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Private Firms and Offshore Finance ^{*}

Marcelo Ortiz [†]

Juan F. Imbet[‡]

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First Draft

Abstract

We study how offshore vehicles (OVs) in tax havens affect domestic investment and tax revenues among private firms. OVs encourage domestic investment by reducing the tax burden of OV users. The induced investment can potentially expand the taxable income, creating a trade-off that may counterbalance the direct tax base erosion traditionally associated with OVs. To test these hypotheses, we build and analyze a large data set of European private firms identified as OV users in offshore data leaks. Our findings suggest that OV users invest more and pay more taxes, and that these effects are stronger for standalone firms and for firms operating in intangible industries. For identification, we leverage the sequence of offshore data leaks in a staggered difference-in-difference approach. Our results indicate that OV users reduce investments post-leak while their tax payments remain relatively stable.

JEL Classification: H25, H26, F23

Keywords: Offshore Vehicles; Offshore Data Leaks; Tax Havens; Corporate Investment; Tax Avoidance.

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[†](Corresponding author) Universitat Pompeu Fabra, UPF-Barcelona School of Management, and Barcelona School of Economics; Email: marcelo.ortizm@upf.edu.

[‡]Paris Dauphine - PSL; Email: juan.imbet@dauphine.psl.eu.

1 INTRODUCTION

Tax havens enable firms to circumvent tax obligations in their domestic jurisdictions. Firms achieve this by either allocating capital and labor (e.g., forming subsidiaries, [Hines and Rice 1994](#)) or registering offshore vehicles (OVs) in tax havens. Compared to creating subsidiaries, establishing OVs in tax havens is less expensive and offers greater secrecy, which explains why offshore centers hold around ten percent of global GDP without conducting substantial business operations ([Alstadsæter, Johannesen, and Zucman, 2017](#)). The role of OVs in corporate tax avoidance gained public attention in 2008 during the Uglund House incident, when former U.S. President Barack Obama accused this house of being part of a tax evasion mechanism, given that it was the registered address for over 12,000 U.S. corporations in the Cayman Islands ([BBC, 2009](#); [The Guardian, 2016](#)). Legislative efforts from the OECD and G-20 nations have tried to reduce offshore tax abuses motivated by cases of large listed firms such as Apple, Meta, and Starbucks.¹ However, little is known about the prevalence of OVs among private firms. While their economic relevance and the potential consequences of their offshore involvement in domestic economies are acknowledged, their limited reporting requirements and the lack of granular data on offshore activity have hindered scholarly investigation. This paper aims to contribute to this discussion by building and studying an extensive database of European private firms identified as OV users by recent offshore data leaks.

Our main finding is that private OV users invest between 2.2 and 2.4 percent points (pp.) more and pay between 0.8 and 1.2 pp. more taxes than similar firms that are not linked to OVs. To guide our results, we develop a simple conceptual framework to analyze how OVs affect private firms' corporate investment and tax revenues. The framework features an entrepreneur deciding how much wealth to invest in a profitable project in her home country. The entrepreneur can transfer a fraction of the income generated to the OVs before declaring it to the tax authority. This fraction is moderated by the monitoring quality of the tax system, in the spirit of [Desai, Dyck, and Zingales \(2007\)](#) and [Bennedsen and Zeume \(2018\)](#). The framework predicts that OVs lead to stronger incentives for investment in the domestic economy. The intuition is that by enabling pre-tax profit shifting to a tax haven, OVs increase the fraction of investment profits received by the

¹For a recent report, see 2022 CRS Report prepared for members and committees of the U.S. Congress <https://sgp.fas.org/crs/misc/R40623.pdf>

entrepreneur. Regarding tax revenues, while OV's directly reduce taxable income, the positive effect on investment increases taxable income. This trade-off leads to an ambiguous prediction about the net effect of OV's on tax revenues.

A central obstacle in studying how firms employ OV's is the inherent difficulty in detecting these entities, as they are often designed to hide their owners behind several layers of shell legal entities. In addressing this, we follow and extend the data matching process in [O'Donovan, Wagner, and Zeume \(2019\)](#) by leveraging a sequence of offshore data leaks released by the Offshore Leaks Database of the International Consortium of Investigative Journalists (ICIJ). The data leaks encompass information on over 800,000 offshore entities, officials, and intermediaries associated with tax haven activities. The leaks, known as the Panama Papers (May 2016), Bahamas Papers (September 2017), Paradise Papers (late 2017 and early 2018), and Pandora Papers (late 2021 and early 2022), unveiled substantial amounts of data from various offshore service providers and law firms associated with tax havens.

To empirically evaluate our predictions, we run an extensive matching process between the ICIJ Offshore Leaks Database and Orbis Europe (Bureau van Dijk), a dataset containing financial, ownership, and managerial information from European firms. From the latter, we obtain the names of all private limited liability firms from the 12 largest economies, their subsidiaries worldwide, and their directors and top executives. From the ICIJ Offshore Leaks Database, we collect the names of entities, officers, intermediaries, and the registered addresses linked to OV's. We match both databases using a fuzzing string matching algorithm at the country level to identify firms, subsidiaries, or executives mentioned in the Panama, Bahamas, Paradise, and Pandora Papers. After manually confirming the matches, we identify 61,417 private firms as OV users, extending the analysis in [O'Donovan et al. \(2019\)](#), who pinpointed 338 public companies across 73 countries as OV users according to the Panama Papers. Naturally, the prevalence of OV users among private firms is significantly larger. This underscores the importance of deepening our understanding of the role and impact of offshore financial centers in the economy beyond public firms. Focusing on private firms also reduces concerns regarding investment decisions affected by agency conflicts ([Bennedsen and Zeume, 2018](#)).

We start the empirical analyses by describing our sample of OV users. They are mainly concentrated in the Services and Finance industry, representing almost 60 percent of the sample.

Many OV users in these industries are linked to wealth management, legal, tax, and consultancy services. Although the role of these local firms in the offshore industry deserves scholarly attention, we exclude them from the empirical analyses as their investment decisions might not be driven by the same theoretical factors we propose. This exclusion reduced the sample of OV users to 24,082 private firms. The next industries with the largest prevalence of OV users are Construction, Manufacturing, Retail, and Wholesale Trade, representing around 33 percent of the sample. Industries like Mining, Transportation, and Utilities have the fewest OV users. Regarding firm size, we find that the average OV user is relatively small (82 million euros in assets). Interestingly, most OV firms in our sample of private firms do not have subsidiaries in Orbis' records, and just 22 percent of them are multinationals.

We then compare the sample of OV users with the rest of the firms in Orbis Europe with basic financial data between 2007 and 2020. Given the limited reporting requirements for small private firms in Europe, we only found 6,518 OV users with all the accounting data needed to pursue the comparison. We find that OV users invest more (measured as annual growth in fixed assets), pay more taxes, and are relatively larger and more profitable.

Next, we move to evaluate the predictions. As OV users are not distributed randomly across industries and business characteristics, we implement three sampling strategies to select the control group. First, we follow the economic literature working with large census and survey data (i.e., [Davis et al. 2014](#)) and match each OV user to other firms in the same country-industry that are comparable in terms of size, leverage, and growth opportunities that we proxy using sales growth. Second, we select control firms using Propensity Score Matching (PSM), identifying the five nearest neighbors for each OV user with replacements while controlling for size, leverage, growth opportunities, and country and industry fixed effects. Lastly, we follow [Barroso et al. \(2023\)](#) and [Christensen et al. \(2017\)](#) and run a Coarsened Exact Matching (CEM) process in a random subsample, comparing each OV user to a single control firm based on the same financial characteristics as the previous methods but creating strata with coarsened covariate distributions, keeping only cases that ensure perfect match at the country and industry levels.

We start by comparing investments between 2007 and 2015. We started our sample period in 2007 because this year Orbis Europe significantly increased the coverage of financial variables among small private firms ([Ortiz et al., 2023](#)). We ended the sample period in 2015, before the first offshore

data leak in our analysis (the Panama Paper), as the public exposure after the leak might have affected their corporate decisions. We find that OV users invest more than similar control firms. This result holds after controlling for firm size, leverage, growth opportunities, and profitability. Regarding the economic magnitude, we find that OV users invest between 2.2 and 2.4 percent points (pp.) more than similar firms, depending on the sampling method. When looking at tax revenues, measured as the logarithm of tax payment, we find that OV users pay between 0.8 and 1.2 pp. more than similar firms.

We run a battery of cross-sectional analyses to understand our results further. First, we assert that companies with significant intangible assets, such as trademarks and patents, are uniquely positioned to leverage tax advantages. This is because these assets are easily moved abroad and present regulatory monitoring complexities (Grubert, 2003; OECD, 2022). By strategically allocating these intangible assets to offshore vehicles and then paying royalties for their domestic use, firms can effectively reduce their taxable income at home while channeling profits to regions with lower tax rates. Given data limitations on intangible assets of private firms, we compute two industry-based intangible asset indicators: the average intangible assets ratio and the mean patent application per firm. These indicators, aggregated over firms and periods, offer a measure of the use of intangible assets in the industry, absent from country-specific technological biases. Our analysis indicates that while intangible assets boost corporate investment among OV users, they do not significantly alter their tax revenues.

Second, we evaluate whether multinational firms drive our results. Extensive research shows how such companies strategically deploy internal debt and assets across foreign subsidiaries to mitigate domestic taxable income (Buettner and Wamser, 2013; Dischinger and Riedel, 2011). Although our theoretical framework predicts a positive effect of OVs on investment based on a firm with a simple structure, the capital allocation perspective on multinationals suggests a stronger impact for firms operating in multiple jurisdictions. However, consistent with our theoretical assumptions, the results document more pronounced effects on investment and tax revenue among standalone firms.

Third, we study the potential for managerial expropriation through the use of offshore vehicles, a concern substantiated by prior research (Durnev et al., 2016; Desai et al., 2007; Bennedsen and Zeume, 2018; O'Donovan et al., 2019). The likelihood of such expropriation is mitigated in controlled firms (Shleifer and Vishny, 1986). Therefore, we expect the positive effect on investment and tax

revenues to be stronger for controlled OV users than noncontrolled OV users. Utilizing ownership data from Orbis Europe, we defined a firm as controlled if an individual or group holds 50 percent or more ownership. Our empirical analysis yields results that challenge the expropriation hypothesis in our setting. We find no significant investment differences between controlled and noncontrolled OV users and observe that controlled OV users actually pay fewer taxes.

Although our findings are consistent with our theoretical predictions, they might be driven by some unobservable factors that are not controlled by our sample-matching methods. To reduce this concern, we use the sequence of offshore data leaks as exogenous shocks that reduce the OV users' capacity to benefit from their offshore activity. Several tax and financial authorities announced further investigations into nationals involved in offshore activities (see [The New York Times \(2016\)](#), [BBC \(2018\)](#), and [Forbes \(2018\)](#)). Furthermore, many regulators announced new tax and transparency regulations after the offshore leaks, increasing the threat of discovery and discouraging the use of offshore vehicles ([O'Donovan et al., 2019](#)). We use the leaks as a staggered difference-in-difference design, comparing OV users with similar firms before and after the data leaks. Our findings indicate that OV users exposed to a data leak experience a significant reduction in investment, which suggests that an increase in tax monitoring curbed the investment incentive. Interestingly, we do not find robust evidence of OV users reducing their tax payments after the leak. We interpret this result as suggestive that OV users keep the level of tax expenses given the increase in public scrutiny.

We contribute to the literature on tax havens and domestic investment, which mainly focuses on optimizing both capital allocation and profit-shifting strategies by multinational firms. [Grubert and Slemrod \(1998\)](#) developed a model that explored how profit shifting to low-tax jurisdictions encourages investment in those jurisdictions. Building on this work, [Suárez Serrato \(2019\)](#) extended the model to investigate the consequences of eliminating firms' access to tax havens on domestic investment. Based on a sample of U.S. multinationals with subsidiaries in Puerto Rico, he finds that firms responded to a policy restricting the tax haven benefits by reducing domestic investment. Our contribution to this literature is twofold. First, our analysis does not rely on offshore entities having relevant business activity or capital needs. Second, we uncover the large prevalence of offshore activity by small private firms and document a positive association between OVs and domestic investment and revenues, an effect that is reduced or muted after offshore data leaks. In this sense,

our findings echo [Suárez Serrato \(2019\)](#) by documenting a positive effect of tax havens on the domestic economy, a result that disappears when firms cannot shift profit abroad.

Second, we build literature on offshore finance and corporate governance. [Bennedsen and Zeume \(2018\)](#) study the role of bilateral tax information exchange agreements (TIEAs) on firm value, finding that higher transparency improves the valuations of firms with subsidiaries affected by the agreements. They conclude that their findings are consistent with offshore finance used to expropriate minority shareholders. Closer to our paper, [O'Donovan et al. \(2019\)](#) study the impact of the Panama Papers on stock valuation, finding that the data leak reduced stock price. Consistent with the leak reducing expected agency costs, the value reduction is weaker among poorly governed firms. We respond to recent calls to research offshore activities ([Wagner and Zeume, 2023](#)) by focusing on the offshore activities of private firms. Besides the relevance of private firms for the economy, this setup enables focusing on a setting where agency conflicts are less severe. Furthermore, we document OV users invest more than similar firms, an effect that is muted after the leaks. Our findings, thus, provide a complementary explanation for the leak-driven stock-price reduction documented by [O'Donovan et al. \(2019\)](#).

Finally, we also connect to the literature on offshore finance and tax avoidance. [Li and Ma \(2022\)](#) document that tax information agreements reduce tax avoidance by U.S. multinationals with subsidiaries in tax havens. [Brown et al. \(2019\)](#) study the role of mandatory country-by-country reporting on the European banking industry. They find a positive association between tax havens utilization and geographic segment aggregation, consistent with tax havens being linked to tax avoidance. While we explicitly recognize the direct negative effect of OVs on taxable income, we uncover a (simple) indirect positive effect on investment that can ultimately expand the tax base. Our findings are consistent with this trade-off and highlight the need for a better understanding of the net effect of tax havens on domestic tax revenues.

This paper continues as follows. Section 2 develops the theoretical framework. Section 3 explains the data assembling process and describes the sample of identified OV users. Sections 4 and 5 present our main results and cross-sectional analyses. Section 6 tests whether the offshore data leaks had a real effect. Finally, Section 7 concludes.

2 THEORETICAL FRAMEWORK

To examine the relationship between offshore vehicles, corporate investment, and tax revenues, we incorporate in a simple investment model some of the tax systems features developed by [Desai et al. \(2007\)](#) and [Bennedsen and Zeume \(2018\)](#).

2.1 CORPORATE INVESTMENT AND INCOME TAX

We consider an entrepreneur with personal wealth W of 1. She has access to a production technology $F(K) = aK^\alpha$ in her home country and decides how much wealth to invest into this technology ($K \leq W \equiv 1$). The remaining wealth is consumed in non-durable goods ($C = 1 - K$). The corporate income tax rate in the home country is τ .

For simplicity, we assume that the entrepreneur has a linear utility and the discount rate equals zero. In this setting, the entrepreneur is interested in maximizing her utility function, which depends on her investment choice: $U(K) = (1 - \tau) aK^\alpha + 1 - K$. Hence, the optimal investment level is

$$K_{home}^* = [(1 - \tau) a\alpha]^{\frac{1}{1-\alpha}} \quad (1)$$

2.2 THE EFFECT OF SECRET OFFSHORE VEHICLES IN TAX HAVENS

We now add an offshore vehicle to this simple model. The entrepreneur can establish an OV to shift a fraction φ of the pre-tax income to a tax haven where the corporate tax rate is zero, reducing the residual taxable income in her home country. Tax regulations and the enforcement capacity of tax authorities limit the feasible shift of pre-tax income to the OV, thus setting an upper bound $\bar{\varphi} \in [0, 1]$. The fixed cost of establishing the OV is γ ([Bennedsen and Zeume, 2018](#)). Once the OV is registered and operative, transferring a marginal dollar is costless, so the entrepreneur transfers the maximum income feasible ($\varphi = \bar{\varphi}$).

The entrepreneur optimizes her utility function by choosing how much wealth to invest:

$$U(K) = (1 - \tau) (1 - \bar{\varphi}) aK^\alpha + \bar{\varphi} aK^\alpha + 1 - K - \gamma$$

The first term is the after-tax income of the fraction of income left in the home country. The

second term is the fraction of the pre-tax income transferred to the OV. The last terms are the remaining consumption and the cost of establishing the offshore vehicle. In this case, the optimal investment is

$$K_{th}^* = ([1 - \tau + \bar{\varphi}\tau] a\alpha)^{\frac{1}{1-\alpha}} \quad (2)$$

When $\bar{\varphi} = 0$, Eq. (2) equals Eq. (1), but for any $\bar{\varphi} \in (0, 1]$, $K_{th}^* > K_{home}^*$. This leads us to the following prediction.

Prediction 1. Ceteris paribus, OV users invest more in their domestic economy than similar firms.

We can use Eq. (2) to evaluate OV users' investment in different tax regimes. For example, as the feasible offshore transfer $\bar{\varphi}$ increases (i.e., a reduction in tax monitoring capacity), the incentive for investing in the home country also increases as this extends the transferable pre-tax income. For a given level of feasible transfer, this positive effect on investment is less pronounced when τ is high. Figure (1a) describes this result graphically. Investment increases with weaker tax monitoring, and this effect is marginally more pronounced in regimes with high tax rates.

The effect of offshore finance on investment has been analyzed before. [Grubert and Slemrod \(1998\)](#) model a U.S multinational firm optimizing capital allocation and profit-shifting to low tax jurisdiction. They conclude that profit shifting is important for increasing investment in low-tax jurisdictions. More recently and closer to our analysis, [Suárez Serrato \(2019\)](#) extends the model of [Grubert and Slemrod \(1998\)](#) to analyze investment in the home country, concluding that investment in low tax jurisdiction reduces the tax-adjusted cost of capital of the multinational, spurring domestic investment. While we reach a similar conclusion regarding the positive effect on domestic investment, our theoretical framework does not require the firms to allocate capital or labor in tax havens.

Next, we analyze tax revenues in the home country. In our simple framework, larger investments result in larger profits. However, given the option to secretly shift part of the pre-tax income to the OV in the tax haven, the manager will optimally shift as much as feasible to avoid corporate tax in the home country. So, what is the net effect of the tax revenues in the home country? Tax revenues are given by

$$TR_{th} = \tau (1 - \bar{\varphi}) a [K_{th}^*]^\alpha \quad (3)$$

For a given production technology (a, α) , we can use Eq. (3) to describe how the tax system $(\tau, \bar{\varphi})$ shapes tax revenues. We analyze Eq. (3) relative to the tax revenue for the case without offshore finance, TR_{home} , which depends on K_{home}^* and sets $\bar{\varphi} = 0$, by deriving the ratio of optimal tax revenues

$$\frac{TR_{th}}{TR_{home}} = (1 - \bar{\varphi}) \left[\frac{1 - \tau + \bar{\varphi}\tau}{1 - \tau} \right]^{\frac{\alpha}{1-\alpha}} \quad (4)$$

When $\bar{\varphi} = 0$, Eq. (4) equals to one, meaning that both types of firms pay the same taxes. To understand the behavior of Eq. (4) when $\bar{\varphi} > 0$, Figure (1b) plots the ratio of tax revenues a function of $\bar{\varphi}$ and τ . OV users pay fewer taxes in regimes characterized by low tax rates. As tax increases, the positive effect of OVs in investment increases, generating more tax revenues. However, the negative effect of profit shifting becomes stronger in regimes where the owner can extract a larger fraction of the project's pre-tax income, turning revenues down to zero as $\bar{\varphi}$ gets closer to one.

Although the common conception is that tax havens deplete the taxable base in their domestic economy, Figure (1b) shows that this relation is strongly shaped by the feasibility of secretly shifting income abroad to avoid local taxes. Indeed, the effect of OVs on tax revenues depends on a trade-off: on the one hand, OV structures spur investment; on the other hand, part of the income generated by the investment will be transferred abroad untaxed. Thus, the net effect on tax revenues remains an empirical question.

Our framework features a single owner, so it does not account for using offshore vehicles to expropriate minority shareholders. See [Bennedsen and Zeume \(2018\)](#) and [O'Donovan et al. \(2019\)](#) for a study of the effect of offshore vehicles on shareholders' conflicts. As such, our framework is more appropriate for characterizing firms where conflicts among insiders and minority shareholders are less severe. Accordingly, the empirical analysis is based on a sample of private firms. Second, the state can impact the owners' incentives for using offshore vehicles from many channels besides corporate taxation, such as inheritance law ([Ortiz et al., 2021](#); [Ortiz M., 2023](#)), nationalization ([Desai et al., 2007](#)), and financial reporting ([Brown et al., 2019](#)). The incorporation of the first two channels is equivalent to a higher tax rate τ , while financial transparency regulation can be

incorporated as a lower feasible transference $\bar{\varphi}$.

3 DATA AND METHODOLOGY

3.1 ICIJ OFFSHORE DATA LEAKS

We rely on the ICIJ Offshore Data Leaks to identify firms with offshore vehicles ([Wagner and Zeume, 2023](#)). This data contain information on more than 800,000 offshore entities in several tax havens. The series of large leaks began with the Panama Papers in May 2016, revealing over 214,000 offshore entities associated with Mossack Fonseca ([O'Donovan et al., 2019](#)). This was followed by the Bahamas Leaks in September 2017, which contained information on more than 175,000 offshore entities registered in the Bahamas. The Paradise Papers were then released between late 2017 and early 2018, containing data from Appleby (an offshore legal advice firm) and seven corporate registries. The series culminated with the Pandora Papers in late 2021 and early 2022, which remains the largest leak, encompassing 2.94 terabytes of data from ten offshore service providers.

3.2 ICIJ-ORBIS MATCHING PROCESS

Figure (2) illustrates the matching process. We use the commercial database Orbis Europe to obtain information on all private firms from the 12 European countries with the largest economies.² In particular, we collected the names of companies, worldwide subsidiaries, directors, and top executives as of 2013, three years before the first large leaks (the Panama Papers). We obtained 6.5 million firm entries, 2.3 million subsidiaries entries, and 21 million directors and executives entries (see Data Appendix). We collect from the ICIJ Offshore Leaks Database the names and linked countries of offshore entities, their registered officers, and intermediaries. In total, we obtained around 80 thousand entries from ICIJ.

Similar to [O'Donovan et al. \(2019\)](#), we use fuzzy string-matching methods to identify connections between both databases. However, given the large scale of Orbis Europe, we run the fuzzy-matching process at the country level, e.g., we compare all the entities' names linked to Spain in the ICIJ's database with the name of all private firms and subsidiaries (and their directors and top executives)

²These countries are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden, and the United Kingdom.

registered in Spain. We then manually confirmed the matches, finding 61,417 private firms as OV users. In the Data Appendix, we provide further details about the manual matching process and report a battery of descriptions of the matched sample. First, we document that the fraction of OV users relative to the number of firms in the country is largely focused on the United Kingdom (0.52%), followed by Italy (0.22%) and Ireland (0.20%). Spain and Finland have the lowest fraction of OV users (0.1% in both cases). We also report that most of the OV users are detected from the Paradise Papers and the Panama Papers, representing 65.9% and 23.8% of the sample, respectively.

As an example of the output of the matching process, Figure (3) depicts a snapshot from the ICIJ Offshore Data Leaks' website of a company detected as an OV user. It presents information about an entity named MCG Energy Sociedad Limitada, along with its two officers, the registered address in Barbados, and the connections to Spain. The address in Barbados, the Chancery House, is shared by 102 other entities as per ICIJ records. Furthermore, the Spanish address aligns with that of another Spanish firm with an identical name as per Orbis Europe's records. Interestingly, the company's directors have the same name as the OV officers in Barbados. As of 2015, Orbis Europe's data indicates that the company specializes in building energy facilities, has assets of 1.5 million USD, and operates two subsidiaries within Spain.

We describe the sample of OV users in Table (1). Table (1) documents a large prevalence of private firms linked to OVs in the Finance and Service industries, representing 61 percent of the sample. A deep look into their business description via their websites and Orbis reveals that many of these firms work on wealth management, legal and tax services, and consultancy. Thus, rather than being the final users of offshore vehicles, they likely are part of or contribute to the offshore industry in their home countries. For this reason, we excluded both industries from the rest of the analyses, leaving a sample of 24,082 OV users. The next most prevalent industries are Construction (12.78 %), Manufacturing (8.71 %), Retail Trade (6.74 %), and Wholesale Trade (5.36 %). Other industries, such as Mining and Transportation, present less than 5 percent individually of the sample and 5.61 percent collectively. In terms of firm size, we find that the average OV firm in the Mining industry has 766.07 million euros in assets, followed by the average OV firm in the Finance and Transportation industries, with 291.28 and 95.33 million in assets, respectively. Interestingly, 77 percent of the sample of OV users is a standalone firm (i.e., with no subsidiaries), and 22 percent

have subsidiaries in other countries.³ Overall, private firms using offshore vehicles seem to be smaller and largely focalized in their home country, as opposed to large multinationals shifting profits across subsidiaries (Hines and Rice, 1994; Alexander et al., 2020).

Next, we describe OV users relative to the rest of the firms in Orbis Europe. For the comparison group, we restrict our attention to firms operating in the same country-industry as OV users and having enough accounting data. Given computational restrictions, we limit the comparison group to firms with assets larger than 100,000 euros. In the case of OV users, we found only 6,158 firms with enough accounting data. Table (2) reports the results. Relative to other firms, OV users invest more and pay more taxes. They are also larger and hold less debt.

3.3 EMPIRICAL DESIGN

We start our empirical analyses by comparing OV users' investment and tax revenues with similar firms by estimating the following equation:

$$Y_{j,c,t} = \beta \times \text{OV user}_{j,c} + \gamma \times X_{j,c,t} + \phi_{c,i} + \nu_t + \epsilon_{j,c,t} \quad (5)$$

Where j , c , i , and t indexes for firm, country, industry, and year, respectively. Y is either investment (defined as the annual growth of fixed assets) or tax revenues (computed as the logarithm of tax revenues, as Desai et al. (2007)). $\text{OV User}_{j,c}$ is a dummy variable identifying OV users. $X_{j,c,t}$ is a set of control variables that are linked to investment and tax revenues, such as leverage (long-term debt over total assets), a proxy for growth opportunities (annual sales growth), cash flows (cash flows over assets), and ROA (EBITDA over total assets). We also absorb the effects of different tax regulations (across countries and industries) and economic shocks by including country-industry and year fixed effects. Finally, we cluster the standard errors at the country level.

3.3.1 SUBSAMPLE ANALYSES

To evaluate the role of offshore vehicles in corporate investment, we need to identify suitable control firms because the distribution of OV users, as seen in Table (1), is not random. Thus, although Eq.(5) includes firm-level determinants of investment and revenues, other unobserved factors might

³In our sample, 2 percent of the firms have a subsidiary in an OECD tax haven list (OECD, 2000; Dharmapala and Hines, 2006)

drive the results. We attempt to reduce this concern by employing three distinct sampling strategies to identify firms similar to the OV users. The three methods identify similar firms in a sample of country-industry peers based on accounting data in Orbis Europe.

The first sampling strategy, called Cells Matching, follows the methodology of [Davis et al. \(2014\)](#). Taking advantage of the extensive coverage of firms in Orbis Europe, we select similar firms based on the full set of interactions among the country, industry, and financial characteristics of the OV firms. We sort firms into cells defined by the cross-product of these dimensions and identify the firms that fall into the same cell as a given OV user, treating them as the control group. Specifically, we consider the interaction of 12 countries, 49 two-digit industries, and the decile groups of firm size, leverage, and sales growth. This results in over 170,000 control cells.

The second sampling strategy utilizes Propensity Score Matching (PSM) to select the control sample. We choose the five nearest neighbors with replacements for each OV user, ensuring that both groups are comparable in terms of the same financial characteristics as the Cells Matching (firm size, leverage, and sales growth). Additionally, we incorporate country and industry fixed effects into our score calculation to further control for potential confounding factors at these levels.

The third approach employs the Coarsened Exact Matching (CEM) method, as demonstrated in recent applications by [Christensen et al. \(2017\)](#) and [Barroso et al. \(2023\)](#). The CEM method categorizes the firms into unique strata, which we defined based on the same financial characteristics as in the Cells Matching. Subsequently, weights are assigned to the control group to achieve a proportional representation in each stratum aligned with the OV firms group. If a stratum does not have both a treatment (e.g., an OV user) and control observation, it is removed for a fair comparison. To create the strata, we coarsen firm size, leverage, and sales growth into ten equally spaced cutpoints while ensuring a perfect match at the country and industry levels. Given the extensive computational requirement of this method in large samples, we run the method under a random subsample (n=500,000).

An important caveat in our empirical design is that we cannot identify firms connected to offshore vehicles by individuals not reported in Orbis Europe (such as family members or lower-level managers) or offshore data leaks. However, this caveat undermines our ability to uncover both groups' statistical differences. This is because OV users who remain undetected will become part of the control group.

4 MAIN RESULTS

To compare the level of investment of OV users, we estimate Eq.(5) between 2007 and 2015 (before the first leak). The results reported in Table (3) show that OV users invest more than similar firms. In Model 1, based on the Cells Matching, we find that OV users invest 2.2 percent more than similar firms after controlling for firm size, leverage, sales growth, profitability, and cash flows. Similarly, Model 2, based on the PSM method, suggests that OV users invest 2.2 percent more. Finally, we obtain similar results in Model 3, which selects control firms using the CEM method, and reports that OV users invest 2.4 percent more. Overall, the results in Table (3) are stable in terms of economic magnitude, regardless of the different sampling methods and resulting sample size.

Table (4) evaluates the relationship between tax revenues and offshore vehicles. As discussed above, theoretical predictions are ambiguous as OVs can spur tax revenues by encouraging investment as well as deplete the taxable base by shifting pre-tax profits abroad. Results in Table (4) indicate that the first effect dominates. OV users pay more taxes than similar firms, an effect ranging between 12.2 and 8.8 percent, according to Models 1 and 3, respectively.

5 CROSS-SECTIONAL ANALYSES

Next, we run additional analyses to understand our results better. In particular, we evaluate whether the positive effects of OVs on investment and tax revenues are affected by cross-sectional variations in the use of intangible assets, the multinational status, and agency conflicts.

5.1 INTANGIBLE ASSETS

Intangible assets, like trademarks, databases, and patents, constitute a major source of profit-shifting opportunities across countries. The portability of intangibles offers firms the flexibility to move these assets across borders without major logistical constraints (Grubert, 2003). Furthermore, evaluating transfer prices for intangible assets is particularly challenging for tax regulators (OECD, 2022). Firms that rely heavily on intangible assets are uniquely positioned to exploit them for tax advantages due to the inherent nature of these assets and the gaps in international tax policy (Dischinger and Riedel, 2011). We expect the association between OV users and investment to be

stronger for firms that rely more on intangible assets.

Due to limited information about intangible assets in our private firm setting, we use industry-wide measures of intangible use. We measure the industry's average intangible assets ratio and the average number of patent applications per firm in the industry using data from the European Patent Office (obtained through Orbis) (Breuer et al., 2019). In both cases, we pool firms across countries and years to capture the intrinsic use of intangible assets for business operations in the industry. Thus, the country's technological specialization or technological shocks should not affect the proxies.

We examine the impact of intangible assets in Table (5). We add to equation (5) the interaction term between the intangible assets proxies and the *OV user* dummy. The direct effects of the intangible assets proxies are excluded from the estimation as equation (5) includes country-industry fixed effects. Columns 1 (2) assess the effect on investment (tax revenues) using the intangible assets ratios. The positive effect on investment increases with the intangible assets ratios, but this doesn't translate into more tax revenues. Columns 3 and 4 use industry patent applications as a proxy for intangible assets but fail to find significant estimates for the interaction terms.

5.2 MULTINATIONAL FIRMS

Our theoretical framework analyzes a firm with a simple organizational structure that leverages OVs to shift profits to tax havens. This approach markedly contrasts with models rooted in capital allocation across large multinationals. Specifically, multinational firms—companies operating multiple subsidiaries across different jurisdictions—possess a significant propensity to utilize legal and financial instruments that enable tax avoidance (Desai, 2009; Desai et al., 2004). Indeed, numerous studies demonstrate how multinational firms deploy internal debt and assets opportunistically across subsidiaries in foreign countries to reduce taxable income in their home country (Buettner and Wamser, 2013; Dischinger and Riedel, 2011). Consequently, while our theoretical setting is silent about the business structure, the capital allocation view indicates that the effect is more pronounced in multinational firms, as they are more equipped to reduce taxable income. Therefore, it is important to disentangle whether multinational firms drive our results.

We source subsidiary data from Orbis Europe and distinguish firms without subsidiaries (*Standalone*) by employing a dummy variable. This variable and its interaction with *OV user* are incorporated into equation (5). As delineated in Table (6), our findings suggest a pronounced

positive influence of offshore vehicles on investment, specifically among standalone firms (column 1). Similarly, the impact on tax revenues is more salient for standalone firms (column 2). Next, to directly test the capital allocation perspective, we classify multinational firms using a dummy variable that denotes firms with a minimum of one international subsidiary (*Multinational*). The results, reported in columns 3 and 4, reveal that multinationals employing OV users tend to invest less and pay fewer taxes domestically. Although this observation aligns with the notion that multinationals are better equipped for tax avoidance, it does not conform to our mechanism.

5.3 AGENCY CONFLICTS

Using offshore entities can facilitate managers' misappropriation of company assets to the detriment of shareholders. Studies by [Durnev et al. \(2016\)](#), [Desai et al. \(2007\)](#), and [Bennedsen and Zeume \(2018\)](#) offer comprehensive data supporting this claim. The underlying mechanism is that managers with significant control can siphon off some funds moved to tax havens for personal gain. The extent of this misappropriation is inversely related to the incentives for monitoring among shareholders. Therefore, this expropriation motivation for offshore activity should be reduced when shareholders have stronger monitoring incentives, such as controlling owners ([Shleifer and Vishny, 1986](#)). In our case, this implies that managers of controlled OV users have fewer chances to use offshore vehicles for personal benefit (relative to those of noncontrolled OV users), fostering the positive effect on investments and tax revenues.

We test the role of expropriation by collecting ownership information from Orbis Europe. We defined a firm as controlled if its global ultimate owner is an individual or group of individuals holding 50 percent or more of the ownership. We add to equation (5) the interaction term between the *OV user* dummy and a dummy variable identifying controlled firms. The results reported in Table (7) are inconsistent with the expropriation motivation. In column 1, we find that controlled OV users do not invest significantly more than other OV users. In column 2, we find that controlled OV users pay less taxes than other OV users.

6 THE REAL EFFECT OF OFFSHORE DATA LEAKS

We implement an alternative empirical strategy to check the robustness of our findings that OV users have higher levels of investment and tax revenues. We exploit the sequence of ICIJ leaks as a staggered difference-in-difference design. This allows us to evaluate how corporate investment and tax revenues behave around multiple offshore data leaks and compare this behavior between OV users and similar firms. Relative to tax reforms, the data leaks provide a natural setting to isolate the effect of increased tax monitoring from variation in other tax system characteristics (e.g., tax rates and tax base) (Alexander et al., 2020).

We estimate the following regression:

$$Y_{j,c,t} = \beta_1 Post_{k,t} + \beta_2 OV\ user_{j,c} + \beta_3 Post_{i,t} \times OV\ user_{j,c} + \gamma \times X_{j,c,t} + \phi_{c,i} + \nu_t \quad (6)$$

where $Y_{i,t}$ is again corporate investment and tax revenues. $Post_{k,t}$ is a dummy variable identifying the years after the offshore data leak k where the OV user j was exposed publicly. As we use several leaks (Panama, Bahamas, Paradise, and Pandora Papers), we can include year fixed effects to absorb trends in investment opportunities. As firms are exposed to the treatment effect (i.e., a lower feasible transfer) in different years, Eq. (6) represents a staggered diff-in-diff where the treatment is exogenously distributed across countries and years, reducing typical concerns of single-event studies. To avoid comparing later treated with early untreated firms, we use data between 2014-2020, keeping fixed the control group as of 2014. As the Pandora Papers were released in 2022 and our sample finishes in 2020, these OV users represent never-treated observations in the sample.

We report the results on corporate investment in Table (8). In Model 1, we find that firms exposed to an offshore data leak reduced their investment by 6.7 percent after this event relative to similar firms. Model 2, using the PSM method, documents an effect of similar magnitude, a 4.7 percent reduction in investment. Lastly, the effect of the data leaks on investment is a 5.5 percent reduction when using the CEM approach in Model 3. Overall, the results in Table (8) align with the data leaks having real economic effects by curbing investment among exposed companies.

Interestingly, when looking at the impact on tax revenues in Table (9), we do not find that the reduction in investment relates to fewer tax revenues. We interpret this result as suggestive that

the higher public scrutiny encourages OV users to keep their level of tax revenues.

7 CONCLUSION

We delved into the unexplored role of offshore financial vehicles among private firms. We identify a large sample of private firms exposed to the largest offshore data leaks. We argue that as an offshore vehicle can encourage investment by increasing after-tax profits, it can also expand the taxable income, creating a trade-off effect that may counterbalance the direct tax base erosion associated with OVs. We find that private firms with offshore activities are associated with greater investment and larger tax revenues than similar firms. Our results underscore the need for a better understanding of the role of OVs in the corporate world and the global economy.

We further investigated the impact of offshore data leaks on investment and tax revenues. Here, we find that public exposure through data leaks leads to decreased corporate investment, suggesting that the data leaks have real economic consequences by limiting access to tax havens. Interestingly, this reduction in investment does not appear to translate into lower tax revenues, which could suggest compensatory behavior for firms to maintain their tax payments amidst increased public scrutiny.

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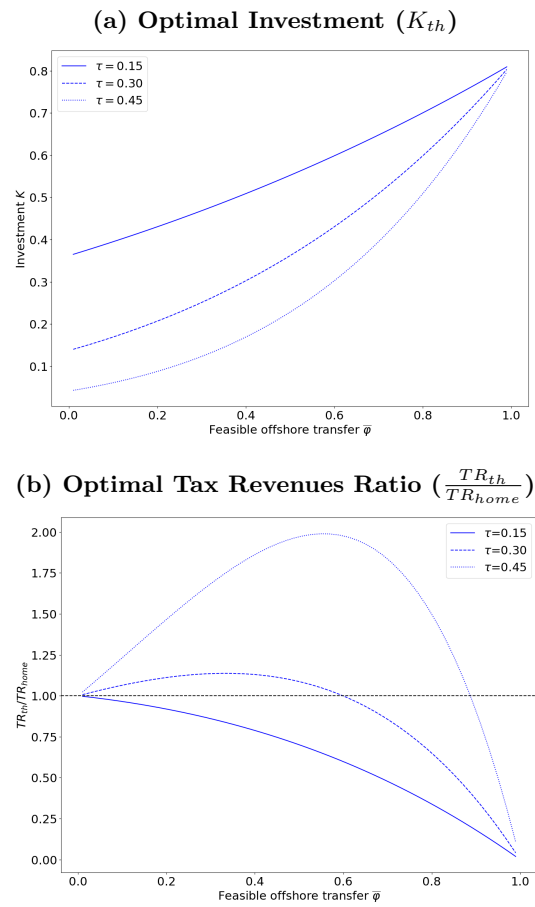
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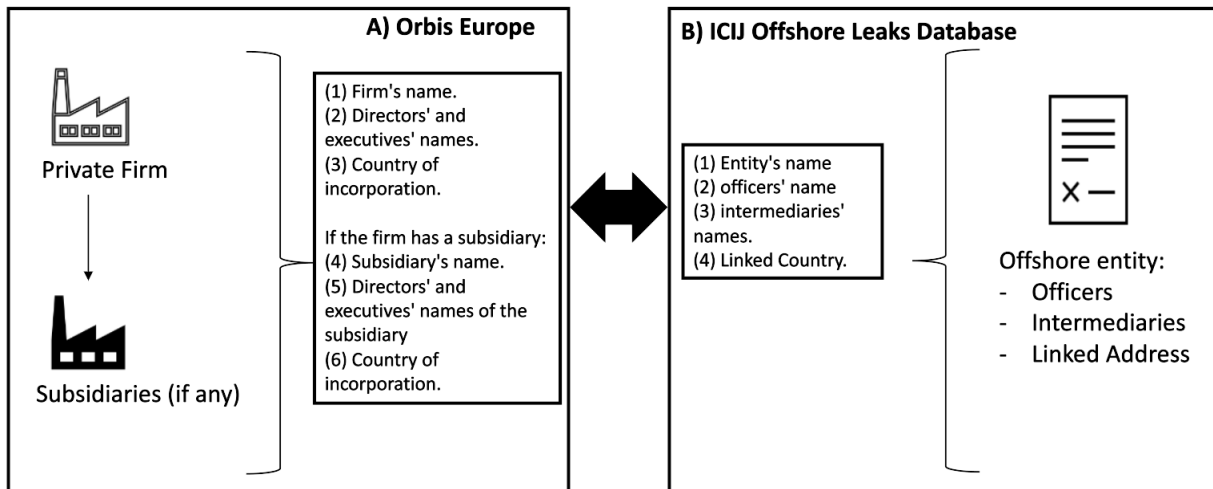
FIGURES

Figure 1: Effects of Offshore Vehicles on Investment and Tax Revenues



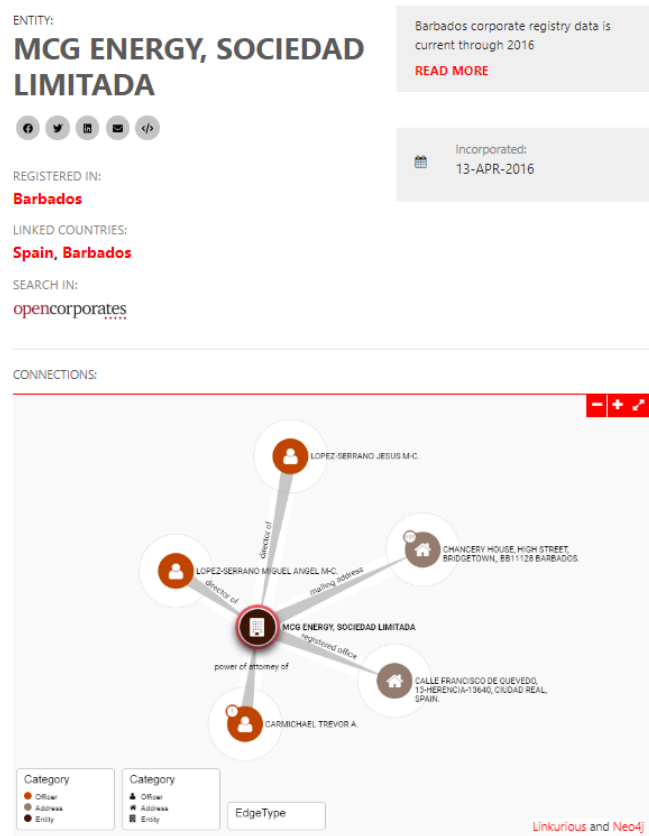
This figure displays the predictions of the model in Section 2, considering $a = 1.2$, $\alpha = 0.8$.

Figure 2: Matching process between Orbis Europe and ICIJ Offshore Data Leals.



The figure illustrates the matching process between Orbis Europe (left) and ICIJ Offshore Data Leaks (right). Matches are made if a firm, subsidiary, director, or top executive is listed as linked to an entity, officer, or intermediary in the ICIJ data. Data Appendix describes the matching process.

Figure 3: Example of a private firm identified as an OV user.



The illustration presents a capture from the International Consortium of Investigative Journalists (ICIJ) Offshore Data Leaks portal. It depicts an enterprise named MCG Energy, Sociedad Limitada, along with its two representatives, which is registered in Barbados and linked to an address in Spain. Notably, the Barbados address, Chancery House, serves as the registered domicile for an additional 102 entities within the ICIJ dataset. Moreover, the Spanish address aligns with that of a firm bearing the same name in the Orbis Europe database. Corroborating this match, the names of two directors in Orbis Europe match those of the officers in the ICIJ records. According to Orbis Europe, as of December 31, 2015, the company’s core business is developing energy infrastructures, boasting total assets amounting to 1.5 million US dollars, and operating two subsidiaries in Spain.

TABLES

Table 1: Description of OV users

| | Frequency | Percent | Mean | | |
|---------------------------------|-----------|---------|--------|------------|---------------|
| | | | Assets | Standalone | Multinational |
| Industry | | | | | |
| Services | 25,974 | 42.29 | 14.18 | 0.85 | 0.14 |
| Finance, Insurance, Real Estate | 11,361 | 18.50 | 291.28 | 0.51 | 0.46 |
| Construction | 7,850 | 12.78 | 21.77 | 0.85 | 0.14 |
| Manufacturing | 5,352 | 8.71 | 43.99 | 0.76 | 0.22 |
| Wholesale Trade | 3,294 | 5.36 | 83.59 | 0.76 | 0.22 |
| Retail Trade | 4,142 | 6.74 | 22.54 | 0.88 | 0.12 |
| Transp., Utilities | 2,869 | 4.67 | 95.33 | 0.74 | 0.24 |
| Mining | 436 | 0.71 | 766.07 | 0.63 | 0.34 |
| Public Administration | 139 | 0.23 | 34.66 | 0.83 | 0.15 |
| Total | 61,417 | 100.00 | 82.47 | 0.77 | 0.22 |

This table describes the sample composition of OV firms. Assets are reported in millions of euros. Standalone (Multinational) is a dummy variable identifying firms with no subsidiaries (with at least one subsidiary abroad). Data comes from Orbis Europe.

Table 2: Summary statistics

| | (1) Non OV user | | (2) Ov User | | (3) Diff | |
|-------------------|--------------------|------|----------------|------|-------------|----------|
| | Mean | SD | Mean | SD | b | t |
| Investment | 0.13 | 0.75 | 0.15 | 0.74 | -0.02*** | (-6.9) |
| Tax revenue (log) | 8.89 | 2.98 | 10.07 | 2.37 | -1.19*** | (-98.2) |
| Assets (log) | 13.80 | 1.46 | 14.57 | 1.55 | -0.77*** | (-111.1) |
| Leverage | 0.13 | 0.19 | 0.08 | 0.14 | 0.05*** | (81.3) |
| Sales growth | 0.01 | 0.32 | 0.02 | 0.32 | -0.01*** | (-6.7) |
| ROA | 0.08 | 0.12 | 0.08 | 0.10 | -0.00*** | (-5.0) |
| Cash flow | 0.06 | 0.10 | 0.06 | 0.09 | 0.00* | (2.2) |
| N. Firms | 1,107,669 | | 6,158 | | | |
| Observations | 10,798,576 | | 49,803 | | | |

This table compares OV users with other firms in Orbis Europe. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. Section 3.3 defines the variables. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2020. Data comes from ICIJ and Orbis Europe. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 3: The Effect of OVs on Investments

| Matching method | (1) Cells | (2) PSM | (3) CEM |
|---------------------|---------------------|---------------------|---------------------|
| OV user | 0.022*** (0.003) | 0.022*** (0.004) | 0.024*** (0.004) |
| Assets (log) | 0.021*** (0.002) | 0.017*** (0.002) | 0.015*** (0.003) |
| Leverage | 0.081*** (0.024) | 0.060** (0.025) | 0.073*** (0.019) |
| Sales growth | 0.247*** (0.015) | 0.249*** (0.021) | 0.236*** (0.035) |
| ROA | -0.022 (0.021) | -0.087* (0.048) | -0.142 (0.088) |
| Cash flow | 0.150*** (0.043) | 0.178*** (0.030) | 0.121*** (0.032) |
| Observations | 2,633,541 | 155,952 | 299,498 |
| R-squared | 0.021 | 0.022 | 0.018 |
| Country-Industry FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |

The dependent variable is *Investment*, defined as the annual growth in fixed assets. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. Section 3.3 defines all other variables. Columns 1, 2, and 3 report the estimates using the Cells, PSM, or CEM method to identify control firms, as described in Section 3.3. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2015. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. *p < .1; **p < .05; ***p < .01.

Table 4: The Effect of OVs on Tax Revenues

| Matching method | (1) Cells | (2) PSM | (3) CEM |
|---------------------|----------------------|----------------------|----------------------|
| OV user | 0.122*** (0.009) | 0.108*** (0.009) | 0.088*** (0.027) |
| Assets (log) | 1.142*** (0.070) | 1.067*** (0.016) | 1.180*** (0.093) |
| Leverage | -1.270*** (0.250) | -1.153*** (0.118) | -1.831*** (0.474) |
| Sales growth | 0.184*** (0.033) | 0.136*** (0.024) | 0.100 (0.078) |
| ROA | 15.284*** (1.194) | 12.771*** (2.258) | 14.289*** (1.601) |
| Cash flow | -7.633*** (1.396) | -5.891** (2.325) | -5.450** (1.903) |
| Observations | 1,844,972 | 111,034 | 199,965 |
| R-squared | 0.444 | 0.513 | 0.458 |
| Country-Industry FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |

The dependent variable is *Tax revenues (log)*, defined as the logarithm of tax payments. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. Section 3.3 defines all other variables. Columns 1, 2, and 3 report the estimates using the Cells, PSM, or CEM method to identify control firms, as described in Section 3.3. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2015. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 5: Cross-sectional analyses on intangible assets

| Dep. variable | (1) Investment | (2) Tax revenues (log) | (3) Investment | (4) Tax revenues (log) |
|------------------------------------|---------------------|---------------------------|---------------------|---------------------------|
| OV user | 0.018*** (0.003) | 0.136*** (0.017) | 0.022*** (0.003) | 0.129*** (0.010) |
| OV user # Ind. Intangibles | 0.058*** (0.018) | -0.194 (0.163) | | |
| OV user # Ind. Patent applications | | | 0.001 (0.009) | -0.133 (0.129) |
| Assets (log) | 0.021*** (0.002) | 1.142*** (0.070) | 0.021*** (0.002) | 1.142*** (0.070) |
| Leverage | 0.081*** (0.024) | -1.269*** (0.251) | 0.081*** (0.024) | -1.270*** (0.251) |
| Sales growth | 0.247*** (0.015) | 0.184*** (0.033) | 0.247*** (0.015) | 0.184*** (0.033) |
| ROA | -0.022 (0.021) | 15.284*** (1.194) | -0.022 (0.021) | 15.284*** (1.193) |
| Cash flow | 0.150*** (0.043) | -7.633*** (1.396) | 0.150*** (0.043) | -7.632*** (1.395) |
| Observations | 2,633,541 | 1,844,972 | 2,633,280 | 1,844,820 |
| R-squared | 0.021 | 0.444 | 0.021 | 0.444 |
| Country-Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

The dependent variables are *Investment*, defined as the annual growth in fixed assets, and *Tax revenues (log)*, defined as the logarithm of tax payment. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. *Ind. Intangibles* and *Ind. Patent applications* are the industry average intangible assets ratio and the industry average number of patent applications per firm, respectively. Section 3.3 defines all other variables. The sample is based on the Cells method. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2015. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. *p<.1; **p<.05; ***p<.01.

Table 6: Cross-sectional analyses on business structure

| Dep. variable | (1) Investment | (2) Tax revenues (log) | (3) Investment | (4) Tax revenues (log) |
|-------------------------|---------------------|---------------------------|---------------------|---------------------------|
| OV user | 0.009 (0.007) | 0.045* (0.025) | 0.028*** (0.002) | 0.146*** (0.010) |
| Standalone | -0.015** (0.006) | -0.094* (0.052) | | |
| OV user # Standalone | 0.018** (0.008) | 0.107*** (0.028) | | |
| Multinational | | | 0.015** (0.006) | 0.092* (0.046) |
| OV user # Multinational | | | -0.019** (0.007) | -0.098*** (0.028) |
| Assets (log) | 0.019*** (0.001) | 1.132*** (0.076) | 0.019*** (0.001) | 1.133*** (0.075) |
| Leverage | 0.081*** (0.024) | -1.268*** (0.251) | 0.081*** (0.023) | -1.268*** (0.251) |
| Sales growth | 0.247*** (0.015) | 0.183*** (0.032) | 0.247*** (0.015) | 0.183*** (0.032) |
| ROA | -0.020 (0.021) | 15.311*** (1.185) | -0.020 (0.021) | 15.311*** (1.185) |
| Cash flow | 0.146*** (0.043) | -7.677*** (1.393) | 0.146*** (0.043) | -7.674*** (1.391) |
| Observations | 2,633,541 | 1,844,972 | 2,633,541 | 1,844,972 |
| R-squared | 0.021 | 0.444 | 0.021 | 0.444 |
| Country-Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

The dependent variables are *Investment*, defined as the annual growth in fixed assets, and *Tax revenues (log)*, defined as the logarithm of tax payment. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. *Standalone* and *Multinational* are dummy variables identifying firms without subsidiaries and firms with at least one subsidiary in another country, respectively. Section 3.3 defines all other variables. The sample is based on the Cells method. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2015. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 7: Cross-sectional analyses on shareholders expropriation

| Dep. variable | (1) Investment | (2) Tax revenues (log) |
|----------------------|---------------------|---------------------------|
| OV user | 0.021*** (0.002) | 0.129*** (0.009) |
| Controlled | 0.044*** (0.006) | 0.038 (0.031) |
| OV user # Controlled | 0.006 (0.007) | -0.070*** (0.021) |
| Assets (log) | 0.022*** (0.002) | 1.143*** (0.070) |
| Leverage | 0.080*** (0.024) | -1.270*** (0.250) |
| Sales growth | 0.246*** (0.014) | 0.183*** (0.033) |
| ROA | -0.023 (0.021) | 15.284*** (1.193) |
| Cash Flow | 0.147*** (0.042) | -7.633*** (1.396) |
| Observations | 2,633,541 | 1,844,972 |
| R-squared | 0.021 | 0.444 |
| Country-Industry FE | Yes | Yes |
| Year FE | Yes | Yes |

The dependent variables are *Investment*, defined as the annual growth in fixed assets, and *Tax revenues (log)*, defined as the logarithm of tax payment. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. *Controlled* is a dummy variable identifying firms with an individual or group of individuals as global ultimate owners holding 50 percent or more of the ownership. Section 3.3 defines all other variables. The sample is based on the Cells method. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2007-2015. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. *p<.1; **p<.05; ***p<.01.

Table 8: The Real Effects of Offshore Data Leaks: Investment

| Matching method | (1) Cells | (2) PSM | (3) CEM |
|---------------------|----------------------|----------------------|---------------------|
| OV user | 0.033 (0.020) | 0.025*** (0.002) | 0.029 (0.018) |
| Post leak | 0.066** (0.026) | 0.032*** (0.008) | 0.061* (0.031) |
| OV user # Post leak | -0.067*** (0.021) | -0.047*** (0.004) | -0.055** (0.024) |
| Assets (log) | 0.006*** (0.001) | 0.004* (0.002) | 0.005* (0.003) |
| Leverage | 0.138*** (0.010) | 0.101*** (0.006) | 0.090*** (0.013) |
| Sales growth | 0.284*** (0.011) | 0.281*** (0.022) | 0.265*** (0.021) |
| ROA | 0.160** (0.068) | -0.040 (0.151) | -0.067 (0.083) |
| Cash flow | 0.028 (0.037) | 0.235*** (0.071) | 0.150* (0.070) |
| Observations | 2,302,950 | 152,190 | 240,114 |
| R-squared | 0.020 | 0.021 | 0.019 |
| Country-Industry FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |

The dependent variable is *Investments*, defined as the annual growth in fixed assets. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. Section 3.3 defines all other variables. Columns 1, 2, and 3 report the estimates using the Cells, PSM, or CEM method to identify control firms, as described in Section 3.3. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2014-2020, keeping the control group fixed as of 2014. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses.*p<.1; **p<.05; ***p<.01.

Table 9: The Real Effects of Offshore Data Leaks: Tax Revenues

| Matching method | (1) Cells | (2) PSM | (3) CEM |
|---------------------|-----------------------|----------------------|----------------------|
| OV user | 0.051** (0.023) | 0.034** (0.013) | 0.078 (0.059) |
| Post leak | 0.008 (0.020) | -0.006 (0.008) | 0.044 (0.052) |
| OV user # Post leak | -0.010 (0.022) | 0.014 (0.009) | -0.096 (0.094) |
| Assets (log) | 1.123*** (0.034) | 1.088*** (0.007) | 1.138*** (0.065) |
| Leverage | -1.114*** (0.064) | -1.083*** (0.076) | -1.327*** (0.305) |
| Sales growth | 0.292*** (0.023) | 0.256*** (0.023) | 0.218** (0.091) |
| ROA | 23.861*** (2.402) | 19.989*** (4.220) | 19.875*** (2.881) |
| Cash flow | -17.248*** (3.826) | -13.631** (4.517) | -11.349** (4.785) |
| Observations | 1,779,822 | 116,947 | 175,151 |
| R-squared | 0.472 | 0.539 | 0.474 |
| Country-Industry FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |

The dependent variable is *Tax revenues (log)*, defined as the logarithm of tax payments. *OV user* indicates whether or not a private firm (or its executives, directors, and subsidiaries) is part of the ICIJ Offshore database. Section 3.3 defines all other variables. Columns 1, 2, and 3 report the estimates using the Cells, PSM, or CEM method to identify control firms, as described in Section 3.3. All continuous variables are winsorized at the 2.5% and 97.5% levels. Sample Period: 2014-2020, keeping the control group fixed as of 2014. Data comes from ICIJ and Orbis Europe. Robust standard errors clustered at the country level in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

DATA APPENDIX

A: MATCHING PROCEDURE

This study uses data from multiple sources to construct a comprehensive dataset of OV firms across the 12 largest European economies. The primary data source is Orbis Europe, which provides information on the location, names, total assets, directors, top executives, and subsidiaries of private firms. To ensure data quality, we include only firms with nonnegative and nonmissing total assets. After a text-cleaning procedure, we remove special characters, numbers, and legal forms from their names. In total, we collect approximately 30 million observations from Orbis Europe (see Panel A in Table A1).

We supplement the Orbis Europe data with information from the International Consortium of Investigative Journalists (ICIJ) data related to various high-profile leaks, including the Panama Papers, Bahamas Leaks, Paradise Papers, and Pandora Papers. The ICIJ data consists of three main components: entities, officers, and intermediaries. We apply the same text-cleaning procedure to these components as we did with the Orbis Europe data. After data processing, we obtained approximately 80 thousand observations from the ICIJ data, with nearly 50 percent of them linked to the United Kingdom.

Next, we employ the Levenshtein normalized similarity index to match observations from Orbis Europe with those from the ICIJ data within the same country. We retain only those matches with a similarity index higher than 95 percent, aiming to ensure accurate linkages between the two datasets. To validate the correctness of the matches, we conduct a manual review of the identified links. Conflicting cases are carefully examined, utilizing additional information from the ICIJ website and European Business registries.

Conflicts in the matching process can arise due to various reasons. Firstly, there may be instances where a single observation in the ICIJ database is linked to multiple firms in the Orbis database having a similarity index above 95 percent. In such cases, we select the link with the highest similarity index. Secondly, a discrepancy can occur when an observation in the ICIJ database is linked to a firm in the Orbis database that shares a large part of the name but includes or excludes one word. To resolve these cases, we investigate business registries and company websites to determine if the firm has undergone a name change or is associated with other names. If no evidence is found, we exclude the link. Similarly, if an observation in the ICIJ database is linked to a firm in the Amadeus database with differing legal forms, we consult business registries and company websites to ascertain if the firm has changed its legal form. If no evidence is found, the link is dropped. Lastly, when an observation in the ICIJ database is connected to multiple managers or directors in the Orbis, we retain only the cases with perfect matches (similarity index equals 100 percent).

As a result of the manual checking process, we obtained a final sample of 61,417 private. The distribution of the matched sample of private firms is reported in Table A2.

Table A1: Raw data description

| Panel A: | | Orbis Europe (thousands) | | | |
|----------------|---------------|--------------------------|-----------------|-----------|-------|
| Country | Private Firms | Subs. | Directors/Exec. | Total obs | % |
| Austria | 130.1 | 61.4 | 314.6 | 506 | 1.7% |
| Belgium | 385.0 | 83.5 | 832.4 | 1,301 | 4.3% |
| Denmark | 214.2 | 157.6 | 558.1 | 930 | 3.1% |
| Finland | 157.6 | 42.0 | 978.5 | 1,178 | 3.9% |
| France | 582.5 | 229.4 | 2448.4 | 3,260 | 10.9% |
| Germany | 196.8 | 503.1 | 2699.7 | 3,400 | 11.3% |
| Netherlands | 404.8 | 313.4 | 1171.5 | 1,890 | 6.3% |
| Ireland | 388.3 | 32.7 | 569.5 | 990 | 3.3% |
| Italy | 759.1 | 222.5 | 2462.0 | 3,444 | 11.5% |
| Spain | 596.3 | 166.6 | 2062.4 | 2,825 | 9.4% |
| Sweden | 377.3 | 135.7 | 856.0 | 1,369 | 4.6% |
| United Kingdom | 2270.6 | 388.3 | 6296.6 | 8,955 | 29.8% |
| Total | 6,462 | 2,336 | 21,250 | 30,048 | 100% |

| Panel B: | | ICIJ Offshore Data Leaks | | | |
|----------------|----------|--------------------------|----------------|-----------|-------|
| Country | Entities | Officers | Intermediaries | Total obs | % |
| Austria | 32 | 1503 | 16 | 1,551 | 1.9% |
| Belgium | 65 | 1591 | 38 | 1,694 | 2.1% |
| Denmark | 17 | 791 | 9 | 817 | 1.0% |
| Finland | 72 | 507 | 12 | 591 | 0.7% |
| France | 325 | 4663 | 101 | 5,089 | 6.3% |
| Germany | 190 | 6435 | 70 | 6,695 | 8.3% |
| Netherlands | 225 | 2264 | 52 | 2,541 | 3.1% |
| Ireland | 406 | 2620 | 39 | 3,065 | 3.8% |
| Italy | 353 | 10523 | 51 | 10,927 | 13.5% |
| Spain | 1197 | 3512 | 202 | 4,911 | 6.1% |
| Sweden | 74 | 2935 | 22 | 3,031 | 3.8% |
| United Kingdom | 10282 | 27621 | 1938 | 39,841 | 49.3% |
| Total | 13,238 | 64,965 | 2,550 | 80,753 | 100% |

This table describes the data used for the matching process. Panel A reports the number of observations from Orbis Europe separated by country and by type of observation. Panel B reports the number of legal entities, officers, or intermediaries reported in the offshore data leaks for each country.

Table A2: Matched sample description

| Panel A: | | |
|----------------|----------|------------|
| Country | OV users | % of Orbis |
| Austria | 775 | 0.15% |
| Belgium | 215 | 0.02% |
| Denmark | 898 | 0.10% |
| Finland | 153 | 0.01% |
| France | 550 | 0.02% |
| Germany | 907 | 0.03% |
| Netherlands | 528 | 0.03% |
| Ireland | 2,017 | 0.20% |
| Italy | 7,747 | 0.22% |
| Spain | 390 | 0.01% |
| Sweden | 428 | 0.03% |
| United Kingdom | 46,809 | 0.52% |
| Total | 61,417 | 0.20% |

| Panel B: | | |
|----------------------|----------|---------|
| Leaks | OV users | % Total |
| 2 or more | 1,209 | 2.0% |
| 2016 Panama Papers | 14,627 | 23.8% |
| 2017 Bahamas Leaks | 2 | 0.0% |
| 2018 Paradise Papers | 40,469 | 65.9% |
| 2022 Pandora Papers | 5,110 | 8.3% |
| Total | 61,417 | 100% |

This table describes the matched sample of OV users. Panel A describes the composition across countries. Panel B tabulates the distribution across offshore data leaks.