Why Do Banks Have So Much Debt In Tax Havens?

Lorenzo Garlanda-Longueville [*1], Mathias Lé [†1], and Kevin Parra Ramirez [‡1,2]

[1]Banque de France

[2]Sciences Po

January 31, 2025

Abstract

This paper examines the role of Offshore Financial Centers (OFCs), which account for more than 20% of the cross-border banking assets and liabilities in the international banking system. Examining the motivations behind banks' utilization of OFCs, the study focuses on whether tax considerations are a possible driving force. Through an comprehensive analysis of cross-border banking activities, we find a negative relationship between the distribution of intra-group liabilities – representing over 50% of bank liabilities – and corporate tax rates in both creditor and debtor countries, with a more pronounced pattern for debtor countries with higher tax rates. These results hold when distinguishing between parent companies and affiliates. Finally, we examine the regulatory arbitrage argument and find that the pattern exists even in situations of limited prudential arbitrage, shedding light on profit-shifting practices. This research contributes to the understanding of banks' global intermediation activities and tax avoidance within the financial sector.

Keywords: Profit-shifting, Debt shifting, Multinational banks, Taxation

JEL classification: H26 G21 F23 F34

[*]lorenzo.garlanda-longueville@banque-france.fr

[†]mathias.le@banque-france.fr

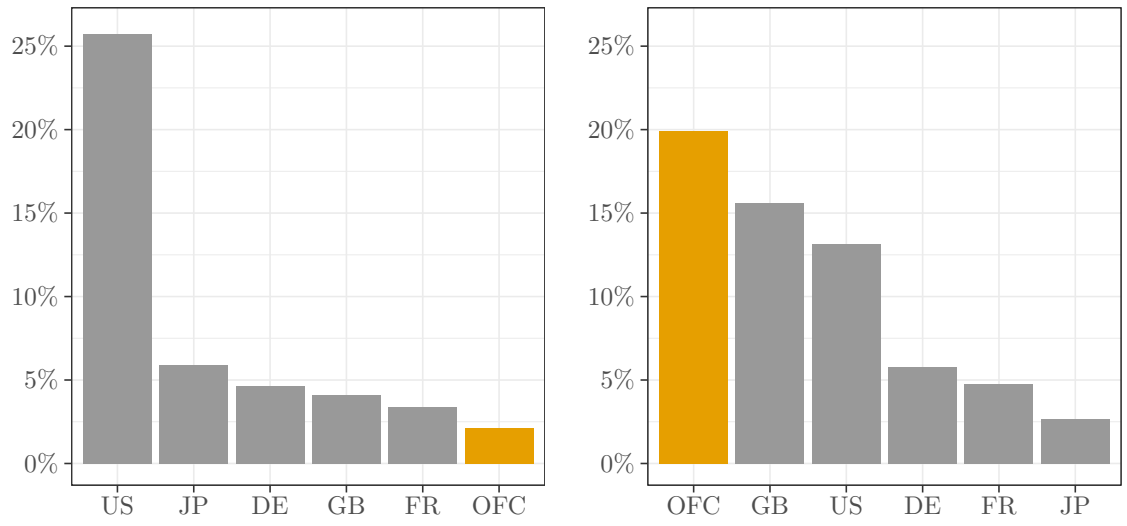
[‡]kevin.parraramirez@banque-france.fr

The authors thank Anne Duquerroy, Pauline Gandré, Dominika Langenmayr, Philippe Martin, Jakob Miethe, Valérie Mignon, Vincent Vicard and Gabriel Zucman for their comments and suggestions. We also thank the participants of the GlobalTax PhD Symposium 2021, the EconomiX PhD seminar, the AFSE Congress 2022, the GDRE Symposium 2024, the Besançon University seminar, the Sciences Po seminar, the UC Berkeley PhD seminar, the EU Tax Observatory seminar and the Banque de France internal seminar. The authors thank the Bank for International Settlements for providing data and valuable comments.

1 Introduction

While the Offshore Financial Centres (OFCs thereafter) represent a negligible fraction of the world GDP, together they account for more than 20% of the cross-border banking assets and liabilities, making them the largest banking system; ahead of the United States and the United Kingdom. Figure 1) illustrates the importance of OFCs within the international banking architecture. Banks are important financial intermediaries and a large number of systemic institutions play a critical role from a financial stability viewpoint, which is why their activities in OFCs raise concerns. In addition, the banking industry is a global business spearheaded by large multinational players with characteristics similar to those of non-financial multinational (MNCs) which make extensive use of OFCs for tax planning, but banks' own strategy remain largely under-studied. In other words, it is crucial to understand their position and function within banks' funding chains. Do banks use OFCs for the same reasons as non-financial corporations, *i.e.* for tax purposes? Or do they use them for other reasons that conceal their activities?

Figure 1: Share of countries in world GDP **(left)** and in the total of cross-border assets **(right)**



Note: The list used to create the 'Offshore financial centres' (OFCs) group is from Kintzler et al. (2020). Relative weight measured using national GDP (2029). Source: World Bank. Lecture: OFCs represent less then 2% of the global GDP but hold 20% of the total of cross-border assets.

Banks are often large and complex entities with a higher leverage on average than non-financial companies of comparable size (De Mooij, 2012, Gu et al., 2015). Due to their unique business activities of balance sheet management and maturity transformation, they are subject to specific regulations and reporting requirements. In particular, the activities of large international banking groups have been subject to increased oversight since the Great Financial Crisis. Basel II and III have enabled the regulation of leverage within the banking sector through the enforcement of various prudential ratios (including the Core Equity Tier 1 ratio or leverage ratios, among others).

The primary objective of these rules is to increase the resilience of the banking system and preserve its ability to lend. However, they have also been extensively used as an argument to exempt banks from certain rules limiting profit shifting. A recent example is the negotiations of the OECD/G20 Base Erosion and Profit Shifting (BEPS) initiative to implement the two-pillar solution to tax challenges. The UK[1] has pushed for a carve-out for financial industry from Pillar 1 rules, which would give additional taxing rights to the jurisdictions where the users of digital services reside. The argument pushed by banking representatives, playing on the complexity of prudential rules, has been echoed by the BEPS initiative:

> "The defining character of the [financial] sector is that it is subject to a unique form of regulation, in the form of capital adequacy requirements [...]. It is this regulatory driver that generally helps to align the location of profits with the market. The scope of the exclusion derives from that requirement, meaning that Entities that are subject to risk-based capital measures (and only those) are excluded." Pillar One – Amount A: Regulated Financial Services Exclusion, May 2022.

In contrast to the well-documented tax avoidance practices of non-financial corporations and households in the public economics literature, there is a noticeable lack of evidence on the tax avoidance strategies of banks. This can be attributed to several factors, the primary reason being the complexity of banking activities: financial schemes, special accounting rules, prudential regulation, proprietary trading vs activities for their clients, complexity of the organisation of banking groups, which often regroup different regulated activities (banking, insurance, etc.). Moreover, the business model of financial institutions differs significantly from that of non-financial entities, making comparisons of their preferred profit shifting mechanisms challenging (Langenmayr and Reiter, 2022). This lack of literature is also partly due to the widespread use of consolidated data for banks, which *de facto* excludes intra-group activities.

Tax avoidance by banks is an important issue for several research and policy agendas. First, it allows for a better understanding of financial circuits by decomposing their opaque intermediation activities, *i.e.* understanding what banks really do. Second, a better mapping of offshore activities would allow policymakers to complement prudential regulation, either by reinforcing existing measures or adding existing ones for the non-financial sector. In particular, identifying the different roles of parent companies and subsidiaries allows for more targeted regulation. Finally, since tax avoidance leads to fiscal losses, it is important for tax authorities to better understand how to combat this phenomenon.

[1]Source : Financial Times, 1 July 2021 https://www.ft.com/content/f10b3e92-03e9-402b-9462-237f53b4d140

In this paper, we shed new light on profit shifting by banks by examining the cross-border activities of the largest international banking groups, in particular their intensive use of intra-group exposures. First, we document the process of banking globalisation by showing the growing share of international intermediated debt since the 1980s. We then show that the share of intra-group debt in total bank liabilities is significant, accounting for more than 50% of total bank positions. Furthermore, we observe that this share has been increasing over time, rising from 52% in 2014 to 60% in 2020. These observations testify to the interest in focusing on banks' own activities.

We then show that the geographical distribution of cross-border intra-group liabilities is highly correlated with the corporate tax rates of both (i) lender countries - countries in which lender banks operate - and (ii) borrower countries - countries in which borrower banks operate, without being particularly explained by the underlying cross-border economic exchanges.

For this purpose, we first group lender countries in time-varying quintiles of corporate income tax rates. Then, we compare the distribution across these quintiles of intra-group liabilities to the distribution across the same quintiles of interbank liabilities. Our identifying assumption is that in a world without profit shifting by banks, the shape of the two distributions should be similar. We show that this is not the case: the first quintile of lender corporate tax rates - *i.e.* the lender countries with the lowest tax rates - represents a larger relative share in the case of intra-group liabilities than in the case of interbank liabilities. We confirm this observation by showing that the ratio of the relative share of intra-group liabilities to the relative share of interbank liabilities is disproportionately higher for this first quintile than for other quintiles. Essentially, for a given borrower country and a given lender country, banks in the borrower country tend to borrow disproportionately more from their affiliates (relative to borrowing from other banks) if the lender country has very low corporate tax rates that make profit shifting more attractive and effective. The same pattern is observed when the lender country is regarded as an OFCs.

Next, we provide evidence that this pattern is most pronounced when we focus on a subset of borrower countries with significant corporate tax rates, *i.e.* a subset of countries where banks have the strongest incentives to shift profits. We also examine whether this pattern has a different intensity for (i) parent bank borrowing from their subsidiaries and (ii) inter-subsidiary borrowing and find evidence that inter-subsidiary borrowing pattern is more pronounced in favor of borrower and lender countries with the most tax incentive.

Finally, we consider a competing hypothesis for this pattern. Throughout the paper, we hypothesize that the disproportionate role of intra-group exposures in lender countries within the first quintile of corporate tax rates (or considered as OFCs) reflects the practice of profit shifting by banks. However, OFCs are not only jurisdictions with very low corporate tax rates, but they also offer

significant opportunities for regulatory arbitrage, which may also explain the pattern we find. We explicitly test this competing hypothesis by focusing on cross-border banking exposures within the European Union (EU). Indeed, since 2014 and the implementation of the Basel II rules in the EU (as well as the entry into force of the Single Supervisory Mechanism), the possibility of regulatory arbitrage is very limited, if not non-existent. Nevertheless, we continue to observe our pattern - the disproportionate role of intra-group exposures in lender countries with low corporate tax rates - in this subsample where regulatory arbitrage is unlikely.

Overall, to the best of our knowledge, this paper is the first to examine the crucial role of banks' intra-group exposures in shifting profits to low corporate tax jurisdictions. In particular, we document the disproportionate importance of intra-group bank exposures (i) when the lender country – the country in which the lending banks operate – has a low corporate tax rate or is an OFC, and (ii) when the borrower country – the country in which the borrowing banks operate – has a high corporate tax rate.

The rest of the paper is organised as follows. The next section briefly reviews the literature on bank profit shifting. Section 2 presents our data sources. Section 3 details our methodology. Section 4 provides an overview of the importance of cross-border assets and liabilities and intra-group exposures. Section 5 discusses our main findings and section 6 concludes.

2 Related Literature

2.1 Bank Profit Shifting

Our paper is related to the larger literature on corporate profit shifting and contributes more specifically to the literature on bank profit shifting which the following literature review focuses on. One of the first piece of indirect evidence on bank profit shifting was provided by Demirgüç-Kunt and Huizinga (2001) who showed that the reported profits of foreign-owned banks are negatively correlated with the tax rate of the country of incorporation. Huizinga et al. (2014) find that taxes affect the profitability of banks and their FDI. Merz and Overesch (2016) are the first to concentrate on profit shifting by banks, albeit with a limited focus on tax havens: they show that the tax elasticities of bank subsidiaries' profits are twice as large as the effects found for non-financial firms. They also note that some activities' gains, in particular trading, are highly sensitive to tax rates.

With the introduction of Country-by-Country Reporting (CbCR) requirements,[2] several studies have been able to measure the extent of profit-shifting in the European banking industry using microdata by comparing the level of reported profits by employees in a number of tax havens and high-tax countries. NGOs (Oxfam and Transparency International) were the first to make use of these data. Numerous academic work : Aliprandi et al. (2021), Barake (2023), Bouvatier et al. (2017), Dutt et al. (2019), Fatica and Gregori (2020), Janskỳ (2020), have since then shown a clear negative relationship between profits per employee and the statutory or effective tax rate.

2.2 Instruments of Profit Shifting

There is no consensus on the relative importance of the different profit-shifting instruments for non-financial and financial corporations. The most frequently cited instrument for non-financial firms is transfer pricing which allows companies to set artificially low (high resp.) prices for intra-firm payments in order to increase (decrease) their profits in low-tax (high-tax) jurisdictions. These prices are regulated by the so-called arm's length principle which states that the prices of intra-firm transactions should correspond to the market price paid by unrelated parties in a comparable transaction. To bypass this rule, firms reallocate specific economic activities (research, trading, etc.) or even more commonly, intangible assets and services in such a way that no comparable transaction can be used to infer "reasonable" prices (Beer et al., 2020, Heckemeyer and Overesch, 2017).

[2]CbCR is part of the Basel III prudential regulation for the financial sector. Since 2015, in the EU, article 89 of the Capital Requirements Directive IV forces financial institutions to disclose annually a) the names, natures and location of their activities b) turnover c) number of employees d) profit before tax e) tax on profit, etc.

Trading offshore : Langenmayr and Reiter (2022) are the first to propose a profit shifting channel specific to financial corporations. Using German microdata, they show that banks artificially relocate their proprietary trading activities to low-tax jurisdictions, while the trading is still carried out by operators in high-tax jurisdictions.

Debt shifting is the strategic allocation of artificial debt within a MNC.[3] A firm in a high-tax country i can issue internal debt towards its subsidiary in a low-tax country j. This creates a transfer in the form of interest payments from the high-tax country to the low-tax country, which reduces the profits reported in i and increases the profits in j. In addition, most tax systems in the world allow for the deductibility of debt interests, further reducing the taxable base in the country i. Despite the introduction of capital and leverage ratios aimed at limiting leverage in the banking sector (Basel II and III), studies have shown that corporate taxes play a role in bank leverage (De Mooij, 2012). In fact, while theoretically constrained, financial companies exhibit similar debt bias as non-financial companies. One reason is that prudential regulations constrain the amount of external debt that banks can have, but not the amount of internal debt, as leverage ratios (Tier 1 leverage ratio, debt-to-equity ratio and debt-to-capital ratio) are consolidated at the parent company level. This creates an incentive for banks to use internal rather than external debt. While many countries have implemented thin-capitalization rules (limiting the tax deductibility of intererest payments), several had no limitation rules prior to 2019 (*e.g.* France had no limitation for banks, Italy allowed a deduction of 96% of the total amount of interest etc.[4]).

In economic policy, this issue of debt shifting has been clearly identified by the G20/OECD as part of the Inclusive Framework on BEPS (OECD, 2016). The recommendation to limit interest deductibility between related parties has consisted in implementing fixed ratio rule and group ratio rule – "thin-capitalization" rules, based on the EBITDA of the company.[5] Thin-capitalization rules can be effective for non-financial companies,[6] but restrictions on interest deductibility only apply on net interest expense, *i.e.* financial expenses net of total financial income. This de facto excludes any bank with a positive financial margin from the scope of the rule (De Mooij and Hebous, 2018, Reiter et al., 2021, Suet and Dallemagne, 2018). Finally, banks tend to aim for capital ratio targets that are higher than the minimum required by regulation, meaning that the regulation constraint is generally not binding (Heckemeyer and De Mooij, 2017).

Heckemeyer and De Mooij (2017) and De Mooij and Keen (2016) are, to the best of our knowledge, the first studies on banks' debt bias. Using microdata, they compare the debt sensitivity to tax

[3]See Fuest and Hemmelgarn (2005) for a theoretical model that features this type of profit shifting

[4]See OECD (2016) Appendix III.B for a detailed presentation of the rules limiting interest deductibility in the banking sector.

[5]e.g., in the EU, member states are required to limit the deductibility of 'net borrowing costs' up to 30% of the taxpayer's earnings before interest, tax, depreciation, and amortization.

[6]See Buettner et al. (2012) and Blouin et al. (2014) for empirical evidence.

rates between financial and non-financial company. Overall, the response is of the same magnitude for banks and non-banks but they show that capital-tight banks are less responsive than capital-abundant banks. De Mooij and Keen (2016) also find that larger banks are less sensitive to tax and that taxation has no impact on the use of hybrids. Gu et al. (2015) find that banks' leverage depends on corporate income tax and the international tax difference vis-à-vis other bank subsidiaries. Fatica et al. (2020) show the link between tax rates and the concentration of debt in bank affiliates and question the implications for financial stability. Bremus et al. (2020) find that the introduction of bank levies leads to lower leverage as the cost of debt increases. However, they note that the reduction in leverage is weaker the higher corporate income taxes are, showing that the tax break advantage of the debt bias mitigates the effect of the tax. Finally, the closest paper to ours is Reiter, Langenmayr and Holtmann (2021) that are the first to extensively study debt shifting in the banking sector using bilateral administrative microdata for German international banks. They find that a ten percentage points higher corporate tax rate increases the internal debt-to-assets ratio by 5.1 percentage points, which is a stronger effect than what is reported for non-banks in similar settings.

2.3 Discrepancies between micro and macro estimates

Similar to other fields of economics, the tax avoidance literature - which is notoriously plagued by data scarcity - has favored the use of administrative data, as noted by Godar et al. (2024). Economic agents involved in tax avoidance scheme - corporations, OFCs and households - deliberately hide information, making administrative data the best tool to avoid downward biases or overly conservative estimates. The data can be confidential tax returns (see for example Dowd et al. (2017) for the USA or Bilicka (2019) for the UK) or in the case of bank profit shifting microdata on direct investment (Reiter et al. (2021), for Germany). As they are only available for specific countries, researchers have also turned to other sources of data for international comparison which can be divided into micro data, usually from private databases (Bureau van Dijk's Bankscope/Orbis or Compustat) which collect a large set of financial statements from a combination of annual reports, information providers and regulatory sources or macro data *e.g.* foreign direct investment statistics and foreign affiliate statistics.[7]

Against this background, in this study, we make use of confidential macro-level data on bank positions; we are, to the best of our knowledge, the first to use these data to study banks' own profit shifting, as related research has so far relied exclusively on data where tax-haven are almost

[7]Large discrepancies remain between micro and macro estimates, and this is true for both the tax elasticity and the total amount of profits shifted, with micro data giving smaller estimates than macro data (Clausing, 2016, Dharmapala, 2014). Tørsløv et al. (2023) explain the effect by showing that the coverage on profits booked in low-tax jurisdictions is lacking in private micro databases, because these types of registries are incomplete or do not exist.

absent (De Mooij and Keen, 2016, Heckemeyer and De Mooij, 2017), or CbCR data, which only informs us about the activities of banks headquartered in the European Union. Johannesen (2014) uses restricted Locational Banking Statistics data to measure the effect of an EU tax reform on Swiss bank deposits held by EU residents. Johannesen and Zucman (2014), O'Reilly, Parra Ramirez and Stemmer (2019) and Menkhoff and Miethe (2019) also use the LBS data to evaluate the G20 policies against tax evasion by households, namely the automatic exchange of information.

3 Data sources

3.1 Locational Banking Statistics

In this paper, we use a restricted macro-level dataset from the Bank for International Settlements (BIS) to study bank profit shifting. The *Locational Banking Statistics* dataset (LBS thereafter) provides quarterly cross-border banking positions at the country level over the last four decades. They are compiled according to principles that are consistent with balance-of-payments statistics but restricted to banking activities. Crucially, these banking positions are *unconsolidated* and the reporting of these data follows the *residence principle*. In other words, these data tell us what assets and liabilities are held by banks *located* in country A (but not necessarily *incorporated* there, *i.e.* they may be of another nationality) vis-à-vis counterparties located in country B. The BIS also disseminates a dataset of *consolidated* cross-border banking positions – the *Consolidated Banking Statistics* (CBS) dataset – but it is of less interest for the study of profit shifting because consolidated accounts tend to hide operations resulting from profit shifting strategies.

These counterparties in country B of positions reported by banks in country A can be broken down into non-financial corporations, households, general governments, but also non-bank financial institutions and banks. With regard to the latter, the data set provides us with an additional and crucial breakdown between *intra*-company and *inter*-company positions. The comparison between these two types of banking positions is at the heart of our empirical strategy. The breakdown of cross-border banking positions by financial instrument – loans/deposits vs. debt securities vs. derivatives – is not available in our dataset and we therefore consider cross-border positions including all financial instruments. While we do not have an instrument breakdown, similar data from the BIS suggest that our statistical aggregate of 'debt' is composed of deposits for 85% and securities and derivatives for 15%. For more details about the LBS dataset, see the reporting guideline edited by the BIS as well as the Appendix A.

The positions reported in the LBS are unconsolidated but supplemented with information on the *nationality* of the reporting banks (derived from the CBS). The nationality indicates the country in which the headquarter of the reporting bank is *incorporated*. Thus, we could observe assets and liabilities held by banks located in country A vis-à-vis counterparties located in country B and headquartered in, say, country C. The organising principle is thus the "nationality" of the controlling interest rather than the residence of the operating unit.

We do not consider the currency breakdown and we pool all positions regardless of their currency. Note also that we do not use the cross-border banking *flows* but rather focus on the *outstanding amounts*. The reason for this is that corporate income tax rates are broadly stable over time,

which means that quarterly changes in bilateral loans are likely to be driven by effects other than tax rates (business cycles, exchange rate fluctuations, risk management, regulatory motives, etc.). By focusing on outstanding amounts, we filter out these short-term fluctuations and identify the medium- and long-term factors behind the level of intra-group activity.

In this paper, we rely on the breakdown between intra-group positions – *i.e.* cross-border assets and liabilities held between affiliates belonging to the same banking group – and interbank positions. However, the quality of reporting on bilateral intra-group positions is not satisfactory before 2014. Moreover, we do not want our analysis to be contaminated by the large fluctuations in cross-border positions caused by the Covid episode. For all these reasons, we restrict our analysis to the quarters going from 2014-Q1 to 2019-Q4. A large part of the dataset is publicly available, but the counterparty breakdown of each reporting country is confidential. Eventually, using the liability side of the data, we observe the cross-border positions of 28 *reporting* countries vis-à-vis 67 *counterparty* countries covering 43 nationalities.[8]

3.2 Corporate income tax rates data

Broadly speaking, our identification strategy is to show that banking groups located in high-tax jurisdictions (especially in large and developed banking systems) engage in relatively intensive intra-group transactions with their subsidiaries located in low-tax jurisdictions in order to shift profits and reduce their tax burden in the high-tax jurisdiction.

Statutory corporate income tax rates (STR). In the paper, we mainly use the STR (see the Appendix C for sources and details). There are a number of caveats when using this measure, the first being that the corporate tax rate is not the only tax paid by companies and sometimes it is not the largest tax. The second is that tax authorities recognize the special role of credit institutions in the economy, and banks are entitled to numerous tax breaks that make the calculation of an industry-wide theoretical tax rate challenging.[9] Nevertheless, previous studies have found significant effects when using statutory tax rates (Gu et al., 2015). The STR must therefore be regarded as an imperfect proxy for the actual level of tax rates supported by financial institutions.

[8]The BIS disseminates the LBS under two datasets: the LBS by *Residency* (LBSR) and the LBS by *Nationality* (LBSN) which is the one we use. See Appendix A for more details on the countries included in our sample.

[9]De Mooij (2012) notes that, from a legal perspective, the introduction of hybrid financial instruments (convertible bonds, subordinated debt, warrants, etc) has blurred the frontier between debt and equity instruments. Banks make extensive use of these securities, which allow some interest payments to be tax deductible. This has led tax authorities to redefine what constitutes debt on a case-by-case basis, leaving room for interpretation on theoretical tax rates. Moreover some countries make extensive use of tax rulings that are not reflected in statutory rates.

4 Methodology

Our aim is to better understand the underlying reasons for the massive cross-border assets and liabilities held by banks from the main banking systems (US, UK, France...) in very small jurisdictions classified as OFCs with little or no economic activity. We suspect that, as is the case with other multinational firms (REF TBA), these cross-border positions are largely the result of tax avoidance strategies implemented by the banking groups located (or incorporated) in these developed countries.

As explained above, we hypothesise that banking groups opportunistically use Intra-group debt to shift profits from the taxable income of the parent company or subsidiaries located in high-tax jurisdictions to subsidiaries located in low-tax jurisdictions such as OFCs. Essentially, a subsidiary located in a low-tax jurisdiction can lend to another subsidiary – or to the parent company itself – located in a high-tax jurisdiction. As a result, the Interest income paid by the parent company (or the subsidiary) located in the high-tax jurisdiction to the subsidiary located in the low-tax jurisdiction reduces the taxable income of the former and increase the taxable income of the latter.

To test this hypothesis, we examine the cross-sectional/geographical distribution of cross-border debt and ask to what extent this cross-sectional/geographical distribution of debt can be related to the cross-sectional/geographical distribution of corporate income tax rates. Indeed, if our main hypothesis is correct, we should observe a systematic relationship between (i) the relative use of Intra-group debt and (ii) the corporate income tax rate of both the lender country (where the profits move) and the borrower country (where the profits originate): the lower (higher) the lender (borrower) country corporate income tax rate, the higher the incentive to shift profits through Intra-group transactions.

Thus, we basically need two ingredients to implement this identification strategy: (i) a country-level measurement of the relative use of Intra-group debt and (ii) a country-level measurement of the corporate income tax rate paid by banks.

4.1 The cross-country distribution of corporate income tax rates

To characterise the cross-sectional/geographical distribution of corporate income tax rates, we construct quintiles of the distribution of corporate income tax rates observed in the *lender* country j: $Q_{1t}, ..., Q_{5t}$. To take into account the potential change in a country's statutory corporate tax rate over our period and the downward trend in STR – the average STR in our sample is 24% in 2014 and 21% in 2020, with an important decrease from some large and high-tax countries like the USA, France etc. – we calculate time-varying quintile Q_{zt} (Table 10). This means that a lender

country can move from one quintile to another over time. For example, the United States' STR was 38.9% in 2017 and 25.8% in 2018 after the tax reform, which means that the country moves from the the 5^{th} quintile in 2017 to the 4^{th} quintile in 2018. Note, however, that the quintiles based on the ETR are, by construction, time-invariant.

Table 1: **Statutory tax rate quintiles of the lender countries**

Quintile	Q_1	Q_2	Q_3	Q_4	Q_5
STR (in %) – Q_{zt}	[0-15]	[15-20]	[20-25]	[25-30]	[30-39.08]

Note: This table report the range of STR that characterized each of the quintile of corporate income tax rate we built. Since the STR are time-varying, we report the value of the bounds for the year 2015 as an example.

We start our analysis by using the quintiles of the corporate tax rate of the *lender* countries, Q_z. However, in a second step, we refine the analysis by also taking into account the distribution of corporate tax rates of *borrower* countries, $\mathbb{Q}_z$.

4.2 Lists of Offshore Financial Centres

Alternatively, instead of sorting lender countries j according to their corporate income tax rate, we also analyse the cross-sectional distribution of Intra-group debt depending on whether the lender country is classified as an OFC or not. For this purpose, we use four distinctive lists of OFCs (see the Appendix D for the detail of the countries classified as OFCs).

- First, we use the list compiled by Aliprandi et al. (2021), based on the CbCR data on European banks. Tax havens are defined as jurisdictions that score low on a combination of two parameters: economic activity relative to profits using country-specific profit per employee data and tax rates, based on their computed country-specific effective tax rates. The list contains 16 jurisdictions.
- Second, we use the list from Kintzler et al. (2020), which defines OFCs using LBS data as countries with the highest ratio of cross-border banking positions to resident population. The list contains 13 territories.
- Third, we test our results with the list from Johannesen (2014). In this list of 52 countries, tax havens are countries that do not meet at least one of the following conditions regarding the information provided to tax authorities: availability, access, and exchange. This means that regulation must ensure that banks keep records of the information to which domestic tax authorities must have access and that they are also able to exchange it with foreign tax authorities

– Finally, the list from Hines Jr (2010) identifies tax havens based on their low corporate tax rates, their self-promotion as financial centres, and whether they are also identified as such by other authoritative sources.

4.3 Notations

Before describing our identification strategy in detail, let us first define the notation we will use. At each quarter q, we observe the outstanding amounts of liabilities/debt L_{ijksq} where:

– i denotes the *reporting/borrower* country (where the banks/borrowers operate),

– j denotes the *counterparty/lender* country (where the counterparties/lenders are located),

– k denotes the *nationality* of the banking group (where the parent company of the banking group is incorporated) and

– s denotes the *institutional sector* of the counterparty: banking sector (Inter-group and Intra-group), non-banking financial sector (insurance companies, hedge funds...), public sector, households, etc.

All positions are tridimensional with a reporting country – the borrower – a counterpaty country – the lender – and a nationality –the country of incorporation. The different possible positions are presented in details in the Figure 10 in Appendix B.

Since we only consider Intra-group and Interbank debt, we omit this last dimension and, for the sake of simplicity, consider mainly two different measures (for the same reason, we also omit the nationality dimension for the time being):

– L_{ijq}^{Intra}: the Intra-group borrowing of banks operating in borrower country i from banks operating in lender country j at quarter q

– L_{ijq}^{Inter}: the Interbank borrowing of banks operating in borrower country i from banks operating in lender country j at quarter q

Basically, our empirical strategy will be based on a comparison of the cross-sectional/geographical distribution of these two measures L_{ijq}^{Intra} and L_{ijq}^{Inter} in relation to the level of the corporate income tax rate in the borrower country i and in the lender country j.

4.4 Measuring the relative use of Intra-group and Interbank debt

We start the analysis by comparing the distribution of Intra-group L_{ijq}^{Intra} and Interbank debt L_{ijq}^{Inter} across quintiles of lender country tax rates Q_z. In particular, for a given quarter q and for

a given borrower country i, we examine the relative share of (the lender countries belonging to) each quintile Q_z among the total Intra-group (or Interbank) debt issued by banks in the borrower country i at the end of the quarter q:

$$Share^{Intra}_{Q_z iq} = \frac{\sum\limits_{j \in Q_z} L^{Intra}_{ijq}}{\sum\limits_{j} L^{Intra}_{ijq}} = \frac{L^{Intra}_{Q_z iq}}{L^{Intra}_{iq}} \quad \& \quad Share^{Inter}_{Q_z iq} = \frac{\sum\limits_{j \in Q_z} L^{Inter}_{ijq}}{\sum\limits_{j} L^{Inter}_{ijq}} = \frac{L^{Inter}_{Q_z iq}}{L^{Inter}_{iq}} \tag{1}$$

For each pair of borrower country-lender country tax rate quintile $\{i, Q_z\}$, in order to compare the relative share of Intra-group and Interbank debt, we construct the ratio of the relative share of Intra-group debt to the relative share of Interbank debt:[10]

$$R_{Q_z iq} = \frac{Share^{Intra}_{Q_z iq}}{Share^{Inter}_{Q_z iq}} \tag{2}$$

This ratio of relative shares $R_{Q_z iq}$ captures discrepancies in the allocation of Intra-group and Interbank positions across quintiles Q_z for each borrower country i at the end of quarter q.[11] Alternatively, instead of using the quintiles of corporate income tax rates for the lender country i, we could calculate the relative shares and the ratio for both OFC lender countries and non-OFC lender countries:

$$Share^{Intra}_{OFCiq} = \frac{\sum\limits_{j \in OFC} Intra_{ijq}}{\sum\limits_{j} Intra_{ijq}} \ \& \ Share^{Inter}_{OFCiq} = \frac{\sum\limits_{j \in OFC} Inter_{ijq}}{\sum\limits_{j} Inter_{ijq}} \ \& \ R_{OFCiq} = \frac{Share^{Intra}_{OFCiq}}{Share^{Inter}_{OFCiq}} \tag{3}$$

4.5 Identification strategy

In principle, if our main hypothesis is correct, we should observe that banks in reporting/borrower countries borrow significantly more from their subsidiaries located in low-tax jurisdictions (relative to their subsidiaries located in high-tax jurisdictions). In other words, we should observe that $Share^{Intra}_{Q_k iq} > Share^{Intra}_{Q_z iq}$ for $k < z$.

However, this simple comparison is not sufficient because there are many factors other than corporate tax rates that can affect the relative intensity of Intra-group transactions between the lender country i and the borrower country j. For example, the intensity of trade and the level of economic integration between two countries is likely to have a significant impact on the level of Intra-group

[10] Note that this ratio computed at the quintile level Q_z can be seen as a weighted average of the individual ratios with appropriate weights w_{ijq} (see the appendix E for more details)

$$R_{Q_z iq} = \sum_{j \in Q_z} w_{ijq} \cdot R_{ijq}$$

[11] In the appendix E, we present another way to understand this ratio of relative shares.

transactions. Similarly, two countries that share a common currency or with strong economic, political or cultural ties are more likely to have significant Intra-group transactions. However, all these factors that are likely to influence the importance of Intra-group transactions between two countries are not specific to Intra-group transactions: they also affect Inter-group banking positions.

Conversely, our hypothesis is that, unlike Intra-group transactions, Interbank transactions are not directly affected by corporate tax rates because there is no way for banks to reduce their corporate tax burden by increasing their borrowing from other (non-related) banks. In other words, we should not observe a systematic relationship between the cross-border distribution of Interbank debt and the cross-sectional distribution of corporate tax rates. One exception, which we explicitly address in a later section, is the case of banking regulations: various regulations are likely to favour Intra-group transactions over Interbank transactions, and this could be a credible alternative explanation to the profit-shifting hypothesis.

Therefore, we use the relative share of Interbank positions as a benchmark for Intra-group positions – *i.e.* we use the relative share of Interbank positions as a "control group" for Intra-group positions – and we focus on the ratio of the relative share of Intra-group debt to the relative share of Interbank debt: R_{ijq}.

In a sense, our identification strategy is conceptually analogous to a difference-in-differences strategy where the control group consists of loans to unrelated banks, the treated group consists of loans to related banks, and the (magnitude of the) treatment is the corporate tax rate of the lending country. We now work with the ratio aggregated at the quintile level (the derivation works exactly the same if we consider OFC vs non-OFC rather than different quintiles Q_z)[12]:

$$\overline{R}_{Q_z} = \frac{\overline{Share}_{Q_z}^{Intra}}{\overline{Share}_{Q_z}^{Inter}} = \frac{\dfrac{\sum\limits_{j \in Q_z, i} \overline{L}_{ij}^{Intra}}{\sum\limits_{j,i} \overline{L}_{ij}^{Intra}}}{\dfrac{\sum\limits_{j \in Q_z, i} \overline{L}_{ij}^{Inter}}{\sum\limits_{j,i} \overline{L}_{ij}^{Inter}}} \tag{4}$$

Importantly, we have averaged all variables over time before constructing the ratio: $\overline{L}_{ij}^{Inter}$ is the average over all quarters q of L_{ijq}^{Inter} for instance.

As explained above, we hypothesise that banking groups opportunistically use Intra-group debt to shift profits from the taxable income of the parent company or subsidiaries located in high-tax

[12] As detailed in the appendix E, we can derive the same ratio at a more aggregated level using appropriate weights.

jurisdictions to that of subsidiaries located in low-tax jurisdictions such as OFCs. There is a wide variety of tax systems and rather than going into the details of all of them this paper relies on a more general assumption: we assume that, regardless of the specifics of the tax system, cross-border Intra-group transactions are an instrument for shifting taxable income from one jurisdiction to another. As a result, we implicitly assume that once banks tend to optimise their global corporate income tax, we should observe a non-negative relationship between the corporate income tax of a given jurisdiction and the intensity of Intra-group transactions with affiliates located in that jurisdiction. In contrast, we should not observe such a pattern for Interbank transactions.

Thus, due to banks' profit-shifting strategies, we expect to observe larger ratios $\overline{R}_{Q_z}$ for the lowest quintiles of lender countries j (as opposed to higher quintiles of lender countries) or for lender countries classified as OFCs (as opposed to lender countries not classified as OFCs).

4.6 Taking into account the corporate income tax of the *borrower* countries

So far, we have only considered the corporate tax rate of the *lender* countries j. However, when banks optimize their corporate income tax rate when opportunistically their profit among their entities, they take into account not only the corporate income tax rate in the lender countries (to which they shift the profit), but also the corporate income tax rate of the borrower countries (from which the profit is shifted).

We now group borrower countries according to the level of their corporate tax rate. We proceed in the same way as for lender countries j and we build time-varying quintiles of corporate tax rates $\mathbb{Q}_z$, but for borrower countries i. We then repeat the previous analysis for (i) low corporate tax rate borrower countries (1^{st} quintile, $\mathbb{Q}_1$) and (ii) high corporate tax rate borrower countries (5^{th} quintiles, $\mathbb{Q}_5$). Formally, we build:

$$\overline{R}^{H}_{Q_z} = \frac{\sum\limits_{j \in Q_z, i \in \mathbb{Q}_5} \overline{L}^{Intra}_{ij}}{\sum\limits_{j,i} \overline{L}^{Intra}_{ij}} \Bigg/ \frac{\sum\limits_{j \in Q_z, i \in \mathbb{Q}_5} \overline{L}^{Inter}_{ij}}{\sum\limits_{j,i} \overline{L}^{Inter}_{ij}} \quad \& \quad \overline{R}^{L}_{Q_z} = \frac{\sum\limits_{j \in Q_z, i \in \mathbb{Q}_1} \overline{L}^{Intra}_{ij}}{\sum\limits_{j,i} \overline{L}^{Intra}_{ij}} \Bigg/ \frac{\sum\limits_{j \in Q_z, i \in \mathbb{Q}_1} \overline{L}^{Inter}_{ij}}{\sum\limits_{j,i} \overline{L}^{Inter}_{ij}} \tag{5}$$

where H (L resp.) means *high* (*low* resp.) corporate tax rates in the borrower countries, $\mathbb{Q}_z$ refers to the corporate tax rates in borrower countries i and Q_z refers to the corporate tax rates in lender countries j. We expect to observe a significant positive difference in the relative use of Intra-group debt between high and low-tax rate borrower countries, especially for low lender countries' tax rate

Q_z or for OFC's countries:[13]

$$\begin{cases} \overline{R}^H_{Q_1} > \overline{R}^L_{Q_1} \\ \overline{R}^H_{OFC} > \overline{R}^L_{OFC} \end{cases} \tag{6}$$

4.7 Taking advantage of the nationality dimension

Finally, as explained above, an important feature of the dataset is the *nationality* dimension, *i.e.* the information on the country k of incorporation of banks resident in a given reporting country i. So far, we have ignored this dimension, but this information is relevant for the analysis of profit shifting as it allows us to classify Intra-group transactions into two different groups according to the legal status of the entities operating in the borrower and lender countries.

– In the first group, we impose the restriction that the reporting (borrower) country must be the same as the *nationality* country: $k = i$. In other words, we focus on debt issued by banks operating in the country in which they are incorporated. It can be the head office or a domestic subsidiary. This corresponds to the banking position 1 to 4 in Figure 10 in Appendix B.

$$\overline{R}_{Q_z,i=k} = \frac{\sum_{j \in Q_z, i=k} \overline{L}^{Intra}_{ijk}}{\sum_{j,i,k} \overline{L}^{Intra}_{ijk}} \Big/ \frac{\sum_{j \in Q_z, i=k} \overline{L}^{Inter}_{ijk}}{\sum_{j,i,k} \overline{L}^{Inter}_{ijk}} \tag{7}$$

– In the second group, we impose the restriction that both the reporting (borrower) country and the counterparty country must be different from the country of *nationality*: $k \neq i$ & $k \neq j$. In other words, we consider liabilities where both the lender and the borrower banks operate in countries different from their country of incorporation. This corresponds to the banking position 5 and 6 in the Figure 10 in appendix B.

$$\overline{R}_{Q_z,i\neq k,j\neq k} = \frac{\sum_{j \in Q_z, i\neq k, j\neq k} \overline{L}^{Intra}_{ijk}}{\sum_{j,i,k} \overline{L}^{Intra}_{ijk}} \Big/ \frac{\sum_{j \in Q_z, i\neq k, j\neq k} \overline{L}^{Inter}_{ijk}}{\sum_{j,i,k} \overline{L}^{Inter}_{ijk}} \tag{8}$$

[13] It is less clear that we should observe significant differences for higher quintile where we have not observed any specific pattern previously.

We have no particular prediction about the intensity of profit shifting in each of these groups.

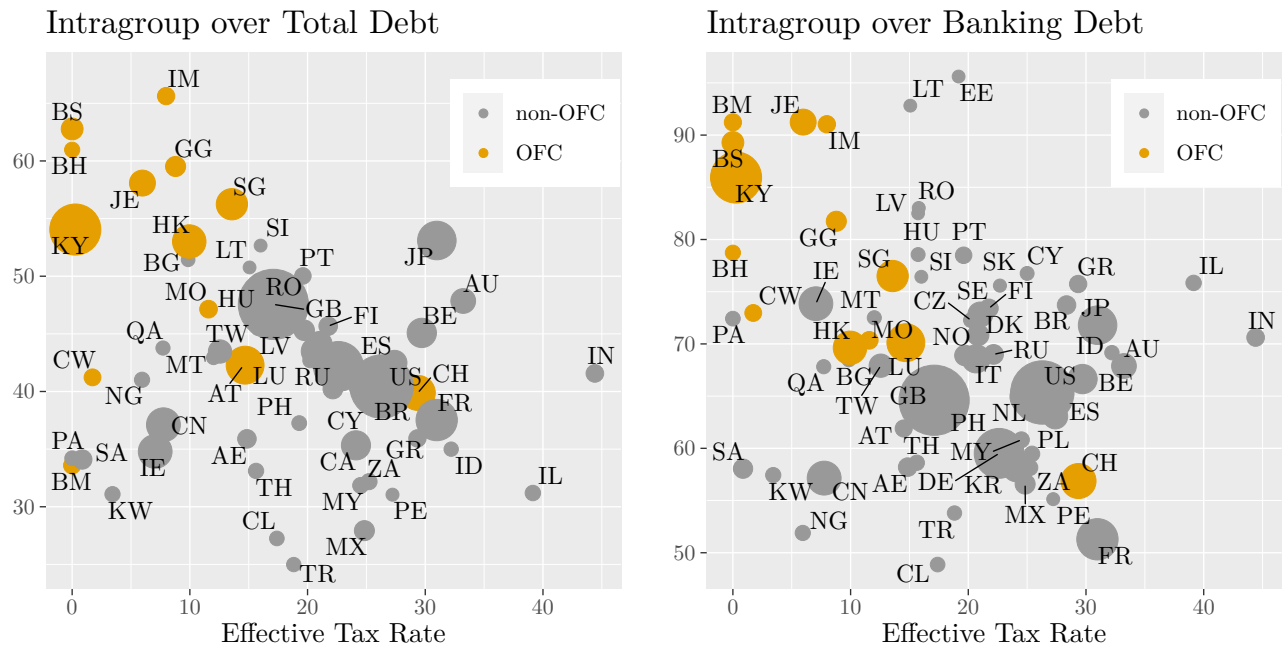
5 Evidence of Profit-Shifting

5.1 Baseline results

The sample of borrower/reporting countries consists of 28 banking systems. Together they account for about 55% of cross-border banking debt. The sample of lender/counterparty countries is restricted by data availability and consists of 67 countries. The period covered is 2014-Q1 to 2019-Q4. Before examining our main variables of interest, namely the relative shares defined in equation 1 in section 4 and the related ratios (equations 11 and 4) aggregated at different levels of interest (quintiles of corporate tax rate of lender countries Q_z, OFC status...), we should have a first look at the dataset at a more disaggregated level.

In Figure 2 below, we plot for each lender country the share of intra-group assets in (i) bank assets and in (ii) total assets[14] (considering all borrower countries and nationalities, and averaging over time) against the *effective* corporate tax rate of these lender countries.

Figure 2: **Share of intragroup banking assets on the total of assets aggregated by country**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each dot represents for each lender country the ratio intragroup debt holding over its total debt holding **left** or over its total banking holding **right**. "OFC" countries are defined according to the lists from Kintzler et al. (2020) Lecture: 59 % of the debt held by Guernsey is intragroup debt **left**. 91 % of the banking debt held by Jersey is intragroup debt.

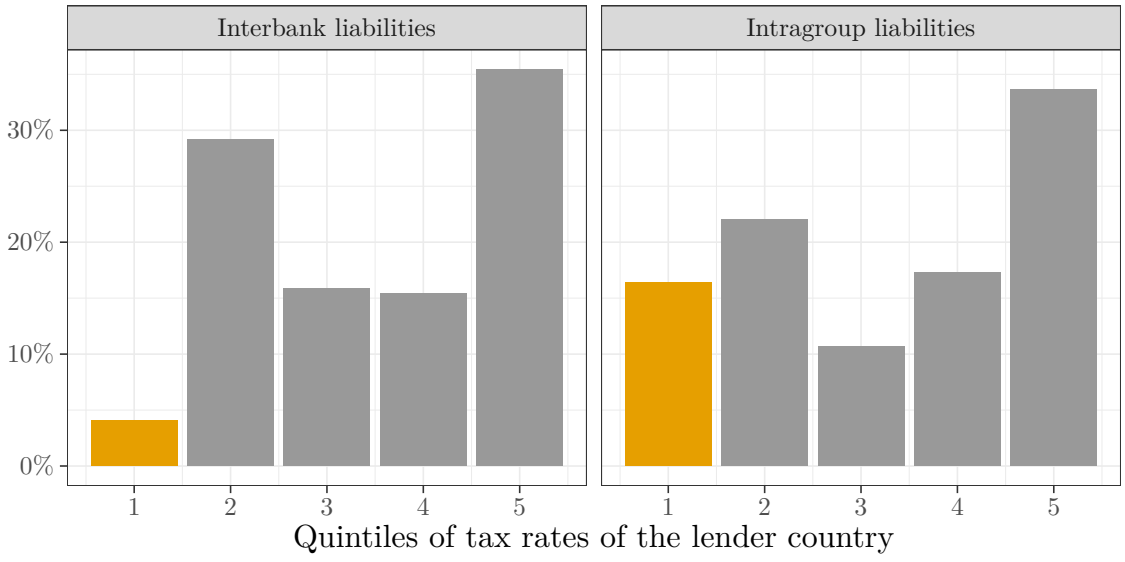
We observe a fairly clear negative relationship between (i) both measures of the importance of intra-group positions and (ii) the level of the effective corporate tax rate: the lower this effective tax rate, the higher the share of intra-group assets in banking assets or in total assets. We can

[14] We still focus on liability positions, but since we are taking here the perspective of the counterpart/lender countries, these liabilities of the borrower/reporting countries are assets for the lender countries.

also see that jurisdictions classified as OFCs (yellow dots) tend to be characterised by both very low tax rates and very significant intra-group positions (often in excess of 80% of bank assets for the most aggressive OFCs like the Caïman Island or Jersey for instance). Overall, this first chart suggests that banks tend to lend more and more to their affiliates (as opposed to other banks) as the corporate tax rate in their country of residence decreases, a behaviour consistent with the profit shifting hypothesis.

Continuing our analysis, we now take the perspective of the borrower country and examine the distribution of intra-group and interbank debt in relation to the corporate income tax rates imposed on banks operating in the lender countries j, namely the country to which profit are shifted. For this purpose, as explained in section 4, we group the lender countries j into quintiles of statutory corporate tax rates Q_z and examine the *relative* share of each quintile for intra-group liabilities on the one hand and interbank liabilities on the other. In other words, we show in Figure 3 the relative share $\overline{Share}_{Q_z}^{Intra}$ and $\overline{Share}_{Q_z}^{Inter}$ as defined in equation 4 in section 4 above.

Figure 3: **Share of the total intra-group debt and the total interbank debt held corporate tax rate quintile of the lender countries**



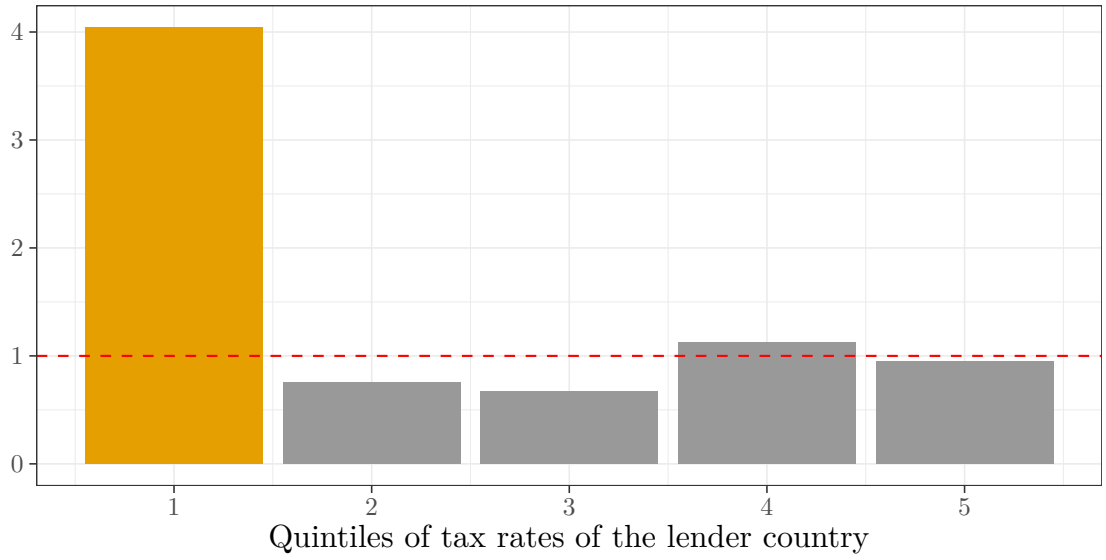
Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents the relative share of total interbank debt (left) and the relative share of total intra-group debt held by each quintile (right). Lecture: Lender banks located in countries with statutory corporate tax rates in the first quintile (Q_1) hold on average 3.9% of the total of interbank debt and 17.1% of the total of intra-group debt.

For both types of banking positions, we first observe that the 5^{th} quintile is the largest: in both cases, it represents around 32-35% of intra-group or interbank debt. In other words, the largest share of both intra-group and interbank debt is issued to banks resident in lender countries with significant corporate tax rates. This is not surprising, given that most banking transactions take place between entities operating in the largest banking systems, which are mainly in the 5^{th} quintile.

However, while the distributions from the 2^{nd} to the 5^{th} quintile are broadly similar for the two types of banking positions, we also observe that the relative importance of the 1^{st} quintile differs significantly between intra-group and interbank positions: a larger relative share of cross-border debt is issued to banks operating in the lender countries with the lowest corporate tax rates in the case of intra-group debt (16.4%) than in the case of interbank debt (4%). In other words, countries in the 1^{st} quintile are almost absent from cross-border interbank financing, while they account for a significant share of intra-group financing.

We now move on to examine our main variable of interest, the ratio of intragroup to interbank debt $\overline{R}_{Q_z}$, as defined in equation 4. This ratio is a convenient way of comparing the relative share of intra-group and interbank debt represented in Figure 3. In Figure 4, we plot the distribution of this ratio across quintiles of statutory corporate tax rates in the lender countries. If the ratio is greater than one, it indicates that the quintile considered represents a larger relative share of intra-group positions than interbank positions.[15]

Figure 4: **Ratio of the relative share of intra-group debt to the relative share of interbank debt, broken down by corporate tax rate quintile of the lender countries**



Note : Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its share in total intragroup debt to its share in total interbank debt. Lecture: Using STR, lender banks located in the countries with the lowest tax rates (Q1) hold relatively 3.9 times more intragroup assets than interbank assets.

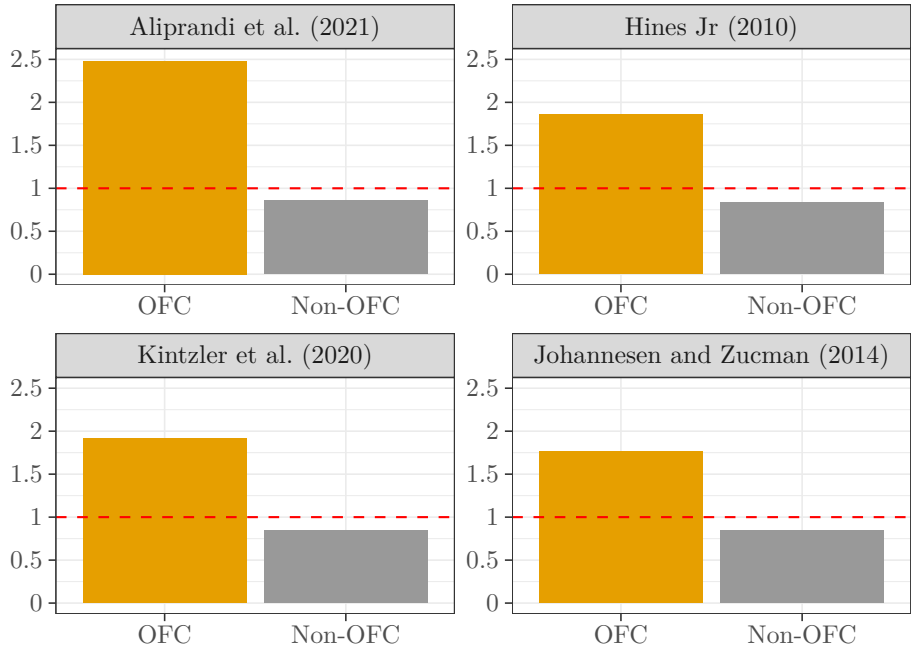
We observe a striking pattern fully consistent with the conclusions drawn from Figure 3. First, the ratio for the 2^{nd} to the 5^{th} quintiles fluctuates around one, *i.e.* the relative share of intra-group and interbank debt is roughly similar for lender countries in these quintiles. Most importantly, the ratio for the first quintile indicates that the relative share of intra-group debt issued to banks

[15]In Appendix G, we reproduce Figure 4 and 5 using a sample of borrower countries restricted to the five reporting countries with the largest outstanding amount of debt (United States, United Kingdom, France, Spain, Italy). Germany and Japan report data to the BIS but do not authorize its dissemination

operating in these low-tax jurisdictions is on average two to four times larger than the relative share of similar interbank debt. In other words, banks located in the lender countries belonging to the first quintile – those with the lowest STR – issue significantly more intragroup debt than interbank debt while banks located in the lender countries belonging to the other four quintiles issue an equivalent amount of intra-group and interbank debt.

We can observe a similar pattern if we classify lender countries according to their OFC status. In Figure 5, we plot the ratio of intra-group to interbank debt for banks operating in OFCs ($\overline{R}_{OFC}$) and banks operating in non-OFCs ($\overline{R}_{nonOFC}$) according to our four lists of OFCs.

Figure 5: **Ratio of the relative share of intra-group debt to the relative share of interbank debt broken down by OFC status of the lender countries**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each type of lender country the ratio of its relative share in intra-group debt over its relative share in interbank debt. OFC countries are defined according to the lists from Aliprandi et al. (2021), Hines Jr (2010), Johannesen and Zucman (2014), Kintzler et al. (2020). Lecture: lender banks located in OFCs (using the Aliprandi list) hold relatively 3.25 times more intra-group debt from high-tax countries as they hold interbank debt from high-tax countries.

Unsurprisingly, the relative share of intra-group debt from lender countries classified as OFCs is significantly higher – between 1.75 and 2.5 times higher – than the relative share of comparable interbank debt. In contrast, the relative importance of intra-group and interbank debt of banks resident in non-OFC lender countries are much more similar. Crucially, this result is very robust to the use of different lists of OFCs.

Overall, for the largest banking groups in the world, we find a robust and meaningful relationship between the relative importance of intra-group borrowing (compared to similar interbank borrowing) and the prevailing corporate tax rate in the lender country. For most lender countries,

intra-group and interbank positions are broadly similar but for countries with very low tax rates – those belonging to the 1^{st} quintile – the use of intra-group borrowing is several times greater than the use of interbank borrowing. These results are fully consistent with the existence of profit shifting by banks through the use of intra-group transactions.

5.2 Taking into account the corporate tax rates of reporting/borrower countries

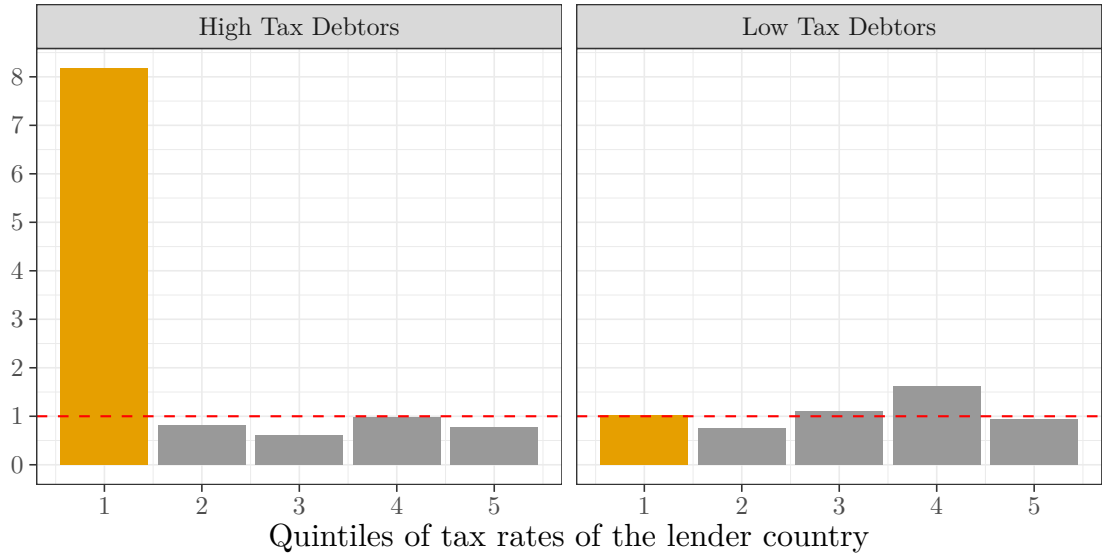
The results presented so far only use the cross-sectional distribution of the corporate tax rates in *lender countries*, *i.e.* the tax rate paid by banks (located in borrower countries) on profits shifted to lender countries through intra-group debt: the lower this rate, the greater the incentive to shift profits in order to reduce the tax bill.

We now add another dimension and also consider the cross-sectional distribution of corporate tax rates in *borrower countries*, *i.e.* the tax rates that banks would pay on profits without profit shifting. Indeed, the incentives to shift profits through intra-group debt to affiliates located in countries in the first quintile of the corporate tax rate distribution are significantly reduced when the borrower country has a similarly low corporate tax rate. Conversely, the incentives to shift profits are strengthened when banks operating in the borrower country are subject to a relatively high corporate tax rate.

In Figure 6, we reproduce the distribution of the ratio $\overline{R}_{Q_z}$ across the quintiles of corporate tax rates in lender countries (as in Figure 4) on two different sub-samples: (i) the sample of banks located in borrower countries with high corporate tax rates on the left ($\overline{R}^{H}_{Q_z}$) and (ii) the sample of banks located in borrower countries with low corporate tax rates on the right ($\overline{R}^{L}_{Q_z}$). We classify borrower countries in the low/high corporate tax rate category as follow (see also section 4.6): low corporate tax rate borrower countries are countries in the first quintile ($\mathbb{Q}_1$) and high corporate tax rate borrower countries are countries in the fifth quintiles ($\mathbb{Q}_5$). For robustness sake, we repeat this analysis in Figure 18 in Appendix G where low corporate tax rate countries are now defined as countries in the 1^{st} or the 2^{nd} quintiles and high corporate tax rate countries as countries in the 4^{th} or the 5^{th} quintiles.

The two distinct patterns revealed in Figure 6 strongly support our main hypothesis that the relative importance of intra-group debt mainly reflects profit shifting by banks. We continue to observe a disproportionate relative share of intra-group debt for banks operating in lender countries with the lowest tax rates (Q_1), but this pattern is only observed for banks located in borrower countries with relatively high corporate tax rates ($\mathbb{Q}_5$). In other words, when banks operate in a borrower country with an already low corporate tax rate, they have much less, if any, particular

Figure 6: **Ratio of of the relative share of intra-group debt to the relative share of interbank debt from high-tax borrower countries (left) and low-tax borrower countries (right) broken down by lender country tax rate quintile**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. Lecture: Using STR, lender banks that resides in country which tax rates in Q1 hold relatively 4.2 times more intragroup debt as they hold interbank debt.

incentives to shift profits by borrowing from subsidiaries operating in lender countries with low corporate tax rates. Note also that while the ratio of intra-group to interbank debt is slightly below 4 for the whole sample of borrower countries, it rises to almost 8 if we focus on the sample of high-tax borrower countries ($\mathbb{Q}_5$). Importantly, this fifth quintiles of borrower countries corporate tax rate contains banks operating in the largest banking systems and represent a very large share of global cross-border debt.

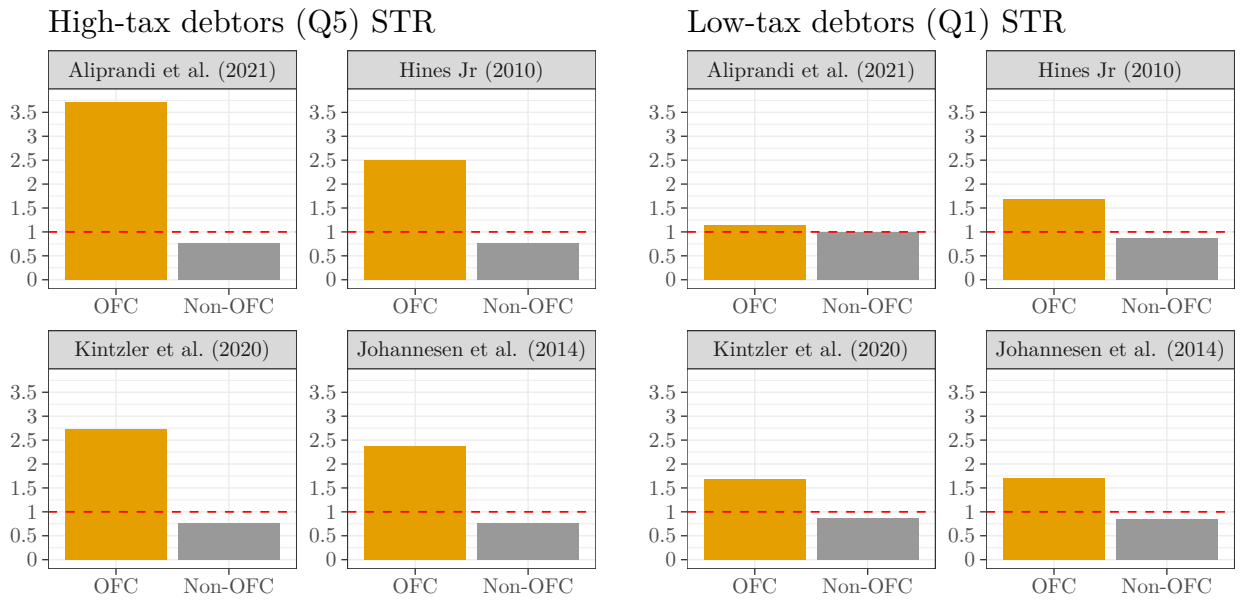
This finding is fully confirmed when lender countries are grouped according to their OFC status rather than their corporate tax rate as shown in Figure 7: the relative use of intra-group vs interbank debt differs significantly between OFC and non-OFC lender countries but only when the corporate tax rate in the borrower country is sufficiently low ($\mathbb{Q}_1$ vs. $\mathbb{Q}_5$).[16]

5.3 Who is shifting profits?

Our main finding is that banking groups tend to borrow disproportionately more from their subsidiaries located in low corporate tax jurisdictions than they do from other, non-affiliate banks operating in the same jurisdictions. Nonetheless, we only observe this striking pattern when these banks themselves operate in a jurisdiction with high corporate tax rate, which we interpret as

[16]In Appendix G, we show that this finding is confirmed if we compare borrower countries in the first and the second quintiles to borrower countries in the fourth and the fifth quintiles (see Figure 19).

Figure 7: **Ratio of of the relative share of intra-group debt to the relative share of interbank debt from high-tax borrower countries (left) and low-tax borrower countries (right) broken down by broken down by type of lender country (non-OFC vs OFC)**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each type of lender country the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. The borrowers are either high-tax countries (fifth quintile of tax rates, left) or low-tax countries (first quintile of tax rates, right). "OFC" countries are defined according to the lists from Aliprandi et al. (2021), Hines Jr (2010), Johannesen and Zucman (2014), Kintzler et al. (2020) Lecture: Lending banks located in OFC (using the Aliprandi list) hold relatively 3.25 times more intra-group debt from high-tax countries as they hold interbank debt from high-tax countries.

evidence of profit shifting.

However, this evidence does not tell us who is most tax evasive in high-tax countries. In fact, our results are consistent with two intertwined but somewhat different stories. On the one hand, banks operating in the largest banking systems where they are incorporated, such as the US, UK or France, could shift profits to OFCs or low tax rate lender countries. In this case, it is the parent companies (or domestic subsidiaries) operating in these high-tax jurisdictions that are shifting profits.

On the other hand, it could equally be foreign banks located in high-tax countries that avoid taxes by creating intragroup relationships with other subsidiaries located in lower-tax countries. This question is at the heart of a recent literature that shows the disproportionate role of foreign subsidiaries in distorting profit localisation (Bilicka, 2019). Interestingly, the nationality dimension of the data allows us to explore this question by comparing two types of banking position:

- Intra-group debt issued by the *parent company* (or by domestic subsidiaries) to subsidiaries resident in another (lender) country. This corresponds to the banking positions 1 or 2 in Figure 10 in Appendix A and to equation 7. These banking positions account for 32.3% of the total of intra-group debt of our sample.
- Intra-group debt issued by foreign subsidiaries resident in a (borrower) country different from the country of incorporation to subsidiaries resident in another (lender) country also other than the country of incorporation. This corresponds to the banking position 5 in Figure 10 in Appendix A and Figure 8. These banking positions account for 24% of the intra-group debt in our sample

As explained in section 4.7, we have also constructed the ratio of the relative shares of intra-group and interbank debt (broken down by quintile) corresponding to these two types of banking positions: $\overline{R}_{Q_z,i=k}$ and $\overline{R}_{Q_z,i\neq k,j\neq k}$. We could then examine the extent to which our main finding – the importance of the ratio for the first quintile and its deviation from the same ratio for other quintiles – is present in both samples. This is the purpose of the Figure 8 below.

Several observations can be made from Figure 8. First, we continue to observe the relative importance of the first quintile for both (i) parent banks' borrowing from their subsidiaries (left-hand side) and (ii) inter-subsidiary borrowing (right-hand side). Second, we remark that the relative importance of the first quintile is significantly more intense for inter-subsidiary borrowing: the volume of intra-group borrowing from countries in the first quintile is three times the volume of interbank borrowing in the case of parent banks' borrowing while it is five times the volume of interbank borrowing for subsidiaries. It is tempting to relate this observation to differences in the

Figure 8: **Ratio of the relative share of intra-group debt to the relative share of interbank debt of parent companies (left) and foreign subsidiaries (right) from high corporate tax rate borrower countries ($\mathbb{Q}_5$) broken down by lender country tax rate quintiles**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. On the left we present the ratio of debt issued by parents companies (or domestic subsidiaries); on the right, the ratio of debt issued by foreign subsidiaries to banks different from the country of incorporation (i.e., the parent country).

fight against profit shifting but we would need additional evidence to support this hypothesis. Despite this observed difference, we conclude that both the countries in which the parent companies of banking groups are located – mainly developed countries – and the countries in which their subsidiaries operate bear the costs of profit shifting.

5.4 Profit shifting or regulatory arbitrage?

The evidence presented in the previous sections supports the profit-shifting hypothesis: by borrowing from their subsidiaries operating in low corporate tax rate countries, banks located in high corporate tax rate countries can shift profits, reduce their domestic taxable income and lower their global tax bill. However, the jurisdictions with low or limited corporate tax rates used to shift profits may also have less restrictive banking regulations and banks may seek to exploit this uneven playing field through intra-group transactions. In other words, our evidence so far is not inconsistent with regulatory arbitrage at first glance (Demirgüç-Kunt et al., 2023, Houston et al., 2012, Ongena et al., 2013).

The fact that we do not find a more intense pattern in the case of parent banks' borrowing from their subsidiaries than in the case of inter-subsidiary borrowing is a first indication that regula-

tory arbitrage is not necessarily a good competing explanation. Indeed, most banking regulations operate mainly at the highest level of consolidation, not least to avoid regulatory arbitrage. Accordingly, we would expect to see stronger evidence of profit shifting in the case of parent banks' borrowing from their subsidiaries than in the case of inter-subsidiary borrowing. We observe the opposite.

In this section, we test this competing hypothesis of regulatory arbitrage more explicitly. For this purpose, we take advantage of the composition of our sample which includes 13 borrower countries and 27 lender countries belonging to the European Union (among 28). Thus, our dataset covers a large fraction of cross-border unconsolidated banking positions between banks resident in EU member states. Remember though that Germany reports data to the BIS but do not authorize their dissemination.

Since 2014, there is a single banking regulation in the European Union (the *Capital Requirements Regulation* and the *Capital Requirements Directive IV* have both implemented the Basel II regulatory framework) and a Single Supervision Mechanism (SSM) within the Eurozone. Consequently, the possibility of regulatory arbitrage by EU banks using intra-group transactions with their subsidiaries resident in other EU member states is significantly reduced, if not entirely eliminated. This aspect of unified and homogeneous regulation is explicitly emphasised in the Single Rulebook: "*This will ensure uniform application of Basel III in all Member States. It will close regulatory loopholes and will thus contribute to a more effective functioning of the Single Market.*".

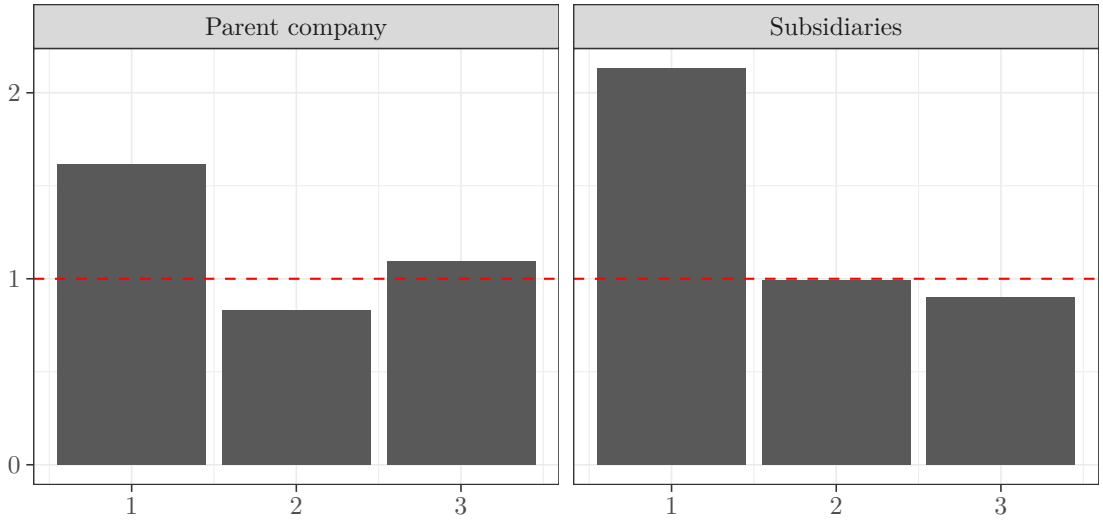
Basically, we can leverage on this particular institutional design and replicate our analysis on this subset of Eurozone member countries to see whether our main finding still holds on a sample of countries where regulatory arbitrage is unlikely.

However, since the total number of countries has decreased significantly (from 28 to 13 for the reporting countries), we no longer break the population into quintiles of corporate income tax rates but rather into terciles. It should also be noted that this sampling restriction results in the exclusion of the most aggressive OFCs, *i.e.* those characterized by zero or near-zero corporate income tax rates. Consequently, all else being equal, the underlying level of profit shifting is likely to be lower and our test must be considered as conservative.

In Figure 9, we show how the ratio $\overline{R}_{T_z}$ varies across terciles of the lender country's tax rate T_z. Following our previous analysis, the distribution of the ratio is shown separately parent companies and for foreign subsidiaries. If regulatory arbitrage is the main driver of our previous findings, we should no longer observe a particular pattern: rather, we should find a ratio fluctuating around 1 for all three terciles.

However, despite the de facto exclusion of the most aggressive OFCs from this analysis, we observe

Figure 9: **Ratio of the relative share of intra-group debt to the relative share of inter-bank debt of parent company (left) and foreign subsidiaries (right) broken down by lender country tax rate terciles; European Union sample.**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. On the left we present the ratio of debt issued by parents companies (or domestic subsidiaries); on the right, the ratio of debt issued by foreign subsidiaries to banks different from the country of incorporation.

a similar pattern to that of the full sample: banks tend to borrow significantly more from their affiliates (compared to interbank borrowing) when the countries where the lender banks are located have a low corporate tax rate. This observation holds for both (i) parent bank borrowing from subsidiaries (left-hand side) and (ii) inter-subsidiary borrowing (right-hand side). In other words, in an identical regulatory and supervisory environment with no possibility of regulatory arbitrage, subsidiaries in the least taxed European countries tend to issue more than twice as much intra-group debt as interbank debt. This confirms that the profit shifting hypothesis in itself has significant explanatory power for the pattern we uncovered.

5.5 Econometric Evidence

In this section we present briefly the results of a number of regressions that directly relate to and complement the graphical evidence presented in the previous sections. We now work with the ratio calculated at the most disaggregated level:

$$R_{ijkq} = \frac{Share_{ijkq}^{Intra}}{Share_{ijkq}^{Inter}} \tag{9}$$

R_{ijkq} is the ratio of intra-group debt over interbank debt in country i vis-à-vis country j in quarter q, for a bank of nationality k. Then, we run the following regressions:

$$\begin{cases} Ratio_{ijkq} = \beta_0 + \beta_1 \cdot Q1_j + \delta_t + \delta_{it} + \delta_{kt} + \delta_{ikt} + \varepsilon_{ijkt} \\ Ratio_{ijkt} = \beta_0 + \beta_1 \cdot OFC_j + \delta_t + \delta_{it} + \delta_{kt} + \delta_{ikt} + \varepsilon_{ijkt} \end{cases} \tag{10}$$

$Q1_j$ is a dummy variable identifying the first quintile of the corporate tax rate of the *lender* countries (as defined in section 4.1). Then, the estimated coefficient $\hat{\beta}_1$ identifies the marginal effect on $Ratio_{ijkq}$ of considering a banking position where the lender countries belong to the first quintile of corporate income tax rates, relative to the baseline effect – *i.e.* the average value of the ratio on Q_2 to Q_5 captured by the estimated coefficient $\hat{\beta}_0$. In other words, $\hat{\beta}_0 + \hat{\beta}_1$ should be about the same size as the yellow bar representing the first quintile in the previous Figures.

Similarly, OFC_j is a dummy identifying banking positions where the lender country is located in one of our four list of OFC countries and $\hat{\beta}_1$ is the associated marginal effect on the level of the ratio R_{ijkq}.

The equations are estimated using weighted least squares with the appropriate weights

$$w_{ijkq} = \frac{L^{Inter}_{ijkq}}{\sum_{j \in Q_z} L^{Inter}_{ijkq}}$$

Those weights are derived in Appendix E. The sample period goes from 2014-Q1 to 2019-Q4[17], we use an unbalanced panel with 507 country-pairs with a minimum of 2 years and maximum of 6 years. Our setting is somewhat similar to a gravity model with pair-wise observations (lender-borrower) but with the addition of the dimension k, the nationality of the bank.

Table 2 reports the coefficients of interest $\hat{\beta}_0$ and $\hat{\beta}_1$, estimated after successively adding different sets of fixed effects (FE). First, we control for aggregate shocks by adding quarter FE. Then, we control for shocks specific to the reporting/borrower country by adding borrower country * quarter FE. We also control for the shocks that could affect the country of incoporation of the headquarter of the bank in question by adding parent country * quarter FE. However, we cannot add counterparty/lender country * quarter FE because the quintiles of the corporate tax rate of the lender countries varies at this level.

Several observations can be made. First, the estimated intercepts – the $\hat{\beta}_0$ coefficient – is not very different from unity. Formally, we can reject at the XX% significance level that these estimated intercepts are statistically different from unity. This implies that for cross-border banking positions where the lending bank is located in a lender country in the second to the fifth quintile (or belonging to a non-OFC lender country), the market share of intragroup debt and interbank debt are quite similar.

[17] See Appendix A

Table 2: **Ratio of the relative share of intra-group debt to the relative share of interbank debt: Q_1 vs. Q_2 to Q_5 and OFC lender relative to non-OFC lender**

	(1)	(2)	(3)	(4)	(5)
Intercept	0.83***				
	(0.10)				
Quintile 1 (STR)	**2.73****	**2.80****	**3.63****	**3.95****	**4.69****
	(1.03)	(1.05)	(1.11)	(1.24)	(1.57)
Intercept	0.82***				
	(0.11)				
OFC: Aliprandi et al. (2021)	**1.30****	**1.32****	**1.65****	**1.95****	**2.19****
	(0.47)	(0.48)	(0.50)	(0.56)	(0.66)
Intercept	0.81***				
	(0.11)				
OFC: Kintzler et al. (2020)	**0.87****	**0.88****	**0.99****	**0.96****	**1.17****
	(0.35)	(0.36)	(0.40)	(0.39)	(0.43)
Intercept	0.81***				
	(0.11)				
OFC: Hines Jr (2010)	**0.83****	**0.84****	**0.90****	**0.92****	**1.06****
	(0.33)	(0.33)	(0.35)	(0.34)	(0.38)
Intercept	0.81***				
	(0.11)				
OFC: Johannesen and Zucman (2014)	**0.74****	**0.75****	**0.75****	**0.73****	**0.91****
	(0.31)	(0.31)	(0.32)	(0.31)	(0.34)
Observations	36931	36931	36931	36931	36931
Quarter FE	No	Yes	Yes	Yes	Yes
Borrower cty * Quarter FE	No	No	Yes	Yes	Yes
Parent cty * Quarter FE	No	No	No	Yes	Yes
Parent cty * Borrower cty * Quarter FE	No	No	No	No	Yes

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. The table reports the results of weighted OLS estimations from 2014-Q1 to 2019-Q4 where the dependent variable is the ratio of intragroup debt over intergroup debt. Q1 (STR) indicates a binary variable that takes the value 1 if the lender country belongs to the first quintile of statutory tax rate, it measures the additional (marginal) effect of the first quintile over the other quintiles. OFC_j indicates a binary variable that takes the value 1 if the lender country belongs to the relevant OFC list (Aliprandi et al., 2021, Hines Jr, 2010, Johannesen and Zucman, 2014, Kintzler et al., 2020). Standard errors clustered at the country-pair level are in parentheses.

Second, the estimated coefficients $\hat{\beta}_1$ are large and significant. This means that when we consider the borrowing from banks that belongs to the first quintile of the tax rate of the lender countries or to an OFC, the market share of intragroup debt is several times larger than the market share of interbank debt.

Overall, across all estimations, there is a large evidence that we find a significantly higher ratios R_{ijkq} when the lending bank is located in the lowest quintile of the corporate tax rates of lender countries. Similarly, we also observe that the marginal effect of the lending bank being located in an OFC is large and significant.

6 Conclusion

In this paper, we document for the first time in a multi-country perspective the extent of one of the main channels of profit shifting by banks. In particular, we show that the distribution of cross-border intra-group liabilities is highly correlated with the corporate tax rates of both the borrowing and lending countries. This pattern of artificial intra-group debt holds for a large number of countries, including those with the largest banking sectors (the United States, the United Kingdom, France, Spain, Italy, etc.). We also show that this pattern is more pronounced for banks located in high-tax countries, regardless of their nature (parent companies or foreign subsidiaries). Moreover, by examining the case of intra-group debt in the European Union, we are able to rule out a competing explanation, namely regulatory arbitrage, and show that the main determinant is the tax rate of the creditor country.

Banks are not immune to the well-documented phenomenon affecting non-financial companies. It is therefore necessary to question the philosophy of international, European and national regulations, which have tended to exclude banks from the new rules. More specifically, by demonstrating that all banks (parent companies, branches and subsidiaries) play with the CIT rates of the counterparty countries, we show that regulations aimed at the countries with the most developed banking systems may not be sufficient. Since we are able to document this pattern using unconsolidated data, we show that rules that apply only at the consolidated level, which is common for prudential regulation, are not sufficient to limit the erosion of the tax base.

For now, the existing data does not allow us to identify the intragroup when the counterparty is a non-bank. As some financial groups carry out both banking and non-banking activities, we can hypothesise that these companies are able to artificially issue intra-group debt to a non-bank counterpart, which we cannot take into account for the time being. Moreover, since we do not know the interest rates at which the loans are granted, we have so far only documented one instrument (debt-shifting), but it would not be surprising if banks also use the instrument of transfer pricing, allowing them to shift even more to low-tax jurisdictions. It would therefore be interesting for international organisations to disseminate data on interest income by sector in order to isolate banks and possibly identify over-yielding. In addition, as noted in the literature, banks make use of derivatives that can be treated as debt from a fiscal point of view, opening the door to more tax deductibility, while at the same time being considered as capital by the regulator (De Mooij, 2012). Unfortunately, data on this type of instrument is still partial, but new initiatives such as the European Market Infrastructure Regulation (EMIR) may soon provide access to new micro-level data on derivatives.

7 Bibliography

Aliprandi, Giulia, Mona Barake, and Paul-Emmanuel Chouc (2021) "Have European banks left tax havens? Evidence from country-by-country data," *EU Tax Observatory report*.

Barake, Mona (2023) "Tax planning by European banks," working paper n°9, EU Tax Observatory.

Beer, Sebastian, Ruud de Mooij, and Li Liu (2020) "International corporate tax avoidance: a review of the channels, magnitudes, and blind spots," *Journal of Economic Surveys*, 34 (3), 660–688, https://doi.org/10.1111/joes.12305.

Bilicka, Katarzyna Anna (2019) "Comparing UK Tax Returns of Foreign Multinationals to Matched Domestic Firms," *American Economic Review*, 109 (8), 2921–53, 10.1257/aer.20180496.

Blouin, Jennifer, Harry Huizinga, Luc Laeven, Gaëtan Nicodème, and Stijn Claessens (2014) "Thin Capitalization Rules and Multinational Firm Capital Structure," *IMF Working Papers*, 2014 (012).

Bouvatier, Vincent, Gunther Capelle-Blancard, and Anne-Laure Delatte (2017) "Banks in tax havens: First evidence based on country-by-country reporting," *CEPR Discussion Paper*, No. DP12222.

Bremus, Franziska, Kirsten Schmidt, and Lena Tonzer (2020) "Interactions between bank levies and corporate taxes: How is bank leverage affected?" *Journal of Banking & Finance*, 118, 105874, https://doi.org/10.1016/j.jbankfin.2020.105874.

Buettner, Thiess, Michael Overesch, Ulrich Schreiber, and Georg Wamser (2012) "The impact of thin-capitalization rules on the capital structure of multinational firms," *Journal of Public Economics*, 96 (11-12), 930–938, https://doi.org/10.1016/j.jpubeco.2012.06.008.

Clausing, Kimberly A (2016) "The effect of profit shifting on the corporate tax base in the United States and beyond," *National Tax Journal*, 69 (4), 905–934, https://doi.org/10.17310/ntj.2016.4.0.

De Mooij, Ruud A (2012) "Tax biases to debt finance: Assessing the problem, finding solutions," *Fiscal studies*, 33 (4), 489–512, https://www.jstor.org/stable/24440192.

De Mooij, Ruud A and Michael Keen (2016) "Debt, taxes, and banks," *Journal of Money, Credit and Banking*, 48 (1), 5–33, https://doi.org/10.1111/jmcb.12289.

De Mooij, Ruud and Shafik Hebous (2018) "Curbing corporate debt bias: Do limitations to interest deductibility work?" *Journal of Banking & Finance*, 96, 368–378, https://doi.org/10.1016/j.jbankfin.2018.07.013.

Demirgüç-Kunt, Aslı and Harry Huizinga (2001) "The taxation of domestic and foreign banking," *Journal of Public Economics*, 79 (3), 429–453, https://doi.org/10.1016/S0047-2727(00)00071-2.

Demirgüç-Kunt, Asli, Bálint L. Horváth, and Harry Huizinga (2023) "Regulatory arbitrage and loan location decisions by multinational banks," *Journal of International Economics*, 145, 103840, https://doi.org/10.1016/j.jinteco.2023.103840.

Dharmapala, Dhammika (2014) "What Do We Know about Base Erosion and Profit Shifting? A Review of the Empirical Literature," *Fiscal Studies*, 421–448, https://doi.org/10.1111/j.1475-5890.2014.12037.x.

Dowd, Tim, Paul Landefeld, and Anne Moore (2017) "Profit shifting of US multinationals," *Journal of Public Economics*, 148, 1–13, https://doi.org/10.1016/j.jpubeco.2017.02.005.

Dutt, Verena K, Christopher A Ludwig, Katharina Nicolay, Heiko Vay, and Johannes Voget (2019) "Increasing tax transparency: Investor reactions to the country-by-country reporting requirement for EU financial institutions," *International Tax and Public Finance*, 26 (6), 1259–1290, https://doi.org/10.1007/s10797-019-09575-4.

Fatica, Serena and Wildmer Daniel Gregori (2020) "How much profit shifting do European banks do?" *Economic Modelling*, 90, 536–551, https://doi.org/10.1016/j.econmod.2020.01.026.

Fatica, Serena, Wouter Heynderickx, and Andrea Pagano (2020) "Banks, debt and risk: assessing the spillovers of corporate taxes," *Economic Inquiry*, 58 (2), 1023–1044, https://doi.org/10.1111/ecin.12827.

Fuest, Clemens and Thomas Hemmelgarn (2005) "Corporate tax policy, foreign firm ownership and thin capitalization," *Regional Science and Urban Economics*, 35 (5), 508–526, https://doi.org/10.1016/j.regsciurbeco.2004.07.003.

Godar, Sarah, Giulia Aliprandi, Tommaso Faccio, Petr Janskỳ, and Katia Toledo Ruiz (2024) "The long way to tax transparency: lessons from the early publishers of country-by-country reports," *International Tax and Public Finance*, 1–42, https://doi.org/10.1007/s10797-023-09818-5.

Gu, Grace Weishi, Ruud de Mooij, and Tigran Poghosyan (2015) "Taxation and leverage in international banking," *International Tax and Public Finance*, 22 (2), 177–200, https://doi.org/10.1007/s10797-014-9307-2.

Heckemeyer, Jost H and Ruud A De Mooij (2017) "Taxation and corporate debt: are banks any different?" *National Tax Journal*, 70 (1), 53–76, https://doi.org/10.17310/ntj.2017.1.02.

Heckemeyer, Jost H. and Michael Overesch (2017) "Multinationals profit response to tax differentials: Effect size and shifting channels," *Canadian Journal of Economics*, 50 (4), 965–994, https://doi.org/10.1111/caje.12283.

Hines Jr, James R (2010) "Treasure islands," *Journal of Economic Perspectives*, 24 (4), 103–26, DOI:10.1257/jep.24.4.103.

Houston, Joel F., Chen Lin, and Yue Ma (2012) "Regulatory Arbitrage and International Bank Flows," *The Journal of Finance*, 67 (5), 1845–1895, https://doi.org/10.1111/j.1540-6261.2012.01774.x.

Huizinga, Harry, Johannes Voget, and Wolf Wagner (2014) "International taxation and cross-border banking," *American Economic Journal: Economic Policy*, 6 (2), 94–125, DOI:10.1257/pol.6.2.94.

Janskỳ, Petr (2020) "European banks and tax havens: evidence from country-by-country reporting," *Applied Economics*, 52 (54), 5967–5985, https://doi.org/10.1080/00036846.2020.1781773.

Johannesen, Niels (2014) "Tax evasion and Swiss bank deposits," *Journal of Public Economics*, 111, 46–62.

Johannesen, Niels and Gabriel Zucman (2014) "The end of bank secrecy? An evaluation of the G20 tax haven crackdown," *American Economic Journal: Economic Policy*, 6 (1), 65–91, DOI: 10.1257/pol.6.1.65.

Kintzler, Étienne, Mathias Lé, and Kevin Parra (2020) "Capturing banking flows: The predominant role of OFCs in the international financial architecture,"Technical report, Banque de France.

Langenmayr, Dominika and Franz Reiter (2022) "Trading offshore: Evidence on banks' tax avoidance," *The Scandinavian Journal of Economics*, 124 (3), 797–837, https://doi.org/10.1111/sjoe.12507.

Menkhoff, Lukas and Jakob Miethe (2019) "Tax evasion in new disguise? Examining tax havens' international bank deposits," *Journal of Public Economics*, 176, 53–78, https://doi.org/10.1016/j.jpubeco.2019.06.003.

Merz, Julia and Michael Overesch (2016) "Profit shifting and tax response of multinational banks," *Journal of Banking & Finance*, 68, 57–68, https://doi.org/10.1016/j.jbankfin.2016.03.015.

OECD (2016) *Limiting Base Erosion Involving Interest Deductions and Other Financial Payments, Action 4 - 2016 Update*, 212, https://doi.org/10.1787/9789264268333-en.

Ongena, Steven, Alexander Popov, and Gregory F. Udell (2013) ""When the cat's away the mice will play": Does regulation at home affect bank risk-taking abroad?" *Journal of Financial Economics*, 108 (3), 727–750, https://doi.org/10.1016/j.jfineco.2013.01.006.

O'Reilly, Pierce, Kevin Parra Ramirez, and Michael A Stemmer (2019) "Exchange of information and bank deposits in international financial centres," *OECD Taxation Working Papers* (46), https://doi.org/10.1787/025bfebe-en.

Reiter, Franz, Dominika Langenmayr, and Svea Holtmann (2021) "Avoiding taxes: banks' use of internal debt," *International Tax and Public Finance*, 28 (3), 717–745, https://doi.org/10.1007/s10797-020-09625-2.

Suet, Patrick and Marie-Liesse Dallemagne (2018) "Banque et impôts en France," *Revue d'économie financière* (3), 77–87, https://doi.org/10.3917/ecofi.131.0077.

Tørsløv, Thomas, Ludvig Wier, and Gabriel Zucman (2023) "The missing profits of nations," *The Review of Economic Studies*, 90 (3), 1499–1534, https://doi.org/10.1093/restud/rdac049.

Appendix

A The Locational Banking Stastitics (LBS) data

First, we reproduce a brief official description of the BIS Locational Banking Stastitics[18]: "*The locational banking statistics (LBS) measure international banking activity from a residence perspective, focusing on the location of the banking office. They are compiled following principles that are consistent with balance of payments statistics. The LBS capture outstanding claims (financial assets) and liabilities of internationally active banks located in reporting countries on counterparties residing in more than 200 countries. Banks record their positions on an unconsolidated basis, including Intragroup positions between offices of the same banking group. The LBS capture around 95% of all cross-border banking activity.*"

While our sample covers the period from 2014-Q1 to 2019-Q4, some countries have started to report data later: Hong Kong 2014-Q4, Bahamas 2015-Q2, Philippines 2016-Q4, Spain 2017-Q1, Malaysia 2017-Q3 and Cayman Islands 2018-Q2.

In the Tables 3 and 4 below, we list the various reporting/borrower and counterparty/lender countries of our sample.

Table 3: **List of the 28 reporting/borrower countries**

Austria (AT)	Australia (AU)	Belgium (BE)	Bahamas (BS)
Canada (CA)	Finland (FI)	Cyprus (CY)	Denmark (DK)
Spain (ES)	France (FR)	United Kingdom (GB)	Hong Kong SAR China (HK)
Cayman Islands (KY)	Indonesia (ID)	Ireland (IE)	Italy (IT)
South Korea (KR)	Netherlands (NL)	Luxembourg (LU)	Macao SAR China (MO)
Malaysia (MY)	Turkey (TR)	Philippines (PH)	Portugal (PT)
Sweden (SE)	Chinese Taipei (TW)	United States (US)	South Africa (ZA)

B The structure of the dataset and the nationality dimension

In the in Figure 10 below, we present the global structure of the dataset using stylized examples of cross-border banking positions. To illustrate the richness of this dataset, we identify six typical banking positions using different breakdowns.

1. Outstanding amounts (assets or liabilities depending on which way you look at it) of banks resident in France, of French nationality (*i.e.* whose parent company is incorporated in France) vis-à-vis one of its subsidiaries resident in the Cayman Islands.

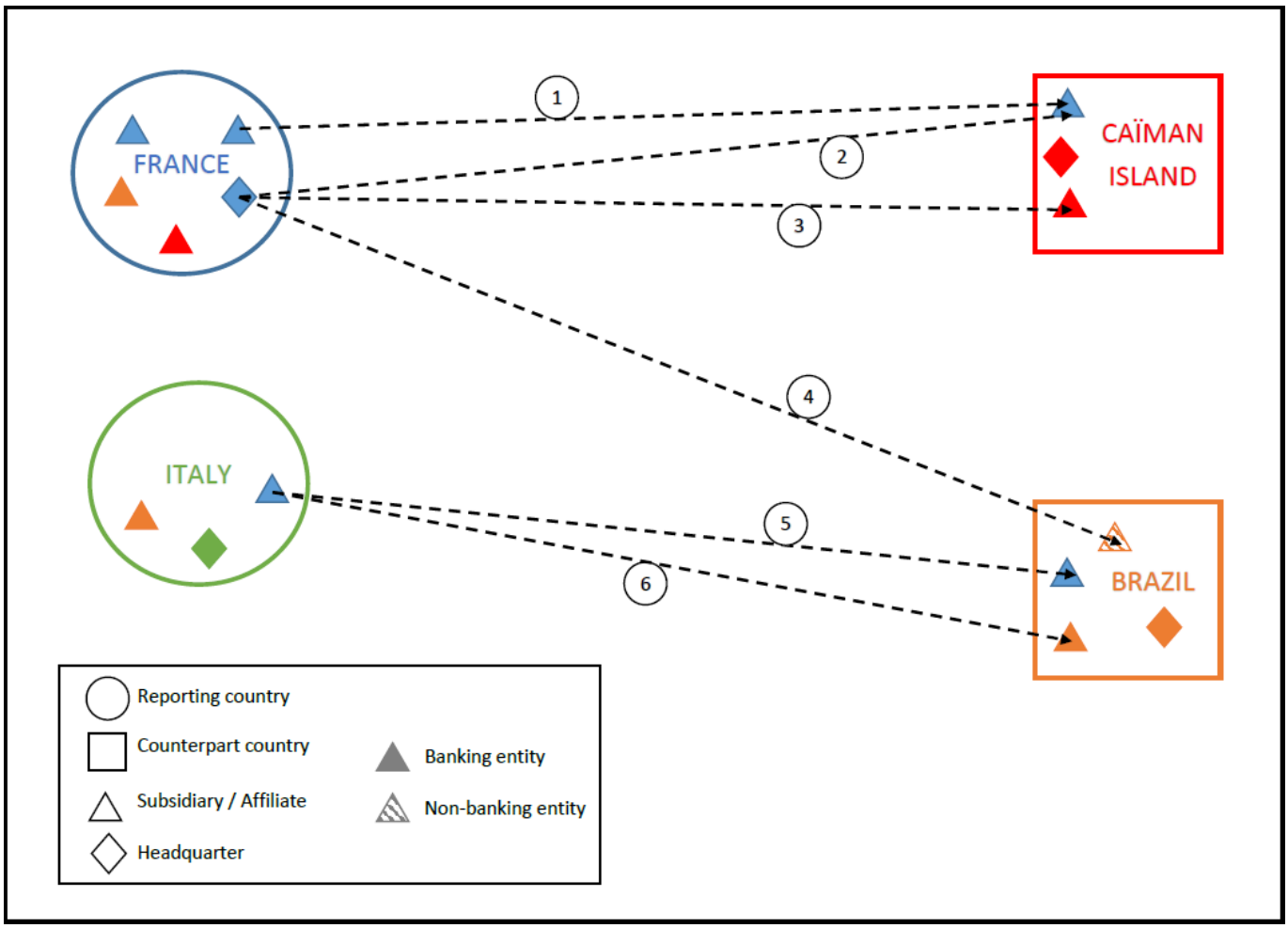
2. This position is identical to the previous one in our data because we cannot distinguish

[18] `https://www.bis.org/statistics/about_banking_stats.htm?m=6%7C31`

Table 4: **List of the 67 counterparty/lender countries**

Czechia (CZ)	Germany (DE)	Hungary (HU)	Slovakia (SK)
United Arab Emirates (AE)	Austria (AT)	Belgium (BE)	Bermuda (BM)
Brazil (BR)	Canada (CA)	Switzerland (CH)	China (CN)
Spain (ES)	France (FR)	United Kingdom (GB)	Hong Kong
Indonesia (ID)	Ireland (IE)	India (IN)	SAR China (HK)
South Korea (KR)	Cayman Islands (KY)	Luxembourg (LU)	Japan (JP)
Mexico (MX)	Malaysia (MY)	Philippines (PH)	Malta (MT)
Singapore (SG)	Thailand (TH)	Chinese Taipei (TW)	Sweden (SE)
Bulgaria (BG)	Italy (IT)	Jersey (JE)	United States (US)
Poland (PL)	Russia (RU)	Turkey (TR)	Netherlands (NL)
Curaçao (CW)	Cyprus (CY)	Estonia (EE)	Chile (CL)
Greece (GR)	Israel (IL)	Isle of Man (IM)	Guernsey (GG)
Panama (PA)	Peru (PE)	Portugal (PT)	Kuwait (KW)
Australia (AU)	Bahamas (BS)	Romania (RO)	Saudi Arabia (SA)
Norway (NO)	Denmark (DK)	Lithuania (LT)	Finland (FI)
Bahrain (BH)	Iran (IR)	Macao SAR China (MO)	Nigeria (NG)
Latvia (LV)	Qatar (QA)	Slovenia (SI)	South Africa (ZA)

Figure 10: **Structure of the LBSN dataset**



between parent company and subsidiaries when the reporting country and the country of nationality are the same.

3. Outstanding amounts of banks resident in France, of French nationality (*i.e.* whose parent company is incorporated in France) vis-à-vis another bank resident in the Cayman Islands

4. Outstanding amounts of banks resident in France, of French nationality (*i.e.* whose parent company is incorporated in France) vis-à-vis a non-bank entity resident in Brazil (non-bank financial entity or non-financial entity)

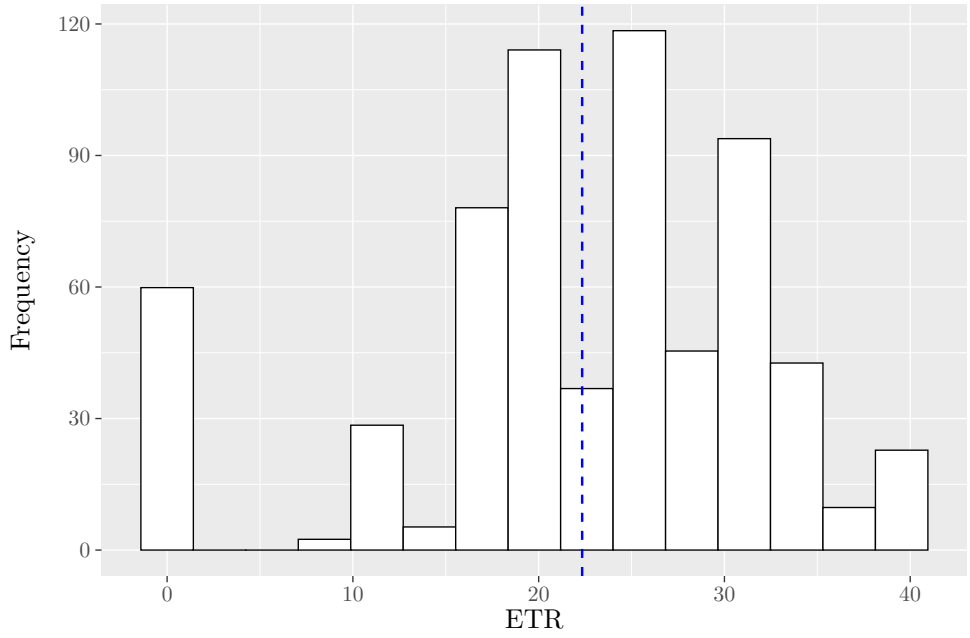
5. Outstanding amounts of banks (subsidiaries) resident in Italy, of French nationality (*i.e.* whose parent company is incorporated in France) vis-à-vis a subsidiary of the same group resident in the Cayman Islands

6. Outstanding amounts of banks (subsidiaries) resident in Italy, of French nationality (*i.e.* whose parent company is incorporated in France) vis-à-vis a bank resident in Brazil

C Statutory Corporate Income Tax (CIT)

We used data from the Tax Foundation think-tank which to our knowledge has the largest database on tax rates. It is freely available at: `https://taxfoundation.org/publications/corporate-tax-rates-around-the-world/`. It is a synthesis of the lists published by audit firms combined with original data collection.

Figure 11: Distribution of the Statutory Tax Rates



D Lists of Offshore Financial Centres

Below are the details of the countries identified as "tax havens" or Offshore Financial Centres (OFC). Note that since 2010, Curaçao and Sint Maarten came into existence due to the secession of the Netherlands Antilles. We have removed the Netherlands Antilles from the Johannesen & Zucman list which goes from 52 to 51 countries and from the Hines list. He have also added Curaçao and Sint Maarten to the Hines Jr list which thus goes from 52 to 53.

Table 5: **List of Offshore Financial Centers from Kintzler et al. (2020)**

Cayman Islands (KY)	Isle of Man (IM)	Curaçao (CW)
Guernsey (GG)	Bahamas (the) (BS)	Singapore (SG)
Jersey (JE)	Bermuda (BM)	Switzerland (CH)
Macao (MO)	Hong Kong (HK)	Bahrain (BH)
Luxembourg (LU)		

Table 6: **List of Offshore Financial Centers from Aliprandi et al. (2021)**

Bahamas	Hong Kong	Macao
Bermuda	Ireland	Malta
British Virgin Islands	Isle of Man	Mauritius
Cayman Islands	Jersey	Panama
Gibraltar	Kuwait	Qatar
Guernsey	Luxembourg	

Table 7: **List of Tax Havens from Johannesen and Zucman (2014)**

Andorra	Dominica	Niue
Anguilla	Gibraltar	Panama
Antigua and Barbuda	Grenada	Saint Kitts and Nevis
Aruba	Guernsey	Saint Lucia
Austria	Hong Kong	Saint Vincent and the Grenadines
Bahamas (the)	Isle of Man	Samoa
Bahrain	Jersey	San Marino
Belgium	Liberia	Seychelles
Belize	Liechtenstein	Singapore
Bermuda	Luxembourg	Sint Maarten (Dutch part)
Barbados	Macao	Switzerland
Cayman Islands (the)	Malaysia	Trinidad and Tobago
Chile	Malta	Turks and Caicos Islands (the)
Cook Islands (the)	Marshall Islands (the)	Uruguay
Costa Rica	Monaco	Vanuatu
Curaçao	Montserrat	Virgin Islands (British)
Cyprus	Nauru	Virgin Islands (U.S.)

Figure 12: **Lists of Tax Havens from Hines Jr (2010)**

Andorra	Guernsey	Nauru
Anguilla	Hong Kong	Netherlands Antilles
Antigua and Barbuda	Ireland	Niue
Aruba	Isle of Man	Panama
Bahamas	Jersey	Samoa
Bahrain	Jordan	San Marino
Barbados	Lebanon	Seychelles
Belize	Liberia	Singapore
Bermuda	Liechtenstein	St. Kitts and Nevis
British Virgin Islands	Luxembourg	St. Lucia
Cayman Islands	Macao	St. Martin
Cook Islands	Maldives	St. Vincent and the Grenadines
Costa Rica	Malta	Switzerland
Cyprus	Marshall Islands	Tonga
Djibouti	Mauritius	Turks and Caicos Islands
Dominica	Micronesia	Vanuatu
Gibraltar	Monaco	
Grenada	Montserrat	

E Methodology : additional derivations

Aggregate ratio as a weighted sum of individual ratios In the methodology section 4, we pointed out that the ratios computed at the quintile level Q_z can be seen as a weighted average of the individual ratios R_{ijkq} with appropriate weights w_{ijkq}.

$$R_{Q_z iq} = \sum_{j \in Q_z} w_{ijkq} \cdot R_{ijkq} = \sum_{j \in Q_z} w_{ijkq} \cdot \frac{\frac{L^{Intra}_{ijkq}}{\sum_{j} L^{Intra}_{ijkq}}}{\frac{L^{Inter}_{ijkq}}{\sum_{ijk} L^{Inter}_{ijkq}}}$$

where Q_z denote the quintile z of corporate tax rate in the lender countries j, i denotes the borrower country, k denote the nationality and q denotes the quarter considered.
The quantity $\frac{L^{Intra}_{ijkq}}{\sum_{j} L^{Intra}_{ijkq}}$ denotes the market share of intragroup debt issued by borrower country i vis-à-vis lender country j with nationality k at quarter q among the aggregate intragroup debt issued at quarter q.

This equivalence explains the correspondence between the graphical analyses and the regression analyses. In this Appendix, we provide the derivation of this equivalence. Let us first, rewrite the ratio $R_{Q_z ikq}$

$$R_{Q_z ikq} = \frac{\frac{\sum_{j \in Q_z} L^{Intra}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}}}{\frac{\sum_{j \in Q_z} L^{Inter}_{ijkq}}{\sum_{ijk} L^{Inter}_{ijkq}}} = \frac{\sum_{ijk} L^{Inter}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}} \cdot \frac{\sum_{j \in Q_z} L^{Intra}_{ijkq}}{\sum_{j \in Q_z} L^{Intra}_{ijkq}} = \frac{\sum_{ijk} L^{Inter}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}} \cdot \sum_{j \in Q_z} \frac{L^{Intra}_{ijkq}}{\sum_{j \in Q_z} L^{Inter}_{ijkq}}$$

We can then rewrite slightly and get

$$R_{Q_z ikq} = \frac{\sum_{ijk} L^{Inter}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}} \cdot \sum_{j \in Q_z} \frac{L^{Intra}_{ijkq}}{L^{Inter}_{ijkq}} \cdot \frac{L^{Inter}_{ijkq}}{\sum_{j \in Q_z} L^{Inter}_{ijkq}} = \sum_{j \in Q_z} \frac{\frac{L^{Intra}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}}}{\frac{L^{Inter}_{ijkq}}{\sum_{ijk} L^{Inter}_{ijkq}}} \cdot \frac{L^{Inter}_{ijkq}}{\sum_{j \in Q_z} L^{Inter}_{ijkq}}$$

Finally, if we define the weights as $w_{ijkq} = \frac{L^{Inter}_{ijkq}}{\sum_{j \in Q_z} L^{Inter}_{ijkq}}$ – *i.e* the share of interbank debt issued by borrower country i vis-à-vis lender country j with nationality k at quarter q among the total

interbank debt issued by borrower country i vis-à-vis all the lender countries belonging to Q_z with nationality k at quarter q – we can rewrite :

$$R_{Q_z iq} = \sum_{j \in Q_z} \frac{\frac{L^{Intra}_{ijkq}}{\sum_{ijk} L^{Intra}_{ijkq}}}{\frac{L^{Inter}_{ijkq}}{\sum_{ijk} L^{Inter}_{ijkq}}} \cdot w_{ijkq} = \sum_{j \in Q_z} R_{ijkq} \cdot w_{ijkq}$$

Alternatively, we could write :

$$R_{Q_z iq} = \frac{Share^{Intra}_{Q_z ikq}}{Share^{Inter}_{Q_z ikq}} = \frac{\sum_{j \in Q_z} Share^{Intra}_{ijkq}}{\sum_{j \in Q_z} Share^{Inter}_{ijkq}} = \sum_{j \in Q_z} \left[Share^{Intra}_{ijkq} \cdot \frac{1}{\sum_{j \in Q_z} Share^{Inter}_{ijkq}} \right]$$

Then,

$$R_{Q_z ikq} = \sum_{j \in Q_z} \left[\frac{Share^{Intra}_{ijkq}}{Share^{Inter}_{ijkq}} \cdot \frac{Share^{Inter}_{ijkq}}{\sum_{j \in Q_z} Share^{Inter}_{ijkq}} \right] = \sum_{ijk} R_{ijkq} \cdot w_{ijkq}$$

In fine, the weight can be seen as :

$$w_{ijkq} = \frac{Share^{Inter}_{ijkq}}{\sum_{j \in Q_z} Share^{Inter}_{ijkq}} = \frac{Inter_{ijkq}}{\sum_{j \in Q_z} Inter_{ijkq}}$$

We could also aggregate these ratios at different intermediate levels as well: for instance, we could compute the same weighted average ratio for a subset of borrower countries i or for a subset of nationalities k.

Alternative interpretation of the ratio of relative shares We have constructed the following ratio of relative shares:

$$R_{Q_z ikq} = \frac{Share^{Intra}_{Q_z ikq}}{Share^{Inter}_{Q_z ikq}} \tag{11}$$

This ratio of relative shares $R_{Q_z ikq}$ captures discrepancies in the allocation of Intra-group and interbank positions across quintiles Q_z for each borrower country i at the end of quarter q. Another way to understand this ratio is to consider that it indicates to which extent the ratio of Intra-group to interbank liabilities for a given quintile Q_z differs from the same ratio for the entire population of lender countries.

$$R_{Q_z ikq} = \frac{\dfrac{\sum\limits_{j \in Q_z} Intra_{ijkq}}{\sum\limits_{ijk} Intra_{ijkq}}}{\dfrac{\sum\limits_{j \in Q_z} Inter_{ijkq}}{\sum\limits_{ijk} Inter_{ijkq}}} = \frac{\dfrac{\sum\limits_{j \in Q_z} Intra_{ijkq}}{\sum\limits_{j \in Q_z} Inter_{ijkq}}}{\dfrac{\sum\limits_{ijk} Intra_{ijkq}}{\sum\limits_{ijk} Inter_{ijkq}}} \tag{12}$$

F Supplementary results with Effective Tax Rates

Effective corporate tax rates. Because of the limitations of using statutory tax rates, we also perform a robustness analysis using these *effective corporate tax rates* (ETR). Using the database compiled by (Aliprandi et al., 2021), and collecting the information on 'profit before tax' and 'tax' reported by European banks in the Country-by-Country Reporting (CbCR) data they are required to publish since 2014, we compute an ETR for each borrower and lender country in our sample. As some jurisdictions have only a small number of European banks, small changes in tax collected or profits realised each year can lead to large variations, so we average the ETR over time. We explain in detail how we construct these ETRs from CbCR data in the Appendix C. Importantly, while STRs used in the rest of the paper are time-varying, ETRs are constructed to be time-invariant, which means that the quintiles introduced in the following section are time-invariant.

To calculate ETR, we use the Country-by-Country Reporting data (CbCR thereafter) for banks in the European Union. CbCR is part of the Basel III prudential regulation for the financial sector. Since 2015, in the EU, article 89 of the Capital Requirements Directive IV forces financial institutions to disclose annually a) the names, natures and location of their activities b) turnover c) number of employees d) profit before tax e) tax on profit, etc. The data include key variables - 'profit before tax' and 'tax'- that allow to compute effective tax rates for each country. Our computation is conducted on the 46 largest banks in the European Union from 2013 to 2019, operating in 152 countries which represent 4418 observations. Because some jurisdictions have only a small amount of European banks operating and due to the important variations in both tax collected and profits realised each year, we calculate weighted average tax rates for each country in the following way:

$$ETR_i = \frac{\sum_b \sum_t Tax_{ibt}}{\sum_b \sum_t Profits_{ibt}} \tag{13}$$

Where i is the country, t the year and b the individual bank. Similarly to Aliprandi et al. (2021), we extract only positive profits and positive taxes.

Figure 13: Distribution of the Effective Tax Rates

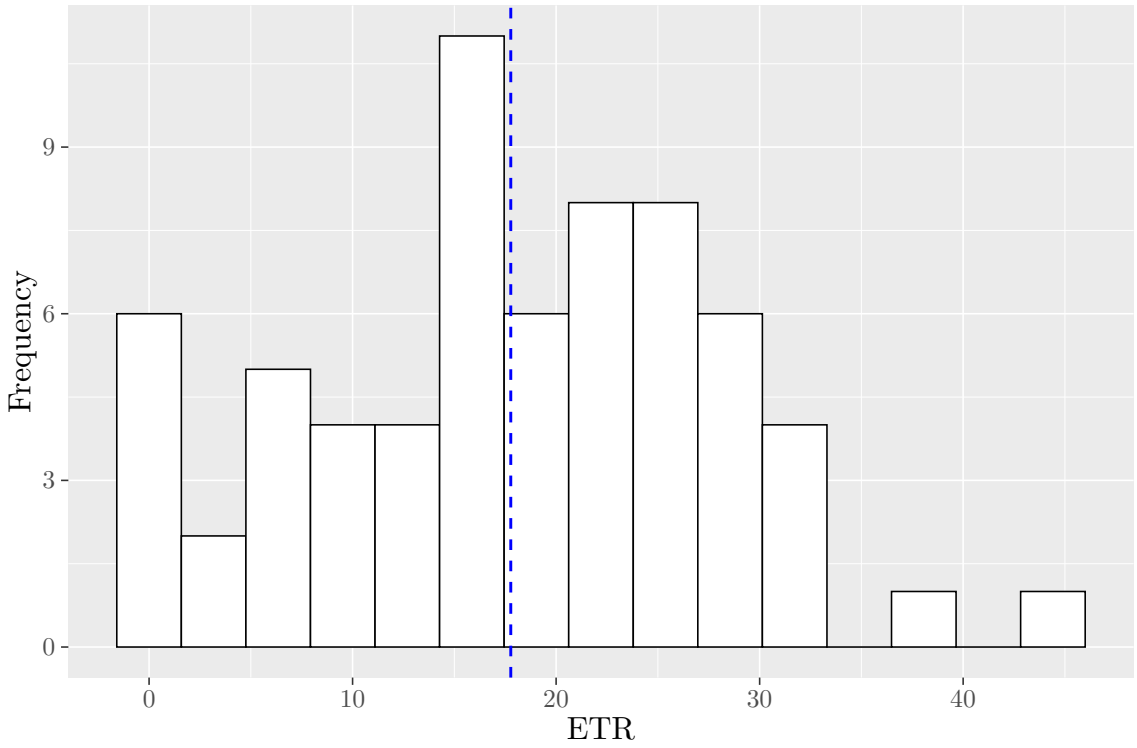


Table 8: **List of reporting banks (CbCR data)**

ABN AMRO Group NV	Allied Irish Banks Plc
Banca Monte dei Paschi di Siena SpA	Banco Bilbao Vizcaya Argentaria SA
Banco de Sabadell SA	Banco Popular Espanol SA
Banco Santander SA	Bankia SA
Barclays Plc	Bayerische Landesbank
Belfius Banque SA	BNP Paribas SA
Commerzbank AG	Credit Agricole Group
Credit Mutuel Group	Credit Suisse Group AG
Danske Bank A/S	DekaBank
Deutsche Bank AG	Dexia SA
DNB ASA	DZ Bank AG
Erste Group Bank AG	Groupe BPCE
HSBC Holdings Plc	ING Groep NV
Intesa Sanpaolo SpA	KBC Group NV
Kreditanstalt für Wiederaufbau	Landesbank Baden-Wuerttemberg
Landesbank Hessen-Thueringen Girozentrale	Lloyds Banking Group Plc
Nationwide Building Society	NIBC Bank NV
Norddeutsche Landesbank Girozentrale	Nordea Bank AB
Rabobank	Raiffeisen Bank International AG
Royal Bank of Scotland Group Plc	Skandinaviska Enskilda Banken AB
Societe Generale SA	Standard Chartered Plc
Svenska Handelsbanken AB	Swedbank AB
UBS Group AG	UniCredit SpA

Table 9: **Estimated Effective Tax Rates**

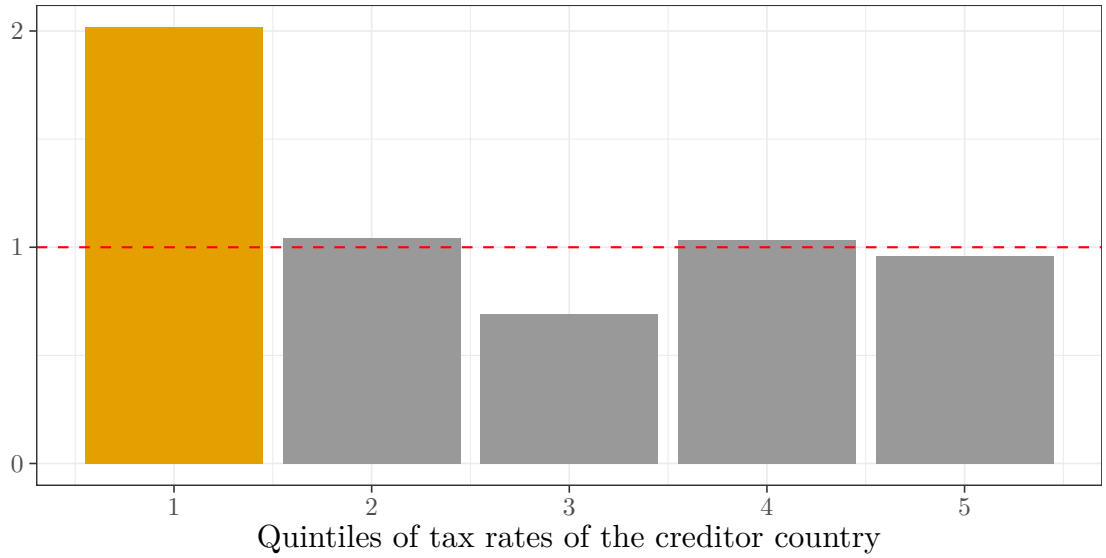
Country	ETR	Quintile	Country	ETR	Quintile
Bahrain (BH)	0.00	1	Estonia (EE)	19.18	3
Bermuda (BM)	0.00	1	Philippines (PH)	19.29	3
Bahamas (BS)	0.00	1	Portugal (PT)	19.60	3
Panama (PA)	0.00	1	Norway (NO)	19.71	3
Cayman Islands (KY)	0.27	1	Czechia (CZ)	20.22	3
Saudi Arabia (SA)	0.86	1	Italy (IT)	20.66	3
Curaçao (CW)	1.73	1	Denmark (DK)	20.84	3
Kuwait (KW)	3.43	1	Sweden (SE)	21.02	4
Nigeria (NG)	5.94	1	Finland (FI)	21.75	4
Jersey (JE)	5.97	1	Russia (RU)	22.15	4
Ireland (IE)	7.06	1	South Korea (KR)	22.18	4
Qatar (QA)	7.72	1	Germany (DE)	22.62	4
China (CN)	7.75	1	Slovakia (SK)	22.69	4
Isle of Man (IM)	7.98	1	Canada (CA)	24.11	4
Guernsey (GG)	8.79	2	Malaysia (MY)	24.51	4
Bulgaria (BG)	9.85	2	Mexico (MX)	24.83	4
Hong Kong SAR China (HK)	9.95	2	Cyprus (CY)	25.00	4
Macao SAR China (MO)	11.59	2	Netherlands (NL)	25.00	4
Malta (MT)	12.02	2	South Africa (ZA)	25.22	4
Chinese Taipei (TW)	12.56	2	Poland (PL)	25.41	4
Singapore (SG)	13.57	2	United States (US)	26.29	5
Austria (AT)	14.51	2	Peru (PE)	27.22	5
Luxembourg (LU)	14.69	2	Spain (ES)	27.39	5
United Arab Emirates (AE)	14.85	2	Brazil (BR)	28.35	5
Lithuania (LT)	15.07	2	Greece (GR)	29.33	5
Thailand (TH)	15.62	2	Switzerland (CH)	29.36	5
Hungary (HU)	15.74	3	Belgium (BE)	29.70	5
Latvia (LV)	15.74	2	France (FR)	30.97	5
Romania (RO)	15.79	3	Japan (JP)	30.98	5
Slovenia (SI)	16.01	3	Indonesia (ID)	32.20	5
United Kingdom (GB)	17.10	3	Australia (AU)	33.22	5
Chile (CL)	17.39	3	Israel (IL)	39.14	5
Turkey (TR)	18.83	3	India (IN)	44.41	5

Table 10: **Effective tax rate quintiles of the lender countries**

Quintile	Q_1	Q_2	Q_3	Q_4	Q_5
ETR (in %) – Q_z	[0-7.98]	[8.79-15.62]	[15.74-20.84]	[21.02-25.41]	[26.29-44.41]

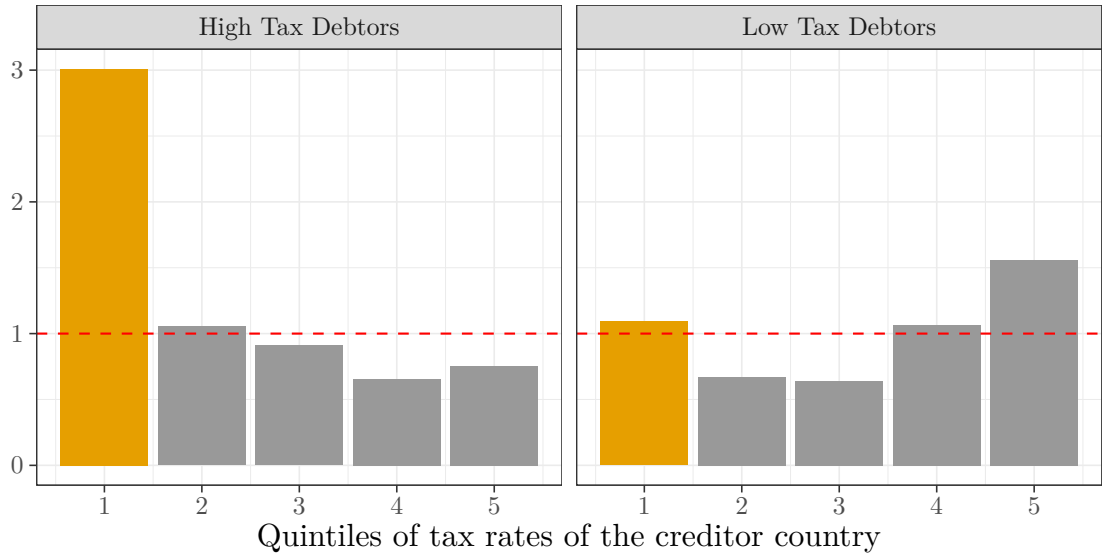
Note: This table report the range of ETR that characterized each of the quintile of corporate income tax rate we built.

Figure 14: **Ratio of the relative share of intra-group debt to the relative share of interbank debt, broken down by effective tax rate quintile of the lender countries**



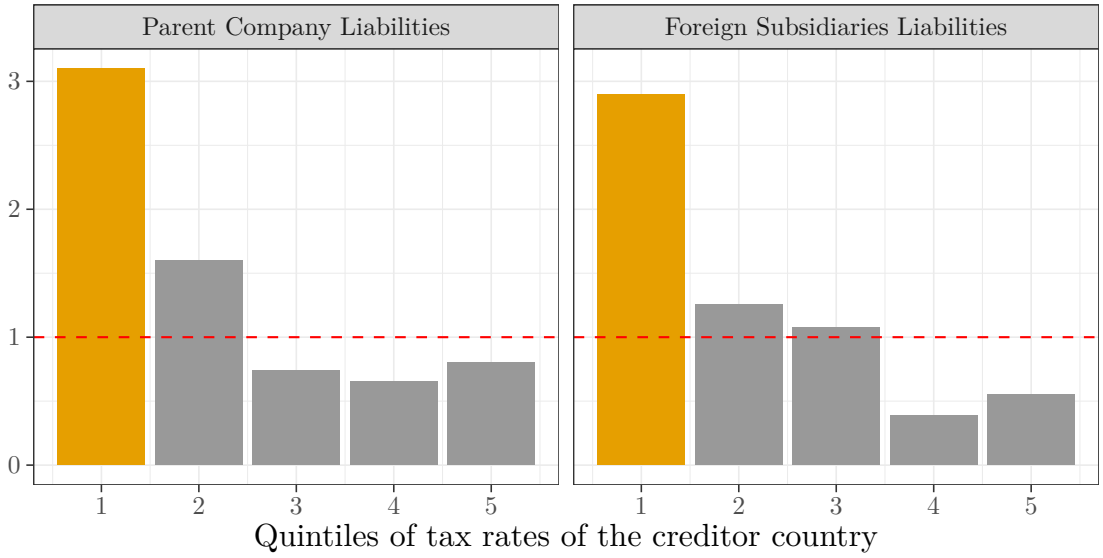
Note : Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its share in total intragroup debt to its share in total interbank debt. Lecture: Using STR, lender banks located in the countries with the lowest tax rates (Q1) hold relatively 3.9 times more intragroup assets than interbank assets.

Figure 15: **Ratio of of the relative share of intra-group debt to the relative share of interbank debt from high-tax borrower countries (left) and low-tax borrower countries (right) broken down by lender country effective tax rate quintile**



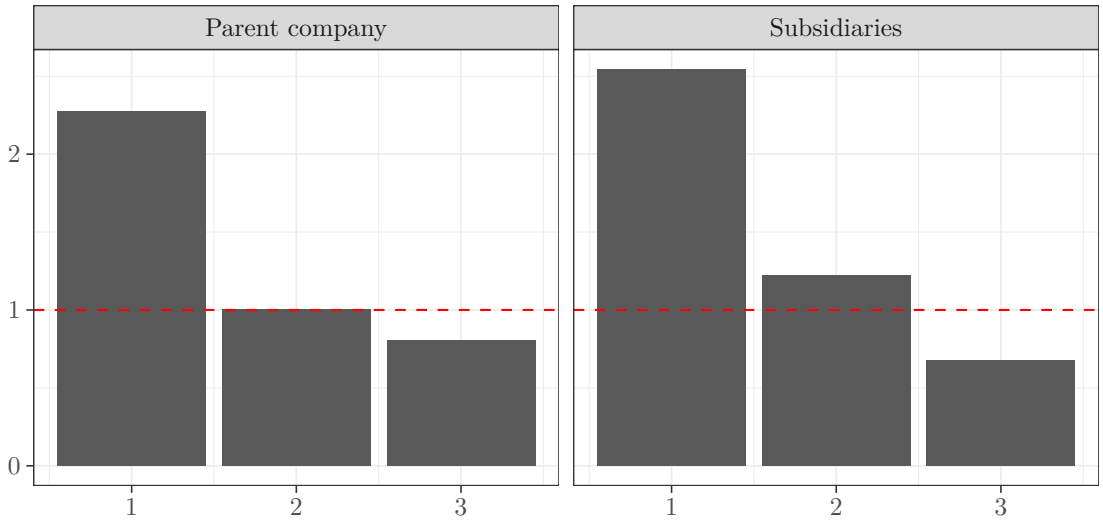
Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. Lecture: Using STR, lender banks that resides in country which tax rates in Q1 hold relatively 4.2 times more intragroup debt as they hold interbank debt.

Figure 16: **Ratio of the relative share of intra-group debt to the relative share of interbank debt of parent companies (left) and foreign subsidiaries (right) from high corporate tax rate borrower countries ($\mathbb{Q}_5$) broken down by lender country effective tax rate quintiles**



Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. On the left we present the ratio of debt issued by parents companies (or domestic subsidiaries); on the right, the ratio of debt issued by foreign subsidiaries to banks different from the country of incorporation (i.e., the parent country).

Figure 17: **Ratio of the relative share of intra-group debt to the relative share of interbank debt of parent company (left) and foreign subsidiaries (right) broken down by lender country effective tax rate terciles; European Union sample.**

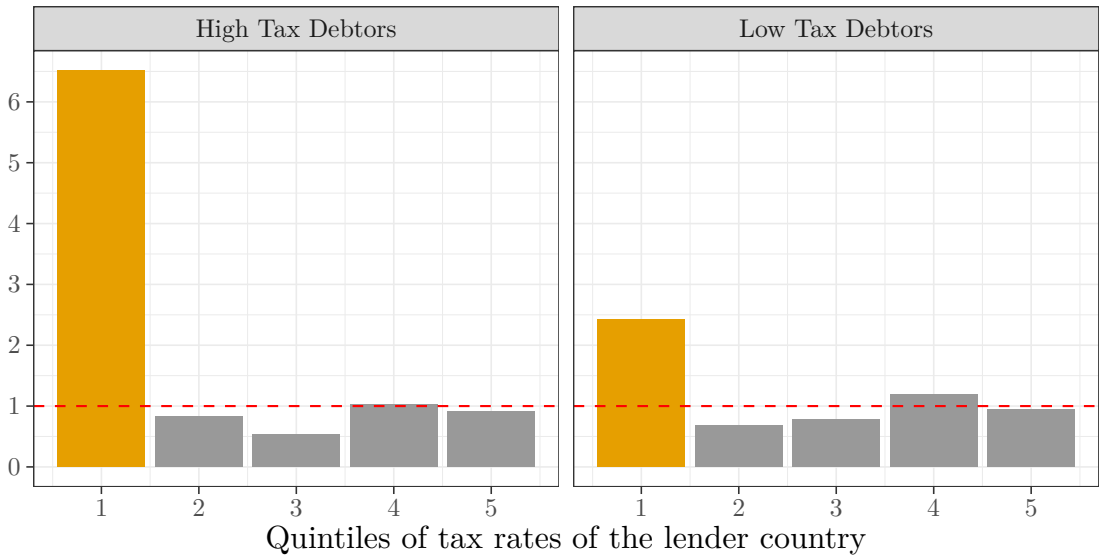


Note: Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its relative share in intra-group debt holding over its relative share in interbank debt holding. On the left we present the ratio of debt issued by parents companies (or domestic subsidiaries); on the right, the ratio of debt issued by foreign subsidiaries to banks different from the country of incorporation.

G Additional robustness checks

In this Appendix, we first replicate the Figures 6 and 7 but we now compare borrower countries in the first and second quintiles ($Q_1 \cup Q_2$) to borrower countries in the fourth and fifth quintiles ($Q_4 \cup Q_5$).

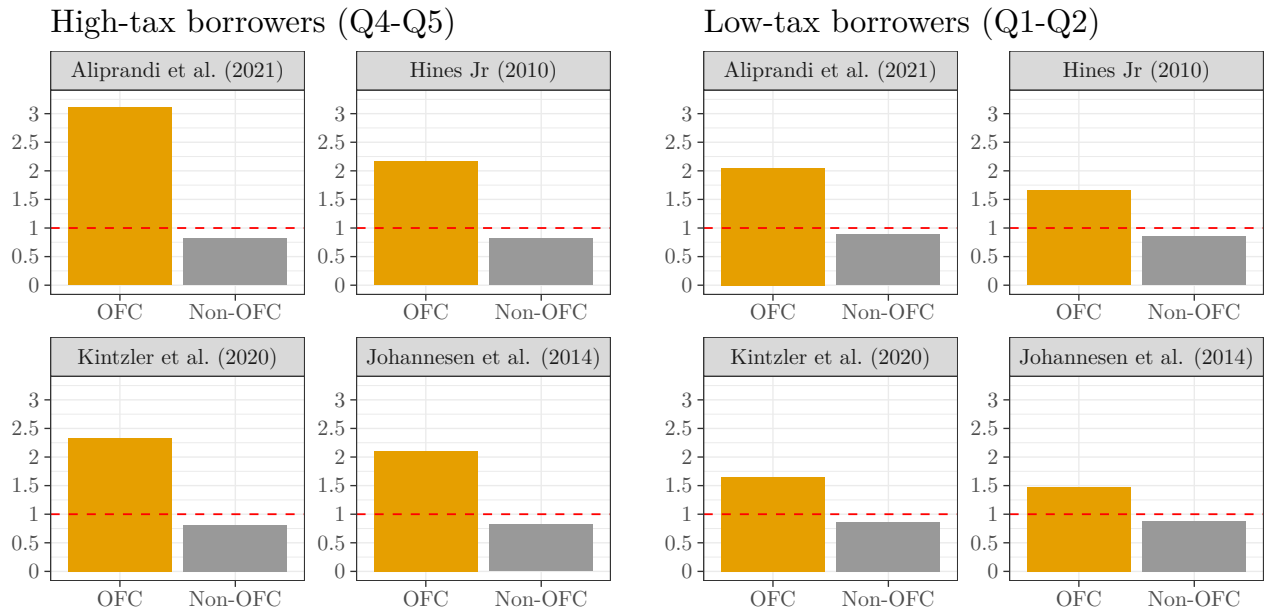
Figure 18: **Ratio of the relative share of intra-group debt to the relative share of interbank debt from high-tax debtors ($Q_4 \cup Q_5$) and low-tax debtors ($Q_1 \cup Q_2$) broken down by creditor country tax rate quintile**



Note : Weighted average between 2014-Q1 and 2020-Q2. Each bar represents for each quintile the ratio of its relative share in Intragroup debt holding over its relative share in interbank debt holding. Lecture : Lending banks that resides in country which tax rates in Q1 hold relatively 4.2 times more Intragroup debt as they hold interbank debt.

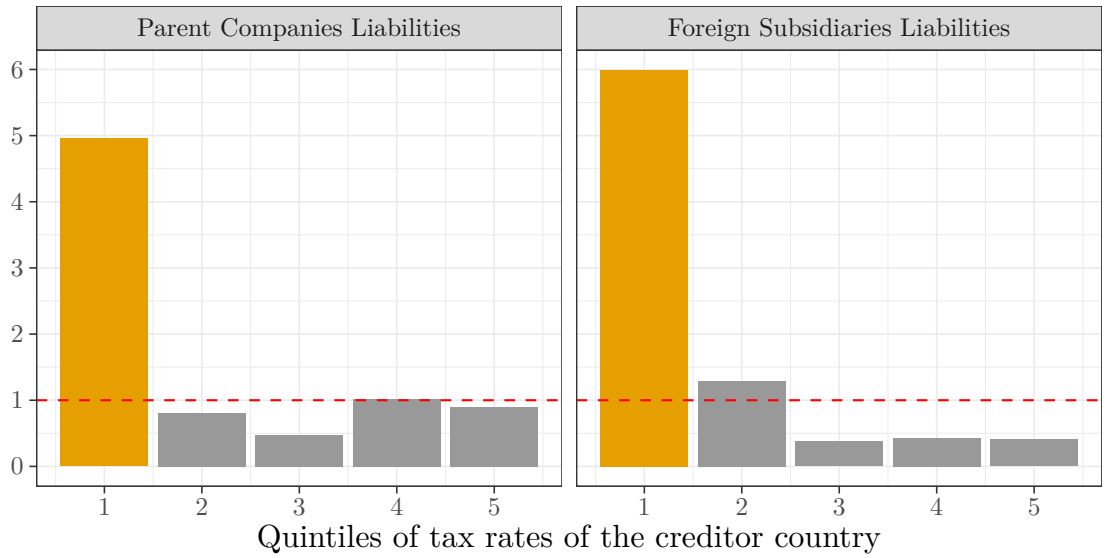
Finally, we conclude the Appendix by reproducing the Figures 5 and 8 but we now limit our sample to the 5 largest reporting/borrower countries: the United States (US), the United Kingdom (GB), France (FR), Spain (ES) and Italy (IT).

Figure 19: **Ratio of the relative share of intra-group debt to the relative share of interbank debt from high-tax debtors ($Q_4 \cup Q_5$) and low-tax debtors ($Q_1 \cup Q_2$) broken down by type of creditor country (non-OFC vs OFC)**



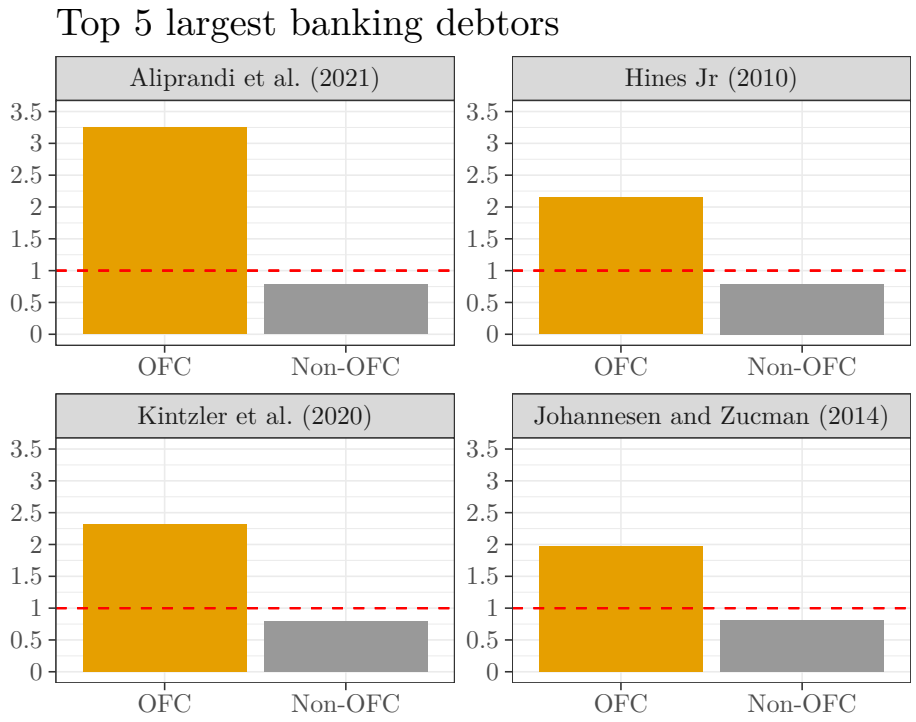
Note: Weighted average between 2014-Q1 and 2020-Q2. Each bar represents for each type of creditor country the ratio of its relative share in Intra-group debt holding over its relative share in interbank debt holding. The debtors are either high-tax countries (fourth and fifth quintile of tax rates, left) or low-tax countries (first and second quintile of tax rates, right). "OFC" countries are defined according to the lists from Aliprandi et al. (2021), Hines Jr (2010), Johannesen and Zucman (2014), Kintzler et al. (2020) Lecture: Lending banks located in OFC (using the Aliprandi list) hold relatively 3.25 times more Intra-group debt from high-tax countries as they hold interbank debt from high-tax countries.

Figure 20: **Ratio of the relative share of intra-group debt to the relative share of interbank debt of parent company (left) and foreign subsidiaries right) broken down by lending country tax rate quintile; top 5 largest reporting/borrower countries**



Note : Weighted average between 2014-Q1 and 2019-Q4. Each bar represents for each quintile the ratio of its share in total Intragroup debt holding over its share in total interbank debt holding. Borrowers located in the United-States, United Kingdom, France, Spain, Italy. Lecture: Using STR, lending banks that resides in country with the lowest tax rates (Q1) hold relatively 3.9 times more Intragroup assets as they hold interbank assets.

Figure 21: Ratio of the relative share of intra-group debt to the relative share of interbank debt broken down by OFC status of lender countries, top 5 largest borrowers.



Note: Weighted average between 2014-Q1 and 2020-Q4. Each bar represents for each type of creditor country the ratio of its relative share in Intra-group debt holding over its relative share in interbank debt holding. Borrowers located in the United-States, United Kingdom, France, Spain, Italy. "OFC" countries are defined according to the lists from Aliprandi et al. (2021), Hines Jr (2010), Johannesen and Zucman (2014), Kintzler et al. (2020) Lecture: Lending banks located in OFCs (using the Aliprandi list) hold relatively 3.25 times more Intra-group debt from high-tax countries as they hold interbank debt from high-tax countries.