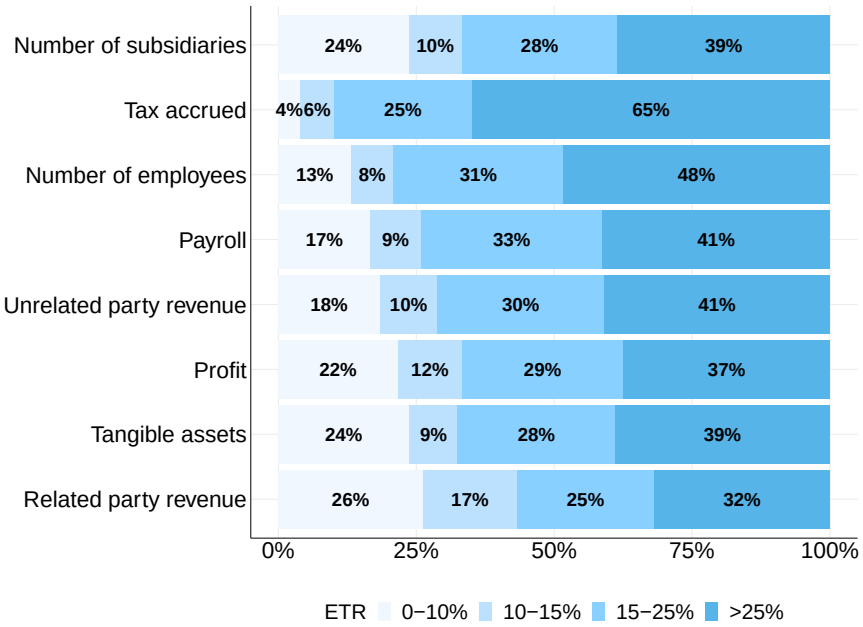
Figure 5 shows that the top 15 MNEs in terms of global revenue account for 47% of foreign profits reported by French MNEs targeted by CbCR and a significant share of real activity, although to a lesser extent than for profits. Furthermore, the 15 largest MNEs make up 48% of consolidated revenues and 60% of the revenues of related parties in tax havens.

To better capture the diversity in the production activities of the large French MNEs, we establish a sectoral classification of these firms. This classification is based on the sector information available at the subsidiary level in OFATS for all foreign countries where these MNEs operate.[11] We aggregate this data at the MNE level by identifying the most represented sectors in terms of labor costs.[12] Figure 6 highlights

[11] In the analysis by sector, we exclude 50 MNEs out of 320 that do not match with OFATS and account for 3% of total revenue in our data.

[12] To better reflect the core activity of each MNE, we exclude broad categories such as Trade or

Figure 4: Distribution of foreign activities according to ETR



Note: This graph shows the distribution of foreign activities, grouping foreign subsidiairies by level of ETR. ETRs are calculated at the multinational-country-year level as the ratio between tax accrued and profit before tax. We restrict the sample to subsidiaries with positive profits and a ETR included between 0 and 1. Then, we compute the share of each ETR group in the total of foreign activities, according to different indicators. *Lecture*: 19% of total foreign revenues are reported in subsdiaries with an average ETR below 10%.

the specific features of each country in terms of the sectors in which the multinationals predominate. Notably, China attracts mainly manufacturing profits, while Luxembourg is overwhelmingly home to banking and insurance companies.

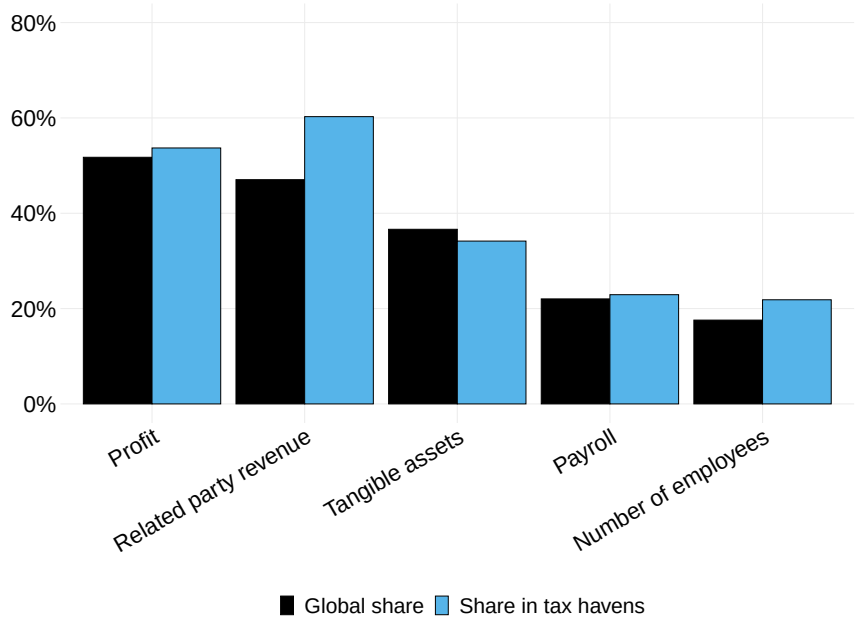
4 Conceptual framework

4.1 Model setup

We use a simple model based on Huizinga et al. (2008) to identify tax-motivated misalignment. We consider a representative MNE that operates in n countries, indexed by $i \in \{1, ..., n\}$. An MNE generates a true pre-tax profit π_i in country i. To reduce its worldwide tax liability, the firm has the possibility to relocate profits between jurisdictions. In particular, the firm can shift a share s_{ih} of its profit π_i earned in country i towards country h, as defined in Wang (2020). In this static model, we consider that the firm has only interest to shift profits from countries with positive earnings (π_i ¿ 0).

Administrative Management, which are common to all multinationals but may not accurately describe their specific operations. The classification consists of 88 sectoral groups. These 88 sectors are defined in the INSEE Nomenclature, which we further consolidate into 18 sectors and, in some cases, into four major sectors to maintain sufficient statistical power in the analysis.

Figure 5: Concentration among the top 15 of French multinational firms



Note: We take the MNEs in the top 15 of the global revenue distribution per year and compute their share in total foreign activities in black bars, and in activities booked in tax havens in blue bars. We average all shares over 2016-2022.

Profit shifting is costly. This cost may encompass various aspects of profit shifting. On the one hand, it may correspond to the resources mobilized by the firm to engage in tax avoidance, such as hiring a team of tax lawyers, developing transfer pricing schemes or shifting debts. On the other hand, it may include potential costs in the event of legal action by tax authorities or a loss of reputation if their tax evasion is exposed to the public by advocacy groups.

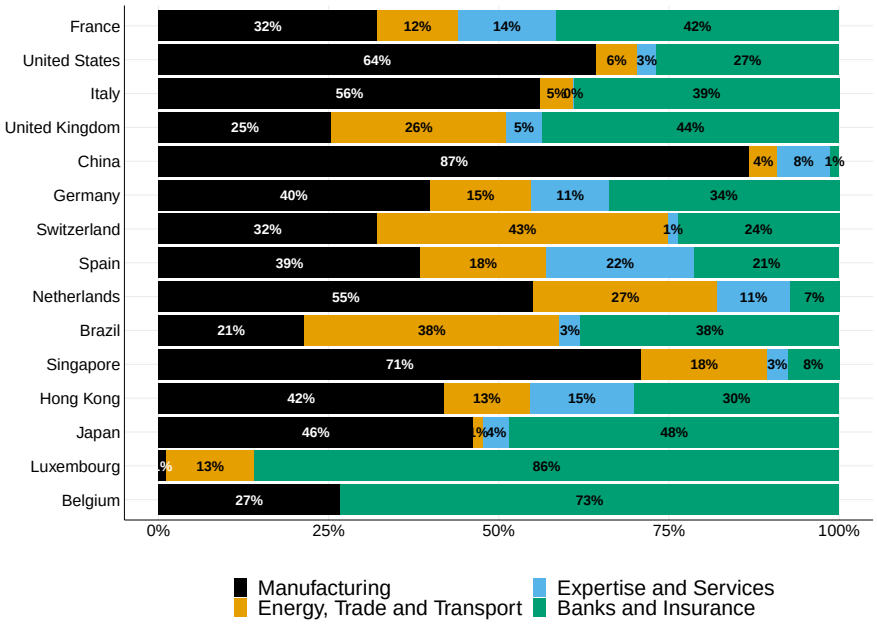
Following Hines and Rice (1994), we model these costs as an increasing and convex function with the share of shifted profits s_{ih}, as it might be increasingly costly to shift an additional share of profits. Moreover, we consider that the cost increases with the size of the firm, proxied by π_i, as larger firms may be under greater scrutiny by the tax authorities. Finally, we assume that the MNE faces fixed sunk costs F when it decides to engage in profit shifting, which is supported by the evidence that mainly large firms engage in such avoidance practices (Davies et al., 2018). If the multinational does not engage in profit shifting, these costs will be zero.

4.2 Multinational profit shifting problem

Absent profit shifting, the worldwide after-tax profit of the MNE is defined by:

$$\Pi^0 = \sum_{i=1}^{n} (\pi_i - t_i \pi_i)$$

Figure 6: Share of sectors in reported profits



Note: This graph shows the distribution of profits reported by French MNEs gathered into four major sectors in the top 20 countries with the highest reported profits. The shares are calculated over the period 2016-2022.
Lecture: 88% of profits reported in Luxembourg come from MNEs operating in the Banks and Insurance sector.

with t_i the corporate income tax rate in jurisdiction i.

The MNE can shift profits across tax jurisdictions to maximize its worldwide after-tax profit:

$$\Pi^{PS} = \sum_{i=1}^{n} \left(\pi_i - t_i \pi_i (1 - \sum_{h=1}^{n} s_{ih}) - \sum_{h=1}^{n} s_{ih} \pi_i t_h - \sum_{h=1}^{n} \frac{\gamma}{2} s_{ih}^2 \pi_i \right) - F$$

with s_{ih} the share of profits of country i shifted to country h, F representing the fixed cost associated with initiating profit shifting, and γ representing the additional cost as the amount of profit shifted increases. Therefore, the firm's maximization problem is the following:

$$\max_{(s_{ih})_{ih} \in [0,1]^{n^2}} \sum_{i=1}^{n} \pi_i \left((1 - t_i) + \sum_{h=1}^{n} s_{ih}(t_i - t_h) - \sum_{h=1}^{n} \frac{\gamma}{2} s_{ih}^2 \right) - F \cdot \mathbb{1}_{PS}$$

In case of profit shifting, the first-order condition gives the optimal share of profits shifted:

$$s_{ih}^* = \begin{cases} 0 & \text{if } t_i < t_h \\ \dfrac{t_i - t_h}{\gamma} & \text{otherwise} \end{cases} \tag{1}$$

We assume that the shifting factor γ is sufficiently large to ensure that the constraint $\sum_{h=1}^{n} s_{ih}^{*} \leq 1$ is never binding.

The model shows that, if the firm engages in profit shifting, it shifts a share of its profits that increases with the tax rate differential between jurisdictions and decreases with the cost of shifting. Moreover, this share is independent of the firm size. However, the total amount of profits shifted from country i to haven h, $s_{ih}^{*}\pi_i$, is then proportional to π_i, indicating that larger firms (with higher π_i) shift more in absolute terms.

The firm decides to engage in profit shifting if the tax benefits offset the cost of engaging in tax avoidance. Formally, the firm chooses to engage in profit shifting if and only if $\Pi^{PS} > \Pi^{0}$. This condition simplifies to:

$$\sum_{i=1}^{n} \pi_i \left(\sum_{h=1}^{n} \frac{(t_i - t_h)^2}{2\gamma} \right) > F$$

It follows that firms will only shift profits if net tax benefits exceed the fixed costs. This creates a minimum threshold for the tax rate differential that must be exceeded before profit shifting becomes profitable. In addition, larger firms are more likely to engage in profit shifting, as they can spread the fixed costs over a wider earnings base. This is observed in the profit shifting condition, where higher values of π_i make it easier to overcome the fixed costs. This methodology allows us to determine a lower bound estimate of profit shifting by considering deviations that fulfill the tax condition.

4.3 Amount of shifted profits

By shifting its profits, the MNE can adjust the amounts declared ρ_i in country i as follows: $\rho_i = \pi_i - \sum_{h=1}^{n} s_{ih}^{*}\pi_i + \sum_{k=1}^{n} s_{ki}^{*}\pi_k$. $\sum_{h=1}^{n} s_{ih}^{*}\pi_i$ represents total outflows from country i to havens h, and conversely $\sum_{k=1}^{n} s_{ki}^{*}\pi_k$ represents inflows from countries k. To estimate the overall amount of shifted profits in country i, we have access to ρ_i with CbCR data, but we need to recover the true profit π_i. To do so, we assume a structural form for the production function. The MNE operates in country i using a Cobb-Douglas production function with constant returns to scale: $F(l_i, k_i) = \theta_i l_i^{\alpha_i} k_i^{(1-\alpha_i)}$ with θ_i the technological factor, l_i the number of employees of the MNE in country i, k_i the amount of tangible assets and α_i the labor share.

The cost of producing a quantity y_i is defined by $C(y_i) = w_i l_i + r_i k_i$, with w_i and r_i costs of labor and capital respectively. In this simple framework, the minimal cost to produce the quantity y_i is linear with y_i: $C(y_i) = c_i y_i$, with c_i the marginal cost. Moreover, the optimal cost of labor represents a share α_i of total costs, and symmetrically the cost of capital represents a share $1 - \alpha_i$.

The true pre-tax profit of the MNE in country i is defined as $\pi_i = y_i p_i - C(y_i)$, with p_i the selling price. It can also be written as $\pi_i = c_i y_i(\mu_i - 1)$ with $\mu_i = \dfrac{p_i}{c_i}$ the gross markup. Moreover, it can be expressed in terms of labor or capital costs separately: $\pi_i = \dfrac{w_i l_i}{\alpha_i}(\mu_i - 1) = \dfrac{r_i k_i}{1 - \alpha_i}(\mu_i - 1)$. Then, the profits π_i made by the MNE in country

i in a given year represent the following share of the global pre-tax profits:

$$\frac{\pi_i}{\sum_j \pi_j} = \frac{\frac{w_i l_i}{\alpha_i}(\mu_i - 1)}{\sum_j \frac{w_j l_j}{\alpha_j}(\mu_j - 1)} = \frac{\frac{r_i k_i}{1-\alpha_i}(\mu_i - 1)}{\sum_j \frac{r_j k_j}{1-\alpha_j}(\mu_j - 1)}$$

We assume that the gross markup μ_i and the labor share α_i are constant for a given MNE in all the countries in which it operates. Besides, since profit shifting does not alter the global amount of profits of the MNE, we notice that $\sum_j \pi_i = \sum_j \rho_i$. Therefore, we can estimate the true pre-tax profit as the share of production factors multiplied by the global profits of the MNE:

$$\pi_i \approx \frac{w_i l_i}{\sum_j w_j l_j} \sum_j \rho_j \approx \frac{k_i}{\sum_j k_j} \sum_j \rho_j$$

5 Estimation of profit shifting

In this section, we present our firm-level estimations of profit shifting. Building on the framework exposed in Section 4, we develop upper-bound and lower-bound estimates of profit shifting. For the upper-bound estimate, we identify profit misalignment by comparing the profitability of individual subsidiaries to the profitability of the group as a whole. For the lower-bound estimate, we focus on cases of profit misalignment that appear to be tax motivated. Specifically, we consider misalignment in jurisdictions with effective tax rates lower than the overall group's effective tax rate. This approach highlights potential tax-driven profit misalignment. We test for alternative approaches in the appendix section E.

5.1 Methodology

Estimation of profit misalignment. We compute profits shifted to or from an entity as the difference between the reported profits and theoretical profits that would have been generated absent profit shifting.

We first estimate the theoretical profit, or true profit, of each firm in each country each year based on its real economic activity and then compare these estimates with the profits reported in the data. This provides us with a firm-country level estimate of profit misalignment $m_i = \rho_i - \hat{\pi}_i$. Aggregating misaligned profits over all the MNEs in our sample at the country level aims to filter out reporting noise, so we can identify the systematic pattern of excess profitability unexplained by production factors alone. That is why we build an aggregate measure at the country level to estimate the extent of profit misalignment:

$$M_i = \sum_{\text{all MNEs}} \rho_i - \hat{\pi}_i$$

To get a global measure of profit misalignment in a given year, we calculate the

sum over the countries for which we find positive misalignment:

$$M = \sum_{i|M_i>0} M_i$$

Positive m_i terms could partially reflect genuine economic productivity rather than tax avoidance behaviors. We use the estimates of profit misalignment M as an upper bound for profit shifting as some of this misalignment could be non-tax related.

Measure of allocation factors. As mentioned in Section 4.3, we use shares of production factors to estimate the theoretical profits. We therefore need to measure the subsidiary's share of production factors within the MNE. To do that, we use both the compensation of employees (wages and salaries as well as employer-paid benefits) and fixed capital assets. Compensation of employees reflects both the number of employees and the wages paid. This already accounts for differences in economic activity and economic context across countries and industries. Fixed capital assets is equivalent to net PPE stocks (Property Plant and Equipment) in other datasets. According to OECD BEPS Action 13, the variable "Tangible Assets other than Cash and Cash Equivalents" is defined as the "*[. . .] sum of the net book values of tangible assets of all the Constituent Entities resident for tax purposes in the relevant tax jurisdiction*" (OECD, 2015).

Including tangible assets in the allocation factors allows to account for the production of capital-intensive firms, which may have high revenue and profits but a low wage bill. This is notably the case for firms in the extractive industry. For the simplicity of our preferred specification, we only use the stock of capital but not the payment to this factor our data does not provide information on the rate of return. This assumes that rates of return do not vary from country to country. In Appendix E, we relax this assumption and use country-specific rates of return and show that our results are robust.

A challenge with this approach is to assign a weight to each factor of production: taking a non-weighted average of both the share of a subsidiary in global payroll and its share in the global tangible assets does not seem satisfactory given that MNEs can operate in more or less capital-intensive sectors. In that respect, a subsidiary holding the vast majority of tangible capital of a given MNE should generate a higher share of profits in a capital-intensive MNE than if it was part of a labor-intensive MNE.

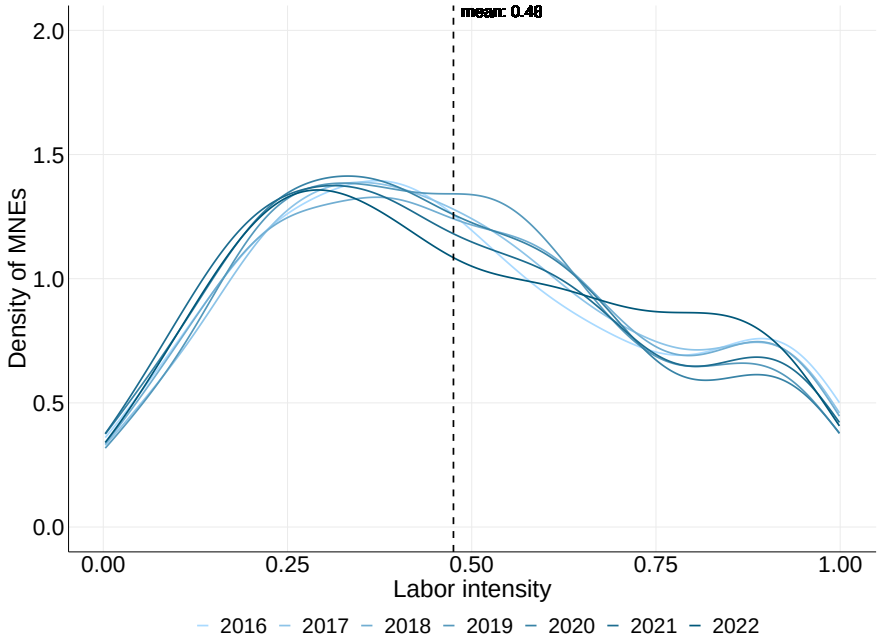
To overcome this issue, we estimate the labor intensity λ of an MNE in a given year as the global wage bill wl divided by the sum of the wage bill and the amounts of tangible assets k:

$$\lambda = \frac{\sum_j w_j l_j}{\sum_j w_j l_j + k_j}$$

MNEs with a zero weight would only have tangible assets, while MNEs with a weight of one would only have employees and no assets. Figure 7 shows the distribution of

firms along these weights and shows that they are slightly biased towards the left and not centered around 0.5, with more firms being quite capital-intensive.

Figure 7: Distribution of labor-intensity weights λ



Note: This figure shows the distributions of MNEs along their labor intensity weight λ for each year of the period. A weight of zero means that the firm only has tangible assets while a weight of one means that the firm has no tangible assets.

Therefore, in our preferred specification, we measure the MNE's profit in country i in a given year based on real economic activities with the following formula:

$$\hat{\pi}_i = \left(\lambda \frac{w_i l_i}{\sum_j w_j l_j} + (1-\lambda) \frac{k_i}{\sum_j k_j} \right) \sum_j \rho_j$$

This formula reflects our apportionment approach using both the share in tangible assets and the share in total compensation of employees of each subsidiary in the MNE. We weight the share of each factor of production by λ comprised between zero and one to better grasp each subsidiary's activity level. We test a series of other specifications in Appendix E to validate the robustness of the estimates.

Estimation of tax-motivated shifting. Our measure of profit misalignment may overestimate profit shifting as some of the misalignment may not be tax-related. Therefore, we define in this section a lower bound of profit shifting by considering only misalignment that coincide with tax incentives, in line with the result presented in equation (1). Indeed, since profit shifting aims at shrinking the tax base in high-tax countries while reporting large profits in low-tax countries, there should be some benefits for the

firm involved in reporting excessive profits in a country. This explains why we focus now on misalignment where there is an incentive to engage in profit shifting, as in Johannesen et al. (2020) and Francois and Vicard (2023). Discarding misalignment that goes against tax incentives allows to partly avoid capturing excess profitability due to other country-level determinants.

Therefore, in our lower bound estimate of profit shifting, we only consider misaligned profits that coincide with tax incentives. Following our conceptual framework in Section 4.3, profit shifting in country i is given by $\sum_{k=1}^{n} s^*_{ki}\pi_k - \sum_{h=1}^{n} s^*_{ih}\pi_i$. However, in our estimation, we cannot directly observe the shifted profits from country i to a specific haven h, $s^*_{ih}\pi_i$, nor the incoming shifted profits from country k, $s^*_{ki}\pi_k$. Instead, we only measure the total amount of these flows between country i and all other locations where the MNE operates. As a result, our estimates cannot rely on tax differences between specific country pairs to motivate profit shifting, such as in equation (1), but rather we adopt a simpler approach by comparing t_i with a global measure of t_h, which captures the overall tax environment faced by the MNE worldwide.

To do so, we evaluate the tax incentive for the MNE to shift profits in country i as the difference between the effective tax rate ETR_i faced by the MNE in country i,[13] with the MNE's global effective tax rate ETR[14]. When $ETR > ETR_i$, we consider that the group has an incentive to shift its profits towards country i, then a positive amount of misaligned profits is qualified as shifted profits. Formally, the profit shifted by the MNE in a country i is defined as:

$$\zeta_i = \mathbb{1}_{\{(ETR-ETR_i)(\rho_i-\hat{\pi}_i)>0\}} \times (\rho_i - \hat{\pi}_i)$$

In our preferred specification, we approximate the MNE's tax liability in country i as an average over all the MNEs operating in that country to increase the precision of these figures. Nonetheless, we have carried out the analysis with the MNE's country-specific effective tax rate in the appendix E, and we find consistent estimates.

As with profit misalignment, we can aggregate these estimates at the country level across all MNEs in our sample to identify countries receiving the highest amount of shifted profits: $Z_i = \sum_{\text{all MNEs}} \zeta_i$. Finally, we compute our global amount of profit shifting as the sum over the countries for which we find positive shifting:

$$Z = \sum_{i|Z_i>0} Z_i$$

[13] In our preferred specification, we estimate ETR_i as the average effective tax rate in country i, defined as the sum of taxes accrued by all MNEs operating in the country divided by their total profits reported in that country, computed over profitable subsidiaries that have an ETR between 0 and 1.

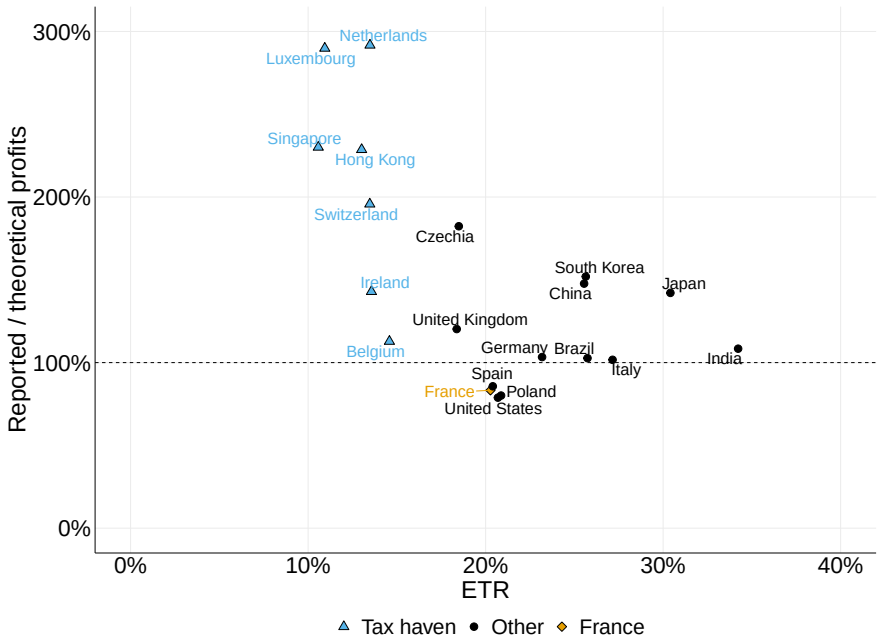
[14] defined as the sum of taxes accrued by the MNE worldwide divided by its global profit, over profitable subsidiaries that have an ETR between 0 and 1.

5.2 Results

5.2.1 Evidence of profit misalignment

We start by estimating the excess profitability of subsidiaries following our methodology presented above. Figure 8 shows the ratio between total reported profits in a given country over total theoretical profits estimated from real economic activities with our apportionment formula. We find that excess profitability is particularly high in tax havens such as Luxembourg (where MNEs are almost three times more profitable than estimated), the Netherlands, Singapore, Hong Kong and Switzerland.

Figure 8: Excess Profitability in Tax Havens

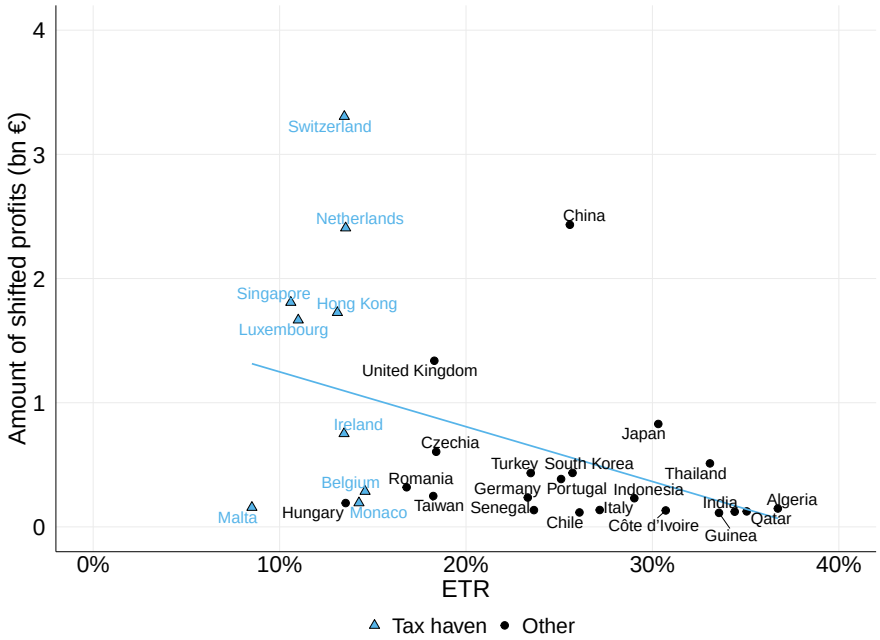


Note: This graph shows on the y-axis the ratio between total profits over the period 2016-2022 reported in a given country and total estimated theoretical profits in that country. The x-axis ranks countries according to the ETR faced by the MNEs there, averaged over the period. Computation of ETRs by country is presented in Section 3.2. The graph includes the top 20 countries in terms of profits reported by French MNEs. *Lecture:* over the period, reported profits in France represent only 87% of the counterfactual profits, and the average ETR faced by MNEs in France is 19%.

We also find that the countries attracting the highest amounts of misaligned profits, with our upper bound estimates, have the lowest effective tax rates. Figure 9 shows our estimate of the annual amount of misaligned profits in the main destination countries, and highlights the negative correlation with tax rates. The five tax havens mentioned above are the main recipients of profit misalignment by French multinationals.[15] This hints at a potential tax-related justification of such high amount of reported profits.

[15]There are some outliers such as China, where we find over €2.5 billion in misaligned profits. This is consistent with the findings of Garcia-Bernardo and Janský (2024).

Figure 9: Profit Misalignment and Effective Tax Rate



Note: This graph shows the correlation between profit misalignment and ETR. The amounts of misaligned profits are computed by country without the tax condition, as the sum of all profit differentials (positive and negative) of the French MNEs in the country in a given year, and then the figures are averaged over the period 2016-2022. Computation of ETRs by country is presented in section 3.2. Only countries with an average annual amount of misaligned profits larger than €100 million are represented in the graph. *Lecture:* over the period, €3.3 billion of profits are shifted by the French MNEs in Switzerland, where they face an average ETR of 13%.

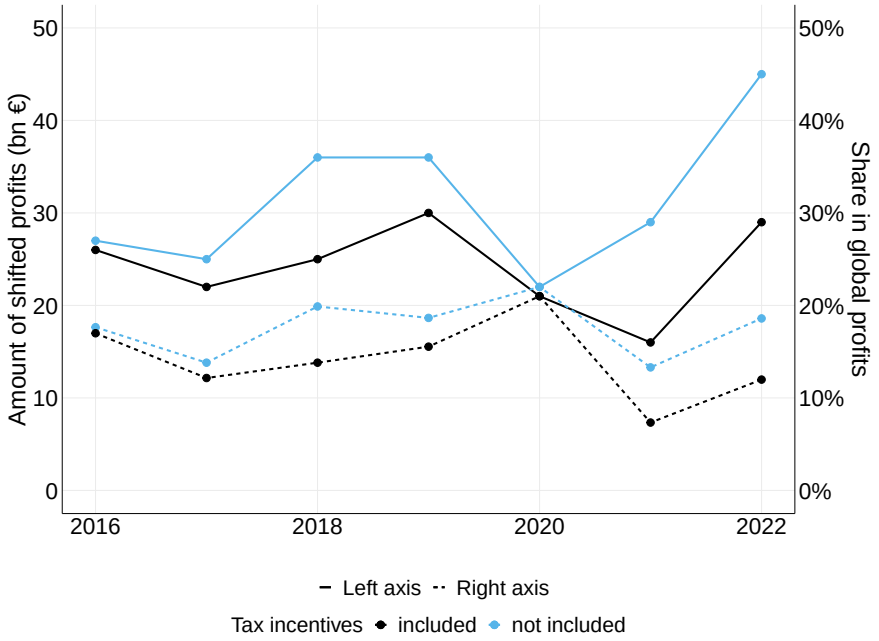
Although we find a strong negative correlation between profit misalignment and corporate tax rates, a substantial proportion of misaligned profits is allocated in countries that are not tax havens and are not necessarily characterized by tax avoidance practices. Such excess profits can simply be due to over-reporting of profits due to miscomputed transfer prices (Tørsløv et al., 2023a).[16] We can also expect that a part of these excess profits is simply driven by inherent profitability differences or specific (one-off) transactions firms undertake, such as mergers, acquisitions or restructuring, which affect their apparent profitability in a given year. To circumvent this issue, in the rest of the paper we consider our two estimates together, profit misalignment as an upper bound and profit shifting, which takes tax incentives into account, as a lower bound.

[16] As shown by Tørsløv et al. (2023a), 10.7% of mutual agreement procedures initiated by high-tax EU countries involve an EU tax haven, while close to 90% involve EU high-tax countries.

5.2.2 Profit shifting quantification

Figure 10 presents our estimates of global profit shifting conducted by French multinational firms included in the CbCR dataset. Each year, these firms shift approximately €31 billion based on our upper bound estimate and €24 billion according to our more conservative estimate. This corresponds to about 14-17% of their global profits, translating to 21–26% of their foreign profits, depending on the estimation approach.

Figure 10: Global amounts of shifted profits by the French MNEs



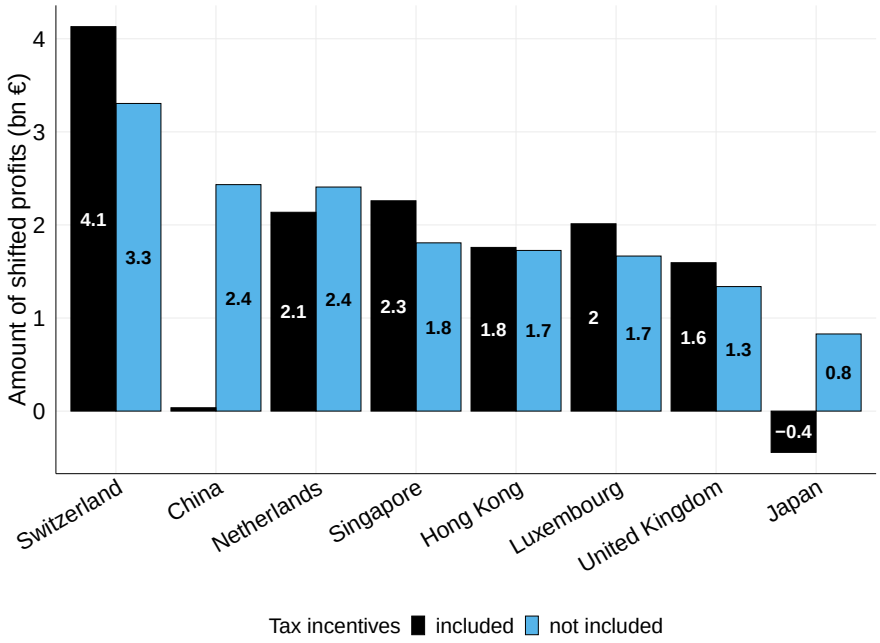
Note: This graph shows the annual amounts of shifted profits by the French MNEs in the world, according to our two main estimation methods. In black, we represent estimates that include tax incentives, and in blue estimates computed directly from the apportionment formula. The full lines represent the global amounts of shifted profits in euros (left axis). The dashed lines represent the share of shifted profits over global profits (right axis). *Lecture:* in 2018, the French MNEs shifted a total amount of €25 billion of profits, that correspond to 14% of global profits, according to our most conservative estimate.

We observe a slight decline in the amount of shifted profits in 2020, attributed to the economic impact of the COVID-19 pandemic. This reduction is driven by a decrease in firm profitability during that year rather than a reduction in profit shifting practices, as the share of shifted profits in global profits remains unchanged. In contrast, 2022 exhibits an increase in shifted profits, primarily driven by a significant rise in profitability within the oil sector.[17] This trend also reflects fluctuations in sector-specific profitability rather than an intensification of profit shifting practices.

To better understand where French multinationals shift their profits, Figure 11 shows the eight countries that receive the largest amounts of misaligned profits, based

[17] As mentioned in Reuters and Energy Profits.

Figure 11: Amounts of shifted profits in the top 8 destination countries



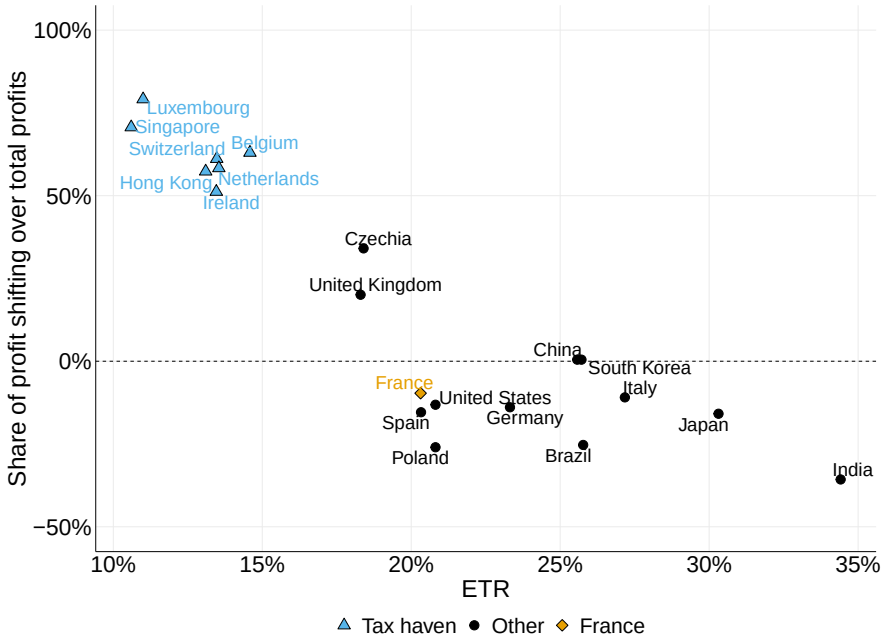
Note: This graph shows the average annual amounts of shifted profits in the top 8 destination countries, according to our two main estimation methods. In black, we represent estimates that include tax incentives, and in blue estimates computed directly from the apportionment formula. These results are the balance computed by country between positive shifting (when reported profits exceed theoretical profits) and negative shifting (when reported profits are lower than theoretical profits). *Lecture:* on average over the period, €2.3 billion of profits are shifted to Netherlands every year; when we restrict to tax-induced shifting, the amount is €2 billion.

on our upper bound estimates. Around 40% of these profits are concentrated in six major financial centers: Switzerland, Singapore, the Netherlands, Hong Kong, Luxembourg and the UK. The inclusion of the UK in this ranking is explained by the high volume of profits reported by French MNEs operating there and the country's ability to attract businesses. Factors contributing to this appeal include its status as a financial hub, geographical proximity to France, and its lower statutory corporate tax rate of 19%, which contrasts sharply with France's 33.3% rate at the beginning of the period. Additionally, the UK offers an extensive range of tax incentives, further encouraging profit shifting of French MNEs.

China and Japan also rank as important destinations for misaligned profits. However, when tax incentives are taken into account, the estimated amounts of shifted profits in these countries become negligible or even negative (indicating that profits are shifted out of the country). In contrast, the inclusion of tax incentives has minimal impact on our estimates for the six financial hubs previously mentioned, as they display low effective corporate tax rates. In some cases, the estimated amount of shifted profits even exceeds the misaligned profits because the tax-incentive condition we impose

leads to discarding some negative misalignment that offsets the positive tax-related misalignment in our upper bound estimate. Collectively, these six financial centers receive €13.7 billion of profits shifted by large French MNEs, representing about 55% of the profits shifted by these companies worldwide.

Figure 12: Share of profit shifting among total profits



Note: This graph shows the share of shifting profits in the total amount of profits reported in each country, for the 20 countries where the French MNEs report largest profits. For each country, we compute the amount of shifted profits over the period, divided by the total amount of profits reported there. We display the estimates that include tax incentives. The x-axis ranks the countries according to their average ETR on the period. Computation of ETRs by country is presented in section 3.2. *Lecture:* 20% of profits reported in the UK by the large French MNEs are in fact shifted for tax reasons, the MNEs facing there an average ETR of 18%.

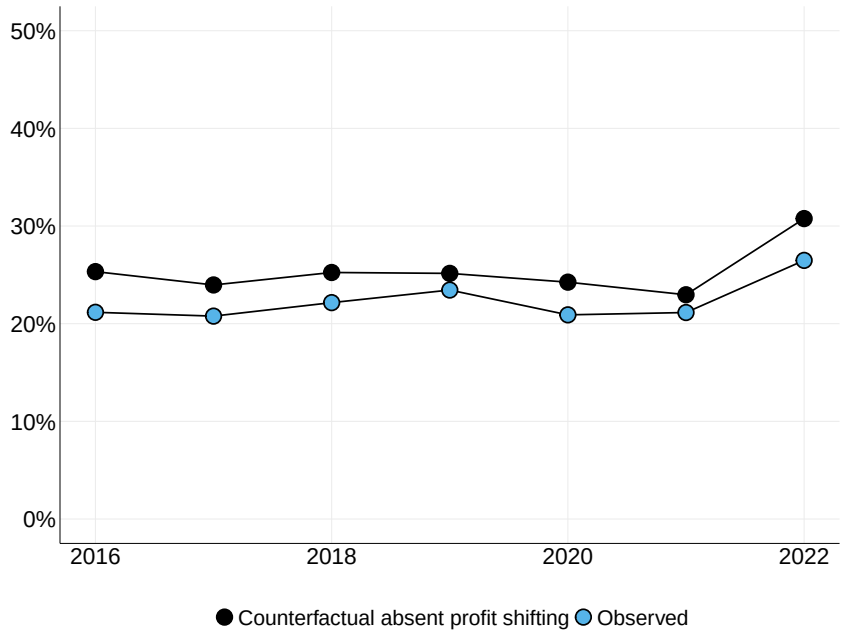
Figure 12 shows how profits reported by countries are distorted by profit shifting. In particular, almost 80% of the profits declared by these French multinationals in Luxembourg are in fact shifted profits and do not correspond to any real economic activity. Shifted profits account for over 50% of profits declared in Switzerland, Hong Kong, Singapore, the Netherlands and Ireland. Below the horizontal zero line are the countries that lose from these avoidance practices. We discuss this aspect in more detail in the Section 5.2.4.

5.2.3 Tax savings implications

Effect on global ETR. We estimate the effect of profit shifting on taxes paid by MNEs and show the result on Figure 13. We consider their effective tax rates with and

without profit misalignment and compute a counterfactual ETR assuming that profits align with real economic activity and apply the actual country-level EATR to these reallocated profits. We find that absent profit misalignment, and behavioral responses, the global ETR would increase on average by around 3pp, which corresponds to a 12-15% increase.

Figure 13: Evolution of global ETR with and without profit shifting



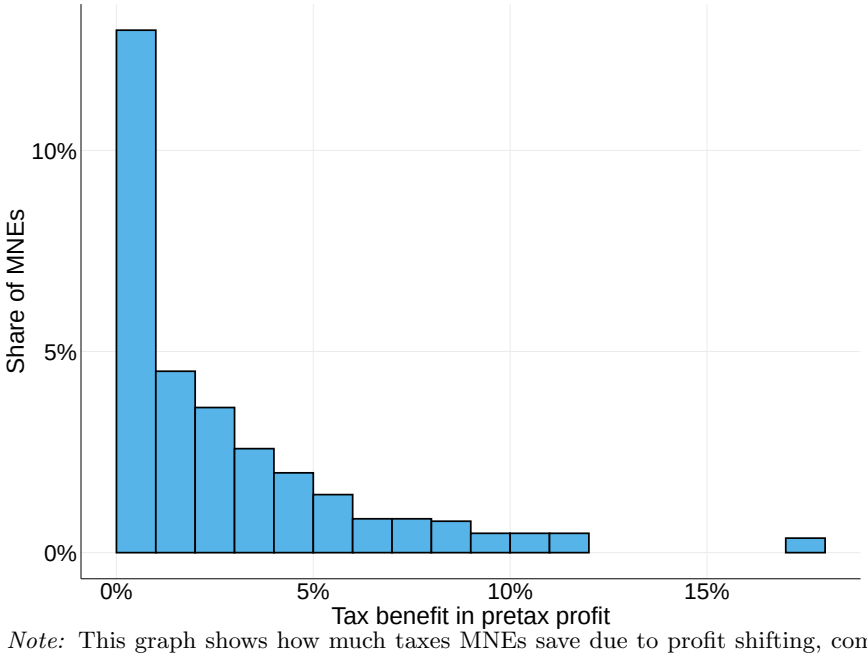
Note: This graph shows the global effective tax rate absent any profit shifting according to the tax-motivated misalignment method. ETR are computed as the sum of global taxes divided by the sum of taxes paid.

Tax savings for MNEs. We find that firms save on average a very small share of their pretax profits due to profit shifting. However, there is substantial variation across firms with about a quarter of MNEs getting a profit shifting benefit equivalent to less than 5% of their pre-tax profit which a minority of firms benefiting of lower taxes than are equivalent to over 10% of their pre-tax profit, according to our more conservative estimation (Figure 14).

5.2.4 Missing profits

We now turn to estimating the tax revenue losses due to profit shifting. Figure 15 shows the evolution of missing profits in France based on our two estimation approaches, both in absolute terms (euros) and as a share of reported profits in France. It shows that the large French MNEs are responsible for €5-12 billion of profits shifted out of France. The upper-bound amount corresponds to 17% of the profits they report

Figure 14: Distribution of tax savings as a share of pretax profits



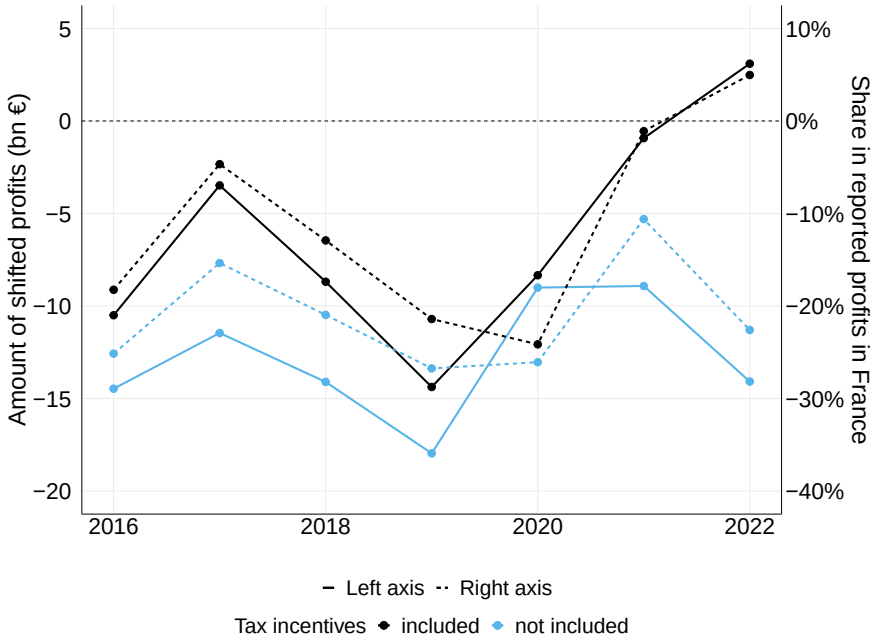
Note: This graph shows how much taxes MNEs save due to profit shifting, computed according to the tax-motivated misalignment method, as a share of total pretax profits.

domestically. In terms of tax losses, a naive calculation that disregards behavioral responses suggests that these missing profits result in an annual loss of €2.5 billion in corporate tax revenue, equivalent to around 7% of total corporate tax revenue in France. It is important to note that this estimate only accounts for the largest French MNEs, though accounting for 35% for corporate income tax revenue, and therefore excludes smaller French MNEs as well as all foreign MNEs operating in France.

Previous estimates, derived from macroeconomic data, suggest that the profits shifted out of France amount to 17-21% of reported profits (Tørsløv et al., 2023b), or 1.3-1.6% of GDP (Vicard, 2022), equivalent to around €30-39 billion annually. Using these figures, we find that approximately one-third of the profit shifting out of France can be attributed to the large French multinational firms, with the rest stemming from smaller French firms and large foreign ones. Given that the large French MNEs account for three quarters of the total profits reported in France by all MNEs filing CbCR returns, but only one third of the missing profits, this suggests that large French companies are relatively less aggressive in tax avoidance than foreign multinationals.

Figure 15 shows a reduction in missing profits after 2020. This decrease corresponds to a decline in the statutory corporate tax rate in France from 33.3% in 2016 to 25% in 2022, accompanied by an even greater reduction in the effective tax rate measured in our sample from 24% to 15%. From 2021 onwards, in our estimation that includes the tax incentive condition, France even appears as a destination for profit shifting. This

Figure 15: Annual amount of missing profits in France



Note: This graph shows the total amounts of shifted profits in France, according to our two main estimation methods. In black, we represent estimates that include tax incentives, and in blue estimates computed directly from the apportionment formula. Negative values indicate that profits are shifted out of the country. These results are the balance between positive shifting (when reported profits exceed theoretical profits) and negative ones (when reported profits are lower than theoretical profits). The full line represents the total amounts of shifted profits out of France (left axis). The dashed line represents the share of shifted profits over profits reported in France (right axis). *Lecture:* in 2018, the French MNEs shifted €9 billion of profits out of France, that correspond to 14% of total profits in France, according to our most conservative estimate.

change reflects the fact that 75% of the large French MNEs no longer have tax incentives to shift profits abroad, given that their global effective tax rate now exceeds the average effective tax rates they face in France. However, if we disregard tax incentives, large French multinationals continue to shift profits out of France at the end of the period, even if they seem to have fewer incentives to do so.

5.3 Robustness

We use alternative estimation methods to support our results. First, we propose different strategies for estimating the share of subsidiaries' costs in their group (for more details, see section E in the appendix). We provide an estimate using equal weights between labor and capital costs in the apportionment formula. Next, we carry out a specification including the rate of return on capital at the national level, since using the capital stock without its return may distort our results. We also test another tax condition than relies on an MNE-country level measure of ETR, instead of computing

the average ETR over all MNEs in the country. All these different strategies give similar overall results, as shown in the table E.1 in the appendix, and at the country level (Figures E.1 and E.2).

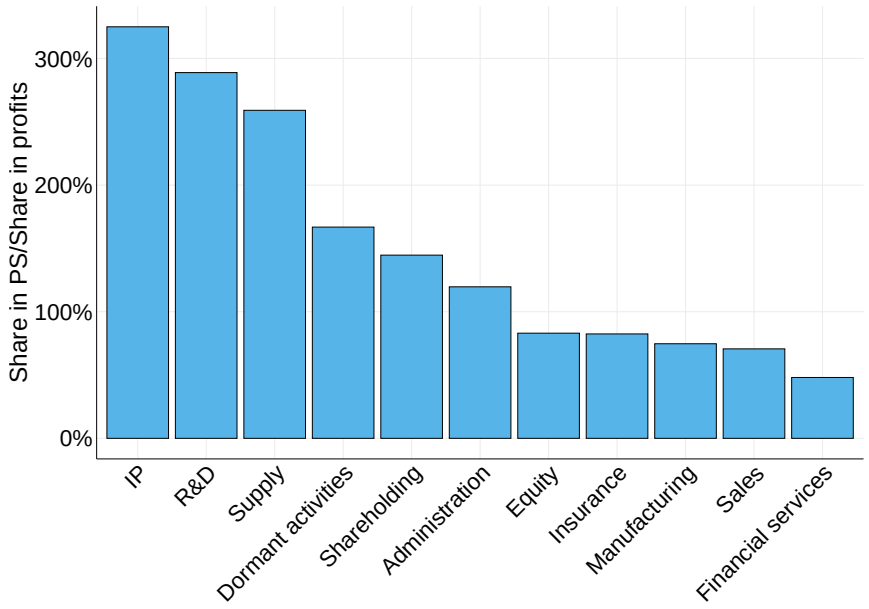
5.4 Mechanisms

There are three main channels through which MNEs can engage in profit shifting. They can use transfer prices on trade in goods (Bernard et al., 2006; Cristea and Nguyen, 2016; Vicard, 2015; Davies et al., 2018; Wier, 2020; Liu et al., 2020), intra-firm debt shifting (Huizinga et al., 2008; Fuest et al., 2011) and the location of intangibles assets in tax havens (Karkinsky and Riedel, 2012; Dischinger et al., 2014; Hebous and Johannesen, 2021) to shift profits from high to low-tax subsidiaries. We show in Figure 1 and Figure 4 that there is some evidence that firms engage in transfer price manipulation as intra-firm revenue are disproportionately reported in tax havens.

To study the role of the two other channels, we use information on the business activities subsidiaries operate in to understand the channels through which firms shift profits. According to the literature (Guvenen et al. (2022), Hebous and Johannesen (2021), Santacreu (2023)), intangible assets and in particular intellectual property play a substantial role for two reasons: (1) they can be moved quickly and cheaply due to their immaterial nature (2) their location does not depend on where the real R&D activity takes place, and so the revenues associated to IP assets can be easily dissociated from real activity. For these reasons, countries have competed to attract these highly mobile assets. In the EU, the implementation of patent boxes - reduced rates on IP revenues - have triggered swift patent reallocation to the most offering countries (Karkinsky and Riedel (2012), Schwab and Todtenhaupt (2021), Ciaramella (2023)). Similarly, it is relatively easy for firms to set up holding and financing subsidiaries in tax havens that act as internal banks within the MNE. As interests paid are deductible from the tax base, subsidiaries in high-tax countries have an incentive to borrow from other subsidiaries in low-tax countries. This way, subsidiaries in high-tax countries can incur the costs of financing, thereby decreasing their taxable income, and subsidiaries in low-tax countries receive the interests, which are taxed at a low tax rate.

Confirming these results, we find that subsidiaries specializing in intellectual property and research and development are overrepresented in our measure of profit shifting. Their contribution to profit shifting is more than three times their share in profits (see Figure 16). Similarly, we find that holding subsidiaries are disproportionately represented in their contribution to profit shifting.

Figure 16: Contribution of each sector of affiliates to profit shifting scaled by their share in profits



Note: Lecture: over the years 2016-2022, subsidiaries specialized in Intellectual Property contributed more than three times more to our measure of profit shifting than in their share of total profits in countries with positive profit shifting. We weight each sector in each MNE-country profits by the number of subsidiaries in each sector times the total number of subsidiaries.

6 Concentration of profit shifting

As shown in Figure 5, profits are highly concentrated in the hands of a few multinational firms. This section investigates whether this concentration is reflected in profit-shifting practices. We also study the contribution of different sectors to our profit shifting quantification.

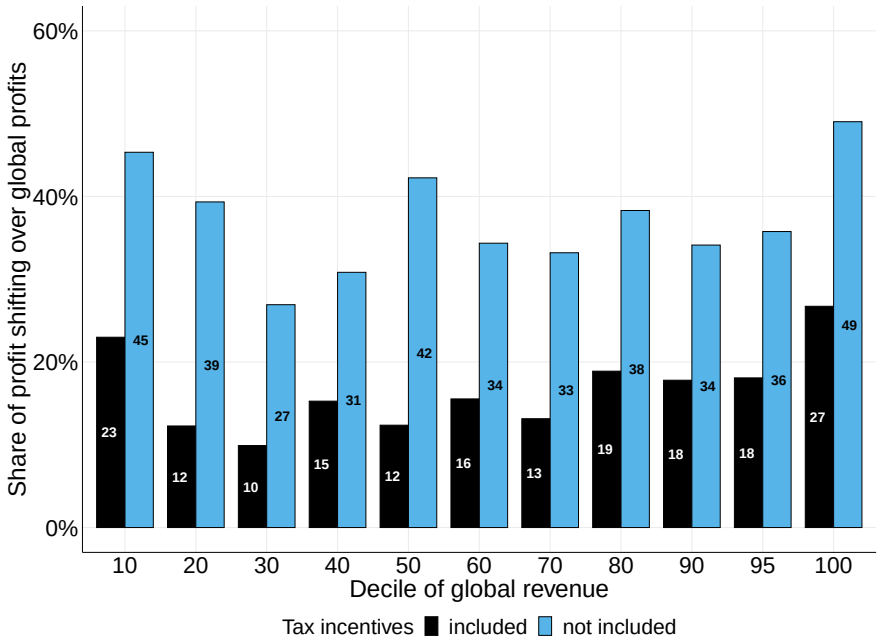
6.1 Profit shifting and firm size

To investigate the relation between profit shifting and firm size, we examine the share of profit shifting by decile of firm size. Figure 17 shows that the share of profits shifted by MNEs is roughly constant from one decile to the next, at between 20% and 40% of their global profits depending on whether we include the tax condition or not. These results are therefore in line with our theoretical model, according to which, once MNEs have an incentive to shift profits, they shift the same share of their profits, whatever their size.

However, if we examine the contribution of multinational companies to global profit shifting according to their size, we observe that the largest firms are responsible for the vast majority of profit shifting (Figure 18). Indeed, the top 5% of multinational

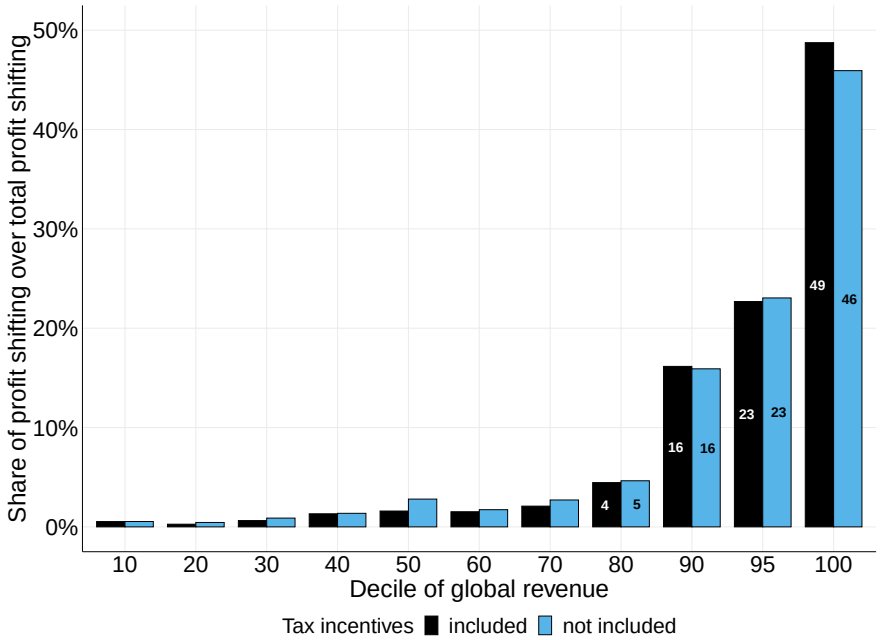
companies, whether in terms of global profits or global revenues, contribute to almost 50% of total profit shifting, and the top 10%, or about 30 MNEs, contribute to over 70% of all shifted profits. 20% of MNEs account for almost 90% of total shifted profits, whiile all other deciles each account for less than 5%. This is not because larger MNEs transfer more of their profits, but because of the huge concentration of profits in the hands of a small number of firms.

Figure 17: Share of profit shifting over global profits by firm size decile



Note: In this graph, MNEs are gathered by decile of global revenue, averaged over the period 2016-2022, with the top decile split in two groups. In particular, the group 100 gathers the top 15 MNEs in terms of average revenue over the whole period. For each decile, we compute the share of profit shifting over global profits as the sum of all positive profit differentials estimated for the MNEs in the group, divided by the sum of their global profits. We use our two main estimations methods, including the tax condition (black bars), or not (blue bars). *Lecture:* MNEs in the bottom decile of global revenue, shift around 20% of their global profits, according to our most conservative estimate.

Figure 18: Contribution by decile to total amount of profit shifting



Note: This graph shows the contribution of each decile to the total amount of profit shifting. For each decile, we compute its contribution to total profit shifting as the sum of all positive profit differentials estimated for the MNEs in the group, divided by the values for all MNEs in our sample. We use our two main estimations methods, including the tax condition (black bars), or not (blue bars). *Lecture:* the 15 largest MNEs in terms of global revenue, the group 100, make up 48% of total profit shifting, according to our most conservative estimate.

Our paper sheds some light on the potential welfare effects of profit shifting. As most profit shifting is concentrated at the top of the distribution, anti-shifting policies should focus on these firms if the goal is to minimize compliance costs and maximize potential tax revenue given that anti-avoidance policies impose often non-negligible compliance and administrative costs on firms and may lead to unintended distortions (Bjørkheim and Scheuerer, 2023). A recent survey by EY shows that 96% of the transfer pricing professionals declare facing ""some" or "substantial" additional work to prepare for public disclosure of Country-by-Country Reports".[18] In that case, leaving smaller firms out of these policies could be optimal, consistent with the OECD Inclusive Framework. However, such discrimination can lead to equity concerns as it appears that smaller firms also engage in profit shifting, to a relative extent similar to larger firms.

6.2 Concentration by sector

Which sectors contribute the most to profit shifting? We study the contribution of each sector to our global estimate of shifted profits. Except for the Energy, water and waste sector, which includes the extractive industry, we find a relatively linear

[18] See 2024 EY International Tax and Transfer Pricing Survey.

pattern between the share of sectors in total profits and their contribution to our measure of profit shifting globally (see Figure 19a). We also find that the pharmaceutical industry is slightly overrepresented in our measure of profit shifting, while labor and tangible assets intensive sectors such as the transport and car industry are slightly underrepresented.

Doing the same exercise focusing on France, we find more heterogeneity across sectors. In particular, Figure 19b shows that the banking sector as well as the energy, water and waste sectors contribute more to total profits shifted out of France than their share in profits in France.

When looking at our top destination of profit shifting, we find a linear pattern between the contribution of each sector to profit shifting and their share in profits made in the country (see Figure D.1).

7 Distributional Impact of Profit Shifting

In this section, we study the distributional impact of profit shifting along several dimensions. We first study the implications of the tax-minimization strategies of MNEs on the location and size of wages to provide evidence of wage shifting behavior. We then study the inequality consequences of such profit shifting by investigating the effects on workers' profit-sharing benefits. Finally, we study the effect of profit shifting on countries' tax revenue and estimate the revenue implication of introduction a global minimum tax.

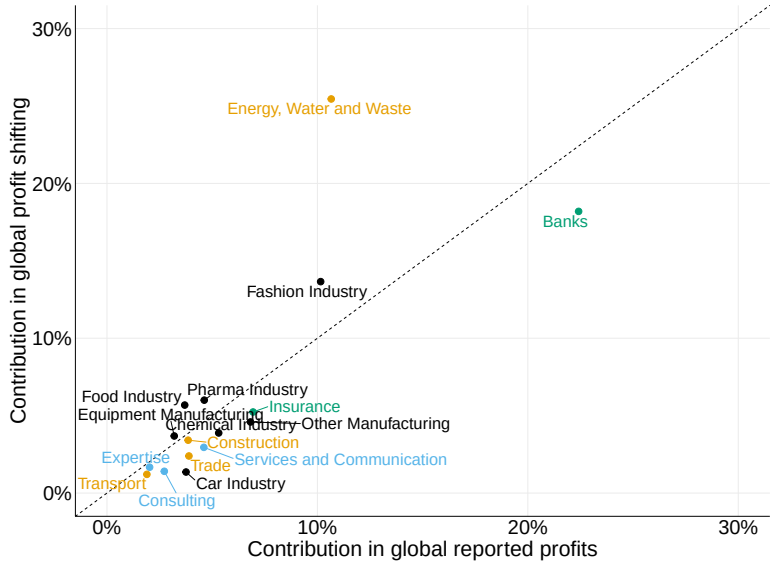
7.1 Inequality within the firm and wage shifting

Profit shifting tends to distorts economic outcomes such as GDP or productivity. It can also affect the labor share and the wage distribution within MNEs across countries. As firms have an increasing incentive to prove that they have some real economic activity in a country to comply with the nexus requirements introduced by OECD BEPS Actions 1 and 7, firms may have an incentive to not only shift their profits to tax havens but also report some real costs, such as a high wage bill. Firms may also have an incentive to set up specific employment contract for some of their executives in tax havens, so they can also lower the tax burden through lower personal income taxes.[19] Descriptively, we find evidence that wages in tax havens are much higher than in non-haven countries in Figure 20, despite some countries having relatively lower median wages compared to non-haven countries. We also compare the within-sector differences in wages between tax havens and non-haven countries in Figure F.1, focusing on OECD countries to ensure a minimum level of economic development. We find that wages in tax havens are systematically higher in tax havens, with the largest discrepancies stemming from the banking and insurance sectors.

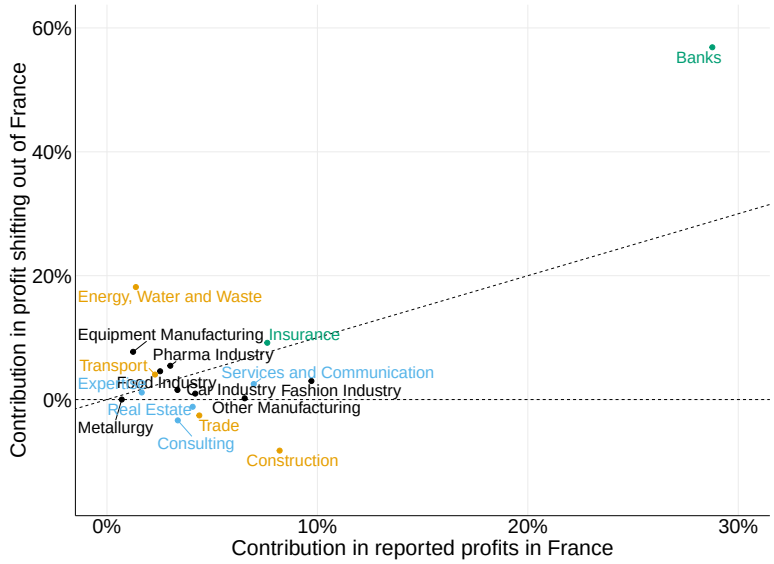
[19] Recent evidence of such pratices by French firms here.

Figure 19: Contribution of each sector to profit shifting and share in global profits

(a) Global



(b) France



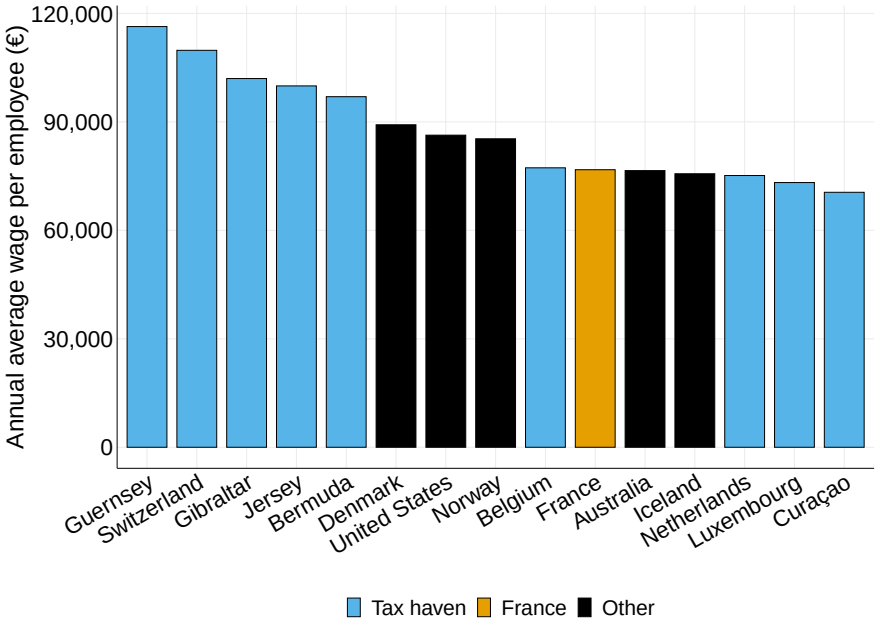
Note: Sectors are defined at the group level.

We therefore estimate the wage premium that is associated with being in a tax haven and correct our measure of allocation measure to re-estimate our profit shifting quantification. We run the following regression on all firm-year observations in OECD countries in our sample:

$$w_{m,c,t} = \beta_0 + \beta_1 \text{TH}_c + \beta_2 \text{Assets}_{m,c,t} + \beta_3 \text{Unrel. rev.}_{m,c,t} + \gamma_t + \zeta_m + \epsilon_{m,c,t} \quad (2)$$

where $w_{m,c,t}$ is the average wage per employee of an MNE m in country c at year t, TH_c a dummy equal to 1 if country c is a tax haven, Unrel. $\text{rev.}_{m,c,t}$ is the amount of

Figure 20: Annual average wage



Note: This graph shows the contribution of each decile to the total amount of profit shifting. For each decile, we compute its contribution to total profit shifting as the sum of all positive profit differentials estimated for the MNEs in the group, divided by the values for all MNEs in our sample. We use our two main estimations methods, including the tax condition (black bars), or not (blue bars). *Lecture:* the 15 largest MNEs in terms of global revenue, the group 100, make up 48% of total profit shifting, according to our most conservative estimate.

third-party trade revenue and $\text{Assets}_{m,c,t}$ represent tangible assets. We also add time and MNE fixed-effects. We find that the tax haven wage premium is equivalent to about €29,000, or 50% of the average annual income. We correct wages in tax havens by the premium and re-estimate profit shifting. The total amount of shifted profits increase by €1bn, to reach bounds of €25-32bn, leading to higher missing profits in France between €7-14bn, against €6-13bn before. We show in Figure F.2 the corrected wage distribution and in Figure F.3 yearly coefficient being in a tax haven or not.

7.2 Profit sharing and distributional analysis

Distributional effects of profit shifting other than direct effects on tax revenues are not well known. In this nascent literature, Alstadsæter et al. (2022) and Souillard (2022) shows that indulging in profit shifting benefits high-income earners more. We can think of many channels through which profit shifting, by decreasing effective tax rates for large MNEs, can have an impact on inequalities. In this paper, we explore this channel through the lens of mandatory profit sharing, a French policy designed to give employees a small fraction of firms profits each year. Our setting only allows us

to give orders of magnitude based on strong hypotheses, and more research is needed to give a definite answer to these questions.

In France, firms with more than 50 employees have to give a small fraction of their benefits to employees. This amount per employee is computed the following way:

$$\text{RSP} = \frac{1}{2} \times \frac{\text{Wage bill}}{\text{Value added}} \times (\text{Net profit} - 5\% \text{ Book equity}) \tag{3}$$

With RSP standing for *Réserve Spéciale de Participation* or special profit-sharing fund. Nimier-David et al. (2023) explain well the history and the logic of this formula introduced in the 1960s France to ensure that employees benefit from investments and growth which were high at that time. We were able to recover the RSP paid in France for all the MNEs we cover and match it to our CbCR data.

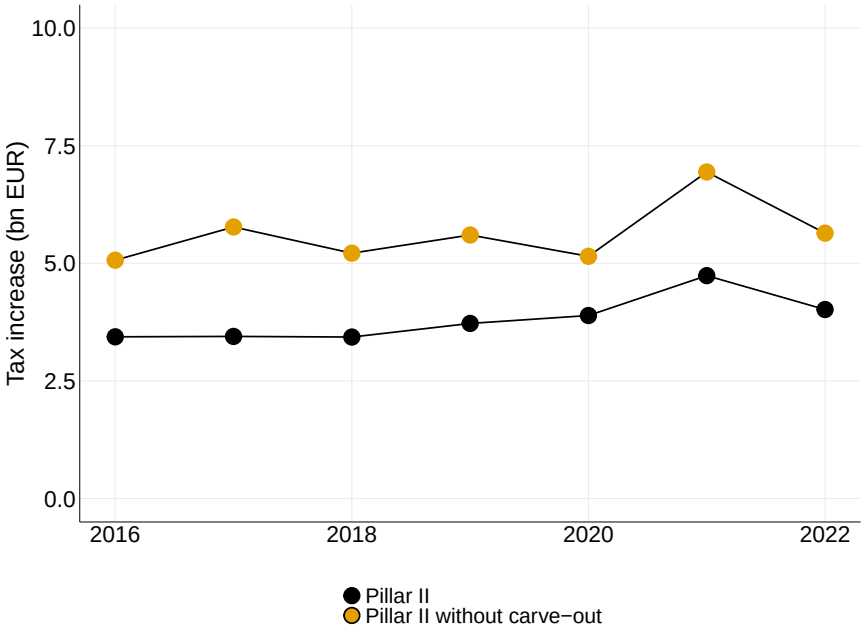
Since profit shifting affects net profit of this formula, it should have a direct effect on how much firms distribute to employees through this channel. If a firm were to shift all of its profits out of France and into a low tax country, employees would receive no RSP at all. An interesting feature of this policy is that the amount of RSP is the same for all employees. In our sample, RSP has amounted to 1.8% of gross wages between 2016 and 2022. To estimate the effects that profit shifting might have on this form of redistribution, we simply look for each firm how removing profit shifting would change the net profit of the French part of the MNE, and compute a counterfactual RSP in the absence of profit shifting. We make the hypothesis that all other factors (the wage bill, book equity, net profit and value-added absent profit shifting) remain constant. We find that between 2016 and 2022, employees lost 1.7% of their gross wage due to profit shifting.

7.3 Affecting redistribution: Tax revenue implication of the Global Minimum Tax

Finally, we investigate the effect of changing the effective tax rate firms pay on tax revenue. We examine the revenue potential of the implementation of a 15% global minimum tax. A large share of MNEs pay an effective tax rate below 15% on a country basis. This is not only an issue in low-tax jurisdictions but MNEs pay also very low effective tax rates in other countries (Hugger et al., 2023). Close to 40% of MNEs in France and the United States have faced ETR below 15% over the period, despite having relatively high statutory tax rates in some years. The share becomes greater than 50% in some tax havens such as Luxembourg, Singapore, Hong-Kong and Ireland as can be seen on Figure G.1a. Focusing on firms in scope of the minimum tax, we observe that some of them pay effective tax rate that can be as low as 4% in Luxembourg on average, 7% in France or the United States. We compute the tax revenue potential of the Global Minimum Tax using different scenarios. Keeping constant the level of profits and the location of production factors, we find that the actual design of the minimum tax which include a carve-out of profits of 10% of wages and 8% of tangible

assets would lead to an increase of taxes paid of around €3.5bn each year on average, which represents about 2% of global profits of French MNEs. Figure 21 shows that the carve-out substantially diminishes global tax revenues, from over €5bn without carve-out to €3.5bn with carve-out.

Figure 21: Global tax increase due to 15% minimum tax



Note: We compute this amount by taking the sum of the difference between 15% and the ETR faced by the firm at the MNE × country level times the level of profits when profits and the rate difference is positive.

We consider other scenarios in Table G.1. We find that increasing the minimum tax rate from 15% to 21% (the French EATR) would dramatically increase tax revenue as more firms would be in scope.

8 Conclusion

We estimate the extent of profit shifting made by French multinational firms, based on newly available data from country-by-country reports covering the years 2016 to 2022. These unique data enable us to provide a micro estimate of profit shifting, overcoming the limitations of previous results based on macro aggregates. Our first contribution is to provide a methodology for measuring and correcting double-counting of intra-group dividends which artificially inflates reported profits. We estimate that about 12% of profits in CbCR data are double-counted.

We find a substantial gap between profits reported by French MNEs in some countries and those estimated from their real local economic activities. We find that about 26% of foreign profits cannot be explained by real activity. Focusing on firms that have an incentive to shift profits out of a given country, we find that 21% of profits are

shifted for tax reasons. The countries receiving most of the shifted profits are Switzerland, the United Kingdom, Luxembourg, Hong Kong, the Netherlands, and Singapore, which make up two thirds of shifted profits. According to our estimates, 45% of total shifted profits are due to only 15 firms, or 5% of the MNEs subject to CbCR.

Our paper therefore also sheds some light on the potential welfare effects of profit shifting by studying within firm-country and within-country across firms inequality through wage shifting and lower benefits of rent-sharing. We also provide evidence of revenue potential associated with raising the effective tax rate firms pay.

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A Data appendix

A.1 List of tax havens

We use the list provided by Tørsløv et al. (2023b). We include five OECD countries (Belgium, Ireland, Luxembourg, Netherlands, and Switzerland) and 36 non-OECD countries or territories, namely Andorra, Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Bahrain, Barbados, Belize, Bermuda, the British Virgin Islands, the Cayman Islands, Curaçao, Cyprus, Gibraltar, Grenada, Guernsey, Hong Kong, the Isle of Man, Jersey, Lebanon, Liechtenstein, Macau, Malta, Marshall Islands, Mauritius, Monaco, Panama, Puerto Rico, Samoa, Seychelles, Singapore, Sint Marteen, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Turks and Caicos, Vanuatu.

A.2 Matching with OFATS and FARE

To recover the compensation of employees paid by each group in each country, we match our CbCR data with data from Outward Foreign Affiliates Statistics (OFATS) and French administrative data (LIFI and FARE).

A.2.1 French subsidiaries

FARE provides tax administrative data on French firms at the subsidiary level. To link this data with MNEs in CbCR, we rely on group structure information from the administrative dataset LIFI. We then calculate the total payroll of MNEs in France by summing the payroll reported by their subsidiaries in FARE. Among the 62,000 subsidiaries reported by MNEs in our CbCR data, we identify 50,000 in FARE over the period 2016-2022.

A.2.2 Foreign subsidiaries

OFATS provides information on the gross wage bill, number of subsidiaries, and number of employees at the MNE-country level abroad of non-financial MNEs. We can match 296 MNEs out of 321 at least one year between 2016 and 2022. However, this match is not always perfect: some matched MNEs can have a reported activity in CBCR which differs from OFATS. We take this issue into account by providing reliable estimates based on the number of employees reported in CBCR and the average employee wage bill at the MNE-country level. Morevover, 22 countries are completely missing in OFATS (out of the 221 countries in CbCR). For 20 of them, they have less than 5 MNEs operating there. The 2 others are Monaco (58 MNEs) and Saint-Martin (13 MNEs).

A.2.3 Quality of the match

We proceed in three steps to boost the quality of the match:

- Since the number of employees is slightly lower in OFATS and FARE compared to CbCR, we use the average wage per employee to estimate total wages at the MNE-country-year level in our dataset.
- Missing wage data is imputed through linear interpolation at the MNE-country level.
- For remaining missing values, we first estimate wages by multiplying the number of employees by the average wage per employee of the MNE in the country over the period. If data is still missing, we use the median average wage per employee of other MNEs in the same country and year.

A.3 Consolidated financial accounts

Our analysis utilizes consolidated financial information from Bureau van Dijk's Orbis database for the multinational enterprises (MNEs) in our sample. Specifically, we extract the following key variables at the consolidated group level: total revenues, reported profits, and number of employees. While Orbis provides a comprehensive source of account-level variables, we manually supplement its coverage for select multinationals by collecting data from their published annual reports to ensure accuracy.

B Data Cleaning

B.1 General data cleaning

CbCR data is still in its early stages and several issues need to be addressed before it can be reliably used for economic analysis. As reported by the OECD[20], common data quality issues include inconsistencies in units, currencies, naming conventions, and missing information. More specific to CbCR are inconsistencies in how companies report tax payments (i.e. with positive or negative signs) and the potential double-counting of intracompany dividends.

We have developed data-cleaning techniques that address both general and CbCR-specific data quality issues, enabling the transformation of raw CbCR data into standardized formats suitable for analysis. Properly handling data issues is crucial, as inappropriate treatment could lead to misleading analytical outcomes. For example, unit errors tend to occur more frequently among large multinationals that may report figures in thousands or millions rather than base units.

The tax payment direction issue stems from unclear OECD guidance on whether taxes paid should be reported as positive or negative figures. This significantly impacts the accuracy of the reported tax variable, which is a key analytical component. Similarly, inconsistencies in the reporting of intracompany dividends can artificially inflate or deflate profit figures for certain jurisdictions, skewing subsequent effective

[20] https://www.oecd.org/tax/beps/common-errors-MNFs-cbc-reports.pdf

tax rate calculations. As highlighted by research from different misteries (Italy, UK, Sweden, Netherlands) and Horst and Curatolo (2020); Garcia-Bernardo et al. (2022), these double-counted dividend amounts can be substantial.

The core of our cleaning methodology involves benchmarking CbCR data against companies' consolidated financial accounts, which eliminates all intragroup transactions and provides a singular entity perspective. This comparison isolates companies that likely include intracompany dividends, enabling the estimation of double-counted amounts.

B.2 Cleaning of double counting

One of the main challenges with Country-by-Country data is the presence of double counting, meaning that certain subsidiaries report received dividends in their profits that were already included in the profits of the subsidiary sending those dividends. This issue arose due to initially unclear OECD guidelines, resulting in some of the groups we studied reporting their intra-group dividends twice.

To solve this, we compare our groups' total profits in CbCR data with group-level consolidated financial data. If total profits in CbCR exceeded consolidated profits by more than 30%, we considered that the group double counted its profits, and estimated the amounts of double counting of this group to be the difference between CbCR profits and accounting profits.

B.2.1 Match with Consolidated Accounts

To match the CbCR data with the Orbis database, we utilize the firms' tax identification numbers (SIREN). First, we perform an exact match based on the SIREN. For firms where an exact match is unavailable, we apply a fuzzy matching technique using company names. Additionally, we manually supplement the dataset with publicly available information to maximize coverage.

On average, we successfully matched 73% of our observations to their consolidated accounts each year. However, for some matched firms, profit information remains unavailable. As shown in Table B.1, our dataset covers a significant portion of the main variables: 90% of unrelated party revenue, 94% of profits, and 86% of employees reported in the CbCRs.

Table B.2 presents the distribution of the ratios between CbCR and consolidated values for unrelated party revenues, profit and employees. The mean ratio for profits (1.44) is significantly higher than that for revenues (1.13) and employees (1.11), indicating larger discrepancies between CbCR and consolidated data for profit figures, possibly due to the inclusion of dividends. In contrast, the ratios for revenues and employees demonstrate more consistency, with mean values close to 1, indicating a generally good match between the two data sources. Specifically, the revenue ratios range from the 10th percentile (0.98) to the 90th percentile (1.20), and the employee ratios range from

Table B.1: Results of the matching with consolidated accounts

Year	Matched	Obs.	N. obs. (%)	Unrelated revenue (%)	Profit (%)	Employees (%)
2016	No	51	25	13	8	17
2016	Yes	157	76	88	92	83
2017	No	56	23	10	6	14
2017	Yes	192	77	90	94	86
2018	No	54	22	9	3	13
2018	Yes	194	78	91	97	87
2019	No	55	22	7	2	11
2019	Yes	198	78	93	98	89
2020	No	67	26	9	6	12
2020	Yes	187	74	91	94	88
2021	No	72	28	9	7	13
2021	Yes	187	72	91	93	87
2022	No	89	40	11	7	16
2022	Yes	135	60	89	93	84

Note: This table presents the percentage share of multinationals matched or unmatched to consolidated accounts, showing their representation in key variables such as unrelated revenue, profit, and employees. "Yes" indicates a successful match, while "No" indicates no match was found.

the 10th percentile (0.91) to the 90th percentile (1.12), showing tighter distributions compared to profits. Overall, while profit figures exhibit more variability, the data for revenues and employees align more closely between CbCR and Orbis.

Table B.2: Ratios between CbCR and consolidated accounts

Variable	Mean	Median	Q10	Q25	Q75	Q90
Unrelated party revenues	1.13	1.05	0.98	1.00	1.09	1.20
Profit	1.44	1.04	0.48	0.92	1.55	2.59
Number of employees	1.11	1.00	0.91	0.98	1.02	1.12

Note: The table presents the distribution of the ratios between CbCR and Orbis values for revenues, profit, and number of employees at the consolidated level. A ratio larger than 1 indicated that CbCR values are larger than those found in consolidated accounts for a given multinational.

We rely on the comparison between the revenue reported in consolidated accounts and in CbCR to ensure the quality of the information before identifying firms with potential inclusion of dividend payments. We differentiate between high-quality and low-quality matches based on the ratio of CbCR unrelated party revenues to consolidated revenues. If the ratio between unrelated party revenues and consolidated group revenues falls between 0.7 and 1.3, we categorize the match quality as high. Firms with a good match on revenue represent most of our observations in terms of total revenue, profits, and employees.

B.2.2 Identifying groups with potential inclusion of intracompany dividends

To assess the potential inclusion of intracompany dividends in the profit variable and estimate their size, we classify multinationals into three distinct groups based on specific criteria. This analysis aims to provide insights into the presence and magnitude of intracompany dividends within the dataset.

The three groups are defined as follows:

1. **Dividends included**: This group consists of multinationals with a high-quality match on revenues and a ratio of CbCR profit to consolidated profit ($\frac{Profit_{CbCR}}{Profit_{conso}}$) exceeding 1.3. In such cases, there is a high probability that intracompany dividends are included in the reported profit figure.

2. **Dividends excluded**: This group consists of multinationals with a high-quality match on revenues and a ratio of CbCR profit to consolidated profit ($\frac{Profit_{CbCR}}{Profit_{conso}}$) lower than 1.3. For these multinationals, intracompany dividends are most likely excluded from the reported profit.

3. **Other**: multinationals falling into this category are excluded from the dividends analysis due to potential matching issues between the CbCR data and the Orbis dataset.

To ensure the accuracy of our analysis, MNEs with negative profit values (both in CbCR and Orbis data) are excluded from the study. This exclusion is necessary as negative profits would result in a positive ratio without dividend inclusion. Including such cases could lead to an overestimation of our measure for dividend inclusion. In addition, there is a low risk that multinationals reporting overall losses double counted their profit figures as the inclusion of dividends would result in the addition of large positive amounts.

B.2.3 Estimation of double counting

For each multinational that potentially includes intra-group dividends, we estimate the amount of double-counted profit by calculating the difference between the aggregated values reported in the Country-by-Country Reports and the consolidated figures.

Table B.3 shows the overall amount of double-counted profits. We observe that double counting represent 37% of total profits for MNEs in which we observe double counting. In aggregate, considering multinationals for which we have a good match on revenues, double-counted profits account for 13% of total reported profits in CbCR.

B.2.4 Distribution of double-counting across countries

We assume that the inclusion of dividends will result in observations with very high profitability and low effective tax rates (ETRs). Based on this assumption, we

Table B.3: Estimation of Profit Double Counting

Year	Dividends	Obs.	Rev. CbCR (Bn€)	Rev. Orbis (Bn€)	Profit CbCR (Bn€)	Profit Orbis (Bn€)	Double Counted Profit (Bn€)	Double Counted Profit (%)	Double Counted Profit (in and out %)
2016	In	34	265	255	54	22	24	44	17
2016	Out	79	1157	1089	86	87			
2016	No Match	95	481	164	36	10			
2017	In	51	438	407	63	28	22	36	12
2017	Out	97	1268	1173	11	13			
2017	No Match	100	394	126	25	6			
2018	In	47	456	411	67	30	24	36	13
2018	Out	105	1298	1182	11	11			
2018	No Match	96	414	140	26	4			
2019	In	51	358	340	63	30	21	33	12
2019	Out	109	1461	1373	11	12			
2019	No Match	93	487	222	37	5			
2020	In	32	234	218	39	11	24	61	26
2020	Out	123	1286	1186	52	51			
2020	No Match	99	533	193	36	7			
2021	In	42	306	305	74	36	28	38	13
2021	Out	119	1535	1424	142	150			
2021	No Match	98	406	120	51	14			
2022	In	27	160	158	29	12	13	45	5
2022	Out	90	1825	1759	213	198			
2022	No Match	107	485	130	39	12			

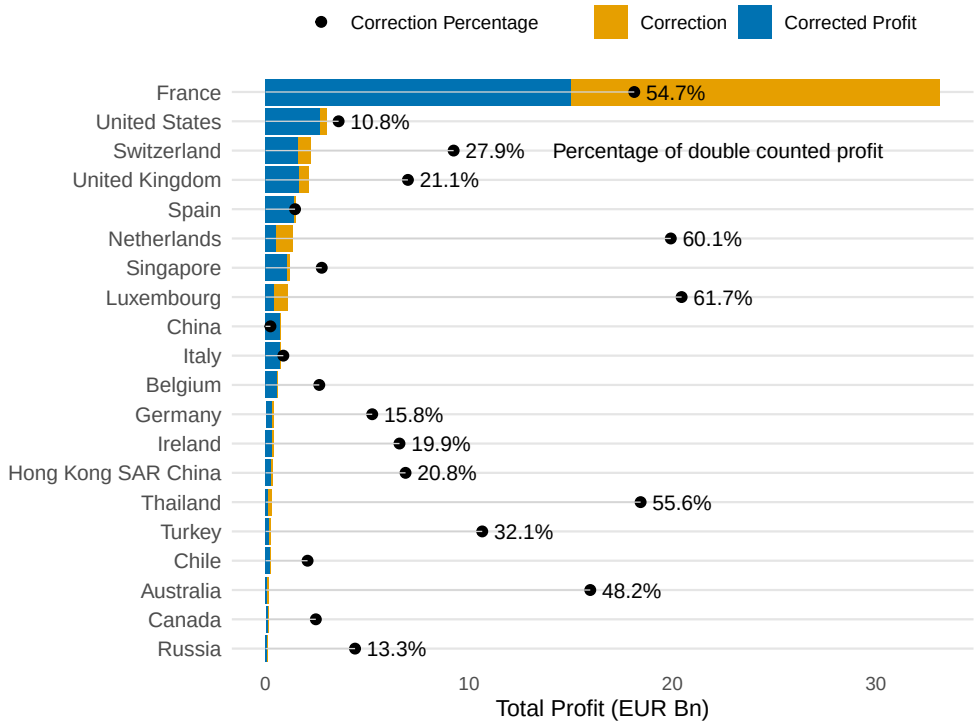
Note: Revenue and profit figures are presented in billions of euros (Bn€). Double-counted profits refer to instances where CbCR-reported profits exceed consolidated profits by at least 30%. The second last column displays the percentage of double-counted profits for companies that include dividends, while the final column shows the percentage of dividends relative to profits for companies both including and excluding dividends.

select problematic countries within each multinational to correct for double-counted dividends. Specifically, within each multinational we flag subsidiaries in the bottom 30th percentile of ETRs and the top 30th percentile of profitability (calculated as profit over total revenue). For these selected jurisdictions plus the ultimate parent France, we treat the double-counted dividends as distributed income, allocating amounts pro-rata based on reported profit.

The inclusion of dividends poses challenges, especially for countries serving as holding hubs that are instrumental for dividend repatriation for multinational corporations. We use below the share of holding companies in total companies as an indicator for the location of double-counted profits.

Figure B.1 shows the distribution of total profits (both potentially including and excluding intra-group dividends). It shows that the amount of profits is largely corrected for some countries, notably Netherlands, Switzerland and Luxembourg.

Figure B.1: Correction of double counting per country



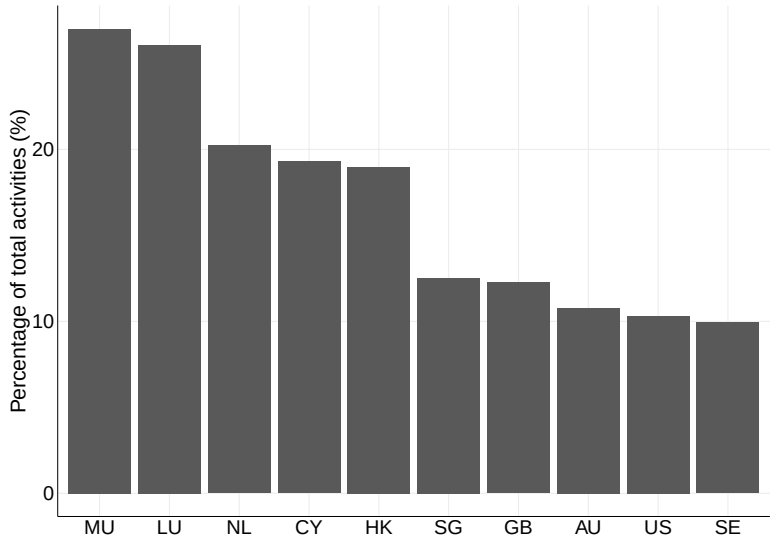
Note: The graph presents the amount of double counting correction averaged over the available years, only for companies potentially including dividends. The graph shows the top 20 in terms of profit. The sum of yellow and blue bars shows the total profits before double counting correction. The blue bars show the corrected amount of profits we use in our estimation of profit shifting. The black dot indicates the percentage of double counted profit in each country.

B.2.5 Validation of double counting cleaning methodology

To validate our method, we first used the comments of the groups in their CbCR reports. We checked that the groups indicating that they double counted their intra-group dividends were indeed identified as such by our methodology. Out of the over 15 MNEs that reported information on whether they include intra-company dividends, our correction was correct in over 75% of the cases. We also use the share of holding companies in total companies as an indicator of potential double-counted profits. We expect countries that have many holding activities to receive a lot of dividends. Figure B.2 shows that holding companies are very prevalent in tax havens, consistent with our top countries for which we observe a lot of double-counted profits.

We then compare effective tax rates and profitability of the corrected groups with groups that did not double count their intra-group dividends. Table B.5 shows as expected that the ETR of firms for which we observe double counting is much lower than for those without double counting. After correction, the ETR is much closer to the ETR for observations where there is no double counting.

Figure B.2: Share of holding activity in total observations per country



Note: Percentage of holding activity in total observations per country. Includes countries with more than 50 multinational firms per year from 2016 to 2022.

Table B.4: Descriptive Statistics of Effective Tax Rates (Accrual Basis) - Group level

Variable	N. Obs.	Mean	Median	Q5	Q10	Q25	Q75	Q90	Q95
ETR dividends in	284	17.5	13.3	0.8	4.4	7.9	20.0	29.2	35.7
ETR dividends out	634	54.6	26.3	3.7	12.2	20.2	35.5	53.5	83.2
ETR corrected	284	36.4	19.9	1.5	7.8	14.3	27.8	51.4	88.8
ETR corrected (no step)	284	47.4	25.9	1.9	10.1	18.5	36.2	66.9	115.5

Note: Descriptive statistics of the effective tax rate calculated at the MNE level using corrected and not corrected profit. "ETR dividends in" indicates MNEs that potentially include dividends,"ETR dividends out" indicates MNEs do not include dividends, " ETR corrected" indicates "ETR dividends in" after the correction is applied. We include all observations with positive profit for the years 2016 to 2022.

B.2.6 Robustness checks

We run several robustness checks to assess the sensitivity of our double-counting corrections to specific parameter choices, including:

- the 1.3 threshold, beyond which we determine that CbCR and Orbis data are not aligned.
- The 30^{th} percentile quantile, where we identify entities that potentially include double-counting in their reported earnings.

B.2.7 Comparison with existing estimates

When comparing our findings with previous estimates of double counting, we observe variations depending on the specific dataset and jurisdiction analyzed. The following are some notable comparisons:

Table B.5: Descriptive statistics of profitability - Group level

Variable	N. Obs.	Mean	Median	Q5	Q10	Q25	Q75	Q90	Q95
Profitability divid. in	284	16.7	13.2	1.3	2.5	5.8	20.4	38.2	51.7
Profitability divid. out	634	9.2	6.3	0.7	1.3	3.2	12.1	20.8	27.3
Profitability corrected	284	10.4	8.6	0.8	1.2	3.6	13.1	19.5	32.8
Profitability corrected no step	284	8.0	6.6	0.6	0.9	2.8	10.1	15.0	25.3

Note: Descriptive statistics of profitability calculated at the MNE level using corrected and not corrected profit divided by total revenues. "Profitability divid. in" indicates MNEs that potentially include dividends,"Profitability dividends out" indicates MNEs do not include dividends, " Profitability corrected" indicates "Profitability dividends in" after the correction is applied. We include all observations for the years 2016 to 2022.

With aggregated data. Previous studies that utilized aggregated data have reported the following estimates of double counting:

- Horst and Curatolo (2020): Estimated a double counting rate of 23% (including stateless entities) based on the US Country-by-Country Reporting (CbCR) data for the year 2017.
- Garcia-Bernardo et al. (2022): Found double counting rates of 49%, 72%, and 47% for the years 2017, 2018, and 2019, respectively (including stateless entities) using US CbCR data.
- Dutch Government: Reported that dividends accounted for 16% of total profit based on the Dutch CbCR data for the year 2017.

At the parent level. Some tax authorities have provided estimates of double-counted profits at the parent jurisdiction level. These estimates are as follows:

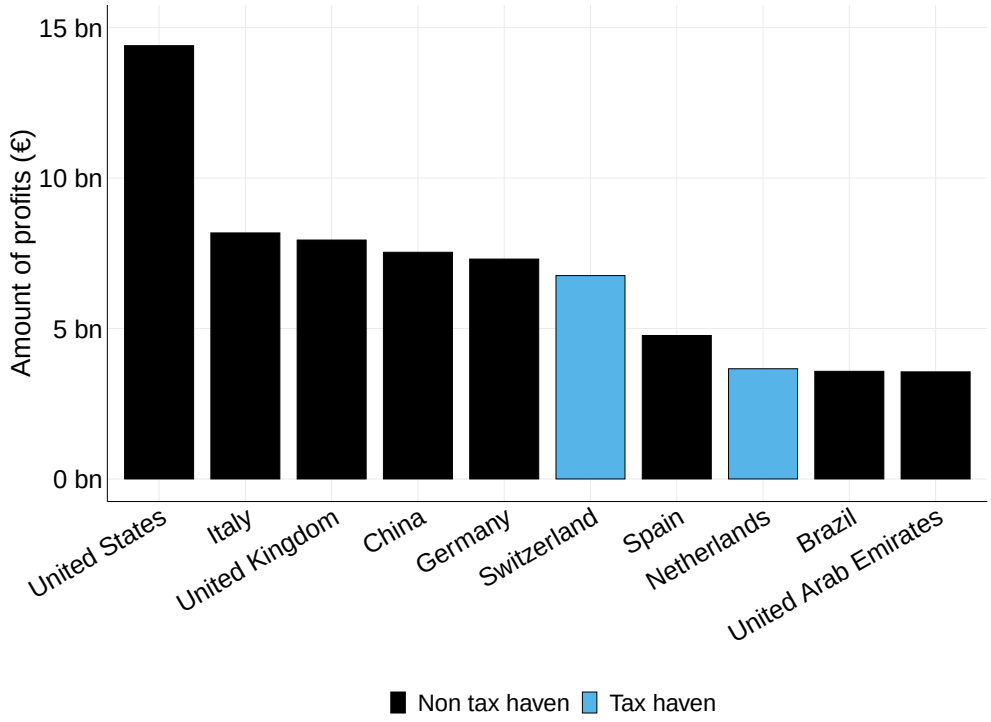
- UK HMRC: Estimated that 49% of domestic CbCR profit reported by UK MNEs was double counted, with approximately 25% of UK-headquartered groups including dividends. The estimate was based on the UK CbCR data for the year 2017.
- Italy: Reported an average double counting rate of 38.2% based on the Italian CbCR data for the year 2016.
- Sweden: Identified double counting rates of 58% for the year 2016 and 52% for the year 2017 based on the Swedish CbCR data.

These comparisons highlight the varying degrees of double counting observed across different datasets and jurisdictions. The differences in rates can be attributed to variations in data quality, matching methodologies, and specific reporting practices within each jurisdiction.

C Additional descriptive evidence

Figure C.1 shows the geographical location of the French MNEs' activities by displaying the total amounts of reported profits in the top 10 foreign countries.

Figure C.1: Location of foreign profits



Note: This graph shows the annual amounts of profits booked in the top 10 foreign countries aggregated at the country level. It sums up profits and deducts losses. We average the amounts over 2016-2022.

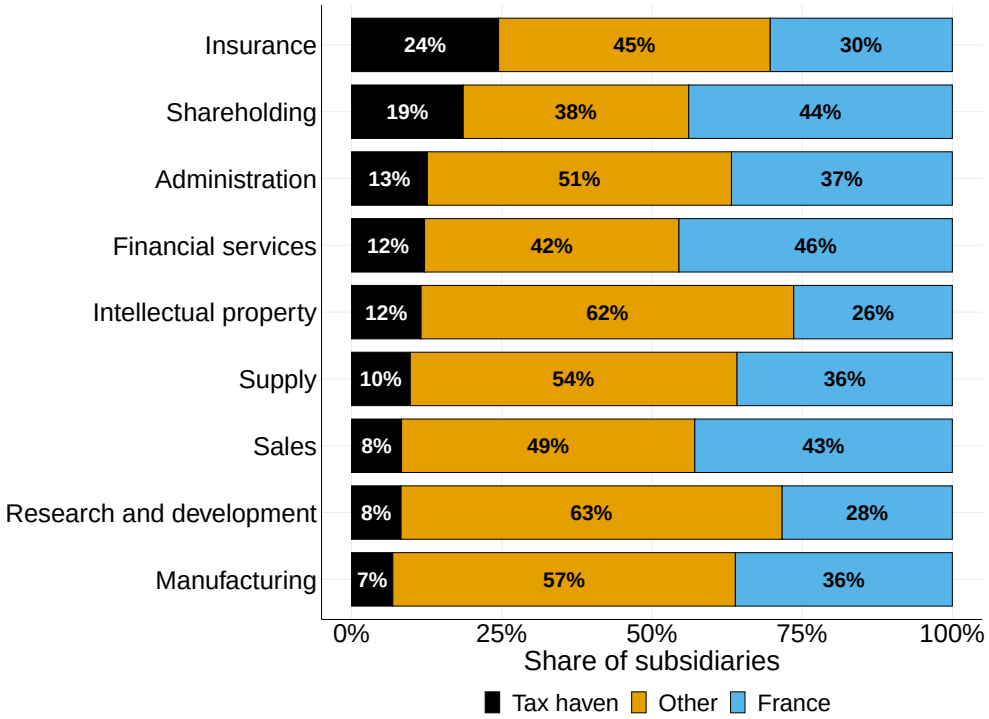
In Figure C.2, we plot the distribution of the business activity of the subsidiaries by country type. We differentiate between France, tax havens and other countries. We observe that activities that tend to be more associated with profit shifting, such as holding activities, financial and insurance activities, are prevalent in tax havens. These activities are likely to be decorrelated from real economic activities as they do not necessarily require much physical presence and are very mobile. In total, 21% of financial and insurance activities are reported in tax havens, against only 5% of manufacturing.

We show the distribution of effective tax rates (ETR) by jurisdictions in Figure C.3,[21] and limit our sample to 20 biggest countries in terms of reported profits (excluding France). Several tax havens strike out as having relatively low effective tax rates, much lower than the statutory tax rate, such as Luxembourg or Singapore.

Figures C.5 and C.6 show the distribution of the main variables among the MNEs.

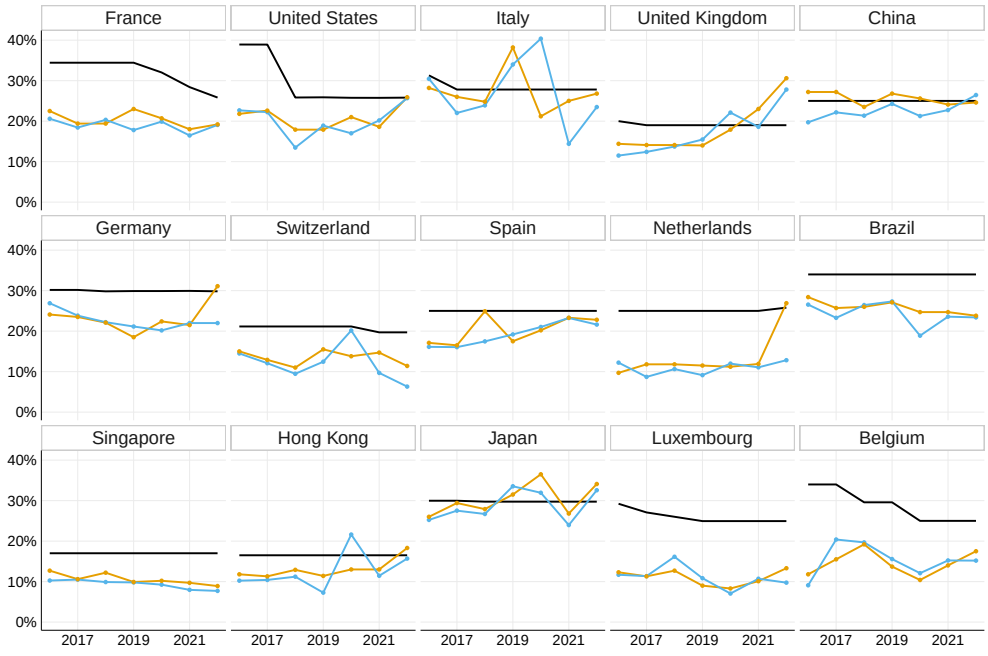
[21] We compute Effective Average Tax Rate as the ratio of total taxes paid to total reported profits in a given country.

Figure C.2: Business activities of subsidiaries



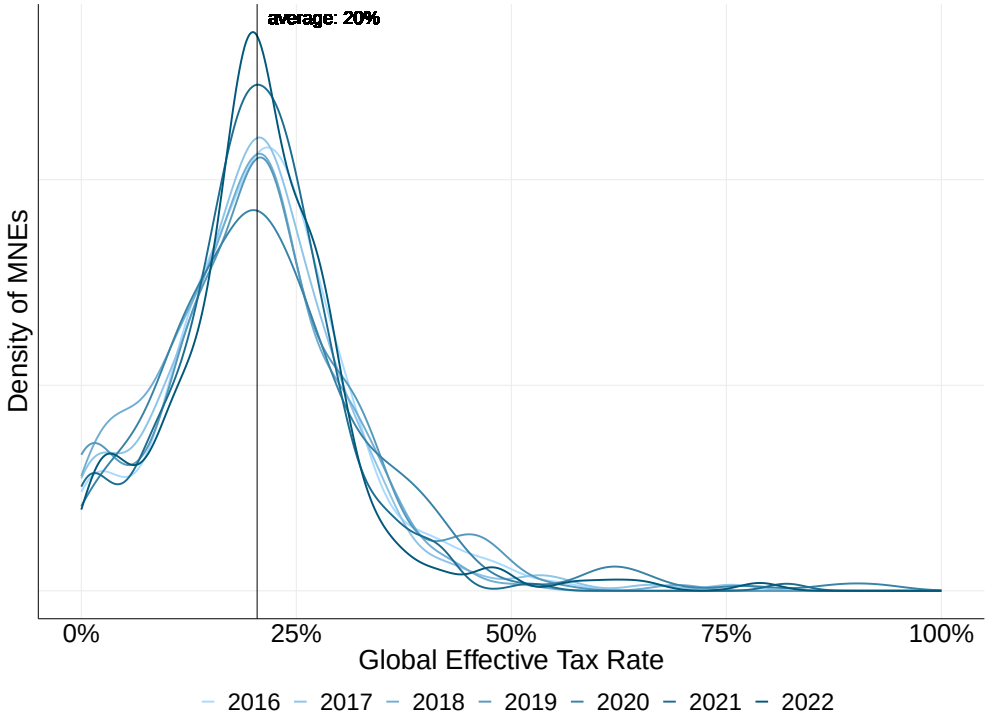
Note: This graph shows the location of subsidiaries according to their business activities. *Lecture:* 13% of subsidiaries involved in administration services are located in tax havens.

Figure C.3: Evolution of country ETR and STR



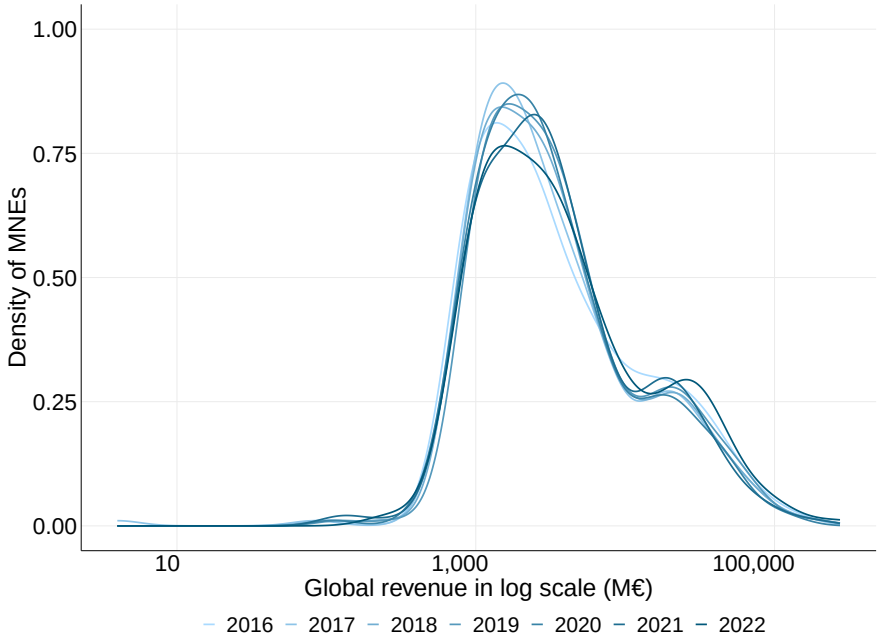
Note: For each jurisdiction, effective tax rates are computed using tax accrued (orange line) and tax paid (blue line). The black lines represent the statutory tax rates for corporate income tax. Only the top 15 countries in term of profits reported by the French MNEs are displayed. To uphold confidentiality standards, jurisdictions with fewer than 10 observations where one multinational accounts for over 85% of total revenues are excluded.

Figure C.4: Distribution of global effective tax rates



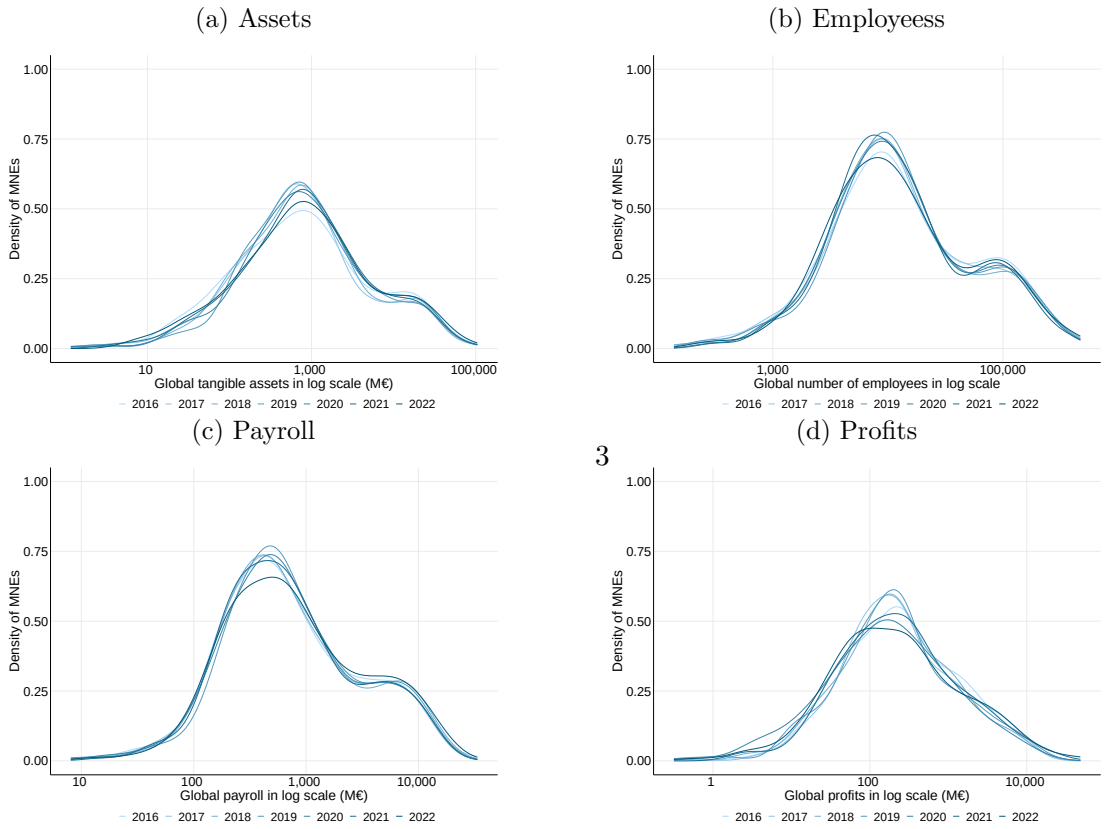
Note: This graph shows the distribution of the global effective tax rates faced by French MNEs.

Figure C.5: Distribution of revenue



Note: This graph shows the distribution of global revenue of the French MNEs, for every year in the period.

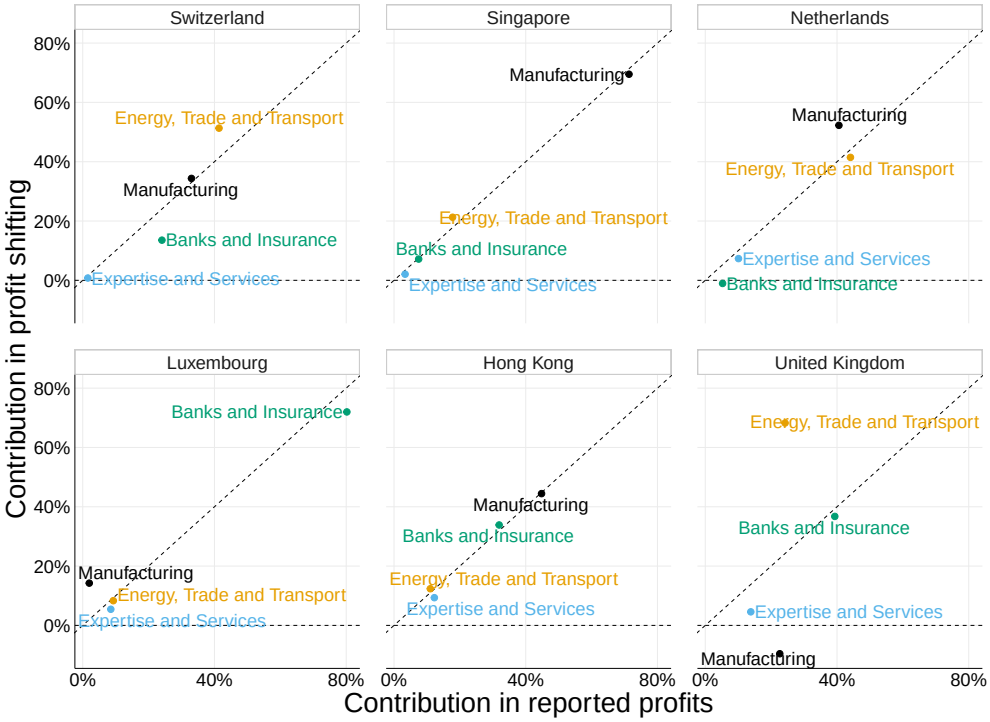
Figure C.6: Distributions of other variables



Note: These figures show the distribution of assets, employees, payroll and profits in our sample, for every year of the period.

D Additional results

Figure D.1: Contribution of each sector to profit shifting and share in country profits



Note: Sectors are defined at the group level.

E Details on robustness checks

We use alternative estimation methods to support our results. In this appendix, we propose several methods for estimating the share of subsidiaries' costs in their group and defining the tax condition.

In our preferred specification, we estimate the share of costs as the sum weighted by the group's labor-intensity of the share of wages and the share of tangible assets. This apportionment formula is the result of a trade-off between accuracy and simplicity. To ensure that our choice is appropriate, we compare our results with those of other specifications that calculate the share of costs differently. First, we check the robustness of our results to the definition of labor intensity weights by considering three different scenarios: one where labor and capital costs are weighted equally, and two extreme cases — one based solely on labor costs and the other solely on capital costs. Next, we consider an alternative specification that accounts for both labor and capital costs simultaneously.

In addition, we test an alternative version of the tax condition by using a different measure of MNEs' tax liabilities across countries. Instead of relying on the average ETR faced by MNEs in a given country, as in our preferred specification, this measure is computed at the MNE-country level over the time period.

Finally we provide the results using the amounts of reported profits before our correction for double-counted intra-group dividends.

Table E.1 shows the global results for each method that we present in more detail below. Moreover, Figure E.1 displays the results for the top 15 countries in terms of profits reported there, and Figure E.2 shows the estimations of profit shifting as a share of reported profits in the country.

Robustness tests on labor intensity weights

To check that our results are not too dependent on our definition of the labor intensity weights, we compute theoretical profits with equal weights for the labor share and the capital share:

$$\text{Equal weights: } \hat{\pi}_i = \left(\frac{1}{2} \frac{w_i l_i}{\sum_j w_j l_j} + \frac{1}{2} \frac{k_i}{\sum_j k_j} \right) \sum_j \rho_j$$

We also test the two extreme values for the labor intensity weights: $\lambda = 1$, meaning we allocate profits according to the share of labor costs only, and $\lambda = 0$ retaining only capital costs.

$$\text{Payroll: } \hat{\pi}_i = \frac{l_i w_i}{\sum_j l_j w_j} \sum_j \rho_j$$

$$\text{Assets: } \hat{\pi}_i = \frac{k_i}{\sum_j k_j} \sum_j \rho_j$$

Table E.1: Global results of alternative methods (in billion €)

	Baseline	Equal weights	Payroll	Assets	Comprehensive costs	Tax condition	MNE-country tax condition	Uncorrected profits
2016	27	26	28	27	28	26	27	27
2017	27	27	32	27	30	22	23	25
2018	36	38	44	35	40	25	24	36
2019	35	37	42	33	38	30	29	34
2020	25	24	24	26	24	21	25	24
2021	31	30	32	30	30	18	21	29
2022	42	41	46	41	42	35	44	40
Average	32	32	35	31	33	25	28	31

Note: This table shows the global amounts of shifted profits by the French MNEs. These results are the balance between positive (when reported profits exceed theoretical profits) and negative (when reported profits are lower than theoretical profits). Our baseline method is the one presented in section 4.3. "Equal weights" means that we assign a weight of 0.5 to both assets and employment when computing our theoretical profits. "Payroll" means that we only use the cost of labor as an apportionment factor. "Assets" only takes into account tangible assets in the formula. "Comprehensive costs" refers to the method including the costs of capital. "Tax condition" means that we only consider tax-induced misalignment when the effective tax rate faced by the MNE in a given country is lower than the its global effective tax rate, as defined in section 5.1. "MNE-country tax condition" also imposes a tax condition but uses the MNE's ETR in the country, and not the average ETR of all MNEs in the country. "Uncorrected profits" relies on the same formula that the baseline, but using uncorrected profits.

The results remain largely consistent, particularly for the method with equal weights. The other two specifications give a relatively narrow range for our baseline estimates, with a few exceptions such as the USA and Germany. When only tangible assets are used, the profit misalignment is not detected in these countries, whereas it is striking when wages are taken into account. This suggests that in these countries, the production of multinational firms may be more dependent on a highly skilled workforce than on expensive physical assets.

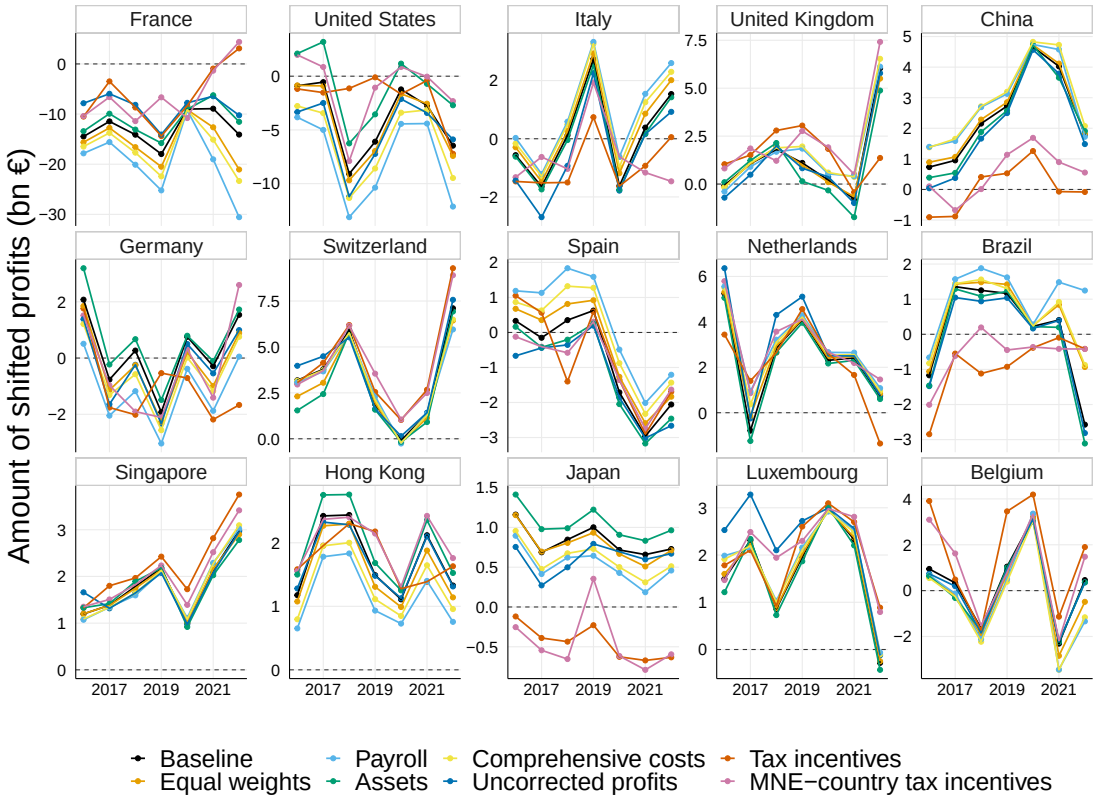
Testing a more comprehensive measure of production costs

We try another approach to compute a comprehensive measure of costs including payroll wl and tangible capital k: $c_i = w_i l_i + r_i k_i$. This measure requires estimating the value of the cost of capital r_i. Chari and Rhee (2020) calculated the rate of return on capital at the firm level in a large number of countries, and we use their country estimates in this method. We calculate theoretical profits as follows:

$$\text{Comprehensive costs: } \hat{\pi}_i = \frac{w_i l_i + r_i k_i}{\sum_j w_j l_j + r_j k_j} \sum_j \rho_j$$

Results are very similar with our baseline, suggesting that the weights we use are consistent with the actual share of factors in production costs.

Figure E.1: Comparison of the methods on the amounts of shifted profits



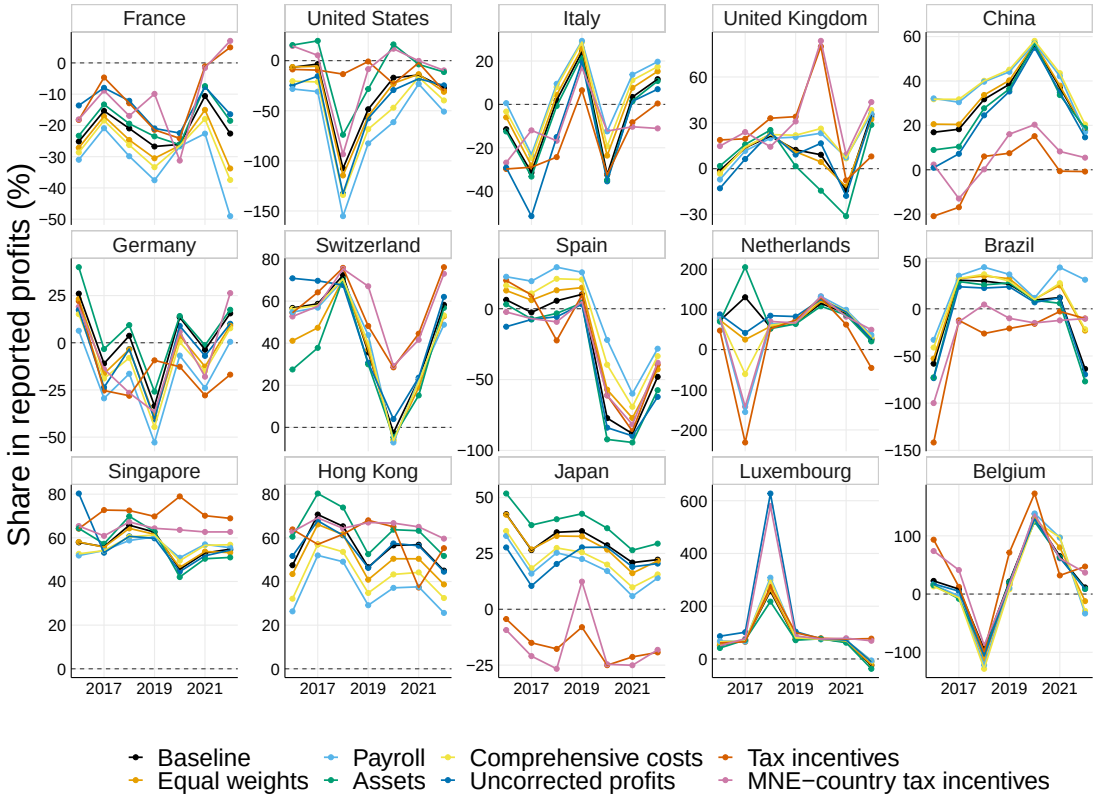
Note: This graph shows the amount of shifted profits according to each method, for the top 15 countries in terms of reported profits.

Another measure of tax incentives

In addition, we test an alternative version of the tax condition. While our preferred specification defines the fiscal liability of a MNE in a given country as the average ETR faced by all MNEs in that country, our robustness check instead defines the fiscal liability as the average ETR paid by the MNE itself in the country over the time period, provided the statutory tax rate remains constant.

The results remain largely consistent with our preferred specification including tax incentives. If anything, using the MNE-country-level measure of ETR introduces slightly more volatility, as it is based on fewer observations, which supports our choice to use the average ETR of MNEs in each country.

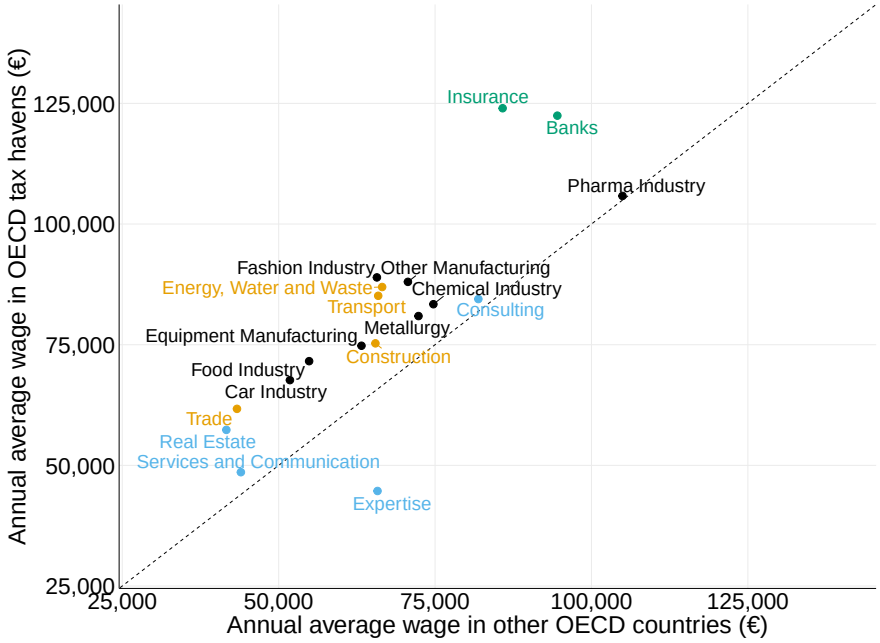
Figure E.2: Comparison of the methods on the share of shifted profits



Note: This graph shows the share of shifted profits over total profits reported to each country, according to each method, for the top 15 countries in terms of reported profits.

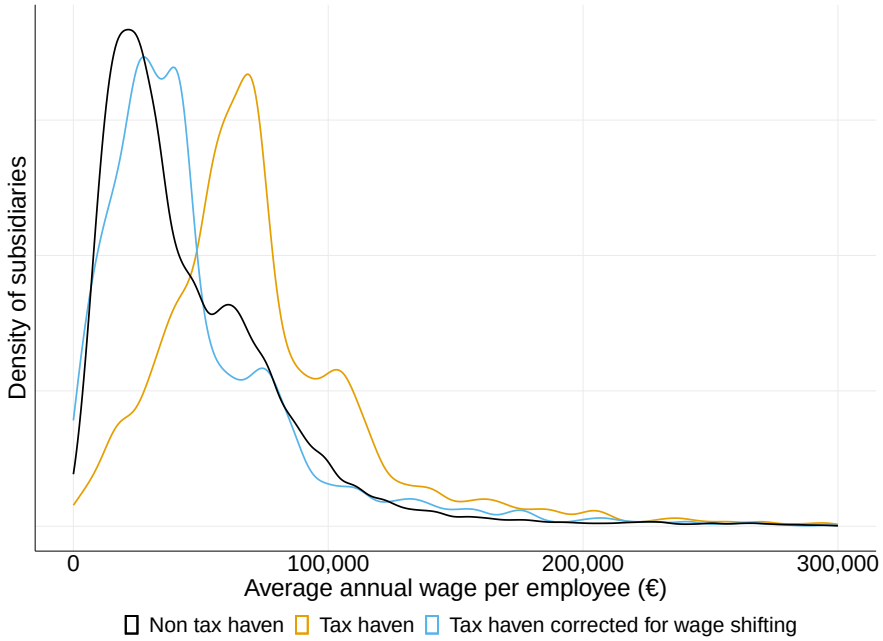
F Wage shifting

Figure F.1: Within-sector wage differences across countries



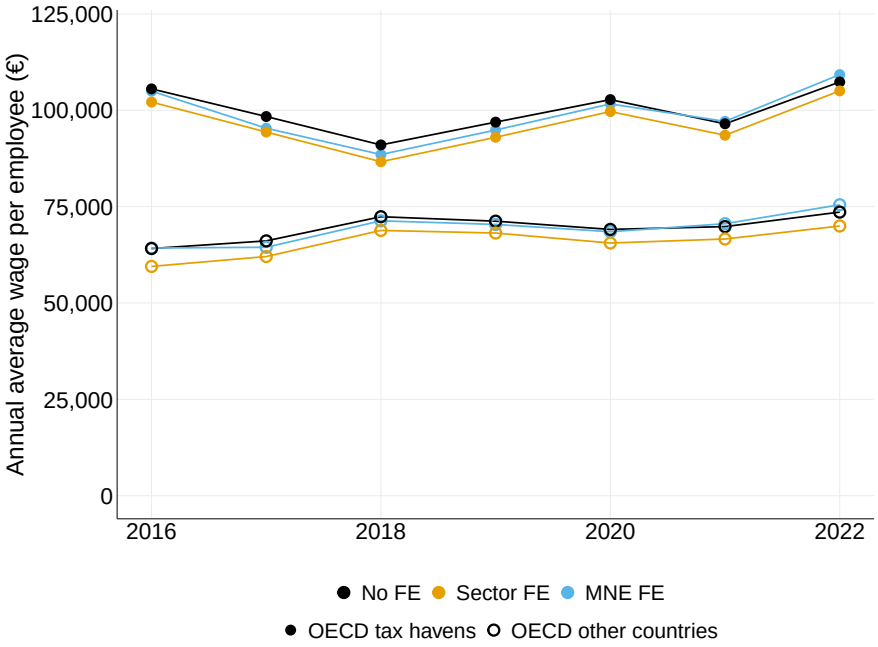
Note: We consider only firms in OECD countries and compare the average wage reported in a given sector by firms in OECD tax havens and OECD non-haven countries.

Figure F.2: Corrected wage distribution



Note: We consider only firms in OECD countries. The corrected wage distribution in tax haven correspond to the distribution of wages in tax haven less the tax haven premium.

Figure F.3: Regression coefficient - wage premium

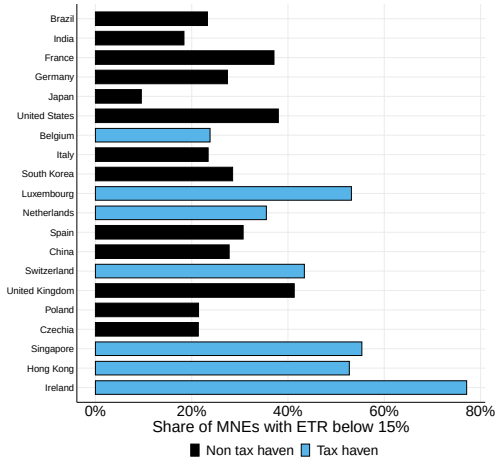


Note: This figure shows the yearly point estimate of eq. 2.

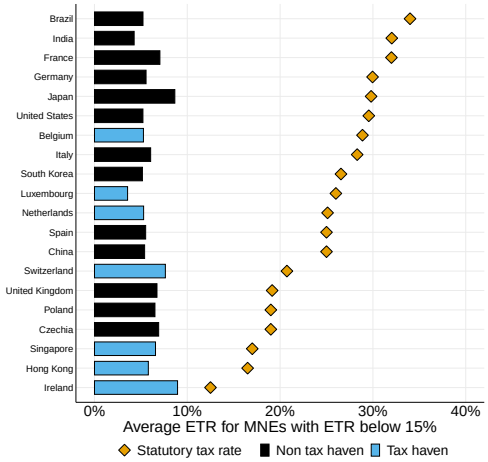
G Global Minimum Tax

Figure G.1: Scope of the Global Minimum Tax

(a) Share of MNEs with ETR < 15%



(b) Average ETR of MNEs in scope



Note: Figure G.1a shows the share of MNEs in a given country that has an ETR below 15%. Figure G.1b shows the average ETR of MNEs, restricting the sample to MNEs with ETR below 15%.

Table G.1: Global tax revenues in different scenarios (in bn€)

Year	**15% min. tax with carve-out**		**15% min.tax**		**10% min. tax**		**French ETR min. tax**		**French Stat. Rate min. tax**	
	Tax rev.	Share of tot. profits	Tax rev.	Share of tot. profits	Tax rev.	Share of tot. profits	Tax rev.	Share of tot. profits	Tax rev.	Share of tot. profits
2016	3.5	2.3%	5.1	3.3%	2.4	1.5%	10.9	7.2%	26.2	17.2%
2017	3.7	2.0%	6.1	3.3%	2.8	1.5%	9.7	5.3%	30.4	16.7%
2018	3.4	1.9%	5.2	2.9%	2.2	1.2%	9.2	5.1%	31.1	17.2%
2019	3.8	1.9%	5.7	2.9%	2.8	1.4%	13.6	7.0%	31.3	16.2%
2020	4.4	4.3%	5.7	5.5%	2.8	2.7%	10.4	10.1%	24.7	23.9%
2021	7.3	3.1%	9.8	4.1%	5.1	2.2%	10.6	4.4%	31.7	13.3%
2022	7.1	2.7%	9.0	3.4%	4.5	1.7%	9.4	3.5%	24.9	9.3%