



# Profit Shifting, Returns on Foreign Direct Investments and Investment Income Imbalances

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## Abstract

This paper shows that the well documented US excess return on its net foreign assets is no exception at the global level: on average, high corporate tax countries earn larger yields on their foreign direct investment assets than on their liabilities, generating an excess return on their net foreign assets consistent with tax-motivated profit shifting by multinational enterprises. Cross-country evidence based on aggregate data is confirmed using detailed firm-level data for France. A quantification exercise suggests that profit shifting inflated the French FDI income balance by €16 to €32 billion (0.7–1.5% of GDP) in 2015, largely explains the excess return on French FDI assets versus liabilities, and has increased substantially over recent years.

**JEL Classification** H26 · H25 · H32 · F23 · F3

## 1 Introduction

The United States receives positive net investment incomes from the rest of the world despite being a net international debtor, and has been so for over three decades. This intriguing feature of US cross-border investments constitutes the income puzzle in the international macroeconomics literature. However, the income puzzle is no exception at the global level: Fig. 1 shows that, since 2001, at least France, Sweden and the UK have similarly experienced a long lasting positive net investment income balance despite a negative international investment position.

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The original online version of this article was revised: There were two formatting mistakes in table 7.

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Research has shown that the US income puzzle is primarily due to a yield differential within the class of foreign direct investment (FDI). US multinational firms get a larger yield on their foreign direct investments than foreign multinationals do on their direct investments in the US.<sup>1</sup> This paper shows that differences in the apparent profitability of FDI are pervasive at the global level, beyond the US case. In an environment where gross cross-border asset stocks dwarf net positions, understanding the source of discrepancies in FDI yields has important implications for the analysis of global and regional imbalances and the sustainability of current accounts.

This paper investigates to what extent tax avoidance by multinational enterprises (MNEs) contributes to differences in FDI yields and distorts flows of FDI income at the global level. Regardless of their specific features, tax avoidance schemes aim at shifting profits from high-tax to low-tax jurisdictions in order to avoid corporate taxes.<sup>2</sup> In doing so, multinational companies leave their footprint by distorting the apparent profitability of their subsidiaries located in different countries and the related FDI income flows.<sup>3</sup> A parent company in a high-tax country shifting profit to its low-tax subsidiary increases the reported profitability of its subsidiary and inflates the flow of FDI income (either repatriated dividends or retained earnings) to the parent's country. Conversely, a parent in a low-tax country that shifts profit from its subsidiary in a high-tax country reduces the profitability of its subsidiary and accordingly reduces the flows of FDI income out of the high-tax country. Profit shifting therefore affects FDI returns and FDI income flows through both the asset and liability sides of the balance of payment; by inflating inflows of FDI income in high-tax countries for a given level of FDI stock abroad and decreasing outflows, it generates an apparent excess return on FDI in high-tax countries. This paper shows that tax distortions in reported FDI profitability are global and quantitatively relevant enough to distort the geography of profit location and related investment income imbalances.

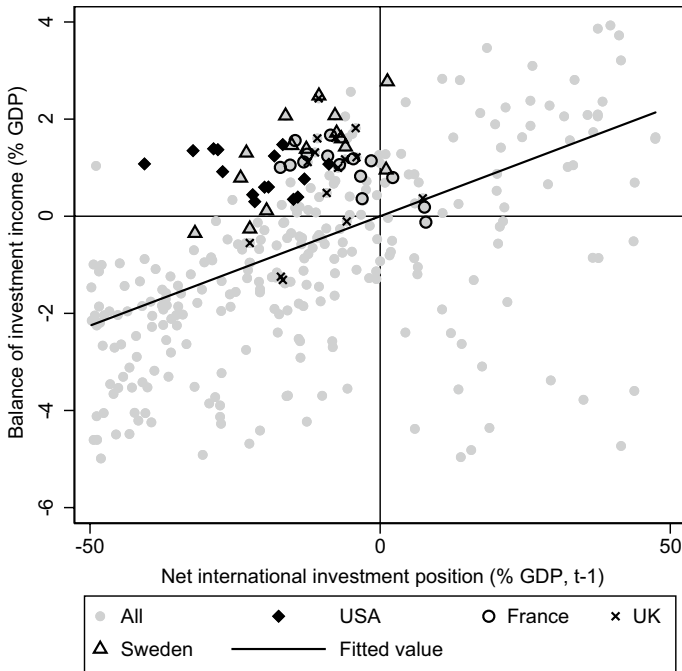
To make these points, the paper leverages data and identification sources at the country, country-pair and firm-level. At the country level, profit shifting from high- to low-tax affiliates decrease yields on FDI liabilities, increases yields on FDI assets, and generates a positive differential between yields on FDI assets and liabilities in high-tax countries. Testing this prediction using IMF Balance of Payments statistics, I confirm that the difference in yields on direct investment assets and liabilities is positively correlated with corporate tax rates for a large sample of countries. This holds in both the cross-section and the within dimension, and also when comparing to the yield differential on investments immune to profit-shifting distortions, namely portfolio equity.

<sup>1</sup> See Curcuru et al. (2013) for a survey of the literature.

<sup>2</sup> Most common avoidance schemes include transfer pricing manipulation on intra-firm international transactions and the strategic location of intangibles assets, remunerated through royalties or other exports of services, and of intra-group debt, whose interest is tax-deductible.

<sup>3</sup> Tax avoidance schemes based on the manipulation of transfer prices or the location of intangible assets also affect exports and imports of goods and services (Vicard 2015), while schemes using the location of intra-group debt distort the primary income balance, through flows of interests on intra-group debt, and the cross-border debt stock (Feld et al. 2013).





**Fig. 1** International investment position and investment income balance (2001–2015). *Source:* IMF BOP statistics, sample of EU and OECD countries with at least 10 years of data over 2001–2015 (see Appendix Table 15 for the country list). Each data point is a country-year observation

At the country-pair level, when profit shifting prevails, yields on bilateral FDI depend on the difference in corporate tax rates between the home and host countries of investors. Using data for a sub-sample of country pairs and years from the OECD International Direct Investment database, I find that yields on assets increase, yields on liabilities decrease, and yield differentials increase with corporate tax differentials. However, conclusions from cross-country regressions suffer limitations due to potential differences across countries in the compilation of FDI income and stock data (Curcucu et al. 2013; Blouin and Robinson 2019), in tax systems, or in the composition of foreign companies across locations.

To circumvent these issues, I focus on France and use detailed firm-level data to assess variations in profitability across affiliates within French multinational companies. France is a good candidate for studying the impact of profit shifting on investment income; similarly to the US, it is a high-tax country, exhibits an excess return on its net international investment position (Fig. 1) and finances its trade deficit through FDI income net inflows. But, contrary to the US over the period of analysis, it applies a territorial tax system that provides a clear rationale for multinational companies to shift their profits to low-tax jurisdictions.<sup>4</sup> Detailed firm-level

<sup>4</sup> Under the French participation exemption, parent companies may exclude up to 95% of the dividends distributed by their affiliates (of which they own at least 5% of the shares) from their taxable profit (Direction générale des finances publiques 2017). The US had a residential tax system in which corpora-



information on investment stocks, dividends and reinvested earnings allows comparing yields on all direct affiliates of French parent companies. At the MNE level, profit shifting increases yields on affiliates located in low-tax countries and decreases them in high-tax countries, beyond the overall profitability of the MNE. Consistent with this, I find that, within multinationals, affiliates located in low-tax jurisdictions and tax havens report significantly larger yields.

Endogeneity may affect firm-level results because of omitted variable bias or endogenous selection in different countries. To deal with these issues, I first include country fixed effects so that the identification comes from variations over time in the corporate tax rate in the host country of the subsidiaries. Second, I implement a selection model using the cost of starting a business as an exclusion variable. Although both exercises have limitations, they show a slight upward bias on the estimated coefficient on tax differential but conclusions remain qualitatively similar.

Finally, I conduct a quantification exercise to assess the extent to which profit shifting may affect the location of multinationals' profits across countries, by computing income flows from yields net of tax distortions using the firm-level regressions. The results suggest that tax-motivated profit shifting inflated the French income balance by €16 to €32 billion (or 0.7–1.5% of GDP). Profit shifted have increased substantially over recent years, from under €1 billion in 2001, are mainly shifted to European tax havens and conduit countries, and can explain the excess return on French FDI assets versus liabilities observed over the 2001–2015 period.

**Related literature** This paper is related to the international finance literature investigating cross-border asset returns. The higher apparent return on US foreign assets than liabilities has prompted a large literature on the exorbitant privilege of the dollar. The US excess return has been attributed to composition effects—US foreign assets are weighted towards equity and FDI, whose average returns are higher, whereas US liabilities are weighted towards bonds—, and return differentials within the FDI class of assets (Obstfeld and Rogoff 2005; Gourinchas and Rey 2007; Lane and Milesi-Ferretti 2009; Gourinchas et al. 2010; Curcuru et al. 2010).<sup>5</sup> Curcuru et al. (2008, 2013) discuss the size of the US excess return on methodological grounds. Bosworth et al. (2007), Curcuru et al. (2013) and recently Wright and Zucman (2018) attribute a large role to tax motives in explaining the US return differential. This paper is the first to document an apparent excess return on FDI for high-tax countries worldwide and to link it to profit shifting to low-tax countries and tax havens.

Quantifying the impact of profit shifting on foreign asset returns involves an estimation of the amount of profits shifted by multinational companies operating in

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Footnote 4 (continued)

tions were taxed on their activities worldwide until end 2017. The 2018 tax reform shifted the system toward a more territorial taxation but still feature taxes on worldwide profits (Auerbach 2018).

<sup>5</sup> Habib (2010) investigates returns on net foreign asset positions for a larger sample of countries. Knettsch and Nagengast (2017) focus on Germany and Rogoff and Tashiro (2015) on Japan.



France. In this respect, this paper is related to the literature on international taxation that investigates tax avoidance by multinational companies based on firm-level financial data (Huizinga and Laeven 2008; Johannesen et al. 2016; Dowd et al. 2017). Clausing (2016) and Tørsløv et al. (2018) criticize aggregate estimates of income shifting from this line of research on the grounds that balance-sheet data on affiliates located in tax havens are typically missing in the Orbis data used in most studies. Moreover, Bilicka (2019) and Johannesen et al. (2016) stress that a large proportion of foreign multinational subsidiaries report zero taxable profits accounting for a large share of profit shifting, which would not appear in micro-studies focusing on log profits. I focus here on the ratio of foreign affiliates' after-tax profits, in line with FDI income registered in the balance of payments and a capital market approach of cross-border investments, to the FDI stock, i.e. including zero or negative reported profits. Weichenrieder (2009), using similar micro-data for Germany, shows that returns on outbound and inbound investments vary with tax differentials, but does not investigate the aggregate implications for current account imbalances. Janský and Palanský (2019) document a negative relationship between the share of FDI from tax havens and the rate of return on FDI liabilities, and provide country-level estimates of profit shifting. Using data collected for the production of balance of payments statistics provides me with firm-level information on all affiliates directly held by a parent company located in France, including those in tax havens, that are suitable for aggregate estimates, but for a single country.

Finally, this paper contributes to the literature investigating how tax avoidance affects official statistics. At the international level, tariff evasion through mislabeling of products has been shown to explain discrepancies between reported bilateral imports and exports (Fisman and Wei 2004). Vicard (2015) provides evidence that the manipulation of transfer prices in international intra-group transactions biases the trade balance. And Alcalin and Blanchard (2016) document how corporate taxation may generate simultaneous FDI inflows and outflows. Focusing on individuals instead, Zucman (2013) exploits bias in reported portfolio liabilities to quantify the wealth hidden in tax havens. At the national level, Guvenen et al. (2017) investigate how profit shifting by US MNEs affects the measured productivity growth; Bruner et al. (2018) extend their analysis to other US official statistics. Finally, Tørsløv et al. (2018) quantify worldwide profits shifted to tax havens exploiting tax-generated anomalies in national account statistics of recipient countries. Compared to the last two papers, I propose an alternative estimation methodology for profit shifting based on available official statistics—the balance of payments statistics—from high-tax countries.<sup>6</sup>

The rest of the paper is organized as follows. Section 2 details methodological issues and the data sources used in the analysis. Section 3 presents macro-level evidence of tax-generated yield differentials on FDI for a large sample of countries. Firm-level data are analyzed in Sect. 4, while the related robustness analysis is reported in Sect. 5. Finally, in Sect. 6, I detail the assumptions of the quantification

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<sup>6</sup> Interestingly, estimations of missing profits based on different data and identification sources yield similar amounts for France.



exercise and the implications for the level and the geography of FDI income flows, missing profit in France and return differentials on FDI.

## 2 Methodology and Data

### 2.1 Comparing Yields on Cross-Border Assets

The yields on foreign assets and liabilities can be computed at different level of aggregation, for  $i = [\text{country}, \text{country pair}, \text{firm}]$ , using balance of payments data on direct investment income credit and debit, and international investment positions on stocks of foreign assets and liabilities as:

$$i_{it}^A = \frac{InvIn_{it}}{A_{it-1}} \quad \text{and} \quad i_{it}^L = \frac{InvOut_{it}}{L_{it-1}} \quad (1)$$

where  $InvIn_{it}$  is direct investment income credit,  $InvOut_{it}$  is direct investment income debit, and  $A_{it-1}$  and  $L_{it-1}$  are the stocks of gross FDI assets and liabilities.<sup>7</sup> The yield differential is then the difference between yields on assets and liabilities,  $i_{it}^A - i_{it}^L$ .

Foreign direct investment includes both equity investment and intra-group debt. Accordingly, FDI income include interests, dividends distributed to the parent company and re-invested earnings. Profits (dividends and re-invested earnings) are expected to be shifted from low-tax to high-tax affiliates in the event of tax avoidance, thereby affecting yields. On the contrary, yields on intra-group debts are not necessarily affected by tax avoidance: interests on intra-group debt are expected to flow from high-tax to low-tax countries or tax havens as interest expenses are deductible from the corporate tax base, but such tax schemes require that the associated stock of intra-group debt be located accordingly.<sup>8</sup> Profit shifting is therefore expected to affect primarily the equity component of FDI incomes.

In the balance of payments definition, FDI income is after (host country) tax income. The empirical analyses below will therefore consider after-tax yields or yield differential on FDI. In this, I depart from the literature on profit shifting that mostly considers earnings before taxes and introduces capital as a determinant (Huizinga and Laeven 2008). In an international framework, investors (MNEs) arbitrage across different locations for their FDI depending on their after-tax return on investment. In a global capital market equilibrium, *after-tax* returns are therefore expected to be equalized (in expectation). In this respect, deviations in *after-tax* yields on FDI related to tax determinants can be interpreted as evidence of profit shifting.

<sup>7</sup> Note that the analysis focuses on the income stream generated by foreign asset holding, i.e. interests, dividends or re-invested earnings in the case of FDI. The total return also includes valuation effects related to asset price changes in domestic currency that are not considered here.

<sup>8</sup> Thin capitalization rules restrict the deductibility of interests above a certain debt level and affect the leverage of foreign subsidiaries in different countries (Blouin et al. 2014).



An important issue when mapping micro to macro data on FDI incomes is the presence of a large number of zero or negative income flows at the firm-level that are offset at higher level of aggregation. In the French firm-level data, more than a quarter of FDI income reported by foreign subsidiaries of French MNEs is negative or equal to zero. Accounting for such observations is therefore particularly important for micro-to-macro quantification exercises. Moreover these observations are not neutral when investigating profit shifting. While observing a bunching of reported profits at zero is not evidence of profit shifting per se, Bilicka (2019) and Johannesen et al. (2016) show that foreign multinationals are more likely to report zero profit than similar domestic firms and that they are more likely to do so in high-tax than low-tax countries. Raw data on French affiliates is consistent with such tax-generated bunching at zero profit: the proportion of subsidiaries of French MNEs reporting zero profit (defined as a yield on FDI between -0.5% and 0.5%) is 6.8% on average, 8.2% for subsidiaries located in countries with a larger corporate tax rate than France and 5.7% for subsidiaries located in countries with a corporate tax rate more than 10 percentage points lower than France. Focusing on FDI yields instead of the level of reported profits allows including information on zero or negative profits in firm-level regressions and consistently accounting for those flows in the quantification.

## 2.2 Data

Following the sixth edition of the IMF Balance of Payments and International Investment Position Manual (BPM6), FDI income is decomposed into dividends, reinvested earnings and interests on intra-group debt. Reinvested earnings are the retained earnings of foreign subsidiaries that are not distributed as dividends; they are attributed to the direct investors according to the share of equity they hold. Reinvested earnings are defined as net operating surplus plus primary income (dividends, interest and rents receivable, and share of reinvested earnings of any direct investment enterprises) and current transfers receivable, minus primary income (excluding reinvested earnings payable), taxes and other current transfers payable. Dividends and reinvested earnings are after-tax incomes since the corporate tax is payable by the enterprises and not its owner.

Information on affiliates indirectly held through other foreign affiliates is not reported but the chain of direct investment relationships should appear in FDI flows and stocks of the first affiliate, according to BPM6 standards.<sup>9</sup> Focusing on direct affiliates prevents any double-counting of income and profits shifted, as can be the case for other data sources (Altshuler and Grubert 2006; Blouin and Robinson 2019).

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<sup>9</sup> In principle, retained earnings include earnings receivable from any direct investment enterprises. To the best of my knowledge, however, only the US includes re-invested earnings in earnings receivable from direct investment enterprises, so that only dividends of second order affiliates are reported for other countries.



The standard valuation of FDI in the balance of payments (BPM6) follows the mixed value, which values listed equity stocks at market price and unlisted equity stocks at book value. The book value of unlisted foreign affiliates comes from either the balance sheet of foreign companies (when available) or from information on subsidiaries and interests in the notes to the annual financial statements of resident companies. The value of resident affiliates held by foreign direct investors is taken from their balance sheets.<sup>10</sup> Equity capital is computed as the sum of share capital, reserves, retained earnings, and the current year profit or loss (Banque de France 2015).

**Country Specificities** Curcuru et al. (2013) emphasize that the collection of FDI income data differs across countries and over time. As an illustration, Blouin and Robinson (2019) underline an important difference in US statistics—the inclusion in US direct investment income data of reinvested earnings (“equity income”) from second-order affiliates, while most countries collect only dividends—that is likely to bias direct comparisons of yields across countries (but not when using the within dimension of cross-country panel data).

Relatedly, Appendix 1 details a different statistical issue in the French case—related to the registration of intra-group debt stocks and incomes—and shows that it affects mainly the level of yields at the country level, and only secondarily their differentials. Corrected data show a 2.1% yield differential between FDI assets and liabilities.

**Country Level Data** Data on FDI income flows and FDI stocks at the country level come from the IMF BOP Statistics. Stock and flow information required to compute yields is available for at least 10 years over the 2001–2015 period for 76 countries (listed in Appendix Table 15). Yields are trimmed for outliers exceeding  $\pm 100\%$ . The corporate tax rate is the statutory corporate tax rate. Table 1 reports descriptive statistics on the two samples used in the analysis below.

**Bilateral FDI Income Data** The OECD International Direct Investment Database provides information on FDI income flows and FDI stocks on assets and liabilities for 30 declaring countries, with a maximum of 151 partner countries (listed in Table 16 in Appendix). Both FDI income flows and stocks can be decomposed into earnings on equity investments and interests on intra-group debt payables for a sample of countries, allowing the computation of yields on total FDI and FDI equity and intra-group debt separately. Data availability, however, is substantially lower for disaggregated data. Data span the 2006–2016 period but with limited coverage before 2014 (more than 75% of observations are from the 2014–2016 period) so that the within dimension of the data cannot be leveraged out. Data are trimmed for yields exceeding  $\pm 100\%$ .

<sup>10</sup> Real-estate investment is calculated at market value through cumulative flows valued at historical cost and updated yearly using various price indexes.





Table 1 Descriptive statistics

	Full sample						Restricted sample (OECD and EU)					
	N	Mean	SD	p25	Median	p75	N	Mean	SD	p25	Median	p75
Yield differential direct inv	1020	-0.03	0.10	-0.06	-0.02	0.01	560	-0.01	-0.01	0.07	-0.04	0.01
Yield differential direct inv. equity	745	-0.03	0.12	-0.07	-0.01	0.02	497	-0.02	0.00	0.11	-0.05	0.02
Yield differential direct inv. interest	561	0.00	0.07	-0.01	0.00	0.00	409	0.00	0.00	0.03	-0.01	0.00
Yield on FDI liability	1022	0.09	0.07	0.04	0.07	0.11	561	0.07	0.06	0.06	0.04	0.09
Yield on FDI liability equity	917	0.10	0.10	0.05	0.08	0.13	523	0.08	0.07	0.09	0.04	0.11
Yield on FDI liability interest	817	0.03	0.05	0.01	0.03	0.04	484	0.04	0.03	0.06	0.02	0.04
Corporate tax rate	1022	0.25	0.08	0.20	0.26	0.31	561	0.26	0.26	0.08	0.20	0.30
Tax haven dum.	1022	0.10	0.30	0.00	0.00	0.00	561	0.11	0.00	0.32	0.00	0.00



**Firm-Level Data for France** The main source of data is confidential firm-level data on FDI stocks and dividends and reinvested earnings from foreign affiliates collected by the Banque de France for compiling the balance of payments statistics. The dataset includes information on all foreign affiliates directly held by the parent company located in France. Data are collected from several sources. The outward foreign direct investment stocks and income credit come from the ‘*Survey of direct investment abroad*’, a yearly survey of resident parent multinationals (industrial and commercial enterprises, financial intermediaries and insurance corporations) conducted by the Banque de France. It collects various information on their investment abroad, including ownership shares, equity capital, current income, exceptional income, other equity capital and dividends. Information on all non-resident subsidiaries in which a resident direct investor holds an equity capital stake of more than 5 million euros, or where the acquisition cost was greater than 5 million euros, must be reported in the survey. Major non-financial enterprises (*‘Déclarants directs généraux’*, i.e. whose total international transactions in services or incomes exceed 30 million euros a year) report on an infra-annual basis their service transactions and their income payments to or from non-residents. The data related to foreign affiliates are therefore reported by the resident MNEs, and do not rely on the availability of financial reports in host countries and, in particular, of corporate registers in tax havens.

Data on inward direct investment stock and income debit are compiled from the FIBEN database (*‘Fichier bancaire des entreprises’*), the firm-level dataset produced by Banque de France providing balance-sheet information on non-financial resident companies. Those data are supplemented by sources from the ACPR for the banking sector and from INSEE (ESANE data).

The dataset includes detailed information on a yearly basis on the stock of FDI assets and liabilities and the associated flows of FDI income for each parent-affiliate pair for all parents and affiliates resident in France. Information is aggregated at the parent-country-year level because no identifier enables matching stock and income flow data of affiliates from the same parent located in the same country. Data are available over the 2001–2015 period.

The raw data show that French MNEs have on average 5.2 direct foreign affiliates (median of 3) and that 33% of them have at least one affiliate in a tax haven (according to the Hines and Rice 1994 list). Gumpert et al. (2016) report tax-haven investment by 20% of German multinationals and 59% of US multinationals. Differences in the reporting threshold, which is lower in the German MiDi data, likely explain those discrepancies related to the inclusion of small multinational companies.<sup>11</sup> Affiliates located in tax havens represent 10.5% of observations in the estimation sample.<sup>12</sup>

<sup>11</sup> The average number of foreign affiliates by parent was 2.8 in the German MiDi data in 2002 (Gumpert et al. 2016) and between 7.5 and 7.8 for US parents in the data used by Desai et al. (2006).

<sup>12</sup> 14.5% and 0.8% using the top 15 tax havens and OECD lists, respectively.



The geographical distribution of French FDI income is biased towards low-tax countries: in 2015, 19% of the foreign profits of French parents were booked in tax havens (which account for only 12% of FDI assets). More generally, seven small jurisdictions (Belgium, Hong Kong, Ireland, Luxembourg, Netherlands, Singapore and Switzerland) are as large a location of foreign profits of French parents as the G7 countries plus China. The share of tax havens in both asset stocks and income flows has been steadily increasing since 2001 (particularly since 2009), from 11% to 7% in 2001, respectively.

On the liability side, the share of tax havens is even larger: the Big 3 European tax havens (Ireland, Luxembourg and Switzerland) represent 30% of the stock of French direct investment liabilities (plus another 1% for other tax havens) and 22% of DI income debits in 2015.

**Other Data** Data on corporate tax rates are from the OECD tax database supplemented by information from KPMG.<sup>13</sup> I use the statutory corporate tax rate as my main measure for tax rate differentials but also consider the sensitivity of the results to alternative measures of tax rates using effective average and marginal tax rates computed by Egger and Bosenberg (2017) and the Oxford Center for Business Taxation.

Figure 2 shows that, over the last fifteen years, France has progressively moved from being an average to a high corporate tax country despite a relatively stable statutory corporate tax rate. The average tax differential with respect to the rest of the world has increased from 5 to 16 percentage points, and from 2 to 18 percentage points with respect to other EU countries.<sup>14</sup>

Finally, tax havens are from the list of Hines and Rice (1994); alternative lists from OECD (2000) and using information from Oxfam (Bouvatier et al. 2017) are used for robustness. GDP and CPI data are from the World Bank WDI.

### 3 Macro-Level Evidence

This section provides macro-level evidence of excess returns on FDI in high-tax countries, beyond the case of the United States, consistent with profit shifting.

#### 3.1 Excess Return on FDI in High-Tax Countries: Cross-Country Evidence

Tax avoidance by multinational enterprises inflates profit reported by subsidiaries in low-tax countries and reduces it in high-tax countries. At the country level, it

<sup>13</sup> <https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html>.

<sup>14</sup> The same pattern holds when using effective tax rates. Using the marginal effective tax rate, the differential increased from 0 to 6 percentage points with respect to the rest of the world, and from 2 to 7 percentage points with respect to other EU countries.



translates into higher average reported yields on foreign assets and lower yields on FDI liabilities in high-tax countries. Combined, this generates an excess return on FDI in high-tax countries, i.e. a larger yield on FDI assets than on liabilities. This section tests this expected country-level relationship when tax avoidance prevails using balance of payments data for a large sample of countries.

Before turning to regression results, Panel (a) of Fig. 3 presents a scatter plot of raw yield differentials against the corporate tax rate for the cross-section of EU and OECD countries in 2007. It shows that high-tax countries have positive yield differentials while the opposite holds for low-tax countries, with the US at the upper right having the highest differential and corporate tax rate, and Ireland and Cyprus at the other end. The pooled data presented in panel (b) confirm the positive correlation between yield differentials and corporate tax rates over the 2001–2015 period.

Table 2 reports the results of the regression of FDI yield differentials of country  $c$  on the level of corporate income tax rate ( $Tax_{ct}$ ) and a tax haven dummy ( $TH_c$ ) as follows:

$$i_{ct}^{A,FDI} - i_{ct}^{L,FDI} = \beta_0 + \beta_1 Tax_{ct} + \beta_2 TH_c + FE_t + \epsilon_{ct}. \quad (2)$$

$FE_t$  are year fixed effects that control for the average level of corporate tax rate at the world level, since the FDI yield differentials should depend on relative national tax rates.

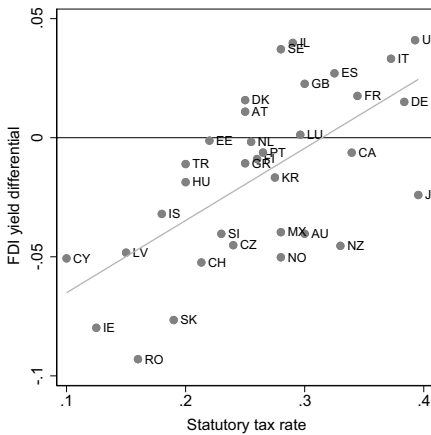
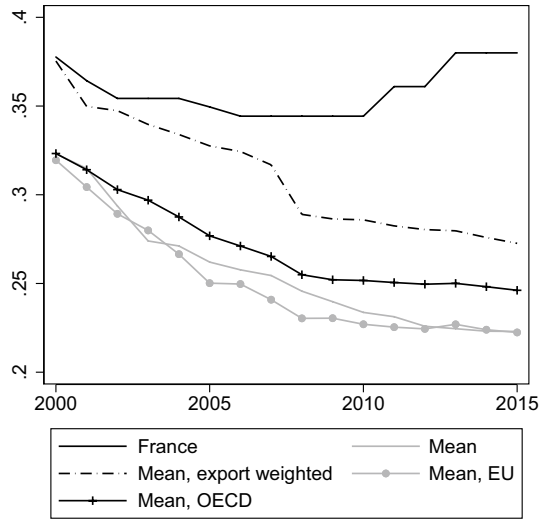
Column (1) presents results pooling data across countries and years for the full sample of 76 countries. It shows a positive coefficient, significant at the 1% level, on the corporate tax level, as expected in the case of profit shifting strategies inflating net FDI incomes in high-tax countries. Direct investments from advanced economies to emerging markets however are likely to differ from FDI in the other direction, in terms of associated risks in particular. In column (2) I focus on the sample of EU and OECD countries which are arguably more comparable. The coefficient on corporate tax rate is almost twice as large and more precisely estimated. In column (3), I further restrict the sample excluding tax havens since these are countries where the statutory corporate tax rate may not be a meaningful measure of the effective marginal tax rate on profits. The coefficient on corporate tax differential increases and is again more precisely estimated.<sup>15</sup> In the US case, the point estimate implies that profit shifting explains 1.8 (column (1)) to 4.0 (column (3)) percentage points out of the 4.3 percentage points differential on FDI yields over the period 2001–2015. For comparison, Curcuru et al. (2013) estimate the contribution of profit shifting to the US FDI yield differential at 1.8 percentage points over the 1983–2010 period, a period during which the tax differential was lower than since 2001.

Going one step further, columns (4) and (5) make use of more disaggregated data distinguishing direct investment debt and the related interest flows and direct investment equity and associated income flows (profits). Profit shifting affects the yields on FDI equity but not on FDI debt since tax avoidance schemes through debt shifting

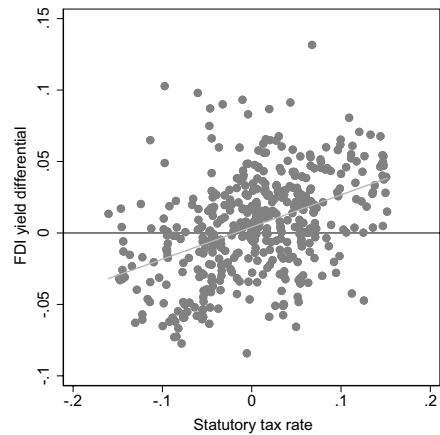
<sup>15</sup> Note that the  $R^2$  more than doubles when tax havens are excluded from the sample of countries, and corporate tax rates explain 21% of the variance of FDI yield differentials.



**Fig. 2** Statutory corporate tax rate. *Source: OECD and KPMG*



**(a)** Year 2007



**(b)** Pooled 2001-2015

**Fig. 3** Yields on FDI liability and corporate tax rates. *Note:* Sample of EU and OECD countries. Yields on FDI liability,  $r_{it}^{L,k}$ , as defined in Eq. 1. In Panel **b**, FDI yields and statutory tax rates are purged from year fixed effects

affects primarily the leverage of subsidiaries in high-tax countries and their debt stock but not necessarily interest rates. When excluding intra-group debt and related interests (column (4)), the coefficient on the corporate tax rate remains similar to column (2). It is worth noting that FDI debt represents only a small share of total FDI stocks except for tax havens. Conversely, in column (5) I use only intra-group debt and interest payments when computing the yield differential. As expected, the corporate tax rate is not correlated to the difference in yields on FDI debt assets and liabilities at the country level. The positive and significant coefficient on tax-haven



**Table 2** Yield differential on FDI and corporate tax rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Yield differential: $i_{ct}^{A,FDI} - i_{ct}^{L,FDI}$							
Asset class				Equity	Interest		Portfolio Equity	
Sample	All	Restr.	Restr.+	Restr.	Restr.	All	Restr.+	Restr.+
Statutory tax rate	0.13 <sup>a</sup> (0.05)	0.22 <sup>a</sup> (0.06)	0.30 <sup>a</sup> (0.03)	0.20 <sup>b</sup> (0.08)	- 0.00 (0.03)	0.04 (0.19)	0.33 <sup>b</sup> (0.14)	0.25 <sup>b</sup> (0.05)
Tax haven dum.	0.02 (0.02)	0.01 (0.02)		- 0.03 (0.02)	0.02 <sup>a</sup> (0.01)			
Constant	- 0.04 <sup>b</sup> (0.02)	- 0.07 <sup>a</sup> (0.02)	- 0.09 <sup>a</sup> (0.01)	- 0.06 <sup>b</sup> (0.03)	0.00 (0.01)	- 0.04 (0.05)	- 0.12 <sup>a</sup> (0.04)	- 0.11 <sup>a</sup> (0.02)
Observations	1020	560	535	497	409	615	342	428
R-squared	0.03	0.08	0.21	0.06	0.09	0.03	0.11	0.16
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	-	-	-	-	-	Yes	Yes	-

Robust standard errors clustered in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The baseline dependent variable is the yield differential,  $i_{ct}^{A,FDI} - i_{ct}^{L,FDI}$ , on direct investment as defined in Eq. 1. In column (4), the yield on direct investment is computed excluding intra-group debt and interests; the dependent variable in column (5) is computed on intra-group debt and interest only. In column (8), the dependent variable is the yield differential on direct investments minus the yield differential on portfolio investment equity for the same country. The sample is restricted to EU and OECD countries in columns (2), (3), (4), (5) (7) and (8). Columns (3), (7) and (8) additionally exclude tax havens. Country fixed effects included in columns (6) and (7) and the sample is restricted to the latest period after the last break in data collection, as reported by the IMF BOP statistics

status echoes the central role of these jurisdictions in tax schemes using intra-group debt to shift profit. Such results are again consistent with tax avoidance by multinational enterprises.

Composition effects between FDI assets and liabilities may, however, generate yield differentials at the country level. Such concerns can be attenuated by using the panel dimension of the data. Focusing on the within-country dimension also helps to address cross-country comparability issues in the level of yields on assets and liabilities due to differences in compilation methods (Curcuro et al. 2013); issues of consistency in the collection of balance of payments data over time however calls for caution in interpreting the results.<sup>16</sup> Including country fixed effects in columns (6) and (7), the coefficient on corporate tax rate remains positive but significant only in the restricted sample of EU and OECD countries. An alternative method for controlling for country specific characteristics is to use as dependent variable the

<sup>16</sup> Balance of payments data feature breaks in statistical series that prevent comparisons over time. In columns (6) and (7), the sample is restricted to observations after the last break in statistical series, as indicated by the IMF BOP Statistics.



difference in yield differentials on FDI and portfolio equity. Any country specific economic characteristics increasing the yields on liabilities should indeed increase both the yields on FDI and portfolio equity. On the contrary, any inflated net investment income flow related to profit shifting should be specific to the FDI class of assets. Results in column (8) confirm the positive relation between corporate tax rate and FDI yield differentials.

In Table 3, I focus on FDI liabilities and test for the expected negative relation between yields on FDI liabilities and corporate tax rates across countries. Parents in low-tax countries or tax havens shift profits away from their high-tax affiliates, thereby reducing profits reported in high-tax countries and the yields on FDI liabilities (Janský and Palanský 2019). The structure of Table 3 is similar to Table 2. It shows a systematic negative relationship between yields on FDI liabilities and the level of corporate tax rates, consistent with results on yield differentials.

### 3.2 Yields on Bilateral FDI Stocks and Corporate Tax Rate Differentials

At the country pair level, corporate tax avoidance by MNEs decreases the apparent profitability of affiliates in high-tax countries when their parent is located in a low-tax country and vice versa, thereby increasing yields on bilateral FDI liability from a higher-tax country and decreasing yields on bilateral FDI assets in higher tax countries. Yield differentials on bilateral FDI stocks should therefore depend positively on the difference in corporate tax between countries.

The OECD international direct investment database reports information separately on FDI assets and liabilities, so that, for a declaring country  $c$  and a partner country  $p$  and year  $t$ , we can estimate:

$$i_{cpt}^{A,FDI} - i_{cpt}^{L,FDI} = \beta_0 + \beta_1 TaxDiff_{cpt} + \beta_2 TH_c + \beta_3 TH_p + FE_t + \epsilon_{cpt} \quad (3)$$

where  $i_{cpt}^{A,FDI} = \frac{InvIn_{cpt}^{FDI}}{A_{cpt-1}^{FDI}}$  and  $i_{cpt}^{L,FDI} = \frac{InvOut_{cpt}^{FDI}}{L_{cpt-1}^{FDI}}$ , and  $TaxDiff_{cpt}$  is the difference in corporate tax between country  $c$  and partner  $p$ . A larger tax differential between country  $c$  and  $p$  is expected to be associated with higher yields on assets and lower yields on liabilities, i.e. a larger yield differential so that  $\beta_1$  is expected positive as in the country-level analysis.  $TH_c$  and  $TH_p$  are dummies for the tax haven status of country  $c$  and  $p$ , respectively. Standard errors are clustered at the country pair level.

Results are reported in Table 4. Column (1) reports results using as dependent variable the yield differential between assets and liabilities computed on total FDI. It shows that high-tax countries have significantly higher yield differentials on FDI from low-tax partners. The estimated coefficient is similar in magnitude to the country-level results presented in Table 2: a one percentage point difference in corporate tax rate between the country and its partner is associated with a 0.18 percentage



**Table 3** Yield on FDI liability and corporate tax rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Yield on FDI liability: $i_{ct}^{L,FDI}$							
Asset class				Equity	Interest	Portfolio		
Sample	All	Restr.	Restr.+	Restr.	Restr.	All	Restr.+	Restr.+ Equity
Statutory tax rate	-0.07 <sup>c</sup> (0.04)	-0.13 <sup>a</sup> (0.04)	-0.19 <sup>a</sup> (0.03)	-0.14 <sup>b</sup> (0.05)	0.00 (0.04)	-0.18 (0.12)	-0.33 <sup>b</sup> (0.15)	-0.15 <sup>a</sup> (0.04)
Tax haven dum.	0.03 <sup>b</sup> (0.01)	0.03 <sup>b</sup> (0.02)		0.03 <sup>b</sup> (0.02)	0.03 <sup>c</sup> (0.02)			
Constant	0.08 <sup>a</sup> (0.01)	0.09 <sup>a</sup> (0.02)	0.11 <sup>a</sup> (0.01)	0.09 <sup>a</sup> (0.02)	0.06 <sup>a</sup> (0.02)	0.11 <sup>a</sup> (0.04)	0.15 <sup>a</sup> (0.05)	0.07 <sup>a</sup> (0.01)
Observations	1022	561	535	523	484	616	342	449
R-squared	0.09	0.20	0.25	0.19	0.09	0.17	0.26	0.18
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	-	-	-	-	-	Yes	Yes	-

Robust standard errors clustered in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The baseline dependent variable is the yield on FDI liability,  $i_{ct}^{L,FDI}$ , as defined in Eq. 1. In column (4), the yield on direct investment is computed excluding intra-group debt and interests; the dependent variable in column (5) is computed on intra-group debt and interest only. In column (8), the dependent variable is the yield on direct investments minus the yield on portfolio investment equity for the same country. The sample is restricted to EU and OECD countries in columns (2), (3), (4), (5) (7) and (8). Columns (3), (7) and (8) additionally exclude tax havens. Country fixed effects included in columns (6) and (7) and the sample is restricted to the latest period after the last break in data collection, as reported by the IMF BOP statistics

point yield differential. Columns (2) and (3) show that this yield differential is driven by yields on FDI equity (column (2)) but not interests on intra-group loans (column (3)). The tax haven dummies are insignificant but with the expected signs in column (2).<sup>17</sup>

The remaining columns of Table 4 further show that larger yield differentials from low-tax countries are driven by both the asset and liability sides. In column (4), the dependent variable is the yield on assets held by country  $c$  in partner  $p$ ,  $i_{cpt}^{A,FDI}$ , and the corresponding yield on liabilities of country  $c$  held by partner  $p$ ,  $i_{cpt}^{L,FDI}$ , in column (5). At this level, it is possible to control for characteristics of the host country of FDI potentially correlated to corporate tax rate and FDI profitability through the inclusion of country  $\times$  year fixed effects (partner  $\times$  year fixed effects in column (5), respectively). The identification then comes from the return on FDI served by a given host country to different home countries depending on their corporate tax rates. As expected, the

<sup>17</sup> As emphasized in the previous section, the sign of  $TH_c$  and  $TH_p$  is ambiguous in column (1) including both interests on intra-group debt and dividends and reinvested earnings. Note that the only declaring country  $c$  listed in the tax haven list is Ireland.





**Table 4** Yields on bilateral foreign direct assets and liabilities and corporate tax rate

Asset class	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	DI	DI	DI	DI	DI	DI	DI
	Total	Equity	Interest	Equity	Equity	Equity	Equity
Yields	Assets minus liabilities			Assets	Liabilities	Assets	Liabilities
Corporate tax diff.	0.18 <sup>a</sup> (0.04)	0.15 <sup>a</sup> (0.05)	- 0.01 (0.02)	0.20 <sup>a</sup> (0.06)	- 0.06 <sup>c</sup> (0.03)	0.22 <sup>a</sup> (0.06)	- 0.06 <sup>b</sup> (0.03)
Tax haven dum. partner	- 0.01 (0.01)	0.01 (0.01)	- 0.00 (0.01)		- 0.01 (0.01)		- 0.00 (0.01)
Tax haven dum. country	- 0.03 (0.02)	- 0.03 (0.02)	- 0.02 (0.02)	- 0.01 (0.02)		- 0.01 (0.02)	
Constant	0.01 <sup>c</sup> (0.00)	- 0.00 (0.01)	- 0.00 (0.00)	0.06 <sup>a</sup> (0.00)	0.05 <sup>a</sup> (0.00)	0.06 <sup>a</sup> (0.00)	0.05 <sup>a</sup> (0.00)
Observations	4478	3055	2902	4313	4526	5533	5602
R-squared	0.01	0.01	0.01	0.17	0.08	0.17	0.08
FE year	Yes	Yes	Yes	No	No	No	No
FE partner × year	No	No	No	Yes	No	Yes	No
FE country × year	No	No	No	No	Yes	No	Yes

Note: Robust standard errors clustered at the country pair level in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable is the yield differential at the bilateral level,  $i_{cpt}^{A,FDI} - i_{cpt}^{L,FDI}$ , in columns (1)-(3), the yield on assets  $i_{cpt}^{A,FDI}$  in columns (4) and (6) and the yield on liabilities  $i_{cpt}^{L,FDI}$  in columns (5) and (7). In columns (2) and (4)-(7), the dependent variable is computed on FDI equity and on interest on intra-group debt in column (3). In columns (6) and (7), yields are computed using the current year stocks minus the flow of reinvested earnings as denominator

estimated coefficients are positive when focusing on assets and negative on liabilities. Finally, columns (6) and (7) show that the results of columns (4) and (5) are robust to measuring yields using current year stocks minus the flow of reinvested earnings instead of the stock in year  $t - 1$  as denominator.

#### 4 Evidence from Firm-Level Data for France

This section makes use of detailed firm-level data on subsidiaries' dividends, reinvested earnings and capital stock to identify the impact of tax-motivated profit shifting on yields on FDI assets. Using individual data allows exploiting variations within a multinational enterprise across affiliates located in different jurisdictions to control for any MNE-level characteristics likely to affect its overall profitability. Firm-level data can also be leveraged to address the endogenous selection of affiliates in different locations.



## 4.1 Empirical Specification

For affiliates located in country  $i$  and a French parent  $j$ , I regress the yield on FDI on the corporate tax rate differential between France and country  $i$  and a tax haven dummy as follows:

$$i_{ijt} = \beta_0 + \beta_1 TaxDiff_{it} + \beta_2 TH_i + FE_{jt} + \epsilon_{ijt}, \quad (4)$$

where  $i_{ijt} = \frac{FDI_{inc_{ijt}}}{FDI_{stock_{ijt-1}}}$ .<sup>18</sup>  $TaxDiff_{it}$  is the difference between the corporate tax rate in France and in country  $i$  and  $TH_i$  is a dummy variable equal to one when the host country  $i$  is a tax haven.  $FE_{jt}$  are fixed effects in the parent  $\times$  year dimension that control for any specificities likely to affect the return on investment at the multinational group level (average productivity, mark-up, intangible assets, etc.).<sup>19</sup>

As underlined in Sect. 2, arbitrage opportunities of international investors will equalize after-tax yields on investment across locations for a given MNE. In this regard, deviations in after-tax yields related to the host country's fiscal characteristics, as identified by  $\beta_1 > 0$  and  $\beta_2 > 0$  in Eq. 4, can be interpreted as evidence of tax-motivated profit shifting. Riedel (2018) underlines that such an assumption may be violated where MNEs sort high-return projects in low-tax countries or if they require higher pre-tax returns to locate in high-tax countries. The former argument however only applies to MNEs facing financing or operating constraints, allowing them to implement only a limited set of projects. The latter applies to pre-tax returns but not necessarily to after-tax returns as here. This issue of endogenous selection of affiliates in different locations is addressed in Sect. 4.3.

Standard errors are clustered at the country/year level.<sup>20</sup>

## 4.2 Results

The baseline results are presented in Table 5. The first three columns introduce progressively the variables of interest. They show a positive coefficient on the corporate tax differential, significant at the 1% level. The impact of tax differential remains similar when controlling for the tax haven status of the country of location of the affiliate and an interaction term between the two variables (column (2)).<sup>21</sup> It suggests that profit shifting does not concern affiliates in tax havens only but all partners.

<sup>18</sup>  $i_{ijt}$  is trimmed for outliers exceeding  $\pm 100\%$  and for negative stocks of assets. Results using alternative trimming procedures are presented in Table 8 in Sect. 5.

<sup>19</sup>  $FE_{jt}$  control for intangible assets specific to the multinational enterprise, and their variation over time, which are major determinants of firm value and their production processes, but not for the location of specific intangible assets (trademark, patents, etc.) across affiliates. Since intangibles assets are not necessarily or incompletely included in capital stocks when developed in-house (Dischinger and Riedel 2011), the estimated coefficients  $\beta_1$  and  $\beta_2$  in Eq. 4 account for any strategic location of intangible assets not measured in FDI stocks to shift profit in low-tax countries or tax havens.

<sup>20</sup> Appendix Table 20 shows that the results are robust to different levels of clustering.

<sup>21</sup> Statutory tax rates may overestimate effective marginal tax rates in tax havens; column (2) however shows that it does not bias the coefficient on the corporate tax differential.



Affiliates in tax havens also exhibit higher yields above and beyond any low corporate tax rates (column (3)).

Columns (4) to (7) of Table 5 show that the results on corporate tax differential are robust to controlling for the specific characteristics of affiliates' host country likely to affect the yield on investment in specific locations. First, in column (4), I control for country-risks associated with investment in a given host country—using the OECD Country Risk Classification<sup>22</sup>—as well as consumer price inflation and GDP growth. The specification in column (5) further includes geographic controls that have been shown to affect FDI location: (log) distance, dummies for countries sharing a common border or language with France, and time zone differences.<sup>23</sup> The results of columns (4) and (5) confirm that reported FDI yields of subsidiaries of French parents increase with the corporate tax differential between France and the host country. Tax haven jurisdictions however are no longer positively associated with higher yields, above and beyond low-tax rates, underlying that the coefficient estimate depends on country characteristics controlled for. Column (6) presents a specification similar to column (5) excluding the tax haven dummy, which yields a slightly larger coefficient on corporate tax rate for all countries than in column (3).

Finally, column (7) controls for all time-invariant country characteristics through fixed effects per country of location of the subsidiary. The positive impact of corporate tax differential on FDI yields is robust to these geographic and economic controls, though the significance level and coefficient are reduced.<sup>24</sup> In this specification, the identification comes from variations over time in the corporate tax rate in the host country of the subsidiaries, limiting the scope for omitted variable bias. While it is reassuring that the main result survives in this demanding specification, exploiting marginal changes in corporate tax rates in host countries may ignore relevant dimensions of profit shifting when the costs of shifting profits are fixed (Bilicka 2019) or when tax audits limit opportunities for tax avoidance generating non-linear effects of tax differentials (see Fig. 4 in Sect. 5.1 below). Including country fixed effects might therefore generate a downward bias in estimates of profit shifting. Moreover, including country fixed effects prevents the estimation of the impact of tax havens per se on yields on FDI. I therefore focus on the specification of column (3) in the sensitivity analysis.

An interesting feature of the data is that it allows profits repatriated in France through dividends to be distinguished from those that are kept abroad as reinvested earnings. Such a decision likely depends on the tax legislation applied to repatriated profits, which can be specific to each host country depending on its fiscal characteristics and the existence of double taxation treaties and their provisions. However, the

<sup>22</sup> The OECD Country Risk Classification measures the country credit risk and the likelihood that a country will service its external debt. It allocates countries in 8 categories based on a quantitative model and qualitative assessments of country risk experts from Export Credit Agencies, and is revised at least once a year. I measure country risk as the logarithm of one plus the country risk category. Measuring country risk using dummies by category does not change the results.

<sup>23</sup> Data are from CEPII's Gravity dataset (Head and Mayer 2014).

<sup>24</sup> Figure 4 in Sect. 5 additionally shows that the results are not driven by specific countries and hold for all deciles of low-tax countries.



**Table 5** Yields, corporate tax rate and tax havens

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corporate tax diff.	0.21 <sup>a</sup> (0.03)	0.18 <sup>a</sup> (0.03)	0.18 <sup>a</sup> (0.03)	0.25 <sup>a</sup> (0.03)	0.23 <sup>a</sup> (0.04)	0.23 <sup>a</sup> (0.03)	0.12 <sup>c</sup> (0.07)
Tax haven dum.		0.01 (0.01)	0.01 <sup>b</sup> (0.01)	0.00 (0.01)	0.00 (0.01)		
Corporate tax diff × Tax haven dum.		0.04 (0.07)					
Log country risk				- 0.01 <sup>a</sup> (0.00)	- 0.01 <sup>a</sup> (0.00)	- 0.01 <sup>a</sup> (0.00)	- 0.00 (0.01)
CPI				- 0.00 (0.00)	- 0.00 (0.00)	- 0.00 (0.00)	- 0.00 <sup>b</sup> (0.00)
GDP growth				0.38 <sup>a</sup> (0.09)	0.43 <sup>a</sup> (0.09)	0.43 <sup>a</sup> (0.09)	0.63 <sup>a</sup> (0.10)
Log distance					0.01 (0.01)	0.01 (0.01)	
Contiguity					- 0.01 (0.01)	- 0.00 (0.01)	
Common language					0.02 <sup>a</sup> (0.00)	0.02 <sup>a</sup> (0.00)	
Time zone difference					- 0.00 <sup>a</sup> (0.00)	- 0.00 <sup>a</sup> (0.00)	
Constant	0.10 <sup>a</sup> (0.00)	0.10 <sup>a</sup> (0.00)	0.10 <sup>a</sup> (0.00)	0.09 <sup>a</sup> (0.00)	0.05 (0.04)	0.05 (0.04)	0.09 <sup>a</sup> (0.01)
Observations	43,461	43,461	43,461	42,215	42,215	42,215	42,207
Nbr of group	9073	9073	9073	8963	8963	8963	9081
R-squared	0.30	0.30	0.30	0.31	0.31	0.31	0.32
FE parent × year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE country	-	-	-	-	-	-	Yes

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding +/- 100% and for negative stocks of assets

French territorial tax system does not provide incentives for MNEs not to repatriate their profits as the ‘check the box’ legislation did in the US. It is therefore likely that profit shifted to a low-tax jurisdiction is repatriated to the parent through dividends. Table 6 shows that the composition of FDI income is indeed driven by tax considerations. In column (1), the dependent variable is the share of dividends in total FDI income flows by parent-affiliate-year as in Eq. 4. The share of dividends increases with the corporate tax differential and is larger when the affiliate is located in a tax haven. The remaining columns of Table 6 reproduce the benchmark specification of column (3) of Table 5 using only dividends (column (2)) or reinvested earnings (column(3)) to compute yields. They show that both yields are increasing



**Table 6** Dividends vs. reinvested earnings

Dependent var.	(1)	(2)	(3)
	Share	Yield	
	Dividends	Dividends	Reinvested earnings
Corporate tax diff.	0.09 <sup>a</sup> (0.04)	0.10 <sup>a</sup> (0.02)	0.08 <sup>a</sup> (0.02)
Tax haven dum.	0.02 <sup>b</sup> (0.01)	0.02 <sup>a</sup> (0.00)	- 0.00 (0.01)
Observations	35,222	46,368	43,919
R-squared	0.34	0.34	0.26
Nbr of group	8004	9415	9104

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable is the share of dividends in total FDI income credit in column (1), and yields  $i_{ijt}$  computed from dividend flows only (column (2)) and from reinvested earnings flows only (column (3)). All specifications include parent  $\times$  year fixed effects

in tax differential. However, the larger yield on investment of subsidiaries located in tax havens originates only from larger flows of dividends.

### 4.3 Selection Bias

Endogenous selection in the location of affiliates could be an issue when estimating Eq. 4. The error term  $\epsilon_{ijt}$  might be correlated with the corporate tax rate of the affiliate's host country either because MNEs sort out high expected return projects in low-tax countries or because only high-profitability MNEs locate in high-tax countries. The former applies to MNEs facing financing or operating constraints that limit the number of projects they can implement (Riedel 2018). In that case, endogenous selection of the affiliate's location would generate a positive correlation between the error term of Eq. 4 and the corporate tax differential. In the latter case, if MNEs investing in high-tax countries have a positive  $ij$  unobserved specific component (because less profitable firms are less likely to enter high-tax countries), they should report higher profits on average, and selection would bias downwards the tax differential coefficient.

The usual Heckman (1979) procedure accounting for potential selection bias cannot be directly applied to Eq. 4 as it involves using a probit estimator to estimate the selection equation, which prevents the inclusion of parent  $\times$  year fixed effects due to the incidental parameter problem (Greene 2004). I instead follow Vella (1998) and implement two alternative procedures based on a linear estimation of the selection equation. Instead of the normality assumption of the Heckman two-step procedure, Olsen (1980) assumes a uniform distribution of the selection equation's error term and proposes including a linear correction term in the second step. Alternatively, Cosslett (1991) proposes a semi-parametric estimation, approximating the selection



term using indicator variables constructed from the predicted entry probabilities. Such procedures require at least one exclusion variable that affects the selection but not the second step equation.

I use as exclusion variable the cost of starting a business, which has been shown to affect the location decision of MNEs but should not affect their return on investment in different locations. Data is from the World Bank's Doing Business database and is measured as a percentage of gross national income per capita. Table 7 reports the results.

Column (1) presents the results using Olsen (1980) procedure and column (2) uses the Cosslett (1991) procedure by including 100 indicator variables corresponding to each percentile of predicted entry probability. The estimated coefficients on the exclusion variable, the cost of business start-up, from the selection equation are reported in the bottom panel of Table 7. The selection equation is estimated using a linear probability model on all potential locations for MNEs in the sample. Finally, column (3) reports the results of the standard Heckman two-step procedure excluding parent  $\times$  year fixed effects. The selection variables have the expected signs. Overall, the results on corporate tax differential remain qualitatively unaffected by these alternative procedures. Across the selection corrections applied, the bias on corporate tax differential is found to be slightly negative. Taken together, these results suggest that endogenous selection is not driving the results presented in Table 5.

## 5 Robustness

This section discusses the robustness to measurement issues of the baseline results of Table 5, and presents sensitivity analysis by time periods and sectoral and firm-level characteristics.

### 5.1 Measurement Issues

Table 8 begins by testing the sensitivity of the results to the measurement of the yield on FDI. In column (1), I trim the dependent variable  $i_{ijt}$  for the top and bottom 1% of observations instead of dropping outliers exceeding  $\pm 100\%$  and negative FDI stocks. The results remain similar although quantitatively larger regarding the impact of tax haven location. In column (2), the dependent variable is the yield computed using the stock in period  $t$  minus FDI flows in  $t$  instead of the stock of FDI in  $t - 1$  as denominator. Column (3) includes observations with negative stock of FDI and column (4) focuses on positive yields only. The results remain quantitatively similar except for the tax haven dummy that turns null and insignificant when restricting the sample to positive yields.

The rest of Table 8 addresses measurement issues related to ownership links. First, in columns (5) and (6), I investigate the robustness of the results regarding the definition of the ownership share required to be included as FDI links. The balance of payments data consider a cross-border investment as an FDI when



**Table 7** Yields and corporate tax rate: selection

	(1)	(2)	(3)
	Linear	Semi-parametric	Heckman
Corporate tax diff.	0.17 <sup>a</sup> (0.05)	0.16 <sup>a</sup> (0.04)	0.14 <sup>a</sup> (0.03)
Tax haven dum.	0.02 <sup>b</sup> (0.01)	0.02 <sup>b</sup> (0.01)	0.01 <sup>a</sup> (0.00)
Entry probability	- 0.09 (0.50)		
Log cost of business start-up	- 0.003 <sup>a</sup> (0.000)		- 0.12 <sup>a</sup> (0.00)
Observations	30,995	30,995	4,348,944
R-squared	0.32	0.33	-
FE parent × year	Yes	Yes	No
FE year	No	No	Yes

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding  $\pm 100\%$  and for negative stocks of assets

the parent company owns more than 10% of foreign company equity shares. The average share held by French parents, however, is much larger: more than 60% hold a share of more than 99% in their subsidiaries. In column (5), I restrict the sample to observations for which the parent holds more than 99% of the shares. Column (6) alternatively uses interaction terms and shows that the larger yield on FDI in tax havens is related to fully owned subsidiaries while the coefficient on corporate tax differential is slightly lower. The latter likely reflects arbitrage among alternative affiliates. Finally, columns (7) and (8) show that French MNEs do not behave any differently from foreign parent companies located in France and that directly hold foreign subsidiaries.

A second source of measurement issue relates to the choice of corporate tax rate. The statutory tax rate used is a proxy for the marginal tax rate that the firm should face on income shifted across jurisdictions. Effective tax rates could reflect more accurately the tax rate on additional profit, but their computation presents methodological challenges and may give rise to endogeneity issues. Columns (2) to (5) of Appendix Table 18 show that the main results are broadly robust to alternative measures of corporate tax rate differentials using average and effective tax rates computed by the Oxford Center for Business Taxation and Egger and Bosenberg (2017) for different sub-samples of our observations.

Appendix Table 18 also investigates to what extent the functional form of the tax rate differential matters. Column (1) uses the difference of log tax rates instead of the tax rate differential in percentage point. Finally, column (6) uses a more flexible approach by including dummies by decile of corporate tax differential. The results presented in Fig. 4 shows that the impact of tax differentials

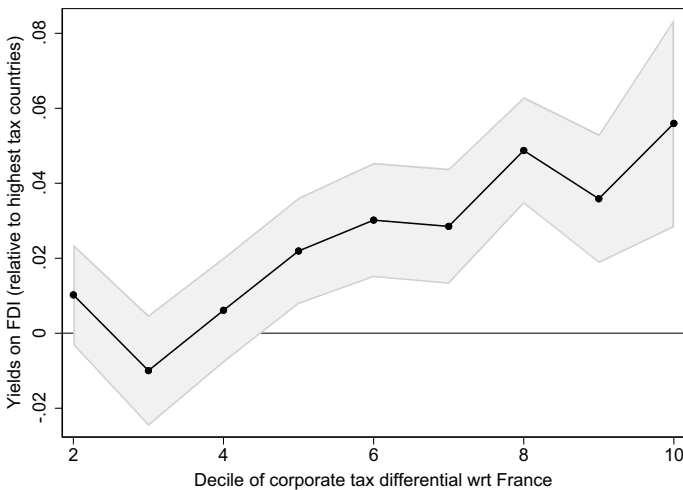


**Table 8** Firm-level evidence: robustness in measurement

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Trimmed	Alt. stock	Incl. neg. stocks	Pos. yields	Ownership > 99%		French MNEs	
Corporate tax diff.	0.19 <sup>a</sup>	0.15 <sup>a</sup>	0.16 <sup>a</sup>	0.19 <sup>a</sup>	0.18 <sup>a</sup>	0.22 <sup>a</sup>	0.20 <sup>a</sup>	0.13 <sup>b</sup>
	(0.06)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.05)
Corporate tax diff. * dum.						-0.06 <sup>c</sup>		0.07
						(0.03)		(0.05)
Tax haven dum.	0.04 <sup>a</sup>	0.02 <sup>a</sup>	0.01 <sup>b</sup>	0.00	0.03 <sup>a</sup>	-0.01	0.01 <sup>b</sup>	0.02 <sup>c</sup>
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tax haven * dum.						0.03 <sup>a</sup>		-0.01
						(0.01)		(0.01)
Observations	49,802	52,087	46,178	30,895	26,792	43,461	33,222	43,461
R-squared	0.23	0.30	0.28	0.34	0.34	0.30	0.30	0.30
Nbr of group	9842	10645	9454	7017	6377	9073	6558	9073

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for the top/bottom 1% of observations in column (1), for outliers exceeding  $\pm 100\%$  in column (3) and for outliers exceeding  $\pm 100\%$  and for negative stocks of assets in other columns. The sample is restricted to positive yields in column (4). All specifications include parent  $\times$  year fixed effects



**Fig. 4** Impact of corporate tax rate on FDI yields by decile. Source: coefficients are reported in column (6) in Appendix Table 18. The omitted category is decile 1 (highest corporate tax host countries)





**Table 9** Yields and corporate tax rate over time

	(1)	(2)
Corporate tax diff.	0.07 <sup>c</sup> (0.04)	0.12 <sup>b</sup> (0.05)
Corporate tax diff. * crisis dum.		- 0.12 (0.10)
Corporate tax diff. * post 2009 dum.		0.13 <sup>b</sup> (0.07)
Tax haven dum.	0.02 <sup>a</sup> (0.01)	0.02 <sup>b</sup> (0.01)
Tax haven dum. * crisis dum.		- 0.01 (0.02)
Tax haven dum. * post 2009 dum.		- 0.01 (0.01)
Corporate tax diff * time trend	0.00 <sup>a</sup> (0.00)	
Observations	43,461	43,461
R-squared	0.30	0.30
Nbr of group	9073	9073

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding  $\pm 100\%$  and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects

on FDI yields is nonlinear which is significantly different from zero for low to medium tax jurisdictions and is not solely driven by specific low-tax countries.

A last measurement issue relates to the list of tax havens used. Appendix Table 19 assesses the sensitiveness of the results to the use of alternative lists of tax haven. Column (3) considers as tax havens the top 15 countries ranked by Oxfam and column (4) uses the list of uncooperative tax havens defined by OECD (2000) (see Table 17 for tax haven lists). The results remain quantitatively similar to the baseline when using the top 15 list but the coefficients are slightly larger when using the OECD list. Note that the latter does not include large tax havens (e.g. Ireland, Luxembourg, Singapore and Switzerland) that are listed on the other two lists.

Finally, Appendix Table 20 reports robustness analysis regarding the clustering of data.

## 5.2 Sensitivity Analysis

**Time variation** Table 9 explores variations over time in the responsiveness of yields on FDI to tax differentials and affiliate location in tax havens. Column (1) introduces an interaction between the corporate tax differential and a time trend. The coefficient on corporate tax differential drops in magnitude and significance but remains



significant at the 10% level and the interaction exhibits a positive coefficient, suggesting that the responsiveness of yields to tax differential within multinational groups is increasing over time. Column (2) divides the sample period into a pre-2008 period, a crisis period (2008 and 2009) and the post-2009 period. It shows that the yield on FDI is increasing in corporate tax rate differential over all three periods, but the coefficient is larger after the financial crisis. Yields on subsidiaries located in tax havens are similarly larger over the whole period.

**Sectoral characteristics** Firms may have different tax avoidance opportunities depending on the characteristics of the sector they belong to, which would translate into a different responsiveness of yields on FDI to tax differential or tax haven location. The first three columns of Table 10 shows that both variables of interest remain significant when restricting the sample to the manufacturing sector (column (1)), to non-financial sectors (column (2)) or to the financial sector (column (3)).

Firms producing differentiated goods or relying more on intangibles have also more instruments to shift profits to low-tax jurisdictions, e.g. through the manipulation of transfer prices in intra-group transactions or the location of intangible assets such as patents or trademark. In columns (4) and (5), I test the sensitivity of the estimated coefficients according to the R&D intensity of the sector of the parent company. Columns (4) and (5) use different thresholds of R&D intensity, focusing on sectors above the median and the 90th percentile, respectively. The responsiveness of yields on FDI to tax differentials appears larger in more R&D intensive sectors but the significance of the coefficient on the interaction term depends on the threshold. Such mixed evidence may be related to the French patent box legislation, which reduces the corporate tax rate for profits from intellectual property licensing to 15%, and the R&D tax credit system in place in France.

**Firm characteristics** Profit shifting within a parent-affiliate pair does not depend on the characteristics of the pairs only but also on tax avoidance strategies at the multinational group level. Differences in yields across subsidiaries are therefore likely to depend on the group characteristics, including the network of affiliates or the company size, since tax avoidance entails fixed costs related to e.g. legal expenses or the cost of setting up administrative documentation (Wier and Reynolds 2018; Davies et al. 2018). Table 11 reports sensitivity analyses on these dimensions.

In columns (1) to (4) I first test whether the estimated coefficients on corporate tax differential and tax haven status vary depending on the overall size of the multinational company, as measured by its total FDI stock (columns (1)–(2)) and its number of affiliates (columns (3)–(4)). Results including interaction terms with a dummy for ‘large’ MNEs are reported using two different size thresholds, the 75th and 90th percentiles. Note that the size dummies are absorbed by the parent  $\times$  year fixed effects. The results do not provide strong evidence in favor of a larger tax responsiveness of yields on FDI within large MNEs, measured by either total FDI or the number of affiliates. However, the fact that the measurement of size is based on



**Table 10** Firm-level evidence: robustness in sectoral characteristics

	(1)	(2)	(3)	(4)	(5)
	Manuf.	Excl. financial ind.	Financial ind.	R&D	
				>p50	>p90
Corporate tax diff.	0.15 <sup>a</sup>	0.22 <sup>a</sup>	0.10 <sup>b</sup>	0.12 <sup>a</sup>	0.17 <sup>a</sup>
	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)
Corporate tax diff. * R & D intensive sector				0.10 <sup>c</sup>	0.07
				(0.05)	(0.06)
Tax haven dum.	0.02 <sup>a</sup>	0.01 <sup>c</sup>	0.02 <sup>c</sup>	0.01	0.02 <sup>a</sup>
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tax haven * R & D intensive sector				0.01	-0.04 <sup>a</sup>
				(0.01)	(0.01)
Observations	17,615	32,574	10,705	43,461	43,461
R-squared	0.32	0.31	0.26	0.30	0.30
Nbr of group	3533	6954	2125	9073	9073

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding  $\pm 100\%$  and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects

data including subsidiaries directly held by resident parents only may blur results, especially for foreign MNEs or groups with more complex organizational structures.<sup>25</sup> Moreover, the measurement of size used here is based on foreign activity only, and is not necessarily correlated with the size of domestic activity measured by employment, sales or taxable profits.

The mere fact of having an affiliate in a tax haven may also affect the entire investment strategy of MNEs (Gumpert et al. 2016). In columns (5) to (7), I therefore investigate whether parents having at least one affiliate in a tax haven exhibit different reactions to tax rate differentials. The results confirm that firms having tax haven affiliates shift more profits abroad but show no significant differences in the elasticity of FDI yields in other locations, even after controlling for the size of the multinational group (column (7)).

Finally, columns (8) and (9) report results of the estimation of Eq. 4 by weighted OLS, using as weights the FDI income flows in absolute value to account for negative credit flows. Weighted OLS yields slightly larger coefficients on both the corporate tax differential and the tax haven dummy, suggesting that the responsiveness of yields does not depend on firm characteristics but is larger when larger flows are at stake.

<sup>25</sup> The fact that larger MNEs have more bargaining power to reduce their domestic tax rate (Egger et al. 2018) could also confound the size results.



Table 11 Firm-level evidence: robustness in firm characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FDI stock		Nbr affiliates		Tax haven affiliate dum.		Weighted		
	> p75	> p90	> p75	> p90					
Corporate tax diff.	0.15 <sup>a</sup> (0.04)	0.18 <sup>a</sup> (0.04)	0.14 <sup>b</sup> (0.06)	0.15 <sup>a</sup> (0.04)	0.20 <sup>a</sup> (0.04)	0.15 <sup>a</sup> (0.04)	0.13 <sup>a</sup> (0.04)	0.37 <sup>a</sup> (0.06)	0.27 <sup>a</sup> (0.08)
Corporate tax diff. * dum.	0.04 (0.05)	0.02 (0.05)	0.05 (0.06)	0.06 (0.04)		0.06 (0.05)	0.04 (0.05)		
Tax haven dum.	0.03 <sup>a</sup> (0.01)	0.02 <sup>a</sup> (0.01)	0.03 <sup>b</sup> (0.01)	0.02 <sup>a</sup> (0.01)	0.01 <sup>c</sup> (0.01)	0.01 <sup>c</sup> (0.01)	0.02 <sup>b</sup> (0.01)		0.05 <sup>b</sup> (0.02)
Tax haven * dum.	-0.02 <sup>c</sup> (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02 <sup>c</sup> (0.01)					
Corporate tax diff. * Aff. nbr > p90 dum.							0.04 (0.05)		
Tax haven * Aff. nbr > p90 dum.							-0.01 (0.01)		
Observations	43,461	43,461	43,461	43,461	26,151	43,461	43,461	42,208	42,208
R-squared	0.30	0.30	0.30	0.30	0.26	0.30	0.30	0.57	0.57
FE it	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nbr of group	9073	9073	9073	9073	4021	9073	9073	8858	8858

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding +/- 100% and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects

## 6 Implications for Aggregate Yields, FDI Income Flows and Missing Profits

This section aims to quantify the extent to which profit shifting inflates net FDI income flows, reduces profit reported in France, and contributes to the observed French excess returns on FDI. Profit shifting affects FDI incomes through both the credit and debit sides of cross-border flows. On the asset side, when a French parent company shifts profits to a low-tax country, it increases the FDI income credits reported in the French balance of payments. Absent profit shifting, those profits would be reported as profits of the French parent and not included in cross-border flows. Similarly on the liability side, when profits are shifted from a French subsidiary to its foreign parent in a low-tax country, it reduces French FDI income debits. Those profits are unreported as profits of the French affiliate and in debit flows while they should absent profit shifting. Combining the asset and liability channels, profit shifting increases French yields on assets compared to liabilities ('excess return'), inflates net FDI flows, and reduces profit reported in France ('missing profits').

I quantify the aggregate impact of profit shifting for France using the firm-level estimates presented in Sect. 4. I compute counterfactual yields on FDI without profit shifting assuming that FDI yields do not vary, between the subsidiaries of a given multinational firm, with host countries tax conditions.<sup>26</sup> Combined with FDI stocks, the counterfactual subsidiary-level yields are used to compute counterfactual aggregate FDI income flows for France absent profit shifting. By equalizing returns on FDI within multinationals, such counterfactual exercise redistributes profits from low to high tax foreign affiliates, decreasing FDI income from low tax countries and increasing FDI income from high tax countries. The difference between counterfactual FDI incomes and actual/predicted FDI incomes is attributed to the parent company and provides a measure of profits shifted out of France. As is standard in the profit shifting literature, the quantification presented here assumes that the level and location of FDI are fixed and that profit shifting only distorts the return on investment (Huizinga and Laeven 2008; Clausing 2016; Tørsløv et al. 2018).

The computation of counterfactual FDI yields differs on the asset and liability sides. The asset side is directly predicted from Eq. 4 by setting the tax differential and tax haven variables to zero. Multiplying the counterfactual yields by the FDI stock in  $t - 1$  gives parent-affiliate-year specific inflows of FDI income, which can then be aggregated and compared to predicted flows.<sup>27</sup> Since Eq. 4 can be estimated on FDI assets and income inflows only, the quantification on the liability side cannot draw directly on predicted yields. I therefore use the observed FDI yields on liabilities at the parent-affiliate-year level as benchmark, and use the estimated coefficients on the corporate tax differential and the tax haven dummy from Eq. 4 to remove the impact of the tax differential and tax haven variables on yields and compute

<sup>26</sup> The average return of all subsidiaries of a given multinational, as estimated by the parent  $\times$  year fixed effects in Eq. 4, remains parent specific.

<sup>27</sup> FDI income inflows are adjusted for missing yields (e.g. single affiliate parents) at the country level proportionally to their stock share.



counterfactual yields without profit shifting. Multiplying the predicted yields by the FDI stock in  $t - 1$  and aggregating provides aggregate counterfactual FDI income debit than can be compared to actual flows.

*Inflated net FDI income flows:* Fig. 5 reports the quantification results based on the specification presented in column (3) of Table 5.<sup>28</sup> Panel (a) of Fig. 5 reports the difference between the predicted and counterfactual FDI credits, i.e. after-tax profits reported by foreign affiliates that should be reported in France. Panel (b) of Fig. 5 reports the difference between the observed and counterfactual FDI debits, i.e. income reported by foreign parents that should be reported by French affiliates.

On the credit side, profit shifting inflates reported flows to a substantial extent: in 2015, a quarter of FDI income flows (€17 billion out of €65 billion) are artificial flows generated by profit shifting strategies of parent companies operating in France. The orders of magnitude are similar on the debit side (although with opposite sign since profit shifting reduces the profits of foreign subsidiaries in France), but it applies on a much smaller scale: official FDI income debits are worth €20 billion in 2015, to which should be added €9 billion of missing after-tax profits from affiliates of foreign MNEs operating in France.

*Comparing with quantifications based on alternative specifications:* Table 12 compares quantification results based on four different specifications. Column (1) reports the benchmark results presented above based on column (3) of Table 5. Column (2) uses estimates from column (6) of Table 5, which accounts for corporate tax rate differentials but not tax haven status and controls for additional economic and geographical factors, and column (3) is based on the country fixed effects estimates of column (7) of Table 5.<sup>29</sup> Column (4) uses the nonlinear estimates including dummies by decile of tax differential (column (6) in Appendix Table 18 and Fig. 4). All alternative quantifications show a significant impact of profit shifting on aggregate net FDI income, ranging from €16 billion when using the country fixed effects estimates (column (3)) to €32 billion when using estimates based on tax differential only or the non linear estimates (columns (2) and (4)). The benchmark results presented above fall in the middle range of the quantifications.

*The French excess return on FDI:* Turning to the implications for returns on cross-border investments, the apparent aggregate yield on FDI assets and liabilities can be computed from the predicted FDI income flows (with and without profit shifting) and observed FDI gross stocks.<sup>30</sup> Correcting for profit shifting reduces the average yield on FDI assets from 7.1 to 6.2% and increases the average yield on FDI liabilities from 5.5 to 6.7%. The yield differential drops from 1.5 percentage points on average over the 2001–2015 period (2.2 pp. over 2009–2015) to -0.5 percentage points.

<sup>28</sup> Figure 8 in Appendix shows the goodness of fit of the model prediction: predicted FDI income credits fit closely observed FDI income credits in level and over time.

<sup>29</sup> Since columns (2) and (3) of Table 12 are based on specifications without a tax haven dummy, only the tax differential is set to zero for computing counterfactual FDI yields.

<sup>30</sup> Aggregate yield differentials estimated from firm-level data may differ from the aggregate figures reported in Table 14 because of the computation procedure or some corrections in the production of the balance of payments data from the Survey data.



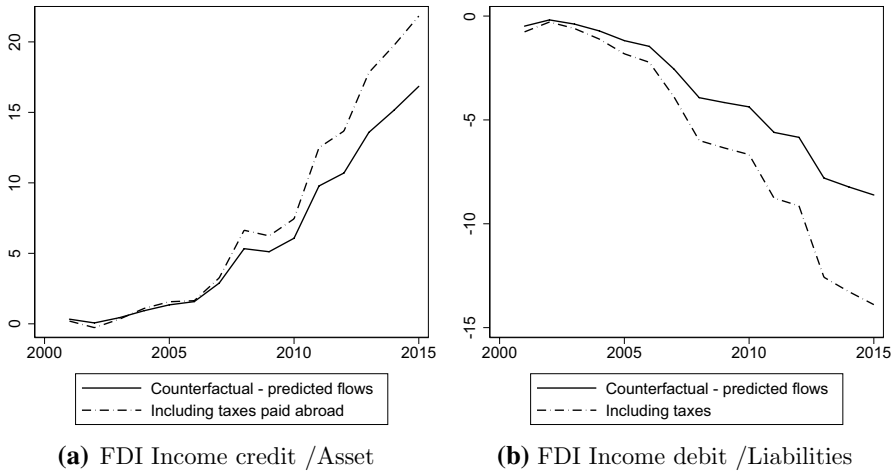


Fig. 5 The impact of profit shifting on FDI income flows

Table 12 Quantification: alternative estimates

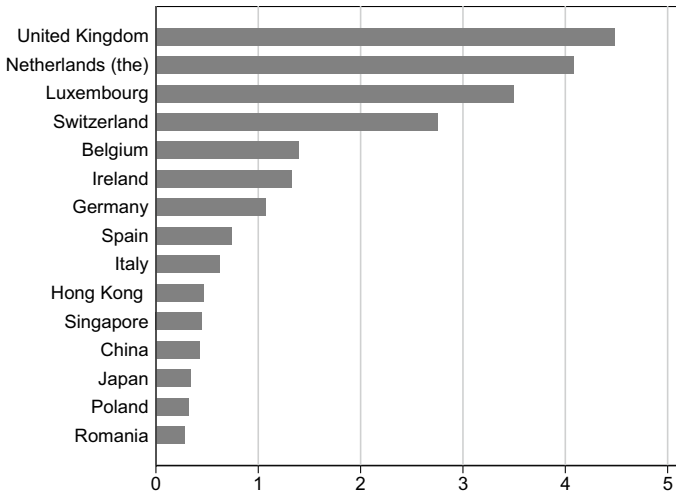
	(1) Benchmark	(2) Tax differential only	(3) Fixed effects	(4) Non-linear
Bias on net investment income (2015)	25.5	31.9	16.1	32.4
Yield differential (percentage points; avg 2001–2015)	- 0.48	- 0.54	1.45	- 1.09
Top 10 countries of profit shifting	United Kingdom	United Kingdom	United Kingdom	United Kingdom
	Netherlands	Netherlands	Netherlands	Netherlands
	Luxembourg	Switzerland	Switzerland	Luxembourg
	Switzerland	Luxembourg	Luxembourg	Switzerland
	Belgium	Belgium	Belgium	Germany
	Ireland	Germany	Germany	Ireland
	Germany	Ireland	Ireland	Spain
	Spain	Spain	Spain	Italy
	Italy	Italy	Italy	China
	Hong Kong	China	China	Hong Kong

Columns (1), (2) and (3) report quantification results based on estimates from column (3), (6) and (7) of Table 5 respectively, and column (4) is based on results reported in column (6) of Appendix Table 18

*Geographical distribution of missing profits:* Figure 6 shows the top 15 countries in terms of total missing net FDI income.<sup>31</sup> Profit shifting occurs mainly with

<sup>31</sup> Figure 9 in the Appendix provides the details for credit and debit separately.





**Fig. 6** Geographical distribution of tax-generated net FDI income flows

closely related partners: all except four countries are European countries. Four countries—UK, Netherlands, Luxembourg and Switzerland—concentrate the bulk of tax-related artificial net income flows: together they represent 58% of shifted profit. Table 12 shows that the concentration and ranking of countries in terms of location of shifted profits is consistent across quantifications based on different firm-level estimates. Multinational companies therefore use mainly European conduit countries (UK, Netherlands)<sup>32</sup> or tax havens to shift profit out of France. Other notable tax havens representing large flows are Ireland, Hong Kong and Singapore.

*Missing profits:* The €25 billion upward bias on the FDI income balance in 2015 is based on after-tax profits. Estimating missing profits in France, i.e. profits reported by foreign subsidiaries instead of their French parents or reported by foreign parents instead of their French subsidiaries, requires the inclusion of taxes paid abroad by foreign affiliates and taxes not paid in France by French subsidiaries on profits shifted abroad (for each country where profits are reported, before-tax profits =  $\frac{\text{after-tax profits}}{(1 - \text{corporate tax rate})}$ ).<sup>33</sup> The dotted lines in Fig. 5 report such esti-

<sup>32</sup> These countries are identified as major conduit countries for tax purposes by Van't Riet and Lejour (2018) and Garcia-Bernardo et al. (2017) because of their network of tax treaties or low withholding taxes.

<sup>33</sup> At the 38% French corporate tax rate in 2015, before-tax under-reported profits by French subsidiaries of foreign parents equal €13.9 billion. The average tax rate on profits reported by foreign subsidiaries of French parents is  $1 - \frac{16.8}{22.0} = 23\%$ .





mation on the credit and debit sides: in 2015, missing profits are estimated to €36 billion, or 1.6% of GDP.<sup>34</sup> At the 2015 statutory rate for large corporations, it translates into lost tax revenues of 0.6% of GDP (€14 billions).

How does this estimate compare to the existing literature? Tørsløv et al. (2018) propose an estimation of missing profits worldwide, and their country allocation, based on national account data of tax havens, i.e. countries at the other end of tax avoidance. Interestingly, their aggregate estimation for France, €29.5 billion in 2015 (Tørsløv et al. 2018, Table 2), is very similar to the one above, although based on different methodologies and official statistics. The geographical allocation of profit shifted however differs, the central role of the UK shown in Fig. 6 being specific here. Two other papers provide estimates of corporate income tax revenue losses due to profit shifting for France in previous years. Using data from the Forbes Global 2000 list, Clausen (2016) approximates tax revenue losses at 23% of total CIT in France in 2012, slightly larger than the 15% from the counterfactual exercise above for 2012. And Cobham and Jansky (2017) estimates, from panel data regressions of CIT revenues on a large sample of countries, a tax revenue loss of €16 billion or 0.7% of GDP in 2013 (against €12 billion or 0.55% of GDP in my estimates). All these are partial equilibrium estimates. Using a computable general equilibrium model, Alvarez-Martinez et al. (2018) find a loss of 15% of corporate tax revenues for France in 2012, in line with my estimate above. The quantification of missing profits presented in this paper is therefore in the middle range of those found in literature.

**Drivers over time:** Figure 5 additionally makes clear that profit shifting inflates net FDI inflows increasingly over time, from less than €1 billion over 2001–2003 to €9 billion in 2008 and €25 billion in 2015. Figure 7 presents estimated FDI income credit under alternative counterfactuals to assess the source of such growing tax-related bias. The dotted black line replicates the benchmark counterfactual (grey line) but assumes that tax differentials are fixed at the 2001 level. The estimated bias remains close to null, meaning that the growing corporate tax rate differential between France and its partners is a major contributor. The black line alternatively assumes that FDI stocks are fixed at their 2001 level. The estimated bias on credit flows is again lower than the benchmark, suggesting that growing FDI gross stocks are another major contributor to the growth of profit shifting.

## 7 Conclusion

This paper has shown that tax-motivated profit shifting by multinational enterprises generates an apparent excess return on FDI for high-tax countries worldwide. Differences in yields on FDI assets and liabilities at the country level are correlated to the

<sup>34</sup> Bruner et al. (2018) estimate missing profits in the United States of a similar order of magnitude (1.5% of GDP in 2014). Note that the approach for estimating profit shifted proposed here differs from the methodology based on formulary apportionment applied by Guvenen et al. (2017) (which requires data on multinational activities collected only by the US BEA).



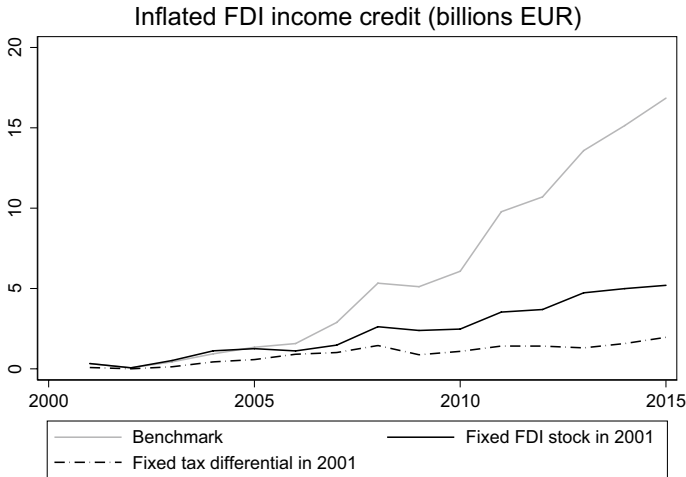


Fig. 7 Predicted inflated FDI income credit under different assumptions

corporate income tax level for a large sample of countries. Cross-country evidence on aggregate data are confirmed using confidential firm-level data on investment stocks, dividends and retained earnings of foreign affiliates for France. A quantification exercise suggests that profit shifting substantially inflates the French FDI income balance - by €25 billion in 2015 - and explains the difference in yields on FDI assets and liabilities observed over the period.

I also propose a methodology to quantify profit shifting to low-tax countries and tax havens based on balance of payments statistics from high-tax countries. Such micro-data are widely collected by central banks and usefully complement existing evidence based on statistics from tax havens.

In view of increasing gross international investment positions and the importance of investment incomes in current account dynamics (Obstfeld 2012; Forbes et al. 2017), a better understanding of the determinants of returns on cross-border asset holdings appears crucial to the analysis of global and regional imbalances and their sustainability. The results presented here underline that tax determinants should be a full part of our reading of current account statistics and international investment returns.

Depending on the instruments used - transfer pricing on international transactions, strategic location of intangibles or intra-group debt -, tax avoidance affects different components of the balance of payments and national account statistics, including debt stocks, GDP and the labor share in value added. Besides the obvious issue of corporate tax base erosion, tax avoidance by MNEs therefore distorts official statistics and their economic interpretation. Given the amounts at stake, such issues deserve further examination.



## Appendix 1: Some Specificities of the French Balance of Payments Data

An important statistical issue for the computation of yield differentials in the French case is the treatment of intra-group loans. Intra-group debt is registered as FDI in the stock data but the related incomes are reported under the “other investment income” item of the “investment income” account up to 2012. Such discrepancy in income flows and stocks of FDI biases the denominator of Eq. 1 when computed using aggregate FDI stocks as provided by the IMF.

I use detailed FDI stock data provided by the Banque de France to correct for this bias, using only equity capital stock of FDI in the computation of yields on FDI and allocating the stock of intra-group debt in the ‘other investments’ category.

Table 13 shows that correcting for intra-group debt increases average yields on FDI from 4.8% (total FDI) to 6.7% (equity capital) for assets on average over the 2002/2012 period and from 3.0 to 4.6% for liabilities. Note that the correction increases not only the level of yields on FDI but also slightly magnifies the differential between assets and liabilities. Columns (2) and (4) show that the yield differential and the correction remain of similar magnitude when applied to stock data in book value instead of market value.

Income on intra-group debt is reported only beginning in 2012. Column (5) of Table 13 shows that the yields on intra-firm debt are indeed lower than on FDI equity and that the differential is negative, i.e. multinational firms located in France pay on average higher interest rates on their intra-firm debt than multinational companies located abroad do on their debt held by French resident affiliated firms. Such a pattern is consistent with profit shifting by multinationals through intra-firm debt.<sup>35</sup>

*The French excess return:* Table 14 reports the yields on asset and liability by class of asset over the 2001/2014 period. It shows a positive average yield differential between assets and liabilities for FDI, especially over 2009/2014, but not for other classes of assets. The yield on FDI assets is 6.4% on average, against 4.3% on liabilities, generating a 2.1 percentage point differential. The corresponding differential is -1.0 pp on portfolio equity, 0.4 pp on portfolio debt and -0.1 pp on other investments, confirming that the positive yield differential is specific to FDI in the French case. Such a pattern of yield differentials with asset classes in a high-tax country like France is consistent with tax-motivated profit shifting by multinational companies.

The middle and bottom panels of Table 14 additionally report yields on French assets and liabilities by sub-period. The yield differential on FDI is larger over the 2009-2014 period than at the beginning of the 2000s, as is the yield differential on total investment. This was a period during which France increasingly became a high-tax country relative to its partners (see Fig. 2). Since gross stock positions are much larger than net positions and growing, the 2.5 percentage points differential on FDI also applies to large asset and liability stocks, and explains the

<sup>35</sup> Flows of interests on intra-firm debt represent 8% of total investment income credit only but 25% of investment income debits in 2014.



**Table 13** Yields on direct investment assets and liabilities: details. *Source:* Banque de France

Assets	FDI	FDI	FDI	FDI	FDI
Subcategory	Tot	Tot	Equity	Equity	Loans
Valuation	Market	Book	Market	Book	
Period	2002–2012 (%)			2012–2014 (%)	
Assets	4.8	5.0	6.7	7.3	1.4
Liabilities	3.0	3.0	4.6	5.0	1.8
Differential	1.8	2.0	2.1	2.3	-0.5

**Table 14** Yields on external assets and liabilities (2001–2014). *Source:* Banque de France

Assets	Total (%)	FDI equity (%)	Portfolio debt (%)	Portfolio (%)	Other inv. <sup>a</sup> (%)
2001–2014					
Assets	2.8	6.4	3.0	4.3	1.8
Liabilities	2.5	4.3	4.0	3.9	2.0
Differential	0.3	2.1	- 1.0	0.4	- 0.1
2001–2008					
Assets	3.1	6.3	2.9	3.3	1.0
Liabilities	3.0	4.5	3.3	2.9	0.9
Differential	0.1	1.8	- 0.4	0.5	0.1
2009–2014					
Assets	2.3	6.5	3.2	3.3	0.9
Liabilities	1.9	4.0	5.0	2.9	0.9
Differential	0.5	2.5	- 1.9	0.5	0.0

<sup>a</sup>Including intra-group debt

gradual appearance of an income puzzle in France: despite a negative net international investment position from 2006, the income balance has remained positive.

## Appendix 2: Data tables

See Tables 15, 16 and 17.



**Table 15** Sample of countries in IMF BOP statistics

Argentina	Germany <sup>a</sup>	Norway <sup>a</sup>
Armenia	Greece <sup>a</sup>	Pakistan
Australia <sup>a</sup>	Guatemala	Paraguay
Austria <sup>a</sup>	Hong Kong	Philippines (the)
Bahrain	Hungary <sup>a</sup>	Poland <sup>a</sup>
Bangladesh	Iceland <sup>a</sup>	Portugal <sup>a</sup>
Belarus	India	Romania <sup>a</sup>
Bolivia	Indonesia	Russian Federation (the)
Bosnia and Herzegovina	Ireland <sup>a</sup>	Senegal
Brazil	Israel <sup>a</sup>	Slovakia <sup>a</sup>
Bulgaria <sup>a</sup>	Italy <sup>a</sup>	Slovenia <sup>a</sup>
Cambodia	Jamaica	Spain <sup>a</sup>
Canada <sup>a</sup>	Japan <sup>a</sup>	Sweden <sup>a</sup>
Chile <sup>a</sup>	Kazakhstan	Switzerland <sup>a</sup>
Colombia	Korea (the Republic of) <sup>a</sup>	Thailand
Costa Rica	Latvia <sup>a</sup>	Former Yugoslav Republic of Macedonia
Croatia	Lithuania <sup>a</sup>	Tunisia
Cyprus <sup>a</sup>	Luxembourg <sup>a</sup>	Turkey <sup>a</sup>
Czech Republic <sup>a</sup>	Malaysia	Ukraine
Denmark <sup>a</sup>	Malta <sup>a</sup>	United Kingdom <sup>a</sup>
Egypt	Mexico <sup>a</sup>	United States of America (the) <sup>a</sup>
El Salvador	Moldova (the Republic of)	Uruguay
Estonia <sup>a</sup>	Morocco	Vanuatu
Finland <sup>a</sup>	Netherlands (the) <sup>a</sup>	Venezuela
France <sup>a</sup>	New Zealand <sup>a</sup>	
Georgia	Nigeria	

<sup>a</sup>Denotes inclusion in the OECD and EU-27 sample



Table 16 Sample of countries in OECD bilateral FDI income statistics

Declaring countries	Partner countries
Poland	Kazakhstan
Germany	Albania
Slovenia	Argentina
Chile	Armenia
Iceland	Australia
Hungary	Azerbaijan
Estonia	Belgium
Korea (the Republic of)	Bangladesh
United States of America	Bulgaria
Italy	Bahamas
Lithuania	Belarus
New Zealand	Bermuda
Denmark	Bolivia
Portugal	Brazil
Netherlands	Canada
Latvia	Switzerland
Greece	China
Sweden	Côte d'Ivoire
United Kingdom	Cameroon
Australia	Cayman Islands
Norway	Germany
Belgium	Denmark
Czech Republic	Egypt
Ireland	Spain
Slovakia	Ethiopia
	Finland
	Ukraine
	Turkey
	Taiwan
	Turkey
	Thailand
	Sweden
	Slovenia
	Slovakia
	Serbia
	Singapore
	Russian Federation
	Romania
	Qatar
	Poland
	Philippines
	Panama
	Norway
	Netherlands
	Nigeria
	Malaysia
	FYR Macedonia
	Mexico
	Luxembourg
	Liechtenstein
	Korea (the Republic of)
	Kazakhstan
	Belize
	Barbados
	Brunei Darussalam
	Montenegro
	Mongolia
	Mozambique
	Mauritius
	Malawi
	Namibia
	Nicaragua
	New Zealand
	Oman
	Pakistan
	Peru
	Papua New Guinea
	Portugal
	Paraguay
	Rwanda
	Saudi Arabia
	Sudan
	Sierra Leone
	El Salvador
	Surinam
	Syrian Arab Republic
	Trinidad and Tobago
	Tunisia
	Jamaica
	Italy
	Iraq
	Iran
	Isle of Man
	Indonesia
	Croatia
	Honduras
	Guatemala
	Estonia
	Ecuador
	Algeria
	Dominican Republic
	Czech Republic



Table 16 (continued)

Declaring countries	Partner countries		
Turkey	Fiji	United States of America	Jordan
Japan	France	Uzbekistan	Kenya
France	United Kingdom	British Virgin Islands	Kyrgyzstan
Canada	Guernsey	Yemen	Cambodia
Spain	Gibraltar	South Africa	Kuwait
	Greece	Aruba	Lebanon
	Hong Kong	Afghanistan	Liberia
	Hungary	Angola	Libya
	India	United Arab Emirates	Saint Lucia
	Ireland	Antigua and Barbuda	Sri Lanka
	Iceland	Austria	Lithuania
	Israel	Bonaire, St Eustatius, Saba	Latvia
	Jersey	Bahrain	Macao
	Japan	Bosnia and Herzegovina	Morocco
			Tanzania, United Republic of
			Uganda
			Uruguay
			Venezuela
			Viet Nam
			Vanuatu
			Samoa
			Zambia
			Zimbabwe

Sample corresponding to column (1) of Table 4



**Table 17** Lists of tax havens. *Sources:* Hines and Rice (1994), Bouvatier et al. (2017) and OECD (2000)

	Hines and Rice	Top 15 Oxfam	OECD
Andorra			1
Anguilla	1		1
Antigua and Barbuda	1		1
Aruba			1
Bahamas	1	1	1
Bahrain	1		1
Barbados	1	1	1
Belize	1		1
Bermuda	1	1	1
British Virgin Islands		1	1
Cayman Islands (the)	1	1	1
Curacao		1	
Cyprus	1	1	1
Dominica	1		1
Gibraltar			1
Grenada	1		1
Hong Kong	1	1	
Ireland	1	1	
Isle of Man			1
Jersey		1	
Jordan	1		
Lebanon	1		
Liberia	1		1
Liechtenstein	1		1
Luxembourg	1	1	
Macao	1		
Maldives	1		1
Malta	1		1
Mauritius		1	
Monaco	1		1
Netherlands (the)		1	
Netherlands Antilles	1		1
Panama	1		1
Saint Kitts and Nevis	1		1
Saint Lucia	1		1
Saint Vincent and the Grenadines	1		
Samoa			1
Seychelles			1
Singapore	1	1	
Switzerland	1	1	
Turks and Caicos Islands (the)			1
Vanuatu	1		1





### Appendix 3: Additional robustness tables

See Tables 18, 19 and 20.

**Table 18** Firm-level data: alternative tax rates

	(1)	(2)	(3)	(4)	(5)	(6)
	log	EATR	EMTR	EATR 2	EMTR 2	
Corporate tax diff.	0.05 <sup>a</sup> (0.01)	0.24 <sup>a</sup> (0.04)	0.06 (0.05)	0.22 <sup>a</sup> (0.04)	0.17 <sup>a</sup> (0.03)	
Tax haven dum.	0.01 <sup>b</sup> (0.01)	0.01 (0.01)	0.02 <sup>b</sup> (0.01)	0.01 <sup>c</sup> (0.01)	0.02 <sup>b</sup> (0.01)	0.01 <sup>c</sup> (0.01)
Corporate tax diff. Dum. 2						0.01 (0.01)
Corporate tax diff. Dum. 3						- 0.01 (0.01)
Corporate tax diff. Dum. 4						0.01 (0.01)
Corporate tax diff. Dum. 5						0.02 <sup>a</sup> (0.01)
Corporate tax diff. Dum. 6						0.03 <sup>a</sup> (0.01)
Corporate tax diff. Dum. 7						0.03 <sup>a</sup> (0.01)
Corporate tax diff. Dum. 8						0.05 <sup>a</sup> (0.01)
Corporate tax diff. Dum. 9						0.04 <sup>a</sup> (0.01)
Corporate tax diff. Dum. 10						0.06 <sup>a</sup> (0.01)
Observations	43,291	36,936	36,936	38,186	38,186	43,461
R-squared	0.30	0.31	0.31	0.30	0.30	0.30
Nbr of group	9048	8322	8322	8063	8063	9073

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding  $\pm 100\%$  and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects. The corporate tax rate is the effective average and marginal tax rates respectively computed by the Oxford Center for Business Taxation in columns (2)–(3) and Egger and Bosenberg (2017) in columns (4)–(5)



**Table 19** Firm-level evidence: alternative tax haven lists

	(1)	(2)	(3)	(4)
	Hines and Rice		Top 15 Oxfam	OECD
Corporate tax diff.	0.18 <sup>a</sup> (0.03)	0.18 <sup>a</sup> (0.03)	0.18 <sup>a</sup> (0.03)	0.22 <sup>a</sup> (0.03)
Corporate tax diff. * Tax haven dum.		0.04 (0.07)	- 0.02 (0.06)	- 0.19 <sup>c</sup> (0.11)
Tax haven dum.	0.01 <sup>b</sup> (0.01)	0.01 (0.01)	0.02 <sup>b</sup> (0.01)	0.05 <sup>b</sup> (0.03)
Observations	43,461	43,461	43,461	43,461
R-squared	0.30	0.30	0.30	0.30
Nbr of group	9073	9073	9073	9073

Robust standard errors clustered by country/year in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding +/- 100% and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects

**Table 20** Firm-level data: clustering

Clustering	(1)	(2)	(3)	(4)
	$it$	$i$	$j$	$it$ and $i$
Corporate tax diff.	0.18 <sup>a</sup> (0.03)	0.18 <sup>a</sup> (0.06)	0.18 <sup>a</sup> (0.04)	0.18 <sup>a</sup> (0.04)
Tax haven dum.	0.01 <sup>b</sup> (0.01)	0.01 (0.01)	0.01 <sup>c</sup> (0.01)	0.01 <sup>c</sup> (0.01)
Observations	43,461	43,461	43,461	43,461
R-squared	0.30	0.30	0.30	0.30
Nbr of group	9073	9073	9073	9073

Robust standard errors clustered by country/year (column (1)), country (column (2)), parent (column (3)), or parent and country/year (column (4)) in parentheses

<sup>a</sup>, <sup>b</sup> and <sup>c</sup> denote significance at the 1%, 5% and 10% level, respectively. The dependent variable,  $i_{ijt}$ , is trimmed for outliers exceeding +/- 100% and for negative stocks of assets. All specifications include parent  $\times$  year fixed effects

## Appendix 4: Quantification: additional figures

See Figs. 8 and 9.



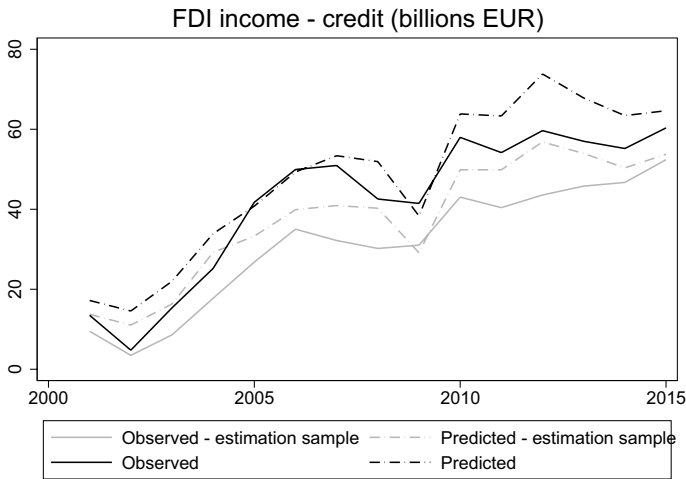


Fig. 8 Predicted and observed FDI income credit

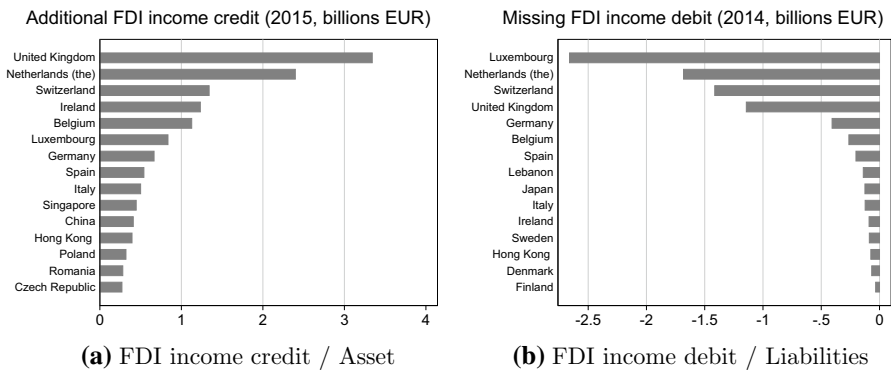


Fig. 9 Geographical distribution of tax-generated FDI income credit and debit

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