The three body problem: Ecuador's tax on tax haven ownership

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February 11, 2025

PRELIMINARY: PLEASE DO NOT CIRCULATE

Abstract

Can a country reduce its exposure to tax havens, and what are the implications? We analyze Ecuador's corporate tax surcharge for firms with owners in tax havens, a reform made possible by the prior establishment of an ownership registry. Comparing the behavior of firms with tax-haven owners at baseline, versus other foreign-owned firms, we find that the reform induced 12 percent of exposed firms to eliminate tax ownership entirely. These firms report owners in non-haven countries that are individuals rather than firms, thereby raising beneficial ownership transparency. Moreover, exposed firms increase their tax payments by around 15%, without reducing employment and investment in Ecuador. Yet, intermediate ownership in tax-havens and transactions with haven parties do not decrease. Overall, the policy which combined a "flashlight" (the ownership registry) with a "stick" (the tax surcharge) raised transparency and mitigated tax erosion, without severing tax haven ties.

JEL codes: H26, H25, H32, F38

Key words: Tax havens, Transparency, Ownership registry, Corporate income tax

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1 Introduction

Tax havens impose global negative externalities by undermining other countries' ability to enforce laws and eroding tax revenues. They facilitate illicit financial flows, sanctions evasion, and multinationals' profit shifting (Laffitte 2024; Zucman 2013). A defining trait of tax havens is their secrecy: it is difficult for other countries to secure their cooperation and obtain information on the beneficiaries of haven based entities. Expectations for multilateral reforms to address these challenges are high, but complex global agreements have historically made limited progress to reduce tax havens' influence (Alstadsæter, Casi, et al. 2023; Bustos et al. 2022). At the same time, some countries are acting unilaterally to establish ownership registries which identify firms' shareholders and, ideally, their beneficial owners. How can new ownership registries be leveraged to raise transparency and curb tax haven usage?

We explore this question in the context of an innovative reform in Ecuador, which in 2015 raised the corporate income tax by 3 percentage points for firms with majority tax-haven ownership. The reform leveraged the prior implementation of a business ownership registry in 2012, which enabled the identification of firms subject to the surcharge. Using comprehensive administrative data, we employ a difference-in-differences approach to compare the reported ownership structure and economic behavior of firms with tax-haven owners at baseline, relative to that of other internationally-owned firms. We find that the tax surcharge achieved part of its objectives, by increasing both beneficial ownership transparency, and corporate tax revenues, although firms did not cut ties with tax havens.

Few countries have unilaterally attempted to challenge the status quo with tax havens, in part due to a lack of data on the exposure of their domestic firms to havens. The foundation of Ecuador's tax surcharge—and of our analysis—is the assembly of a yearly panel of firm ownership between 2012 and 2019, merged with corporate tax returns and records of all transactions in and out of the country. In 2012, Ecuador sought to establish one of the first beneficial ownership (BO) registry in the world. BO registries record firms' individual owners, both domestic and foreign, rather than just intermediate corporate owners. Although financial penalties applied to firms that did not report 100% of their ownership, the reporting of intermediate owners did not generate penalties, due to legal arguments on the difficulty

for firms to track their full ownership structure, beyond their direct owners. Thus, Ecuador fell short of establishing a comprehensive BO registry and some reported owners are firms.

We start by describing Ecuador's corporate ownership structure and the extent to which the registry traces beneficial ownership as intended. We define a terminal owner as the last reported ownership link, which can be to an individual or to another firm. We categorize firms in three groups based on the location of their terminal majority owners: in tax-havens, in foreign non-havens, and in Ecuador. Tax havens are defined by the Ecuadorian government, based in part on a lack of co-operation on tax matters. At baseline, in 2014, tax haven ownership accounts for 3% of firms' revenue, foreign non-haven ownership for 24%, and the remaining 73% is domestically-owned. Ecuador's most important haven exposure is to Panama, with over 350 majority owned firms, followed by the Netherlands and the Bahamas with around 50 each. International non-haven ownership is more spread, with 500 majority owned firms for each of Colombia and the United States, and 300 for Spain. The reporting of beneficial owners (individuals as opposed to firms) is high for domestic-owned firms, but deteriorates for foreign non-haven-owned firms, and especially for haven-owned firms: only, respectively, 59% and 33% of these firms' terminal ownership can be attributed to individuals.

To evaluate the effects of the 2015 tax reform, we use a difference-in-differences design that compares the ownership and activity of firms with pre-reform majority ownership in tax havens ("exposed firms"), to that of firms with pre-reform majority ownership in foreign non-havens. At baseline, haven owned firms display similar revenue, profits, and tax liabilities, but hold more assets than internationally-owned firms. We hypothesize that the reform might (a) encourage exposed firms to report non-haven beneficial owners to escape the tax surcharge; (b) raise tax liability, mechanically by increasing the tax rate of firms maintaining haven ownership, and behaviorally, by raising exposed firms' perceived cost of tax evasion (Bilicka, Devereux, and Güceri 2024; Allingham and Sandmo 1972); (c) increase exposed firms' financing costs and reduce their economic activity in Ecuador.

We first examine how the tax surcharge impacted reported ownership. By raising the corporate tax rate from 22% to 25%, the reform led to a 13 percentage point reduction in terminal tax haven ownership of exposed firms (relative to an 80 percentage point baseline), over the five years post-reform. This result mainly arises from an extensive margin response,

with a 12 percentage point rise in the likelihood of eliminating tax haven ownership entirely. Most of the adjustment occurs upon impact in 2015, followed by moderate growth in subsequent years. Newly reported owners are predominantly individuals, rather than firms. Further, the ownership change is entirely attributable to the reporting of foreign non-haven owners, rather than to a re-allocation to Ecuadorian owners. However, the probability of Ecuadorian firms to report tax haven shareholders is unchanged when we consider intermediate corporate owners. Thus, the reform raised offshore corporate ownership transparency, since a higher share of terminal owners of Ecuadorian firms are now individuals located in cooperating countries, without severing ties to tax havens.

Second, we analyze the impact of the reform on corporate tax payments. A potential flaw with the design of the tax-haven surcharge, is that it only bites when firms report positive taxable profits. Around 75% of both exposed and internationally-owned firms report positive profits at baseline, and this likelihood is unaffected by the reform (we can reject changes of more than 3 percentage points). We estimate that corporate tax payments of exposed firms increase by 18%. A part of this rise is mechanical, stemming from the higher tax rate applied to firms maintaining terminal tax-haven ownership; however, exposed firms also report higher profits, in particular those whose terminal ownership left tax havens. We conjecture that the reform might have raised exposed firms' perceived audit threats, leading to improved compliance.

Third, we turn to the analysis of reported economic activity. Although the previous results are encouraging for the government's stated objectives, in other settings, studies found that a crackdown on tax-havens had negative consequences for the domestic activities of haven connected firms (e.g. Suárez Serrato 2019). Yet, we do not detect changes to the payroll or investment of exposed firms over a five-year post-reform horizon. It thus appears, that in addition to improving transparency, the reform raised tax revenues at low efficiency cost. Finally, transactions between exposed firms and tax havens did not reduce post-reform, including for firms that reported a new terminal owner located outside of tax-havens.[1]

To summarize, many Ecuadorian firms with majority tax haven ownership at baseline continued to report haven-based owners, but paid more taxes, without reducing their economic

[1]These transactions are reported to the tax authorities due to Ecuador's currency exit tax.

activity. Yet, a significant share changed its reported terminal owners. We can summarize the behavior of these firms with a fictional illustration: Condor Construction Corporation (CCC), an Ecuadorian firm, previously reported Isthmus International Incorporated (III), a Panamanian entity, as its majority owner. In 2015, facing a tax surcharge of 3%, CCC updated its ownership registry to unmask its beneficial owner, Don Diego de la Vega (DDD), a Spanish national. At the same time, CCC reported higher profits potentially because the reform heightened its perceived risk of detection for non-compliance. CCC thus chose to both disclose its beneficial owner, DDD, and to reduce its tax evasion.

Our difference-in-difference design relies on baseline ownership–in tax haven versus foreign non-haven–the criteria which determines the tax rate absent changes to reported ownership. Beyond the assumption of parallel trends in the economic behavior of exposed and international firms, a specific threat is that of differential mean reversion in ownership between the two groups of firms. A firm is considered exposed (non-exposed) if its tax-haven (international) ownership share is above 50% in 2014, but, as a result, ownership from this location might tend to revert down. To address this, our analysis compares ownership in 'baseline domicile', and not in tax havens. We show that pre-reform, the mean reversion in baseline domicile ownership is not different between exposed and non-exposed firms. An additional concern, is that the size of the groups differ, as there are 550 majority haven-owned firms versus 3,000 internationally-owned firms. For robustness, we compare Panamanian versus Colombian owned firms (in 2014), which are similar in numbers, and find similar results.

The unilateral policy studied in this paper holds promise. The policy combined a "flashlight" (the ownership registry) and a "stick" (the tax surcharge), which re-enforced each other. There have been proposals to impose withholding taxes on tax haven-connected firms and individuals, but such measures require information on connection to tax havens and incentive-compatible enforcement. Ecuador used its new ownership registry to build such an incentive based anti-haven policy. The policy succeeded in inducing better reporting of beneficial owners, based in cooperating countries (non-havens). While not a panacea, it implies that in case of litigation with a firm, the government could obtain information from the country of citizenship of the owner. Yet, the reform did not cut the connection between Ecuadorian firms and their tax-haven counterparts, and might even have regularized

it. The implications for the design of anti-haven policies are thus nuanced, but also timely, as beneficial ownership registries are rapidly developing worldwide. Unilateral policies could complement multilateral initiatives, such as the common reporting standard on financial wealth and the global corporate minimum tax, if those fail to curb tax haven usage.

The paper is organized as follows. Section 2 introduces the data and legislative context. Section 3 develops our empirical strategy. Section 4 estimates the effects of the CIT surcharge on shareholdership and corporate transparency. Section 5 studies economic activity, financing, and foreign transactions. Section 6 concludes.

1.1 Contributions to the Literature

Our two key contributions are as follows. First, we add to the sparse literature on corporate ownership transparency. Second, an expanding literature on anti tax-haven policies focuses on multilateral solutions, from a high-income country perspective. Our study is complementary, by analyzing a unilateral anti tax-haven policy in a middle-income country. To establish these two contributions, we leverage rich data which characterizes firms' international ownership, reported economic behavior, and cross-border transactions.

A growing literature focuses on the tax compliance effects of multilateral efforts to reduce tax base erosion (e.g. Casi, Spengel, and Stage (2020); Menkhoff and Miethe (2019); Clifford (2019); OECD (2015)). This body of work finds that the effectiveness of anti-haven policies depends on state capacity and on the ability of governments to enforce novel agreements and leverage newly-available data. For instance, Fejerskov Boas et al. (2024) show positive tax compliance effects of the implementation of automatic exchange of offshore financial in Denmark; Alstadsæter, Casi, et al. (2023) show that these impacts deteriorate in countries with lower administrative capacity. Other studies on information coordination find that these policies can be circumvented (e.g. Bomare and Le Guern Herry (2024)). Our setting is informative for developing countries, to implement anti-tax haven policy unilaterally, without needing international coordination, which is often slow, complex, and due to the need for consensus features carve-outs that might undermine its effectiveness.

Within this literature, there has been little focus on corporate ownership transparency. The closest paper to ours is Alstadsæter, Casi, et al. (2023) who studies how compliance with

beneficial ownership reporting and information sharing standards varies across countries, although they do not evaluate how such policies impact ownership.

A thinner literature studies *unilateral* anti tax-haven policies. A common view suggests that unilateral policies are relatively ineffective to target and dis-incentivize tax-haven usage, given that their activity extends beyond national jurisdictions, and that these policies could be easy to circumvent. Most of the work focuses on policies mandating information reporting, such as anti profit-shifting measures that incorporate inter-affiliate trade data (e.g. Wier (2020); Liu, Schmidt-Eisenlohr, and Guo (2020)). These measures reduce tax haven usage, but at substantial compliance costs (Bustos et al. (2022)), and real economic costs (Suárez Serrato (2019)), with potential net negative impacts to tax collection. Instead, Brounstein (2024) shows that by imposing a direct pecuniary cost to send funds abroad, an earlier Ecuadorian policy was successful in reducing tax haven usage by high-earners in Ecuador.

Finally, we contribute to the literature documenting tax haven usage. Londoño-Vélez and Ávila-Mahecha (2024), Brounstein (2024); and Alstadsæter, Johannesen, and Zucman (2019) find that tax haven usage is highly concentrated among the richest individuals. Rose and Spiegel (2007) document the predictors of bilateral flows between different countries and tax havens. Our work describes *firms* shareholder linkages to tax havens (as opposed to individuals). Bilicka, Devereux, and Güceri (2024) characterize the shape of the cost function associated with sending funds to tax havens. Instead, we study a policy that raises the cost of tax haven usage, via a direct increase of firms' corporate itax rate and via its impact on firms' perception of detection by the tax authorities (Allingham and Sandmo (1972)).

2 Data, context, and sample construction

Ecuador is an upper-middle income country of 18 million inhabitants, located on the northwestern Pacific coast of South America. The country has been Dollarized since 2001: all monetary units are expressed in real 2015 USD.[2] We collaborated with the Internal Revenue Service (SRI) to combine three primary data sources: the Annex of Participants, Shareholders, Administrators, and Board Members (APS), the corporate income tax (CIT), and

[2]All monetary units are also winsorized on the 1% level.

the International Currency Movement Annex (MID). We also use data from Orbis (Bureau van Dijk). We describe below each dataset, the context, and the sample construction.

2.1 Data sources

Annex of Participants, Shareholders, Administrators, and Board Members (APS) In 2012, Ecuador became one of the first countries worldwide to implement a comprehensive ownership registry. The stated objective of the APS was to record yearly the full ownership structure of Ecuadorian firms, up to their final individual beneficial owner. When filed as intended, it should contain annual company-shareholder linkages, including direct and indirect ownership percentages, shareholdership tier (the number of ownership layers between shareholder and company), and the country of domicile of each shareholder.

The tax administration maintains the APS by requiring all registered firms in Ecuador to hire a government approved auditor each year, who reports by April the firm's shareholders as of December 31 in the prior year.[3] The reporting firm is responsible for identifying and disclosing every individual and entity in the ownership chain until the final beneficiary is reached, even when intermediate entities are foreign.[4] Thus, firms are required to report the shareholdership chain of their own shareholders, until the beneficial owner is reached. The tax administration validates the personhood of beneficial owners via the presence of an international passport or an Ecuadorian ID.

The APS sees broad compliance in terms of shareholdership reporting, likely because any firm that does not report 100% of its shareholders is sanctioned by a 3 percentage point corporate income tax surcharge, a policy in place since the introduction of the APS in 2012. However, this penalty only applies to incomplete shareholdership reporting—and not to incomplete **beneficial** ownership reporting: as long as the Ecuadorian party reports 100% terminal shareholdership, the business is deemed *compliant* with reporting standards in a manner so as to avoid the 3 percentage point reporting non-compliance sanction. Anec-

[3]The APS also requires firms to report changes to internal shareholdership, partners, members of the board of directors, or administrators that occur within-year, so as to prevent temporary changes that may be attempts to conceal de facto ownership.

[4]Upon its establishment in 2012, the APS only required reporting of shareholdership exceeding 2%. However, starting in 2014, the government expanded the requirement to include all shareholdership linkages.

dotally, this omission likely represents a matter of practicality: a recognition by the tax administration of the difficulties to report beneficial owners for foreign owned firms, which might not be fully within the control of the domestic firm seeking compliance. For instance, for a corporate ownership chain with many layers across several countries, compliance requires each shareholder to pass along its own shareholder information to the firm in which it holds equity.

Corporate income tax declarations (Form F101). We combine the ownership registry with the annual corporate income tax declarations, over the period 2012 to 2019. Ecuador's tax structure only distinguishes between self-employed/single-person firms versus all other business entities. The corporate income tax contains the later. By definition, it only reports information on formal firms: at the beginning of our panel in 2012, around 70,000 firms file the F101, rising to 100,000 by 2019.[5] The corporate tax form reports observations at the firm-year level. In addition to data on revenues, costs, profits, and tax liabilities, the form also disaggregates costs and revenues, and reports on intra-group and affiliate transaction which we use in Section 5 to explore mechanisms.

Annex of International Currency Movements (MID). Finally, we use data on all cross-border transactions with Ecuador over the 2012-2019 period. The Ecuadorian government began collecting these data in 2008 to support Ecuador's foreign transaction tax. The data report information at the transaction level on amounts transferred, transaction dates, the direction of the flow (i.e. entering or exiting Ecuador), the identity of the Ecuadorian party, and coarse categories indicating the nature of the transaction (e.g. dividend payments or profit distributions to shareholders, imports, credit card transactions, etc.). Given that the tax applies to currency exits (but not to currency entries) it is generally considered that exit flows are much better captured than entry flows. We use these data in Section 5 to study whether companies exposed to the tax haven CIT surcharge change their transaction-behavior with parties in tax havens and foreign non-havens in response to the reform.[6]

[5]Ecuador sees relatively high levels of informality, with the informal economy accounting for around 30% of domestic output and around two-thirds of the labor force is employed informally (Elgin et al. (2021); Canelas (2019)). However, while we do not include informal firms, prior studies have shown that tax haven usage is mainly concentrated among by high-earners and firms that require access to formalized banking services (e.g. Brounstein (2024); Londoño-Vélez and Ávila-Mahecha (2021); Alstadsæter, Johannesen, and Zucman (2019)). Therefore, we do not view the exclusion of informal firms as a concern in our setting.

[6]Table A.1 summarizes the inflows and outflows of companies in our to-be-introduced exposed and

2.2 The distinction between beneficial versus terminal ownership

For clarity, we distinguish between two ownership concepts frequently employed in the paper. The first concept, *beneficial*, or *ultimate* ownership, is standard in the analysis of corporate ownership. It refers to the final owner, which itself is not owned by any other entity. Beneficial owners are usually people (as opposed to firms), but can also include not-for-profit and public entities. In practice, we rarely observe such alternate non-person beneficial owners. Thus, we use *beneficial owner* to refer to an individual owner of a company. We contrast this term with the concept of *terminal* ownership, which corresponds to the last reported owner of a company beyond which no further ownership linkages are reported. This distinction is useful, since in the absence of full compliance with beneficial ownership reporting standards, we observe *terminal* owners, that are sometimes persons (thus *beneficial owners*) and sometimes firms (thus *not* beneficial owners). All beneficial ownership represents terminal ownership, but not all terminal ownership is beneficial ownership. We also employ the terms "shareholdership" and "ownership" interchangeably in the paper.

All shareholdership linkages observed in the APS reflect one of three possibilities. Consider Ecuadorian firm i and a shareholder j of firm i. In the first scenario 1), shareholder j is itself a firm that reports its ownership. We can then assign shareholder j's ownership to firm i, weighted by the appropriate shares. The other two scenarios result in a terminal ownership observation: 2) shareholder j is an individual; 3) shareholder j is a foreign business which doesn't report its shareholders to the Ecuadorian tax authorities. These latter two shareholding types are terminal links for firm i. For each terminal ownership link, the tax authority multiplies all direct shareholdership amounts until reaching company i. The tax-haven terminal ownership share is the sum of these indirect ownership amounts over terminal linkages in tax-havens. Figure B.2 shows an example of two hypothetical Ecuadorian firms' tax-haven ownership shares and CIT surcharges, based on their shareholder linkages.[7]

non-exposed groups by the tax haven status of the foreign counterpart to demonstrate the fidelity of the MID in capturing cross-border transactions. The table shows that firms with majority terminal ownership in tax havens exhibit a greater volume and frequency of transactions with counterparts in tax havens than the non-exposed group; which instead demonstrates greater connectedness with counterparts in non-havens.

[7] Section E develops more formalized graph theoretic definitions of these concepts.

2.3 The 2015 CIT surcharge on tax-haven ownership

Ecuador taxes corporate income on a territorial basis, at a flat 22% rate between 2012-2017, which was raised to 25% in 2018.[8] Using the ownership registry (APS), the tax authorities constructed a measure of terminal ownership share by domicile, based on the tax residence of the last reported shareholder. In June 2015, three years after the introduction of the APS, the administration announced that effective the same year, a CIT surcharge of 3 percentage points would apply to firms with terminal ownership in tax-havens, based on the 2015 APS. These legal changes were not accompanied by other changes that may have otherwise affected firms' tax-haven exposure.

The three percentage points tax surcharge applies to any firm majority owned in tax havens (50% or more terminal ownership). For firms with minority-ownership in tax havens, the surcharge rate was lower, and increased linearly based on the ownership share: the surcharge starts at zero and rises to 1.5 percentage points for firms with just under 50 percent terminal tax haven ownership (i.e. a slope of 0.03 percentage points CIT surcharge per percentage point in haven ownership). Upon reaching 50 percent tax-haven ownership, the rate jumps discontinuously to 3 percentage points.[9]

The Ecuadorian tax administration assigns the status of tax haven to countries for which at least two of the following three criteria apply: (1) An absence of cooperation on tax matters and of exchange of information on beneficial ownership, (2) A corporate income tax rate that is below 60% of Ecuador's (thus a CIT rate of 13% or lower) (3) Attracting activity for the sole purpose of appropriating other countries' tax bases. The first criteria–a lack of cooperation and transparency–is directly related to the goals of the 2015 reform. As such tax havens are (partly) defined as non-cooperating countries. The resulting list is largely time invariant, and coincides with frequently implemented lists of corporate and individual tax havens (e.g. Hines and Rice (1994), Tørsløv, Wier, and Zucman (2022)).

[8] The CIT rate is higher for extractive industries, while some preferred industries see a reduction in their statutory rate. The CIT schedule also gives a 10 percentage point reduction for re-investment. Additionally, Ecuador taxes personal income on a worldwide basis with a top marginal rate of 35% and incorporates bilateral tax treaties for resolving international double taxation issues.

[9] The CIT surcharge can be written as $\tau_{it} = 0.0003 \cdot S_{it} \cdot \mathbb{1}\{S_{it} < .5\} + .03 \cdot \mathbb{1}\{S_{it} \geq .5\}$ for terminal tax haven ownership S_{it} of Ecuadorian company i in year t. See Figure B.1 for an example calculation of the surcharge as well as Section E.1 for additional explanation and examples of terminal and beneficial ownership.

2.4 Sample construction and descriptive statistics

Sample Construction We construct our sample by combining the APS and CIT data over the period 2012-2019. We require firms to both 1) have filed a Corporate Income Tax declaration with positive revenue in 2014, and 2) have filed a complete APS declaration at least once between 2012 and 2014, such that firms can be allocated a baseline ownership. The sample of firms with a reported APS consists of 62,350 firms, out of the 73,935 that filed CIT revenue in 2014 (we compare our sample to the never APS filers in the next subsection). We exclude from our sample entities that operate in the oil industry (subject to a special legal and tax regime), government entities, trusts, investment funds, and NGOs. Comparing against Ecuadorian national statistics, firms in our sample comprised 90% of Ecuadorian CIT payments in 2014. Thus, our data consists of a yearly panel spanning 2012 to 2019, for firms active firms in 2014, the baseline reform year.

Table B.1 compares our final sample against the 11,585 eliminated firms due to not having an APS return between 2012 and 2014. We find that these excluded firms are generally very small businesses for whom initially APS filing was not made mandatory. Given their small size, we view their exclusion as not concerning.

Descriptive statistics Table B.2 presents descriptive statistics of Ecuadorian firms that comprise our full sample. The average (median) firm declares USD 1.2 Million (140,000) in yearly revenue. The mean (median) profitability by revenue is 9.3% (3.4%), with 78% of firms reporting positive profits in 2014. Most firms face the standard 22% rate, and on average pay USD 15,000 in corporate taxes.

Table B.2 also reports information on terminal ownership, distinguishing between five categories of owners: Ecuadorian persons, Ecuadorian non-person entities, foreign persons, foreign non-person entities, and a residual category of unaccounted for ownership. Ecuadorian persons account for 83% of terminal ownership of Ecuadorian firms. An additional 4% ownership is attributable to foreign persons. Thus ownership by persons accounts for 87% of the total. Another 10% of terminal ownership is allocated to firms: 8% to Ecuadorian non-person entities, and 2% to foreign non-person entities. This shows partial non-compliance

with the APS intended reporting standards of beneficial ownership.[10] Since we required that firms in our sample filed the APS at least once between 2012-2014, it is not surprising that 99% of firms filed the APS in 2014. Further, 95% of firms complied with reporting requirements so as to *nominally* account for 100% of their ownership. Yet only 79% of firms reported 100% of their beneficial ownership (such that all terminal owners are individuals).

Tax haven usage and beneficial ownership Table 1 tabulates the foreign terminal ownership countries of Ecuadorian companies by various ownership thresholds. Panel (a) presents tax haven countries, while panel (b) displays all other countries. In total 581 firms are majority owned in tax havens, representing 0.9% of all sample firms and 3% of all revenue. The table confirms that Panama is quantitatively the most important tax haven for Ecuador with 353 firm majority terminally owned.[11] Panama appears seven times more frequently as a majority ownership tax haven domicile than the second and third most common countries, the Netherlands and the Bahamas.

Panel (b) includes the same statistics for foreign non tax-havens. In total 3,263 firms are foreign (non-haven) owned, representing 5.2% of all sample firms and 24% of revenue. The most-frequent non-haven countries of majority terminal ownership are Colombia and the US, with just over 500 firms each followed by Spain with under 300. Other Latin American countries complete the ranking of top ownership locations.[12]

3 Empirical strategy

To estimate the causal impact of the 2015 CIT surcharge on firm ownership and activity, our identification strategy compares Ecuadorian firms with tax-haven terminal ownership in 2014, to Ecuadorian firms with foreign *non-haven* terminal ownership in 2014. We construct an 'exposure' group, considering firms with at least 5% tax haven terminal ownership in

[10] Typically, only individuals can serve as beneficial owners of firms. Yet, there are exceptions, since governmental and non-profit entities may also serve as beneficial owners. In the data, we observe indicators for these categories, which are rare, such that almost all non-person entities are for-profit corporations.

[11] This finding corroborates prior results that gravity, both geographically and in terms of common language, predicts countries' ties to tax havens (e.g. Rose and Spiegel (2007)).

[12] A ranking weighted by revenue or by assets yields minimal changes to these ordinal ranks.

2014.[13] We define the control group analogously, requiring that firms' pre-reform foreign non-haven terminal ownership exceeds 5% *and* that their tax-haven ownership does not exceed 5%. The control group should not be impacted by the reform, unless it planned to sell equity to tax-haven owners.

Our main analysis focuses on firms with weak-majority ownership (at least 50%) in their respective group, as of 2014.[14] We refer to the majority exposure and control groups as "T-major" (or exposure) and "C-major" (or control) respectively, and the corresponding groups with minority shareholdership above 5%, as 'T-minor" and "C-minor".[15] These definitions divide our sample into five groups: 1) T-major/exposure: tax haven firms with majority terminal ownership in tax havens, 2) C-major/control: firms with majority terminal non-haven ownership (Our primary control group), 3) T-minor: minority haven-owned firms, 4) C-minor: minority foreign non-haven-owned firms, and 5) Domestically owned firms.

Table 2 displays descriptive statistics for the exposure and control firms. We count 581 majority haven-owned firms and 3,263 majority internationally owned firms. These 3,844 unique firms form our main panel, which is 92% balanced between 2012 to 2019, and by construction all firms file CIT in 2014. Panel (a) shows that exposure and control firms appear similar by revenue, profits, and taxes paid. Yet, exposure firms are larger than control firms in terms of assets, and their low return on assets could indicate baseline avoidance or evasion behavior. As expected, majority foreign-owned firms are much larger than the average Ecuadorian firm.

[13] For firms without an APS declaration in 2014, we use their most recent pre-reform declaration.

[14] We focus on majority ownership for four reasons: 1) We only observe 176 minority-owned tax haven firms; this lower sample size introduces a greater degree of imprecision in our estimation strategy; 2) Conceptually, firms with majority terminal ownership may have more centralized decision-making and potentially illicit use of tax havens; firms with minority terminal ownership see more diffused ownership so that their tax haven usage could represent a different kind of haven affiliation; 3) Table C.1 shows that the minority exposure and control firms differ from each other *and* from the majority exposure/control firms that comprise our main analysis sample. Minority tax-haven exposure firms report more revenue, profit, and CIT liability than majority exposure firms; 4) minority exposure and control firms, possibly due to their differences in observable characteristics, empirically display differential pre-reform trends in outcomes that undermine our identification strategy. We nonetheless replicate our main results for the sample of minority tax haven firms versus minority foreign non-haven firms in Section C. We document results that are largely consistent with (albeit noisy) with results in our main specification.

[15] Firms missing at least 0.5% ultimate shareholdership are assigned to an 'incomplete' category (1,378 firms). We also assign firms to 'Domestic' if they are at least 95% terminally owned by Ecuadorian shareholders (54,164 firms); finally there is a "non-allocable" category (1,046 firms), as the preceding categories do not partition the space of firm ownership (e.g. firms that have non-negligible terminal ownership in both havens and foreign non-havens).

Panel (b) shows ownership characteristics of exposure, control, and domestically owned firms. The table illustrates important differences in ownership patterns between firms associated with tax-havens and those associated with foreign non-havens. The latter maintain greater terminal ownership in Ecuador than the exposure group, although this difference may be partly mechanical, recalling that we required that the control firms have less than five percent ultimate shareholdership in tax havens but imposed no such requirement for exposed-firm shareholdership in foreign non-havens. However, exposure firms appear to report less of their *true* ultimate beneficial owners. Within the major group of comparison, exposed firms only have 43.4% of their ultimate shareholdership attributable to individuals, whereas control firms report 70% of their ultimate ownership as attributable to people. We observe similar pattern for the minority group firms (60% for exposure versus 84.5% for control). This pattern leads us to conclude that, descriptively, firms with ownership in tax havens are characterized by greater ownership opacity than multinational firms with ownership in foreign non-havens.

Our empirical strategy compares the evolution of ownership and economic behavior of majority tax-haven-owned firms in 2014, versus that of majority foreign owned (non-haven) firms in a standard difference-in-differences setting. We estimate equations of the form:

$$y_{it} = \alpha_i + \delta_t + \sum_{t=2012,\neq 2014}^{2019} \beta_t \cdot Exposure_i + \varepsilon_{it}, \tag{1}$$

where y_{it} is the outcome of interest for firm i in year t, α_i and δ_t indicate firm and year fixed effects respectively. $Exposure_i$ indicates that firm i has majority terminal ownership in tax-havens in 2014, such that is should face the tax surcharge absent any changes to ownership. Finally, ε_{it} is a mean-zero error term.

Our outcomes of interest are the ownership shares by domicile $\times$ shareholder type, business activity (tax liability, profits, revenue and costs, etc.), and cross-border transactions. We estimate regressions with equal-weighting and with weights for firm importance as measured by log assets in 2014. All specifications cluster standard errors at the firm level.

Under a parallel trends assumption $\{\hat{\beta}_t\}$ identifies the Intent-to-Treat (ITT) effect of the tax-haven CIT surcharge on exposed firms, in year t relative to 2014. The coefficients $\{\hat{\beta}_{2012}\}$

and $\{\hat{\beta}_{2013}\}$ in the pre-reform years are placebos and serve to test the parallel trend assumptions. We also estimate the coefficient $\{\hat{\beta}_{post}\}$ from the pre versus post reform difference in difference specification. The ITT effect may differ from the Average Treatment on the Treated effect (ATT) of *paying* the CIT surcharge. The ATT would correspond to the effect of a 3 percentage points increase to the corporate income tax rate for firms maintaining tax-haven terminal ownership and paying CIT. Firms may respond to the threat of the reform by reducing their reported tax-haven ownership or by reporting losses as to avoid paying any CIT, such that in practice the surcharge will apply to a subset of exposed firms. One could instrument the change in the tax rate with the exposure status, yet, the reform encompasses more than just an increased tax rate: it also conveys the administration's intent to target firms lacking transparency and associated with tax-havens.

Mean Reversion in Ownership For outcomes related to economic activity (e.g. tax liability), we simply compare their evolution for the two groups of firms, under a parallel trends assumption. However, a concern when evaluating how the reform impacts ownership structures is mean reversion. By construction, the exposure group has over 50% terminal ownership in tax havens, and the control group has almost no ownership in havens. If we estimate Equation (1) with tax-haven ownership as the outcome, we risk biasing $\hat{\beta}$ since the exposure group may be more likely to reduce its tax-haven shareholdership absent a reform, and the control group mechanically more likely to raise its tax-haven ownership (it can hardly decrease its tax-haven ownership further since we defined it to be under 5%).

To mitigate this concern, we compare ownership shares in 'baseline domicile group', instead of in tax-havens. 'Baseline domicile' (or 'prominent group') refers to the majority terminal ownership residence at baseline: for exposure firms this is tax havens; for control firms, this is foreign non-havens (which we term as international). Thus, to estimate the impact of the reform on tax-haven terminal ownership, we compare tax-haven ownership for exposed firms to international ownership for control firms. This now requires that the extent of mean reversion in ownership from the baseline domicile is similar between exposure and control firms. Similarly, we define the 'inverse domicile group', as the opposite foreign domicile category. For exposure firms, the inverse domicile is international, and for control

firms, the inverse domicile is tax-havens.[16]

To further address the threat of mean reversion, Section D considers three alternative definitions for the exposure and control groups that focus specific geographies of firm ownership. One concern is the disparity in the number of firms in the two groups of firms, since there are fewer than 600 majority haven-owned firms versus more than 3,000 internationally-owned firms. As a result, ownership changes within group are mechanically more likely for international firms. In an alternative empirical strategy, we only compare Caribbean versus Colombian majority-owned firms (as of 2014): these two groups of firms are close in numbers and are owned by neighboring countries to Ecuador. Lastly, Section C replicate our main results for minority foreign-owned firms, showing consistency with (albeit significantly more noise than) our main results.

4 Impact of the Tax-Haven Surcharge on Ownership

4.1 Impact of the Reform on the Corporate Tax Rate

How binding was the tax reform in practice? Figure A.1, panel (a), estimates the difference in difference model with the effective corporate tax rate as the outcome. On average, the CIT rate of exposed firms increased by around one percentage point, relative to control firms. This moderate rise in the effective CIT rate of exposed firms could be due to behavioral responses or to an incomplete application of the law. In panel (b), we plot the CIT rate coefficient, conditioning the sample such that the exposure group maintained ownership in tax havens in 2015 and paid positive CIT: for these firms we observe an increase in the effective CIT rate of just under 3 percentage points, showing that the reform was implemented as intended. Note that for the corporate income tax rate to be defined, a firm must report positive taxable profits, which is the case for 74% of both exposure and control

[16] A limitation of using 'inverse domicile group' ownership as the outcome, is that by construction the control groups' tax-haven ownership is below 5%, while the exposure group can have some foreign non-haven ownership (which by definition is below 50%). This could bias downwards our estimates of substitution to foreign non-haven ownership if the control group sees mean reversion towards haven ownership. However, the magnitudes of our results in 4.2 suggest that this possibility is of limited concern. We also implement a design that measures the change in inverse group ownership, conditioning the exposure group on the same requirement as that of the control group, namely limiting its 2014 non-haven ownership to 5%.

firms at baseline. Panel (c) shows that the relative likelihood of reporting positive profits is unaffected by the reform (Section 5 analyzes firms' economic activity).

4.2 Ownership Results

Tax-haven Ownership Figure 1 Panel (a) shows the time series for the average 'baseline domicile' ownership share. For the exposure group this corresponds to their tax-haven ownership, and for the control group to their foreign non-haven ownership. We first describe the shape of these series. Both series slightly rise in the pre-reform years, from just below 80% ownership shares in 2012, to almost 90% in 2014, the year used to define the groups. Thereafter the series continuously decline until the end of the panel. This shape is as expected, given our definition of exposure (control) as majority owned in 2014 in havens (non-havens), and is consistent with some mean reversion in the baseline ownership domicile. Yet the extent of mean reversion can be estimated by the shape of the control group's ownership share in its baseline domicile, which should be unaffected by the reform.

While the two series evolve similarly over the pre-reform in levels and trends, starting in 2015 when the reform is enacted, the tax-haven ownership of exposed firms falls much faster than the foreign (non-haven) ownership of control firms. A gap of 10 percentage points in baseline domicile ownership forms in 2015, and widens over time, to reach nearly 20 percentage points by 2019. We plot a third time series showing the tax-haven ownership share of control firms. By definition it is low at baseline (below 5%), but re-reassuringly hardly changes over time: foreign firms in the control group don't start reporting terminal ownership in tax-havens post reform. Panel (b) plots the yearly coefficients on baseline domicile ownership from estimating the difference-in-difference model in Equation (1).

Figure 1 Panel (c) and (d) show the time series and yearly coefficient for the extensive margin of ownership: the likelihood that the ownership from the baseline domicile has gone to zero. The coefficients are similar to those of the average ownership share, highlighting that most ownership relocation away from tax havens happens on the extensive margin.

Table 3 summarizes these results, by estimating a simple, pre versus post-reform difference in difference regression. Even numbered columns include firm fixed effects, while odd numbered columns do not. Our main coefficient in Column 2 indicates a 12.8 percentage

points reduction in baseline domicile ownership for the exposure group relative to the control, with a tight confidence interval of [-16.5 to -9.1]. The coefficients from regressions with weights for firm importance are very similar (Column 4). The share of firms removing all ownership from the baseline domicile is 11.5% higher for exposed firms than control firms.[17]

We interpret the difference-in-difference coefficients as the change in tax haven shareholdership induced by the tax-haven surcharge reform. To highlight the mechanics of our identification strategy, column (5-6) of Table 3 show the coefficient from a naive regression, were we use tax haven ownership as the outcome, instead of baseline domicile ownership, thus not attempting to correct for mean reversion. We see that the estimate would have been a lot larger, at -30.5%. Figure A.2 shows that unsurprisingly such a regression would have violated the parallel pre-trends assumption.

Who are the new owners? Given the documented reduction in tax haven terminal ownership, we now ask, if (1) the reform improved beneficial ownership transparency (individual ownership), (2) where this new terminal ownership is domiciled, and (3) if exposed firms retain intermediate shareholdership in tax havens.

First, we turn to the effect of the reform on beneficial ownership transparency: that is to what extent are the terminal owners individuals, as intended by the APS reporting standards. Figure 2, panel (a) shows a sustained 10% rise in beneficial ownership, pointing to a rise in transparency.

Second, we turn to the resulting change in domestic and foreign-non haven terminal ownership. By definition, ownership domicile is partitioned into three groups: tax havens, foreign non-havens, and domestic (Ecuador). Importantly, there is no mechanical relationship that should inform *which* of the two non-haven domicile groups receives the resulting reallocation in terminal ownership. Firm equity owned by owners in tax havens can be purchased by

[17] Using the results from the table, we can infer the size of extensive margin movement as based on a decomposition of average "intensive" margin movement and "extensive" margin weighted by their respective shares of compliers: $\hat{\beta}_{dd} = \left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} = 0\right] \cdot p_{t\geq 2015,=0} + \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] \cdot p_{t\geq 2015,>0} \implies -.12 = -.8 \cdot 0.115 + \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] \cdot (1 - 0.115) \implies \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] \approx -0.03$. This calculation implies that there exists very little intensive-margin movement in shareholdership: conditional on not reducing terminal shareholdership in tax havens to zero, the average exposure firm reduced its terminal shareholdership in tax havens by 0.03 percentage points.

domestic parties (possibly purchased back by the Ecuadorian firm itself) or by another party domiciled in a foreign non-haven.

Figure 2, panel (b) illustrates the resulting average changes in terminal shareholdership in foreign non-haven and Ecuador. The results demonstrate that nearly all of the observable decrease in tax haven shareholdership was reallocated to shareholdership in foreign non-havens as opposed to domestically.

Table 3 summarizes all of these results, also displaying estimates that include weighting on 2014 firm size. The table indicates that 80% of the counterfactual decrease in shareholdership accrued to shareholdership in foreign non-havens; we observe no significant increase in domestic shareholdership, which amounts to under 10% of the change.[18]

Figure 2, panel (c) shows however that there has been no change to the shareholdership in tax havens, such that for the average firm, tax havens shareholders are still intermediate owners.

4.3 Heterogeneity by ex-post response

To further explore the mechanics of the results, we consider the characteristics of exposed firms based on their ex-post ownership response (e.g. relocated tax-haven ownership to international). Such an analysis based on ex-post response is not causal, but allows us to speak more closely to the mechanisms underlying our observed responses. These designs and all of the subsequent designs that explore heterogeneous responses along ex-post majority domicile response compare the exposure firms with a given ex-post majority domicile response (e.g. exposure firms that reduced tax haven shareholdership to zero in 2015) against the standard, *complete*, control group in our main specifications. For the rest of the paper, we generally distinguish between three margins of heterogeneity along ex-post majority domicile response: 1) exposure firms that reduced tax haven shareholdership to zero and became majority ultimately owned by domestic (Ecuadorian) shareholders in 2015; 2) exposure firms that reduced tax haven shareholdership to zero and became majority ultimately owned by

[18] Although these changes in inverse group and domestic shareholdership only account for around 90% of the estimates drop in tax haven terminal shareholdership, we attribute this gap to noise in estimation. Indeed, Figure A.3 shows no change in observed terminal ownership residual or whether a firm filed an APS declaration.

shareholders in foreign non-havens in 2015; and 3) exposure firms that maintained terminal shareholdership in tax havens above 50% in 2015. For brevity, we also group together the first two of these firm types as "firms that reduced tax haven shareholdership to zero".

We do not interpret these conditional responses as causal. For instance, our estimates suggest that counterfactually, the CIT tax haven terminal shareholdership surchange induced no additional increase in domestic shareholdership: however, around 7% of exposure firms still reverted their terminal ownership majority to Ecuador (as did within the control group). Rather, we view these designs as illustrative of the mechanisms that underlie our ITT estimates for changes in shareholdership and other outcomes. The designs also offer the quantitative interpretation that their estimates represent a portion of the convex combination of estimates that form the overall corresponding ITT estimate.[19]

Table 5 displays descriptive statistics for three groups. The two groups of firms that maintain their terminal shareholdership abroad are significantly larger than those that change their terminal shareholder majority domicile to Ecuador in terms of revenue and assets. These firms also declare more profit and pay more in corporate income taxes, but this difference is estimated with more imprecision.

Figure 4 estimates difference-in-differences designs for evaluating the change in shareholder domicile among these different groups, distinguishing between firms whose majority terminal shareholdership remained in havens in 2015, and those whose majority terminal shareholdership in havens reduced to zero in 2015. Panel (a) shows a compelling drop in terminal shareholdership by foreign firms that accrues relatively evenly to terminal shareholdership among Ecuadorian and foreign nationals, but also among Ecuadorian firms. The exposure firms in this group also exhibit visibly parallel pre-reform evolution in outcomes as to control firms. Panel (b) shows the response among firms that maintained majority terminal shareholdership in tax havens in 2015. The figure relatively greater volatility in pre-reform evolution in outcomes relative to control firms. Surprisingly, in spite of observationally not changed their majority terminal ownership domicile, these firms saw substantial

[19]These three groups do not necessarily partition the space of ex-post majority shareholdership responses, shareholdership may also be allocated between equally between foreign non-haven and domestic shareholdership or to a non-allocable residual category in a manner that does not define a strict majority domicile.

change in the composition of their terminal shareholdership. Namely, these firms saw a decrease in terminal ownership among Ecuadorian nationals that accrued to terminal shareholdership by foreign nationals. These firms also saw a decrease in terminal ownership by foreign firms (and a modest increase in terminal ownership by domestic firms), which we can rationalize the increase the tax haven person ownership observed in Table 4 Panel (b).

Lastly, we plot the difference-in-differences plots measuring the change in the maximum number of direct ownership chains to reach the firm terminal owner. While Table 4 Panel (c) indicated a null-response, Figure 5 reveals significant heterogeneity based on this margin of *how* the firm's terminal ownership responded post-reform. This variable illustrates the mechanics od the change in shareholdership. Namely, the blue line shows that exposure firms whose terminal ownership majority changed from tax havens to foreign non-havens, these firms effectively added a layer of ownership, "revealing" the person controlling the firm based in the tax haven. This response contrasts with the red line that shows the response for firms that repatriated ownership back to Ecuador. These firms exhibited a decrease in the average ownership chain length, indicating that these firms indeed reduced their presence in tax havens or "removed" a layer of ownerhsip. Lastly, the black line shows the response for firms that remained in tax havens. These firms exhibit little response, albeit a noisy increase in ownership chains toward the end of the time frame.

5 Impact of the reform on economic activity

5.1 Employment, Investment and Financing

One motivation behind the CIT tax haven surcharge lies in the role that tax havens play in facilitating tax base erosion: namely tax evasion and profit shifting. The previous section showed that while the reform led to a sharp reduction in terminal ownership in tax haven and an increase in beneficial ownership reporting, domestic ownership did not increase on average. Instead, exposed firms saw their terminal ownership relocate to foreign non-haven jurisdictions. Given this lack of "domestic ownership repatriation", it is not clear whether the reform impacted tax collections, real economic activity and/or profit shifting. We now

turn to estimating the impact of the reform on these outcomes.

Ex ante, it is not necessarily evident that the reform would result in an increase in tax collections among legally performed profit shifting. The reform targeted firms based on their terminal ownership domicile, whereas multinational firms can engage in profit shifting using any affiliate located in a tax haven. This said, mechanically, the reform would lead to a mechanical increase in tax collections among the firms that maintained their terminal ownership in tax havens and continued to report positive profits in Ecuador.[20] Of course, such mechanical effects would be mediated by the negative effects of the corporate income tax rate on taxable profits (e.g. Kennedy et al. (2024)).[21] On the other hand, in improving the identification of terminal owners, the reform may have had an impact on potentially illicit financial flows or tax evasive flows. The reform and its impacts on transparency may induce an increase in the perceived probability of detection on part of agents, thus leading to a decrease in such flows (Allingham and Sandmo (1972)).

We begin our investigation of tax and real firm outcomes by estimating Equation (1) using profit and tax variables. Figure 6 illustrates the difference-in-difference designs for these outcomes.

Table 6 Panel (a) summarizes the responses. We observe that on average exposed firms exhibited an increase in gross and taxable profits of around 15% per year. On average, exposed firms ended up paying around 15% more in CIT liability. Importantly, Figure 6 Panel (d) and Table 6 Panel (a) columns (9) and (10) illustrate that exposure firms do not change *whether* they pay corporate income tax (i.e. whether they declare taxable profits in Ecuador). While this 15% increase in CIT liability is nearly identical to the proportional

[20] Table 2 finds nearly three quarters of firms in our exposure and control groups declared non-zero taxable profit in Ecuador in 2014.

[21] Lastly, the reform introduces a distortion to truly arms-length external corporate finance. Ecuadorian firms see a penalty for maintaining arms-length terminal shareholders domiciled in tax havens. The drop we observe in tax haven shareholdership could also be generated by some combination of changes to firm shareholder policies prohibiting external financing from shareholders domiciled in tax havens and by arms-length tax haven shareholders themselves voluntarily closing out their positions upon observation that the firm will face a higher CIT rate (which would thus reduce returns to shareholders). Both of these outcomes theoretically reduce external firm financing and reduce firm profits to the extent that they introduce disincentives for genuine and therefore limit firm liquidity. In principle, we could investigate the trading activity of publicly-traded firms on the two Ecuadorian stock exchanges using our exposure/control design. However, in practice, Ecuador is highly under-financialized, with only several hundred firms listed on the two public exchanges in Guayaquil and Quito. Furthermore, trades occur with considerable sparsity, with typically fewer than five transactions occurring per day.

increase in statutory CIT liability induced by the full CIT surcharge, however, the increase reflects responses from both firms that ended up facing the CIT surcharge as well as firms that reduced their tax haven usage. Considering the relative size of exposure firms relative to most firms operating in the Ecuadorian economy, this profit and CIT payments response represents a quantitatively important dimension of the impacts of the reform.

We view this increase in reported profits and CIT liability as surprising. We do not take a stance on whether this change reflects a change in illegal tax evasion or a decrease in legal profit shifting, it would appear unintuitive that the reform would lead to a decrease in profit shifting, given its emphasis on *ultimate* beneficial ownership, as opposed to any association with any corporate affiliates domiciled in tax havens.

Table 6 Panels (b) and (c) further inform the response by disaggregating the response based on ex-post majority terminal owner domicile change. As before, we distinguish between terminal owner majority domicile in 1) Ecuador, 2) foreign non-havens, and 3) tax havens in 2015. The results illustrate similarity in response among these groups. Individual estimates within each group exhibit substantially less precision; the point estimates reveal similar changes in CIT payments, although taxable profit saw the smallest increase among firms whose beneficial ownership remained in tax havens and faced the CIT surcharge, in line with firm behavioral responses to CIT rate increases. However, the point estimate for both gross profits and taxable profits among these firms is still positive (albeit imprecisely estimated): the positive sign on these coefficients may reflect changes in nominal activity within profit declarations.

We also distinguish an additional group as exposure firms that reduced their 2015 tax haven terminal shareholdership to zero. These firms exhibited the largest and most significant response, increasing declared gross and taxable profits along with corporate income tax payments by nearly 25%.

While we do not take a stance on the legality of the underlying flows that changed or between tax avoidance and evasion in our setting, the reform does not directly induce a change in incentives to change profit shifting behavior. Moreover, columns (4) and (10) of Panels (b) and (c) indicate no change in profitability as measured by revenue; i.e. the relative composition of revenues and expenses do not appear to be substantially changing

within the Ecuadorian firm. Typically, firms with multinational affiliates engage in profit shifting activities primarily on the expense-side of operations such as transfer pricing, debt shifting, and intra-group interest payments to offload profits from a higher tax jurisdiction to a lower tax jurisdiction (e.g. Langenmayr and Liu (2020); Liu, Schmidt-Eisenlohr, and Guo (2020); Wier (2020)). A decrease in profit shifting would likely manifest in an increase in profitability by revenue, and observation of no change in profitability suggests that the changes in profits and taxes on part of exposure firms further suggests that exposure firms are not altering any profit shifting activities.

5.2 Foreign transactions

We now turn to exploring the mechanisms that underlie our results. In order to rationalize firms' responses both in shareholdership and in declared profits and CIT payments, we will estimate changes in outcomes pertaining to more detailed activities.

We make use of three new sets of outcome variables and use these variables on the left hand side in regressions analogous to Equation (1). First, we use additional variables on more granular activity, such as expense disaggregations, investment, and labor payments from the income tax form in order to assess changes in real and other potentially nominal outcomes. We also use data on the near universe of cross-border flows to assess changes in patterns in direct transactions with entities in tax havens and non-havens. Lastly, we use data underlying reporting on intra-group/affiliate activity included in income tax declarations). We also explore how these outcomes change along the same margins of ex-post heterogeneity in terminal shareholder majority domicile as before.

Figure 7 shows the average response in select expense categories of interest. Panel (a) shows that exposure firms exhibited no change in labor payments. This null result shows that the additional profits being declared domestically are not being paid out in the form of outsized labor payments, possibly to leadership. This result poses some contrast to the negative impacts of anti-tax haven policies on local labor market outcomes (e.g. Serrato-Suarez (2019)). Rather, panels (b) and (c) illustrate two relatively striking changes in expenses. We find a large proportionate increase in reinvestment out of profit, corresponding

with an increase in around 0.7 log points, or an approximate doubling.[22] We also document a sharp decrease in interest and debt payments. While the reform does not directly change incentives for profit shifting, interest and debt payments represent standard instruments for facilitating multinational profit shifting due to their less tangible nature and the ease by which intangible assets and liabilities can be shifted between entities.

We now turn to outcomes pertaining to cross-border transactions. We construct these variables from cross-border currency flows as observed in the MID. Table A.1 displays 2014 descriptive statistics for cross-border inflows and outflows by non-haven or haven status for the main exposure and control groups. The table demonstrates relatively stronger flows with tax havens for the exposure group and stronger flows with non-havens for the control group, although this is not the case for currency exits to non-havens. We take the table to validate our use of the MID.

If the reform resulted in a decrease in activity involving tax havens on part of Ecuadorian companies, we should observe this outcome directly from the MID transaction data. Just as before for shareholdership, our preferred method of evaluating changes in transactions with parties in tax havens (or non-havens) involves making comparisons with the analogous "prominent" (or "inverse prominent") group with exposure and control firms. For example, by comparing the evolution in tax haven outflows among the exposure firms with the evolution in non-haven outflows for control firms, we aim to overcome mean reverting trends and the mechanical relationship between the construction of our exposure/control groups and their flows with haven or non-haven parties.

Figure 8 plots the results for designs involving the MID transaction data. Instead of exposure firms reducing their ties to tax havens and increasing their ties with non-havens as suggested by their responses in terminal shareholdership, the figures reveal that, if anything, the opposite actually occurred. Panel (a) plots the relative composition of inflows from and outflows to havens (as opposed to non-havens), showing a substantial increase in the share of inflows coming from havens and a noisier and smaller-in-magnitude increase in the share of outflows to tax havens. At the same time, panel (b) speaks to the magnitude change in inflows and outflows. It appears that compared to control firms, treatment firms

[22]This category of post-expense re-investment is disaggregated as it permits a slightly lower CIT rate.

experienced no substantial change in the amount outflows abroad, but saw a substantial decrease in inflows from abroad.

Panels (c) and (d) plot the difference-in-differences coefficients associated with designs for binary variables indicating whether any inflows or outflows occurred with either havens or non-havens. The figures illustrate a compelling increase in the probability that exposure firms saw direct transactions with tax havens — both inflows and outflows — and a similar decrease in the probability that these firms saw transactions with non-havens. This result poses somewhat of a puzzle, and implies that exposure firms became even more visibly connected with tax havens, and less so with non-havens in terms of direct transactions.

Table 7 summarizes these results.[23] In addition to displaying the coefficients associated with binary flows, Panel (b) also shows the coefficients for regressions that use flows normalized by revenue as dependent variables. The table shows that as for binary flows, exposure firms exhibit a significant increase in outflows to havens as a share of revenue, and a decrease in both inflows from and outflows to non-havens as share of revenues. Haven entries also increases, but the coefficient are estimated with substantially greater noise.

These results imply that if anything, the reform induced *greater* observed financial connectedness with tax havens. Table 8 elaborates on this response by stratifying the difference-in-differences designs within the exposure group based on their 2015 ex-post terminal shareholder majority domicile group. We find the most attenuated responses concentrated among exposure firms that changed changed their majority domicile to foreign non-havens, with no coefficients estimated with precision to reject the null-hypothesis that they are equal to zero at 95% confidence. Rather, we find the strongest responses concentrated among the firms that maintained their majority terminal shareholder domicile in tax havens following the reform.

Our last approach in investigating these responses is to study self-reported flows with related parties, as generated from intra-group transaction data.[24] Figure 9 shows these responses, plotting the difference-in-difference coefficients separately for payments to *foreign*

[23] The table also substantiates the robustness of these results by using the dependent variable specification that does not use our approach to correcting mechanical mean reversion.

[24] These data are typically maintained by tax authorities in order to enforce anti-transfer pricing profit shifting activity.

related parties and log payments to *local* related parties. The plots show no compelling change in flows to foreign related parties and an ostensible decrease in flows to local related parties. However, it is possible that these data are not reported so as to accurately reflect intra-group activity.

While this exploration into the evolution of firm mechanics in response to the reform does not answer whether we can attribute the change in terminal shareholdership, ownership reporting, and profit/CIT to changes in either profit shifting or tax evasive activity, the results compellingly illustrate that exposure firms became demonstrably more financially connected with tax havens and less connected with foreign non-havens. Taken in the context of the increase in transparency in corporate offshore ownership, we interpret these results as similarly reflecting an increase in transparency and a simplification of profit obfuscation activity. Exposure firms no longer would take more complicated, possibly more pecuniarily costly paths to transact with other entities in tax havens. Rather, they appear to be transacting more openly with parties in tax havens.

6 Conclusion

We study a unique unilateral anti-tax haven reform in Ecuador. The rise of and resulting challenges posed by multilateral policy solutions to combat tax haven usage for both tax evasive/avoiding purposes and for circumventing international law demonstrate the impetus for determining the scope to which single countries can act on their own to observe and mitigate corporate usage of tax havens. The Ecuadorian CIT surcharge on tax haven terminal ownership reform represents a novel, yet important reform to study. Ecuador is a middle income country, but simultaneously installed an ambitious shareholdership registry *and* leveraged this new piece of data infrastructure to implement a pecuniary penalty on observed shareholdership based in tax havens. Given recent results that show substantial heterogeneity across countries in implementing and leveraging new standards on ownership reporting, we anticipate that the Ecuadorian experience is highly externally relevant for many other developing counties.

Our analysis yields a set of novel and surprising results. Our main analysis compares

firms exposed to the reform based on their majority tax haven shareholdership status in 2014 (the final pre-reform year) against control firms defined based on their 2014 majority shareholdership in foreign non-havens and observed non-affiliation with tax havens.

Our first set of results pertains to changes in shareholdership. We find that the CIT surcharge induced a 12-13pp decrease in tax haven shareholdership among the control group (relative to a baseline of 82%). We document substantial "extensive-margin" movement here, estimating that the CIT surcharge induced 11-12% of exposed firms into reducing their observable tax haven shareholdership to zero in the post-reform period. However, we find that a substantial majority of the shareholdership of these firms relocates to foreign non-havens, and no net increase in Ecuadorian terminal ownership; after correcting for mean reversion, we observe an increase in foreign non-haven ownership of about 10.5pp, or about 85% of the decrease in observable tax haven terminal ownership.

We expand on this result by studying the precise response in terms of the domicile and personhood of terminal owners. In spite of the net relocation to terminal ownership in foreign non-havens, we find a broad increase in terminal ownership transparency; we find a broad decrease in terminal ownership by firms, who definitionally cannot truly serve as beneficial owners, and an increase in terminal ownership by persons. This result is crucial for the enforcing tax policies to and ensuring compliance among offshore entities—a key goal of the establishment of the Common Reporting Standards and the Automatic Exchange of Information. We find an increase in observation of true terminal ownership among both firms that leave tax havens and firms that maintained their majority terminal shareholder domicile in tax havens. However, as a perhaps perverse response, we also observe a modest reduction in domestic corporate transparency in the form of a substitution of terminal ownership from Ecuadorian persons to Ecuadorian firms.

We then turn to studying profit an CIT responses of affected firms. We find an exciting, yet counterintuitive result that firmed exposed to the CIT tax haven terminal shareholdership surcharge increased their profits declared and CIT payments by around 15%. These firms are subtantially larger than most CIT-paying firms in the Ecuadorian economy, which further substantiates the importance of this response. We view this result as surprising, because the reform, through its focus on *ultimate* shareholdership in tax havens (as opposed to

any affiliation with tax haven entities), does not pose any direct disincentives to engage in legal profit shifting. It is perhaps the case that through increasing corporate ownership transparency, the policy serves as a very salient "flashlight" in increasing agents' perceptions that their potentially activity may be placed under scrutiny by the Ecuadorian tax authorities or shared with other tax authorities (e.g. Allingham and Sandmo (1972)).

We investigate this possibility in the final section by estimating the responses of firm affiliate activity, cross-border flows, and firm financials. We find that exposed firms saw no change in their labor payouts, but rather saw increases in their reinvestment out of profits and decreases in their aggregated debt and interest payments, which perhaps suggest changes moreso in terms of *nominal* activities as opposed to *real* activities. Investigating cross-border flows and intragroup activity, we document a compelling decrease in transactions with foreign non-havens and perhaps to a lesser extent with local affiliates, and an increase in transactions with parties in tax havens. We view this result as counterintuitive, and we rationalize this result in that the reform induced an increase in transparency and a simplification of profit obfuscation activity, so that exposed firms no longer saw it worthwhile to take more complicated, possibly more pecuniarily costly paths to transact with other entities in tax havens. Rather, they altered their behavior to transact more openly with parties in tax havens.

We take our results to speak policy on improving business ownership transparency both in developing and developed countries as well as to the frictions and costs associated with tax haven usage (Bilicka, Devereux, and Güceri (2024)). There is little work that evaluates the effects of unilateral anti-haven policies in a data environment in which the researcher can directly observe haven usage. Moveover, going against conventional wisdom that domestic policy likely proves insufficient in combating multinational tax strategy, we find that in combination with a saliently pecuniary threat (in our case the CIT surcharge), domestic policy can demonstrate effectiveness in addressing multinational activity. Our results imply that multinational tax strategy is *not* frictionless, and that even single, developing countries, can introduce measures to monitor and regulate tax haven activity.

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7 Main text figures and tables

Table 1: Foreign terminal ownership of Ecuadorian companies

Panel (a): Tax havens

	Country	> 50%	> 25%	> 10%	> 5%
1	Panama	353	445	500	519
2	Netherlands	52	72	87	92
3	Bahamas	46	51	52	52
4	British Virgin Islands	14	21	27	29
5	Cayman Islands	10	11	11	11
6	Belize	9	9	9	9
7	Luxembourg	9	11	12	16
8+	Other	47	59	72	76
	Unique firms	581			
	Share of firms in sample	0.9%			
	Share of firms (revenue-weighted)	3%			

Panel (b): Foreign non-havens

	Country	> 50%	> 25%	> 10%	> 5%
1	Colombia	555	776	871	927
2	USA	506	800	1023	1143
3	Spain	281	394	458	491
4	Peru	178	264	302	323
5	Venezuela	114	170	186	191
6	Chile	113	160	190	207
7	Costa Rica	98	132	157	168
8+	Other	884	1288	1527	1636
	Unique firms	3263			
	Share of all firms in sample	5.2%			
	Share of firms (revenue-weighted)	24%			

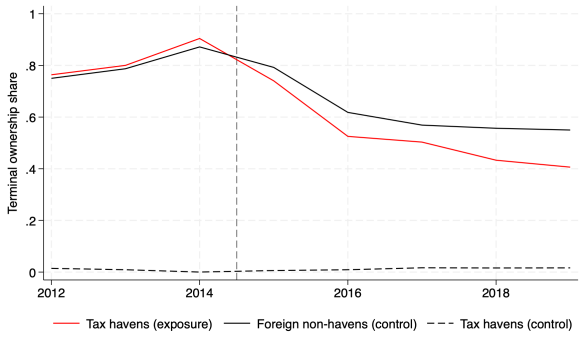
Note: This tables uses the APS to tabulate the top tax and foreign non-haven haven country-domiciles of observed terminal owners of Ecuadorian companies. Firms in sample include all firms that file the F101 business income tax declaration with positive revenues in 2014 and have at least one APS filing between 2012 and 2014.

Table 2: Descriptive statistics and ownership characteristics:
Foreign Owned Ecuadorian Firms (2014)

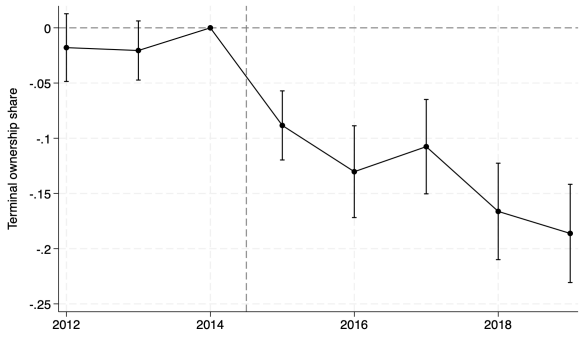
	Exposure	Control	Difference	Domestic firms	Difference of majority foreign firms v. Domestic
Panel a: Firm Characteristics					
Log revenue	12.69	12.50	0.185	11.55	0.979
			(.1316)		(.04321)
Log taxable profit	10.43	10.27	0.168	8.86	1.43
			(.135)		(.0474)
Has positive taxable profit	0.747	0.746	0.00136	0.786	-0.0398
			(.01961)		(.006878)
CIT liability (1000s)	44.18	43.37	0.808	11.69	31.80
			(4.725)		(.8433)
Log CIT liability	8.917	8.756	0.161	7.35	1.43
			(.1342)		(.0472)
CIT rate	0.164	0.164	0.000365	0.173	-0.00879
			(.004316)		(.001514)
Log assets	13.78	12.72	1.060	11.40	1.480
			(.1097)		(.03899)
Profitability by revenue	0.123	0.105	0.0186	0.0906	0.0169
			(.008691)		(.002826)
Labor share of costs	0.242	0.289	-0.0467	0.314	-0.0335
			(.01188)		(.01584)
Panel b: Ownership breakdown					
Ecuadorian person (%)	5.092	11.19	-6.098	91.38	-81.11
			(.7826)		(.4173)
Foreign person (%)	38.34	58.63	-20.29	0.00935	55.55
			(1.908)		(.1847)
Ecuadorian non-person entity (%)	1.621	1.669	-0.0474	8.722	-7.061
			(.3539)		(.4088)
Foreign non-person entity (%)	55.38	29.04	26.34	0.00176	33.02
			(1.994)		(.1945)
Residual (%)	-0.436	-0.531	0.0942	-0.117	-0.400
			(.3029)		(.0596)
Additional ownership characteristics:					
Ownership share of plurality owner	0.805	0.688	0.117	0.618	0.0870
			(.01199)		(.00495)
Avg. ult. shareholder chain	1.916	1.520	0.396	1.009	0.570
			(.04406)		(.004712)
Max. ult. shareholder chain	2.077	1.643	0.435	1.014	0.694
			(.05429)		(.005924)
Owned by at least one $\geq 10\%$ terminal owner	1	0.994	0.00582	0.930	0.0653
			(.003157)		(.004134)
Has a weak-majority person ultimate owner	0.290	0.392	-0.101	0.480	-0.104
			(.02179)		(.008322)
Ownership reporting compliance:					
Filed APS in 2014	0.966	0.917	0.0483	0.913	0.0116
			(.008349)		(.003293)
APS adds to 100	0.974	0.959	0.0156	0.984	-0.0231
			(.008718)		(.002183)
Final beneficial ownership adds to 100	0.329	0.590	-0.261	0.839	-0.288
			(.02201)		(.006304)
Unique firms	581	3263		54164	

Note: This tables displays descriptive statistics of firms in our sample for 2014 from the F101 business income tax declarations and the APS ownership data. The first difference column corresponds with a cross-sectional univariate regression of the dependent variable (given by the row) on an indicator for exposure with the set of majority foreign-owned firms; the second difference column (the final column) compares the union of exposure and control firms against domestic firms. Parentheses contain heteroskedasticity-robust standard errors. This is discussed in Section 3

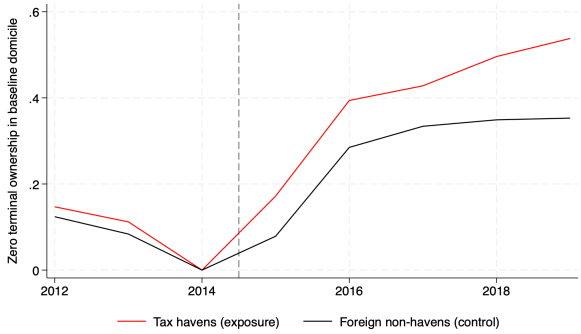
Figure 1: Tax reform impact on terminal ownership



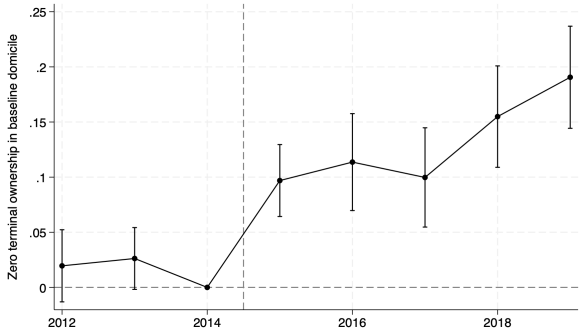
(a) Time series of terminal ownership



(b) Relative change in terminal ownership (DD)



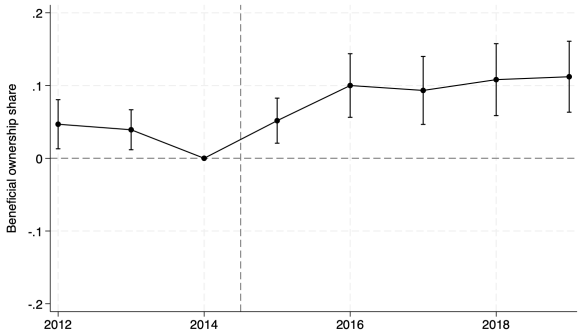
(c) Time series of whether firm has zero terminal ownership in baseline domicile



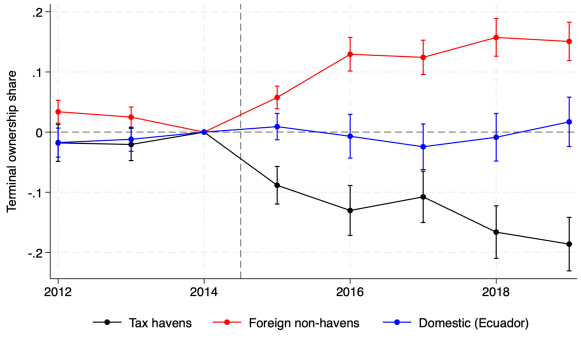
(d) Relative change in probability of zero terminal ownership in baseline domicile (DD)

Note: These figures display the time series and the difference-in-difference results that estimate the change terminal ownership by baseline domicile, following the 2015 reform imposing a higher tax rate on tax-haven terminally owned firms. Baseline domicile is defined as the reported location of the majority owner in 2014. Panel (a) plots the time series of outcome variables by group, including tax haven shareholdership for the control group to illustrate the utility of our approach for correcting mean reversion. Panel (b) uses main group shareholdership as the dependent variable; Panel (c) uses the a binary indicator for main group shareholdership share equals zero; Panel (d) uses inverse group and domestic shareholdership. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

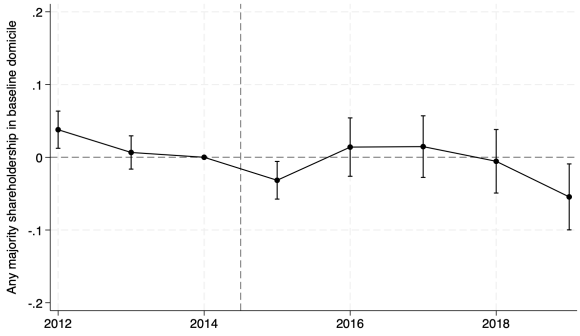
Figure 2: Tax Reform Impact on Beneficial Ownership, Location of Terminal Ownership, and on any Shareholdership in Baseline Domicile (including intermediate)



(a) Change in beneficial ownership



(b) Change in terminal ownership by location



(c) Change in any majority shareholdership (including intermediate) of baseline domicile

Note: This figure displays difference-in-difference results that estimate the change to reported terminal shareholder domicile. The red line plots the results associated with the design estimated for the absolute value of prominent group ownership (the result is mechanically identical in magnitude to Panel (b) of Figure 1) The black and blue lines use inverse group shareholdership and domestic (Ecuadorian) shareholdership, respectively, as the dependent variables. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table 3: Changes in domicile of shareholdership
Main group and tax haven shareholdership

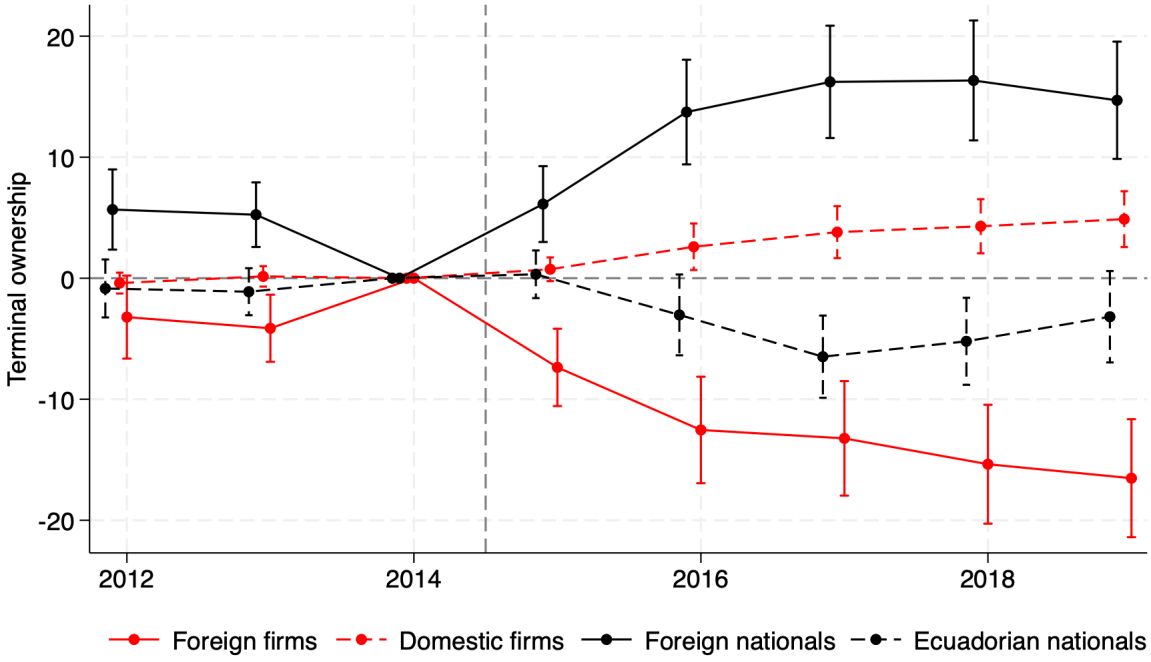
	Baseline domicile				Tax havens	
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure × Year ≥ 2015	-0.118	-0.128	-0.121	-0.131	-0.303	-0.305
	(.01871)	(.01903)	(.01849)	(.01884)	(.0177)	(.01751)
Exposure	0.0191	0.0166			0.816	
	(.01075)	(.0107)			(.00989)	
Year ≥ 2015	-0.180	-0.167	-0.178		0.00528	0.00530
	(.006298)	(.006321)	(.006183)		(.001677)	(.001719)
Constant	0.804	0.808			0.00770	
	(.004346)	(.004403)			(.001044)	
TWFE	N	N	Y	Y	N	Y
Weight (2014 log assets)	N	Y	N	Y	N	N
N	28122	28122	28122	28122	28122	28122
Adjusted R2	0.0627	0.0593	0.109	0.565	0.617	0.138

Panel (b): Reallocation of shareholdership domicile

	Main group zero			Inverse group			Domestic		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exposure × Year ≥ 2015	0.112	0.115	0.128	0.102	0.103	0.107	0.00606	0.00749	0.0121
	(.01954)	(.01939)	(.01952)	(.01226)	(.01194)	(.01264)	(.01579)	(.01562)	(.01546)
Exposure	0.0179			0.0476			-0.0657		
	(.00863)			(.006091)			(.008858)		
Year ≥ 2015	0.206	0.203		0.00528	0.00530		0.181	0.180	
	(.006848)	(.006802)		(.001677)	(.001719)		(.006005)	(.005847)	
Constant	0.0660			0.00770			0.172		
	(.003202)			(.001044)			(.004121)		
TWFE	N	Y	Y	N	Y	Y	N	Y	Y
Weight (2014 log assets)	N	N	Y	N	N	Y	N	N	Y
N	28122	28122	28122	28122	28122	28122	28122	28122	28122
Adjusted R2	0.0803	0.112	0.487	0.0889	0.0344	0.482	0.0572	0.106	0.607

Note: This table summarizes the difference-in-differences results for our main specification on shareholdership domicile. Panel (a) displays results pertaining to the change in "main group" and tax haven shareholdership. Panel (b) assesses the reallocation in majority shareholdership. Standard errors are clustered on the firm-level.

Figure 3: Changes in shareholdership by terminal owner type and domicile



Note: This figure displays difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table 4: Breakdown of terminal ownership response:
Domicile, shareholder type, complexity, and information reporting compliance
Panel (a): Ecuadorian and foreign "ultimate" ownership

	Foreign non-person entities		Foreign persons		Ecuadorian non-person entities		Ecuadorian persons	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	-10.61	-10.43	9.943	9.683	3.382	3.276	-2.962	-2.724
	(1.837)	(1.827)	(1.808)	(1.802)	(.8443)	(.8421)	(1.382)	(1.365)
Exposure	23.86		-17.04		-0.131		-6.455	
	(1.962)		(1.86)		(.3949)		(.8275)	
Year ≥ 2015	-2.875	-3.267	-15.76	-15.39	1.951	1.927	15.88	15.59
	(.5712)	(.5564)	(.7175)	(.7126)	(.2292)	(.2266)	(.5814)	(.5668)
Constant	28.41		52.82		2.192		15.13	
	(.7183)		(.6899)		(.1598)		(.3943)	
Firm fixed effects	N	Y	N	Y	N	Y	N	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	28154	28154	28154	28154	28154	28154	28154	28154
Adjusted R2	0.0246	0.0138	0.0335	0.0485	0.00983	0.0138	0.0493	0.0824

Panel (b): terminal ownership by haven and person status

	Tax haven persons		Tax haven non-person entities		Foreign non-haven persons		Foreign non-haven non-person entities	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	3.708	3.602	-15.49	-15.54	6.235	6.081	4.885	5.103
	(1.615)	(1.604)	(1.854)	(1.856)	(.9959)	(.9809)	(.9106)	(.8823)
Exposure	-18.05		22.09		1.013		1.768	
	(1.807)		(1.948)		(.418)		(.4618)	
Year ≥ 2015	-15.38	-15.07	-3.308	-3.699	-0.378	-0.325	0.433	0.432
	(.7133)	(.7078)	(.5632)	(.5491)	(.173)	(.1713)	(.1703)	(.173)
Constant	51.31		27.47		1.508		0.941	
	(.6934)		(.7131)		(.1854)		(.1342)	
Firm fixed effects	N	Y	N	Y	N	Y	N	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	28154	28154	28154	28154	28154	28154	28154	28154
Adjusted R2	0.0438	0.0522	0.0193	0.0250	0.0255	0.0150	0.0242	0.0131

Panel (c): Ownership chain length and APS compliance

	Avg. ult. shareholder chain length		Max ult. shareholder chain length		Ownership residual		APS compliance (binary)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0440	-0.00607	0.0962	0.0884	0.243	0.200	-0.000447	0.000795
	(.07929)	(.072)	(.08519)	(.085)	(.7347)	(.7525)	(.003529)	(.004028)
Exposure	0.631		0.602		-0.231		0.00536	
	(.05864)		(.06941)		(.4346)		(.001575)	
Year ≥ 2015	0.0747	0.0697	0.113	0.124	0.803	1.148	-0.0116	-0.0149
	(.01136)	(.009051)	(.01672)	(.01549)	(.2425)	(.2585)	(.001779)	(.001985)
Constant	1.315		1.564		1.447		0.992	
	(.01316)		(.02026)		(.1935)		(.00104)	
Firm fixed effects	N	Y	N	Y	N	Y	N	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	20491	20491	22423	22423	28154	28154	28154	28154
Adjusted R2	0.0420	0.00693	0.0209	0.0106	0.000611	0.00168	0.00255	0.00459

Note: This table summarizes the difference-in-differences results for our main specification on shareholdership domicile. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures thatrt indeed may serve as terminal owners. The dependent variable "residual" is constructed as the difference between 100 and observed domestic and foreign terminal ownership of all shareholder types. Standard errors are clustered on the firm-level.

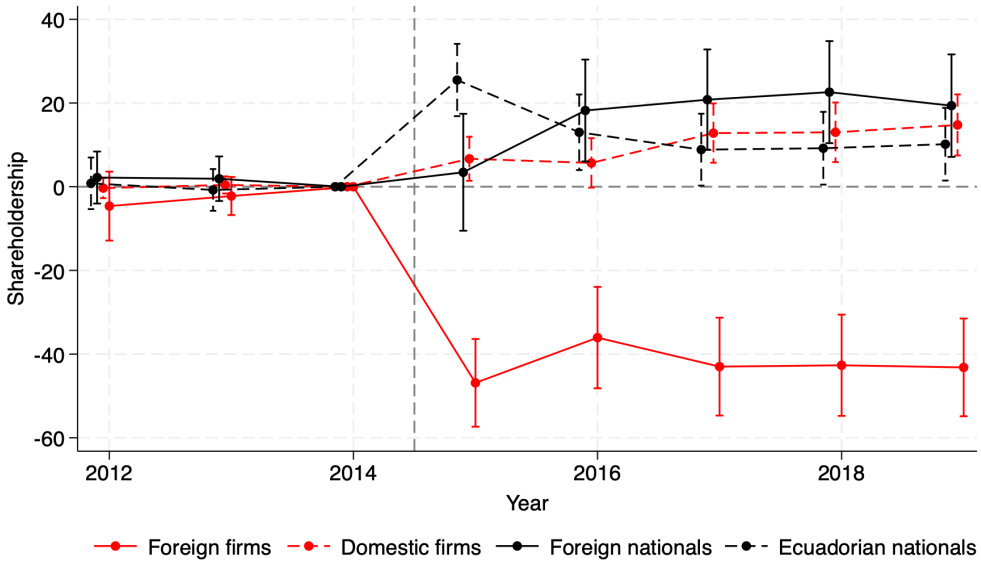
Table 5: Descriptive statistics by ex-post terminal shareholdership majority response (2014)

	Revenue	Log revenue	Total assets	Log total assets	Taxable profits	Any taxable profit	CIT 1000s USD	Profitability by revenue	Profitability by assets	Share of exposure
"Domestic movers"	1903	11.96	3886	13.24	120.9	0.837	26.60	0.207	0.445	0.074
	(1268)	(.4611)	(1450)	(.3353)	(72.36)	(.06621)	(15.92)	(.03263)	(.06281)	
Difference relative to "Domestic movers"										
"Foreign non-haven movers"	4353	2.101	2956	1.634	176.1	-0.0594	37.35	-0.0727	0.233	0.067
	(1878)	(.6831)	(2148)	(.4967)	(107.2)	(.09807)	(23.59)	(.04834)	(.09304)	
"Haven remainers"	2107	0.618	1329	0.528	79.41	-0.0993	17.42	-0.0918	0.107	0.78
	(1326)	(.4825)	(1517)	(.3509)	(75.71)	(.06927)	(16.66)	(.03414)	(.06571)	

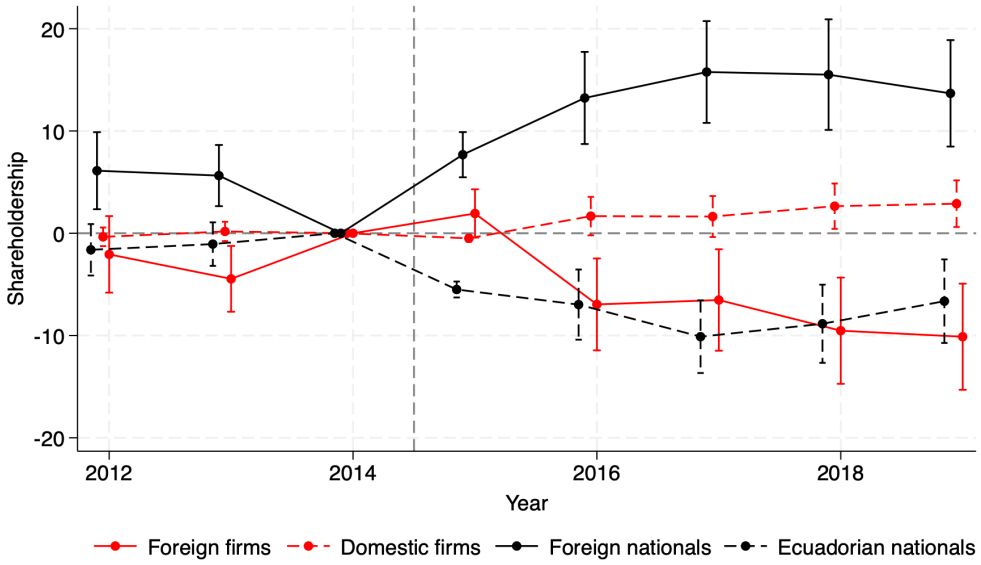
Note: This table summarizes observable characteristics of firms in our exposure group, stratified by their ex-post terminal shareholdership majority response. "Domestic repatriaters" are defined as exposure firms whose terminal shareholdership majority relocated to Ecuador in 2015. "Foreign non-haven movers" are defined as exposure firms whose terminal shareholdership majority relocated to foreign non-havens in 2015. "Haven remainers" refer to exposure firms whose majority terminal shareholder presence remained in tax havens in 2015. Each rows estimates correspond with a cross-sectional regression of the outcome variable (displayed as the column title) on a group-indicators, where the coefficients on each group are calculated relative to the average among "Domestic movers", which represents the intercept term from these regressions. Parentheses contain heteroskedasticity-robust standard errors from these regressions.

Figure 4: Heterogeneity by ex-post response

(a) Exposed firms that reduced tax haven ownership to zero in 2015

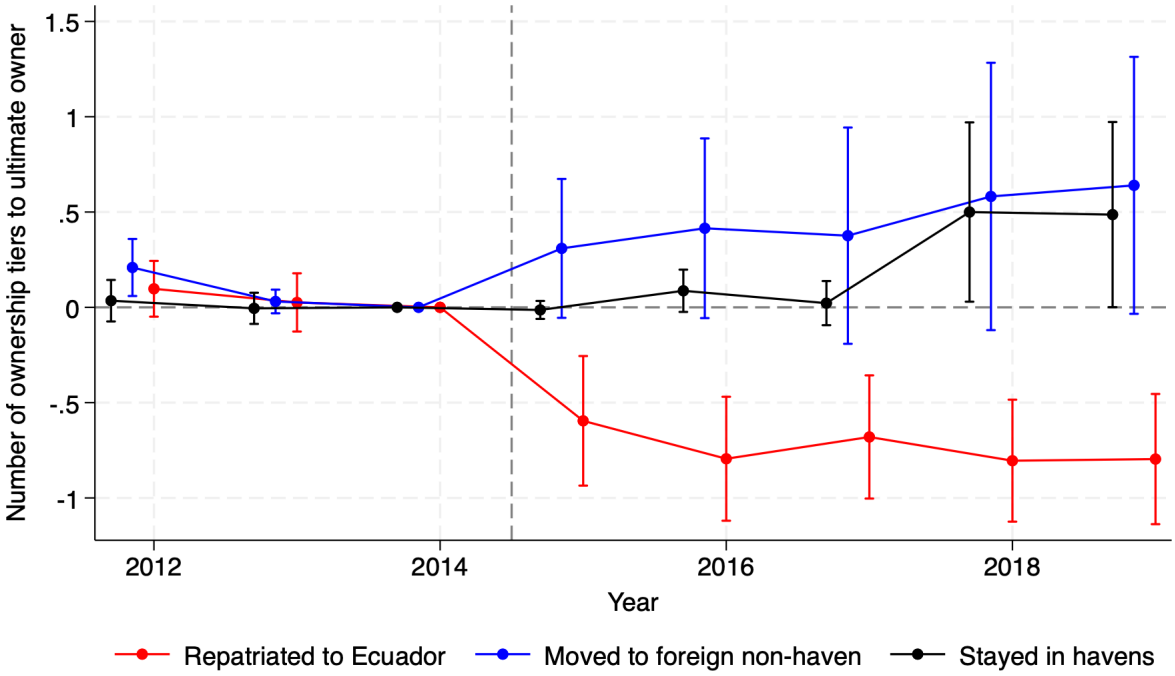


(b) Exposed firms that maintained majority tax haven ownership in 2015



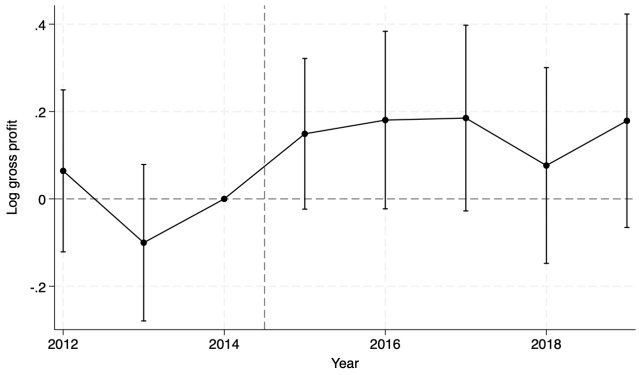
Note: These figures display difference-in-difference results from four regressions that evaluate the change in terminal shareholdership by person × foreign domicile status. Panel (a) uses exposure firms that reduced their tax haven terminal shareholdership to zero in 2015 as the exposure group. Panel (b) uses exposure firms that maintained majority terminal shareholdership in tax havens in 2015 as the exposure group. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure 5: Change in maximum direct ownership linkages to reach terminal owner

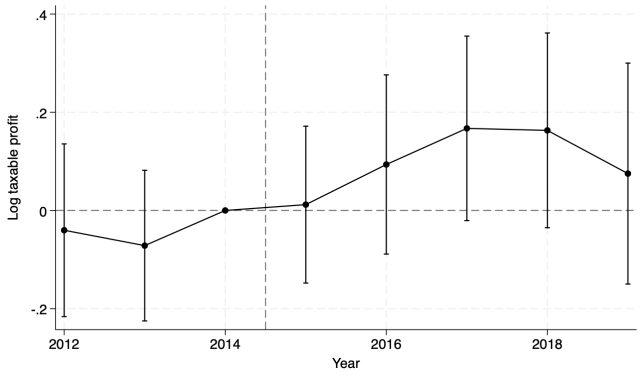


Note: These figures display difference-in-difference results that directly compare the relative changes in ownership chains between the exposure and control groups. Panel (a) uses tax haven shareholdership as the dependent variable; Panel (b) uses foreign non-haven ownership as the dependent variable. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

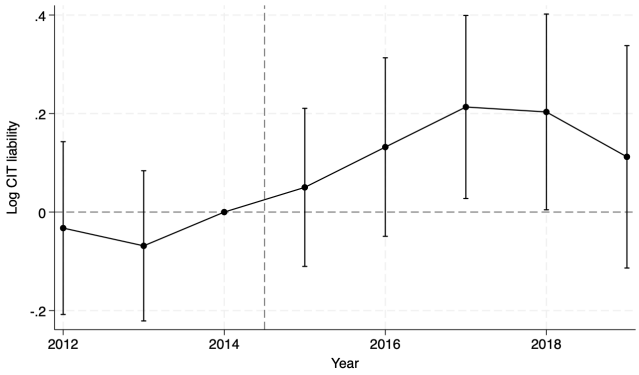
Figure 6: Impacts on profits and CIT liability



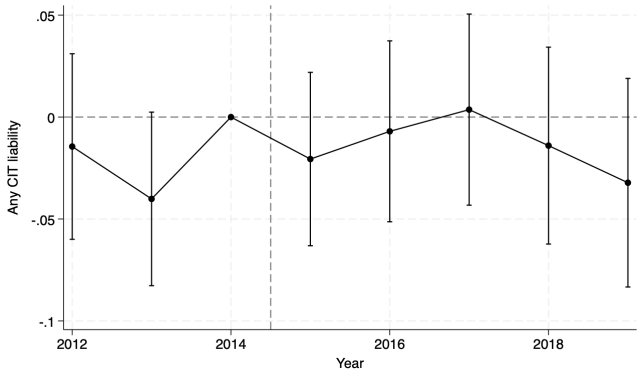
(a) Gross profits



(b) Taxable profits



(c) Log CIT liability



(d) CIT liability (binary)

Note: These figures display difference-in-difference estimates that estimate the change in profits and CIT liability for exposed firms relative to that of control firms. Panel (a) uses log gross profits as the outcome variable; Panel (b) uses log taxable profits; Panel (c) uses log CIT liability; Panel (d) uses a binary variable for whether any CIT was paid. The dashed gray vertical line marks the implementation of the CIT surcharge. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table 6: Changes in profits and tax liability
Panel (a): Main exposure and control firms

	Log gross profit		Log taxable profit		Any taxable profit		Log CIT liability		Any CIT liability	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposure × Year ≥ 2015	0.169	0.168	0.0844	0.135	0.00132	0.00391	0.120	0.171	0.00198	0.00449
	(.09918)	(.07199)	(.09287)	(.06839)	(.01644)	(.01637)	(.09326)	(.06854)	(.01645)	(.01639)
Exposure	-0.0314		0.0824		-0.0238		0.0809		-0.0237	
	(.1319)		(.1285)		(.01687)		(.1283)		(.01687)	
Year ≥ 2015	0.0199	-0.128	0.125	-0.0606	-0.0847	-0.0957	0.157	-0.0286	-0.0850	-0.0959
	(.03896)	(.02961)	(.03761)	(.0281)	(.006831)	(.006752)	(.03758)	(.02804)	(.006824)	(.006745)
Constant	10.51		10.52		0.707		9.022		0.707	
	(.05099)		(.04984)		(.006252)		(.04974)		(.006252)	
Firm fixed effects	N	Y	N	Y	N	Y	N	Y	N	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N	N	N
N	18130	18130	18575	18575	28523	28523	18569	18569	28523	28523
Adjusted R2	0.000265	0.00231	0.000967	0.000713	0.00771	0.0166	0.00148	0.000712	0.00773	0.0166

Panel (b): Heterogeneity by ex-post shareholdership domicile

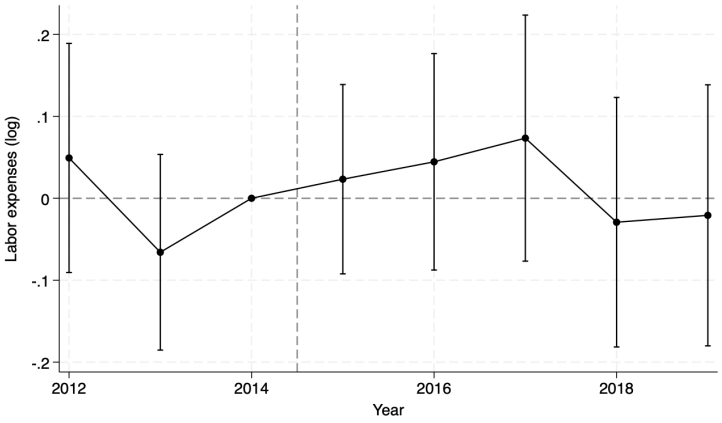
	Treatment firms repatriating shareholdership to Ecuador						Treatment firms changing shareholdership to foreign non-havens					
	Log gross profit	Log taxable profit	Any taxable profit	Profitability by revenue	Log CIT liability	Any CIT liability	Log gross profit	Log taxable profit	Any taxable profit	Profitability by revenue	Log CIT liability	Any CIT liability
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure × Year ≥ 2015	0.199	0.151	0.00472	0.00661	0.158	0.00493	0.0619	0.144	0.0461	0.0129	0.148	0.0464
	(.1861)	(.1421)	(.0518)	(.02739)	(.1416)	(.0518)	(.1693)	(.1892)	(.0549)	(.02056)	(.1899)	(.0549)
Exposure preperiod mean	9.899	9.943	0.752	0.179	8.443	0.752	11.53	11.55	0.728	0.0999	10.05	0.728
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N	N	N	N	N
N	15600	16016	24440	21340	16009	24440	15577	15995	24411	21340	15988	24411
Adjusted R2	0.00264	0.000661	0.0167	0.00217	0.000195	0.0168	0.00264	0.000656	0.0165	0.00218	0.000184	0.0166

Panel (c): Heterogeneity: Firm terminal shareholder domicile in tax havens

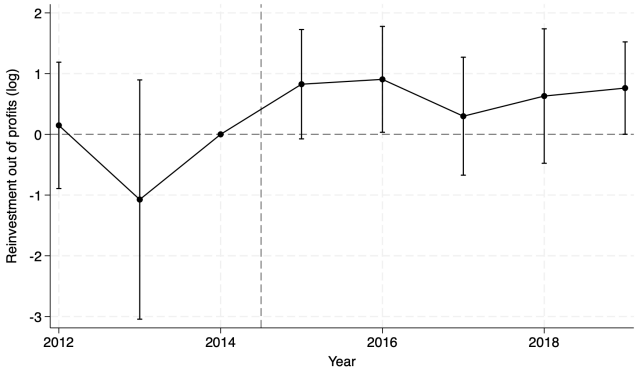
	Treatment firms reducing haven shareholdership to zero						Treatment firms remaining in tax havens					
	Log gross profit	Log taxable profit	Any taxable profit	Profitability by revenue	Log CIT liability	Any CIT liability	Log gross profit	Log taxable profit	Any taxable profit	Profitability by revenue	Log CIT liability	Any CIT liability
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure × Year ≥ 2015	0.248	0.230	0.0255	0.0184	0.246	0.0257	0.141	0.0854	0.0160	0.0107	0.136	0.0169
	(.127)	(.1106)	(.03384)	(.01489)	(.1108)	(.03384)	(.09793)	(.09411)	(.02027)	(.00815)	(.09438)	(.02032)
Exposure preperiod mean	10.80	10.88	0.746	0.131	9.383	0.746	10.49	10.72	0.667	0.0951	9.212	0.667
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N	N	N	N	N
N	15904	16323	24877	21748	16316	24877	16912	17348	26614	23288	17342	26614
Adjusted R2	0.00267	0.000814	0.0165	0.00215	0.000456	0.0166	0.00242	0.000601	0.0163	0.00200	0.000333	0.0163

Note: This table summarizes the difference-in-differences results for income and tax outcomes. Standard errors are clustered on the firm-level. Panel (a) summarizes response for the main specification of all exposure and control firms. Panels (b) and (c) display heterogeneous responses among exposure firms along ex-post majority shareholder domicile, using the same control firms as in Panel (a) as the control. Standard errors in parentheses are clustered on the firm-level.

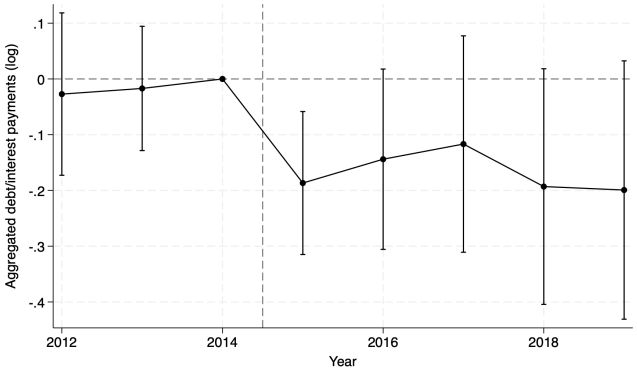
Figure 7: Changes in cross-border flows their composition by tax haven status



(a) Log labor expenses



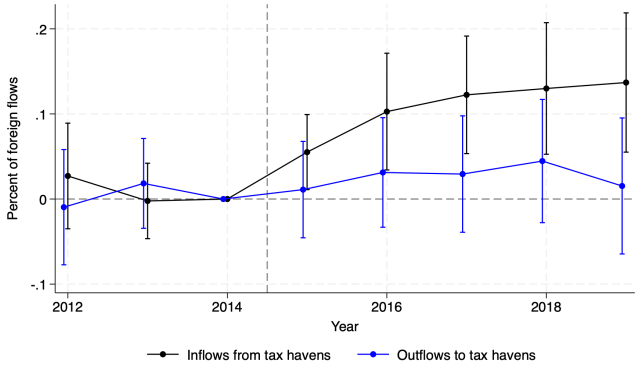
(b) Log reinvestment out of profit



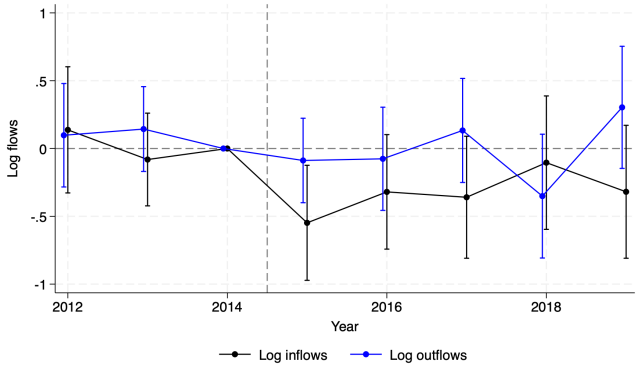
(c) Log debt and interest payments

Note: These figures display difference-in-difference estimates for changes in select expense activity. The dashed gray vertical line marks the implementation of the CIT surcharge. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

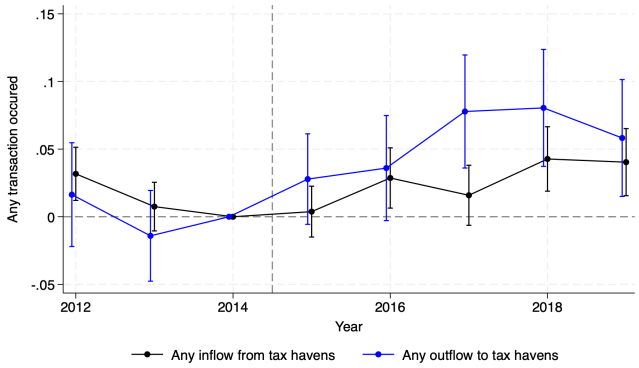
Figure 8: Changes in activity and composition by tax haven status



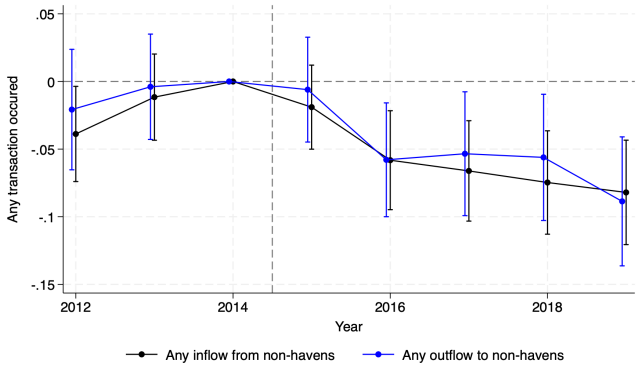
(a) Composition of inflows/outflows by haven status



(b) Log inflows and outflows



(c) Any flows with tax havens



(d) Any flows with non-havens

Note: These figures display difference-in-difference estimates for changes in select expense activity. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table 7: Difference-in-differences: Inflows and outflows by tax haven status

Panel (a): Any flows (binary)

	Any haven exit		Any haven entry		Any non-haven exit		Any non-haven entry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0549	0.0196	0.0133	0.0101	-0.0429	-0.00766	-0.0424	-0.0392
	(.01425)	(.01346)	(.007517)	(.005878)	(.0153)	(.016)	(.01171)	(.01262)
Exposure preperiod mean	0.189	0.189	0.0165	0.0165	0.321	0.321	0.195	0.195
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	28523	28523	28523	28523	28523	28523	28523	28523
Adjusted R2	0.00118	0.000944	0.000536	0.00310	0.000867	0.00113	0.00251	0.000660

Panel (b): Flows as an share of revenue

	Haven exits		Haven entries		Non-haven exits		Non-haven entries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0235	0.00822	0.00877	0.00588	-0.0397	-0.0244	-0.0226	-0.0197
	(.007904)	(.006804)	(.005865)	(.004058)	(.009158)	(.01)	(.01047)	(.0113)
Exposure preperiod mean	0.0479	0.0479	0.00788	0.00788	0.137	0.137	0.152	0.152
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	17749	17749	17749	17749	17749	17749	17749	17749
Adjusted R2	0.00104	0.00119	8.78e-05	0.00183	0.00595	0.00215	0.00217	0.000376

Panel (c): Log flows

	Haven exits		Haven entries		Non-haven exits		Non-haven entries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	-0.0626	-0.0885	0.0525	-0.365	-0.165	-0.139	-0.724	-0.307
	(.1944)	(.2091)	(.3965)	(.4782)	(.1614)	(.1419)	(.3184)	(.1741)
Exposure preperiod mean	10.82	10.82	11.31	11.31	11.53	11.53	11.88	11.88
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	9816	4952	4098	739	5364	10228	1368	4727
Adjusted R2	0.00901	0.00571	0.00251	0.00603	0.00758	0.0102	0.0205	0.00670

Note: This table summarizes the difference-in-differences results for cross-border flows-related outcomes. Standard errors are clustered on the firm-level. Panel (a) uses a binary parameterization for all regression outcome variables; Panel (b) parameterizes all outcome variables as a share of revenue in all regressions; Panel (c) uses a log specification for the dependent variable in all regressions. Standard errors in parentheses are clustered on the firm-level.

Table 8: Heterogeneous responses in cross-border transactions by ex-post terminal shareholder majority domicile (any flows)

Panel (a): 2015 terminal shareholder majority domicile in Ecuador

	Any haven exit		Any haven entry		Any non-haven exit		Any non-haven entry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.102	0.0670	0.00499	0.00178	0.0638	0.0990	-0.0561	-0.0529
	(.03145)	(.0311)	(.01356)	(.01272)	(.05153)	(.05174)	(.02947)	(.02984)
Exposure preperiod mean	0.0620	0.0620	0.0233	0.0233	0.271	0.271	0.147	0.147
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	24440	24440	24440	24440	24440	24440	24440	24440
Adjusted R2	0.00113	0.000808	0.000272	0.00233	0.000775	0.00112	0.00261	0.000347

Panel (b): 2015 terminal shareholder majority domicile in foreign non-havens

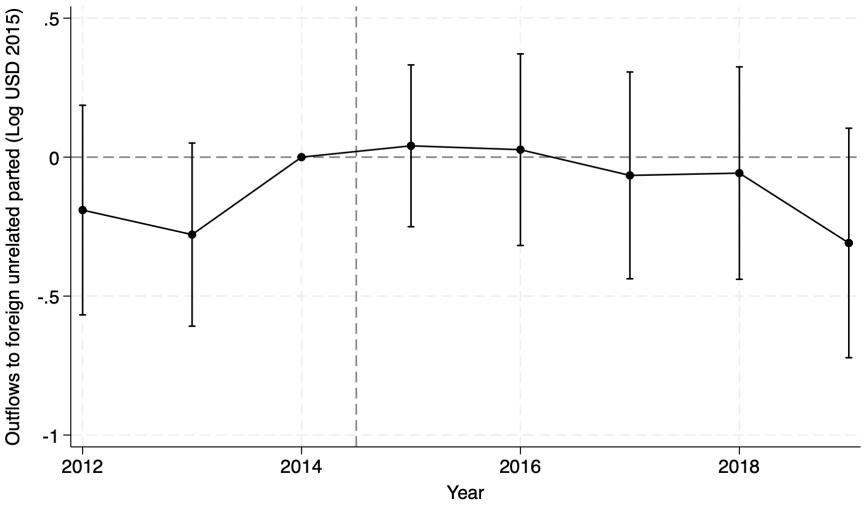
	Any haven exit		Any haven entry		Any non-haven exit		Any non-haven entry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0691	0.0339	0.0378	0.0346	-0.0455	-0.0102	0.0381	0.0413
	(.04122)	(.04096)	(.02948)	(.0291)	(.05696)	(.05715)	(.02949)	(.02986)
Exposure preperiod mean	0.210	0.210	0	0	0.421	0.421	0.0877	0.0877
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	24411	24411	24411	24411	24411	24411	24411	24411
Adjusted R2	0.00102	0.000586	0.000353	0.00271	0.000536	0.000992	0.00270	0.000365

Panel (c): 2015 terminal shareholder majority domicile in tax havens

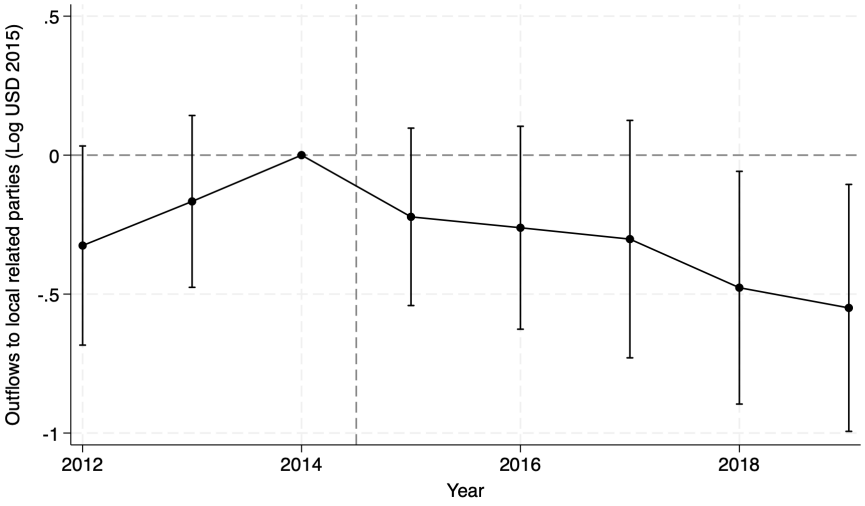
	Any haven exit		Any haven entry		Any non-haven exit		Any non-haven entry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0492	0.0139	0.0245	0.0213	-0.0500	-0.0148	-0.0471	-0.0439
	(.01927)	(.01869)	(.009227)	(.007949)	(.02018)	(.02072)	(.01611)	(.01678)
Exposure preperiod mean	0.220	0.220	0.0156	0.0156	0.326	0.326	0.199	0.199
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	26614	26614	26614	26614	26614	26614	26614	26614
Adjusted R2	0.00103	0.000659	0.000623	0.00362	0.000892	0.00116	0.00275	0.000597

Note: This table summarizes the difference-in-differences results for cross-border flows-related outcomes, stratifying the exposure group by their respective ex-post terminal shareholder majority domicile response. All columns correspond with regressions that use a binary parameterization of the listed dependent variable. Standard errors are clustered on the firm-level.

Figure 9: Expenses made to related parties by foreign/local status



(a) Foreign related parties

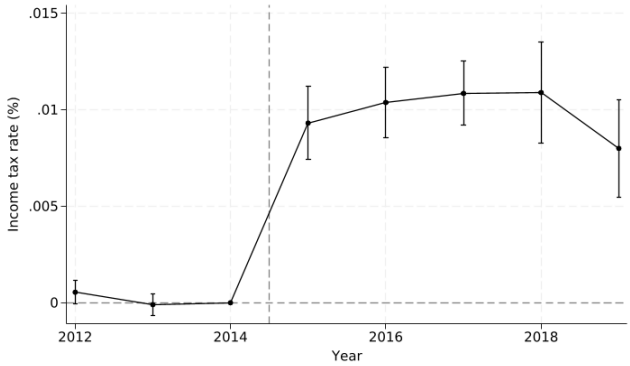


(c) Local related parties

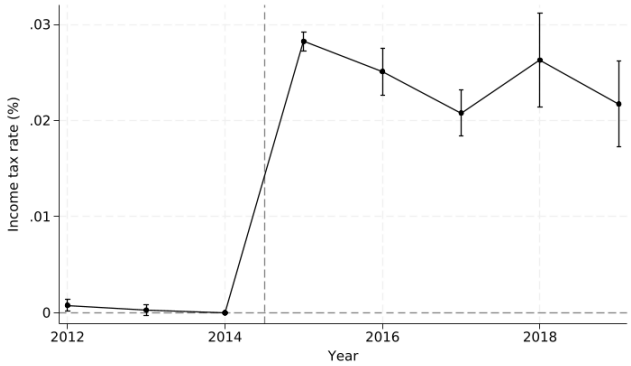
Note: These figures display difference-in-difference estimates for expenses disaggregated by counterparty relation and domicile category. Estimates in black normalize expenses by revenue; estimates in red normalize expenses by total firm expenses. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Appendix A Additional figures and tables

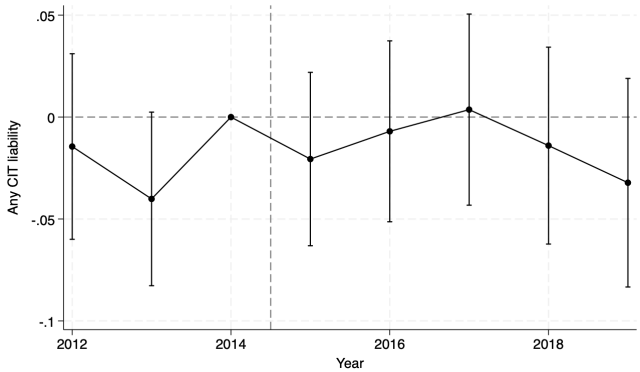
Figure A.1: First stage: change in effective CIT rate



(a) Exposure firms (positive CIT)



Exposure firms (positive CIT) & remaining in tax havens in 2015

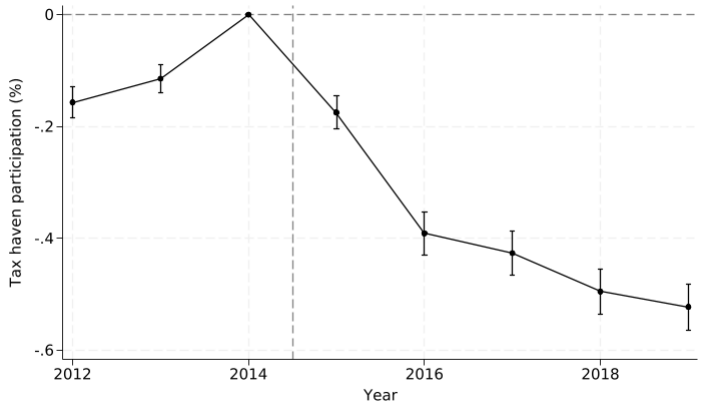


(c) % with positive CIT liability

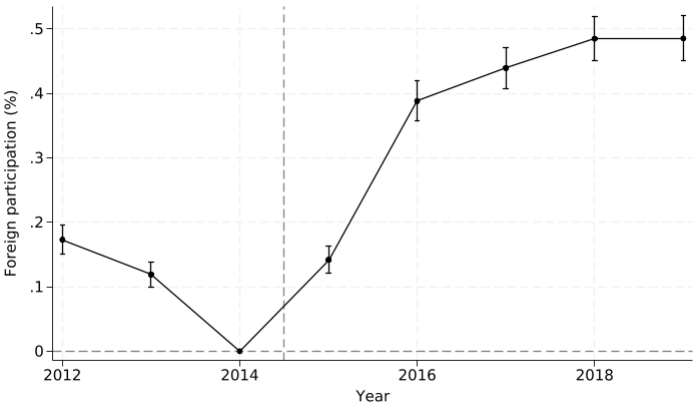
Note: These figures display difference-in-difference results that illustrate components of the "bindingness" of the CIT surcharge among firms that maintain majority shareholdership in tax havens and pay corporate income tax. Panel (a) uses exposure firms with positive CIT obligation in the exposure group; Panel (b) uses exposure firms with positive CIT and majority tax havensharehold ership in 2015 in the exposure group. Panel (c) uses a binary variable for whether firms pay corporate income tax as the dependent variable. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.2: Difference-in-differences results in shareholdership:
Direct comparisons of haven and foreign non-haven ownership without using mean reversion correction technique

(a) Tax haven shareholdership



(b) Foreign non-haven shareholdership



Note: These figures display difference-in-difference results that directly compare the relative changes in ownership domicile between the exposure and control groups. Panel (a) uses tax haven shareholdership as the dependent variable; Panel (b) uses foreign non-haven ownership as the dependent variable. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.1: Demonstration of haven and non haven flows observed in the MID (2014)

	Havens				Non-havens			
	$\frac{Exits}{Revenue}$	Any exit 2012-2014	$\frac{Entrances}{Revenue}$	Any entrance 2012-2014	$\frac{Exits}{Revenue}$	Any exit 2012-2014	$\frac{Entrances}{Revenue}$	Any entrance 2012-2014
Exposure	0.0893	0.288	0.0153	0.0358	0.180	0.490	0.191	0.316
	(.239)	(.453)	(.103)	(.186)	(.319)	(.5)	(.355)	(.465)
Control	0.0401	0.237	0.00616	0.0351	0.197	0.544	0.141	0.274
	(.159)	(.425)	(.0678)	(.184)	(.313)	(.498)	(.313)	(.446)

Note: This table summarizes the cross-border financial flows for with havens and non-havens for exposure and control firms in 2014. Parentheses report standard deviations.

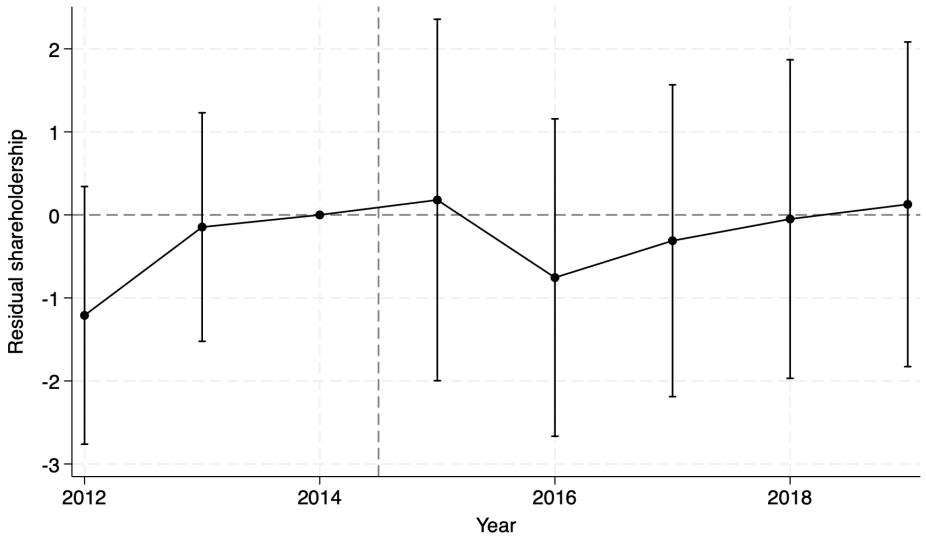
Table A.2: Top country shareholder domiciles among exposed firms that reduced haven ownership to zero (2018)

	Country	Count
1	Ecuador	168
2	USA	27
3	Colombia	13
4	Costa Rica	8
5	Germany	6
6	Spain	5
7	United Kingdom	5
8	Peru	3
9	South Africa	3
10	Argentina	2
11	Other	21

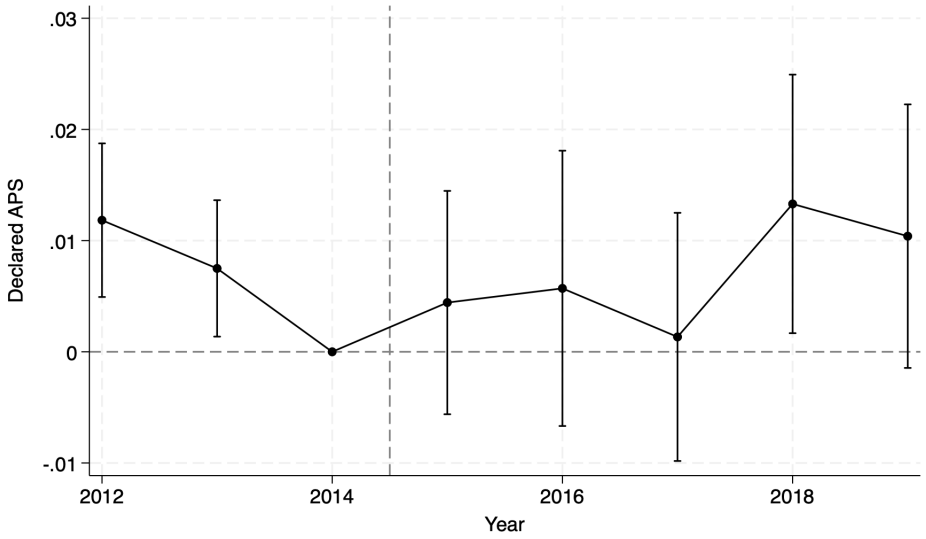
Note: This table tabulates the top countries by plurality shareholdership in 2018 among exposure firms that reduced their haven shareholdership to zero by 2015. Note that the numbers reflect raw counts, rather than any comparison with a control group.

Figure A.3: Difference in differences shareholdership responses
APS filing and ownership residual

(a) Terminal shareholdership residual

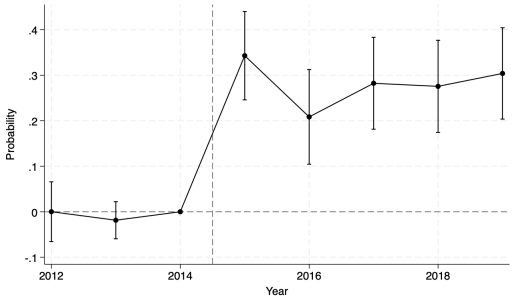


(b) Declared the APS

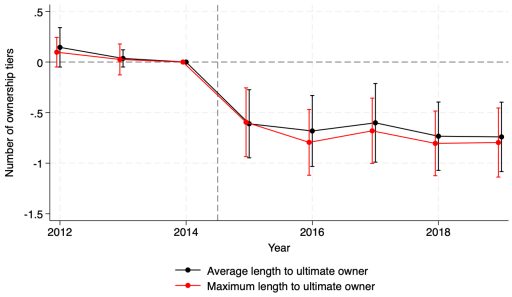


Note: These figures display the difference-in-difference estimates for two different measures of compliance with terminal ownership reporting standards. Panel (a) uses the terminal shareholdership residual as the dependent variable (shareholdership that is not reported in the APS); Panel (b) uses an indicator for whether the firm to domicile not that compares the change in domestic shareholdership for the tax haven exposure group relative to the control firms. This specification isolates a subsample of exposure firms whose APS shareholdership perfectly matches their shareholdership information returns in 2015 (the first year made available in the standard business income tax declaration). Confidence intervals are constructed using standard errors clustered on the firm-level.

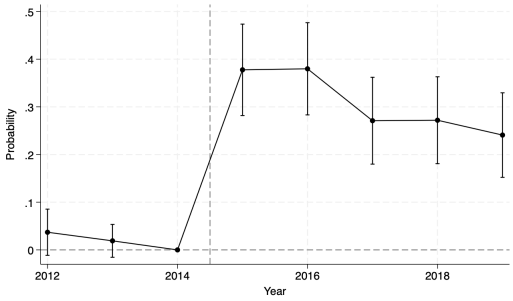
Figure A.4: Changes in majority shareholdership domicile and complexity
Heterogeneity by 2015 ex-post majority shareholder domicile status



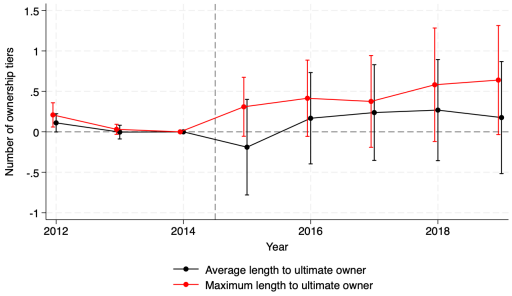
(a) Probability majority Ecuadorian conditional on exiting havens



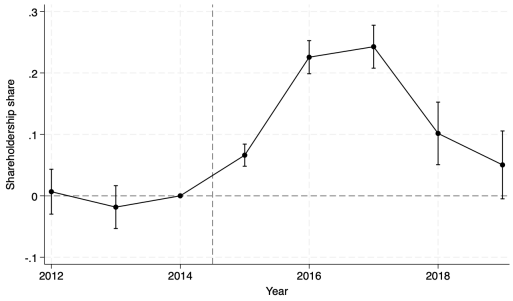
(b) Ownership chains among firms repatriating ownership to Ecuador



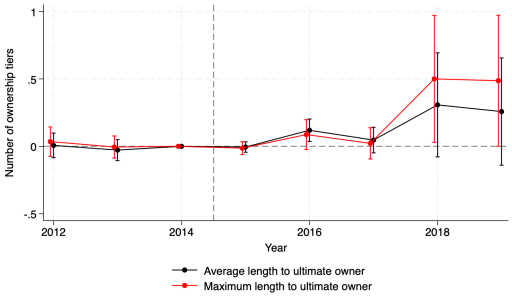
(c) Probability majority foreign non-haven conditional on exiting havens



(d) Ownership chains among firms changing majority domicile to foreign non-havens



(e) Tax haven shareholderhip for exposure firms remaining in tax havens

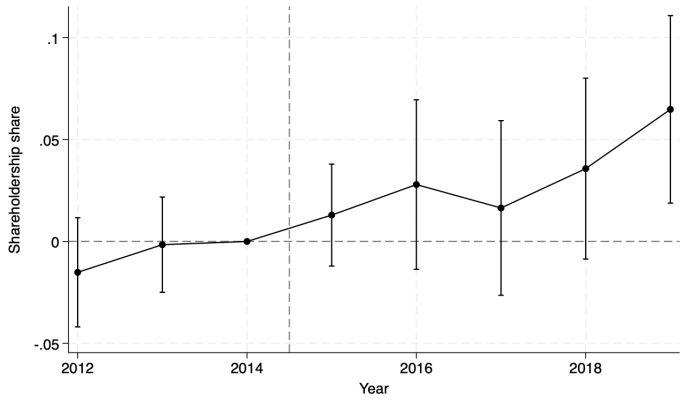


(f) Ownership chains among firms remaining in tax havens

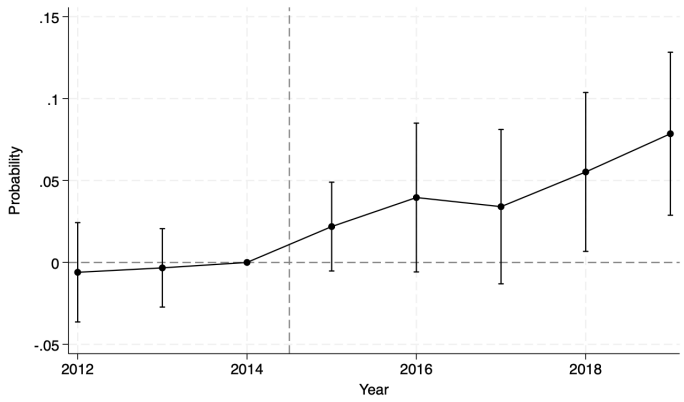
Note: These figures display difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. The results here use a subsample of the exposure group that reported majority presence in Ecuador in 2015. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.5: Difference-in-differences in domestic shareholdership
Subsample with ex-post consistent ownership reporting

(a) Shareholdership in Ecuador

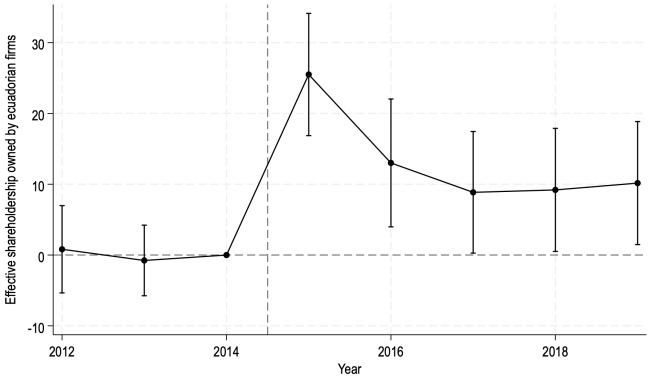


(b) Probability majority repatriated to Ecuador

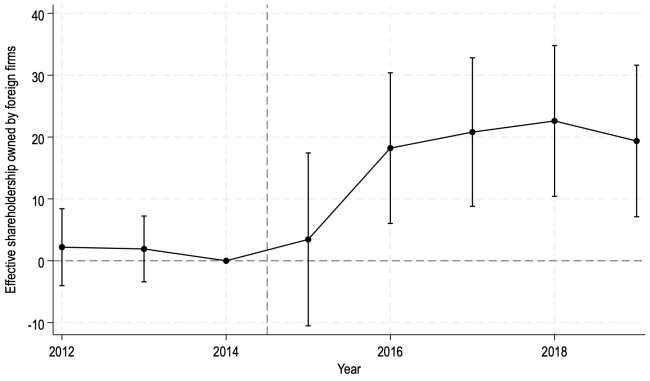


Note: These figures display difference-in-difference results that compares the change in domestic shareholdership for the tax haven exposure group relative to the control firms. This specification isolates a subsample of exposure firms whose APS shareholdership perfectly matches their shareholdership information returns in 2015 (the first year made available in the standard business income tax declaration). Confidence intervals are constructed using standard errors clustered on the firm-level.

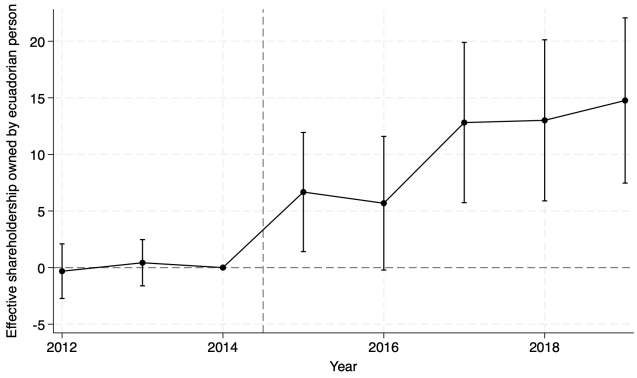
Figure A.6: Changes in shareholdership by terminal owner type and domicile
Exposure conditional on exiting tax havens in 2015



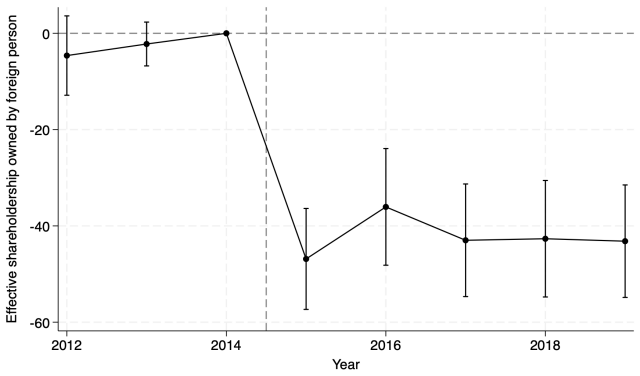
(a) Ecuadorian persons



(b) Foreign persons



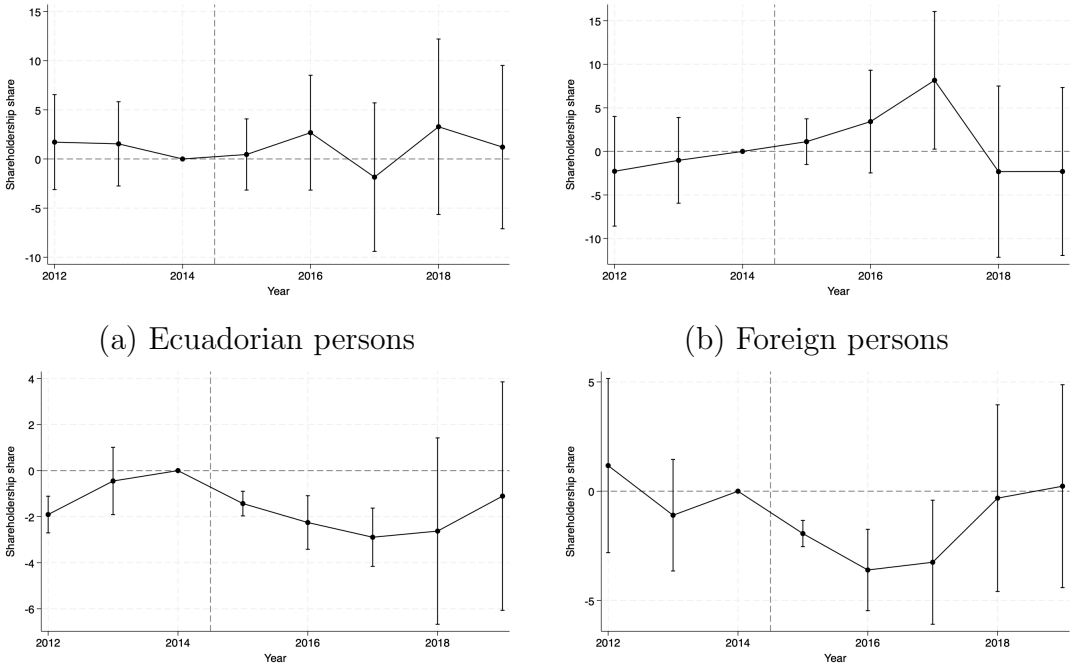
(c) Ecuadorian non-person entities



(d) Foreign non-person entities

Note: These figures display difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. The results here use a subsample of the exposure group that reported zero tax haven presence in 2015. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.7: Changes in shareholdership by terminal owner type and domicile
Exposure conditional on remaining in tax havens in 2015



(a) Ecuadorian persons

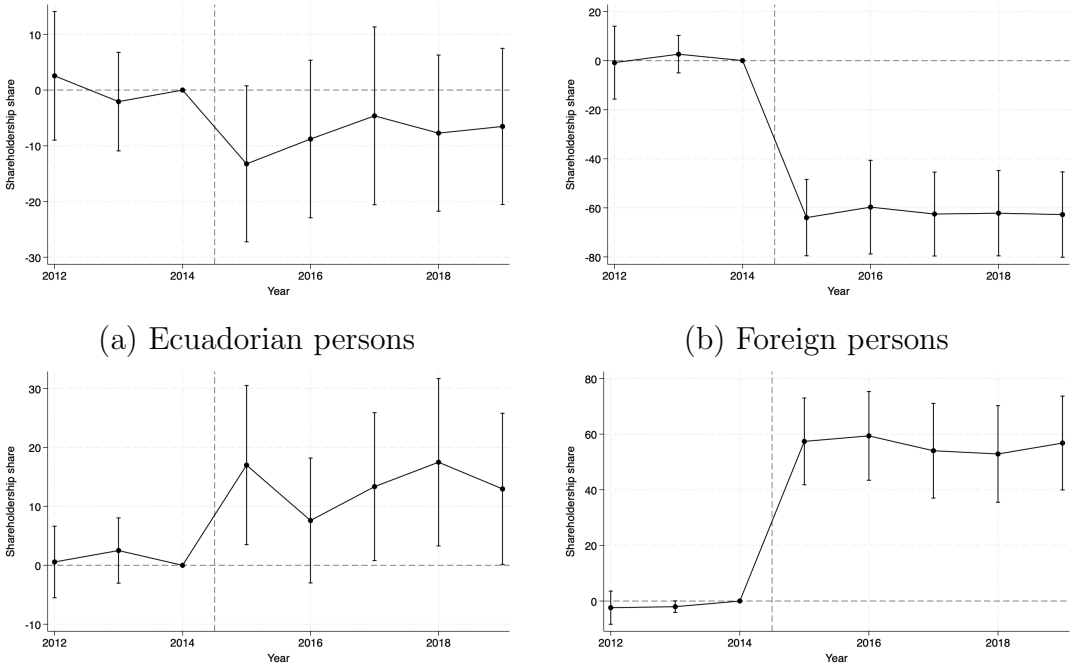
(b) Foreign persons

(c) Ecuadorian non-person entities

(d) Foreign non-person entities

Note: These figures display difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. The results here use a subsample of the exposure group that reported majority tax haven presence in 2015. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.8: Changes in shareholdership by terminal owner type and domicile
Exposure conditional on majority ownership repatriation in 2015



(a) Ecuadorian persons

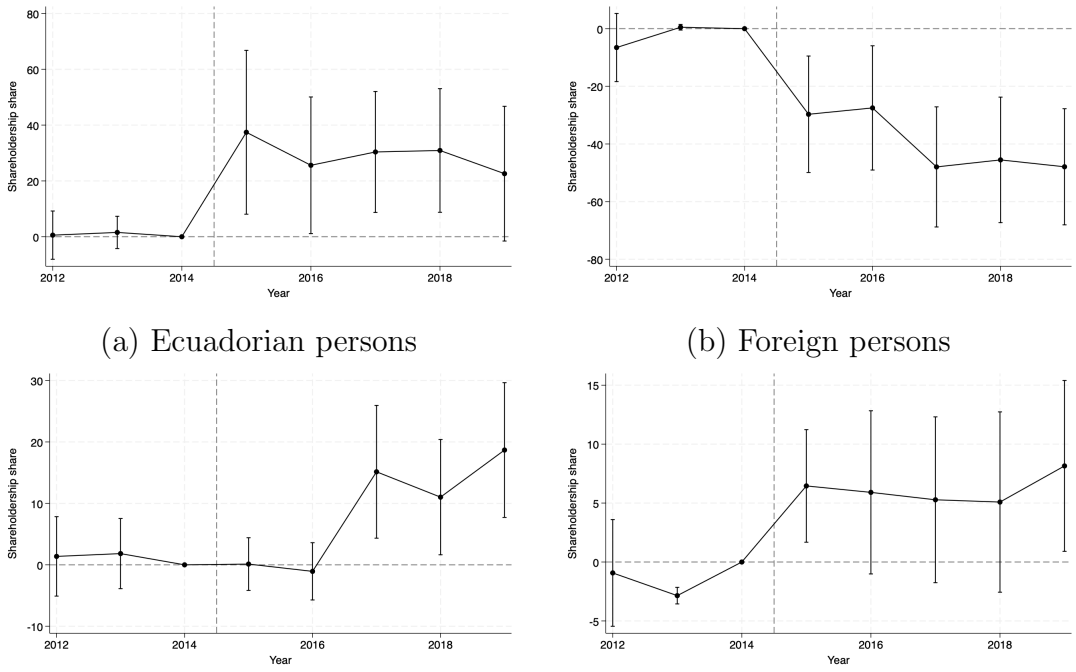
(b) Foreign persons

(c) Ecuadorian non-person entities

(d) Foreign non-person entities

Note: These figures display difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. The results here use a subsample of the exposure group that reported majority presence in Ecuador in 2015. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.9: Changes in shareholdership by terminal owner type and domicile
Exposure conditional on majority domicile change to foreign non-havens in 2015



(a) Ecuadorian persons

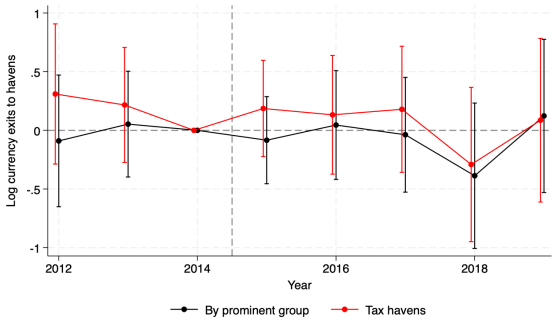
(b) Foreign persons

(c) Ecuadorian non-person entities

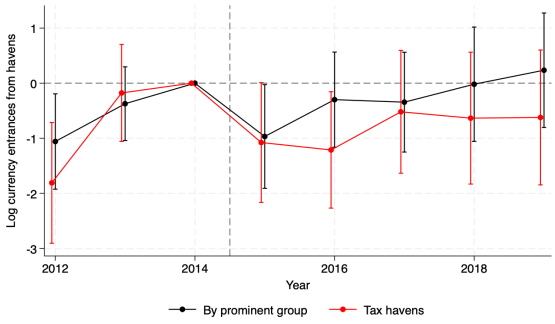
(d) Foreign non-person entities

Note: These figures display difference-in-difference results that estimate the percentage-point change observable "ultimate" shareholder type and domicile per the APS data. The results here use a subsample of the exposure group that reported majority presence in foreign non-havens in 2015. Note that while non-person entities include businesses that by definition cannot serve as terminal shareholders, this group also contains governmental and non-profit structures that indeed may serve as terminal owners. Confidence intervals are constructed using standard errors clustered on the firm-level.

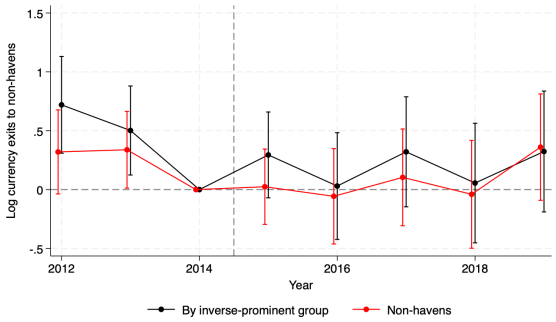
Figure A.10: Log inflows and outflows by foreign country type



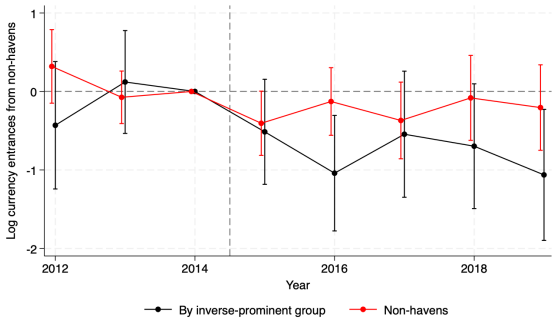
(a) Tax haven exits



(b) Tax haven entrances



(c) Non-haven exits



(d) Non-haven entrances

Note: These figures display difference-in-difference estimates for changes in cross-border activity. Estimates in black compare the prominent or inverse-prominent group of exposed firms against the respective group for control firms (e.g. in Panel (a) comparing haven exits for exposed firms against non-haven exits for control firms). Estimates in red compare the activity in the same domicile category for both exposure and control. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.3: Heterogeneous responses in cross-border transactions by ex-post terminal shareholder majority domicile (flows normalized by revenue)
Panel (a): 2015 terminal shareholder majority domicile in Ecuador

	Haven exits		Haven entries		Non-haven exits		Non-haven entries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0155	0.000165	0.0260	0.0231	-0.000888	0.0144	-0.0571	-0.0542
	(.01832)	(.01787)	(.02412)	(.02374)	(.02465)	(.02498)	(.04018)	(.0404)
Exposure preperiod mean	0.0188	0.0188	0.0218	0.0218	0.0933	0.0933	0.147	0.147
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	15407	15407	15407	15407	15407	15407	15407	15407
Adjusted R2	0.000948	0.000550	4.57e-05	0.00165	0.000531	0.000943	0.00371	0.000195

Panel (b): 2015 terminal shareholder majority domicile in foreign non-havens

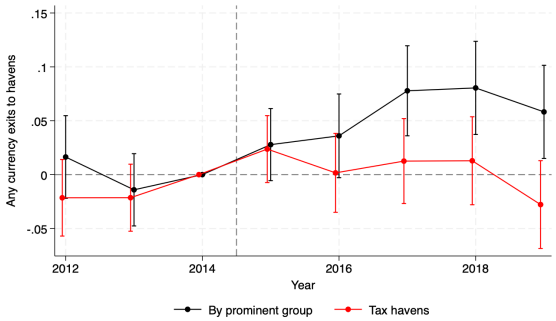
	Haven exits		Haven entries		Non-haven exits		Non-haven entries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0125	-0.00279	0.0180	0.0151	-0.0406	-0.0253	0.00310	0.00599
	(.01343)	(.01281)	(.01716)	(.01663)	(.0258)	(.02611)	(.02531)	(.02566)
Exposure preperiod mean	0.0236	0.0236	0	0	0.151	0.151	0.0770	0.0770
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	15461	15461	15461	15461	15461	15461	15461	15461
Adjusted R2	0.000947	0.000544	3.18e-05	0.00144	0.00139	0.00107	0.000916	3.62e-06

Panel (c): 2015 terminal shareholder majority domicile in tax havens

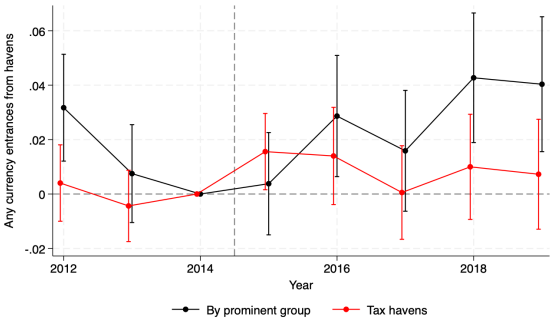
	Haven exits		Haven entries		Non-haven exits		Non-haven entries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0286	0.0133	0.00998	0.00709	-0.0408	-0.0255	-0.0275	-0.0246
	(.01101)	(.01025)	(.00725)	(.005885)	(.01263)	(.01325)	(.0145)	(.0151)
Exposure preperiod mean	0.0558	0.0558	0.00971	0.00971	0.149	0.149	0.147	0.147
Dep. variable correction	Y	N	Y	N	Y	N	Y	N
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	16703	16703	16703	16703	16703	16703	16703	16703
Adjusted R2	0.00109	0.00149	6.72e-05	0.00165	0.00469	0.00173	0.00276	0.000367

Note: This table summarizes the difference-in-differences results for cross-border flows-related outcomes, stratifying the exposure group by their respective ex-post terminal shareholder majority domicile response. All columns correspond with regressions that normalize the listed dependent variable by revenue. Standard errors are clustered on the firm-level.

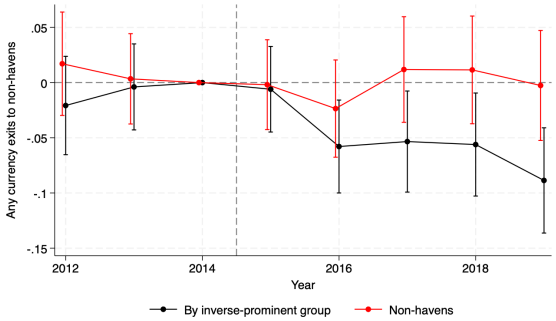
Figure A.11: Any inflows and outflows by foreign country type



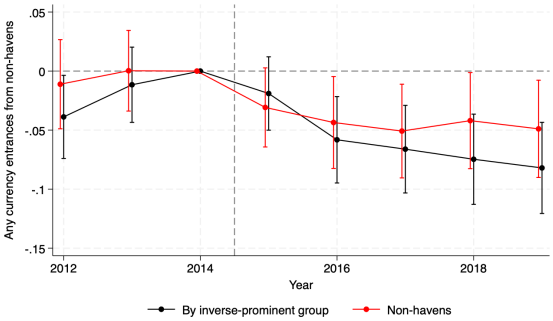
(a) Tax haven exits



(b) Tax haven entrances



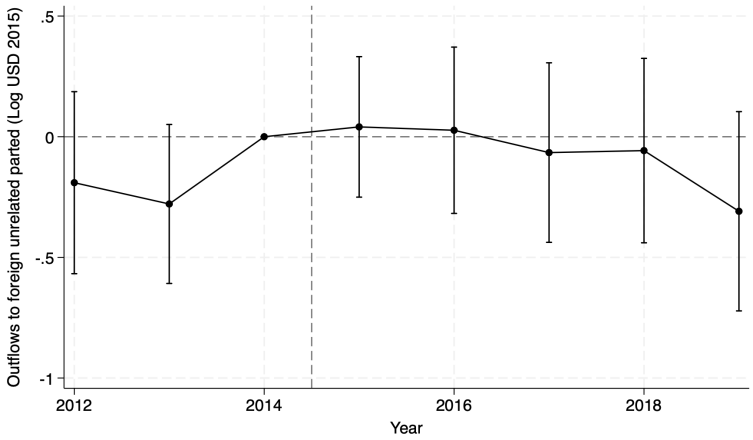
(c) Non-haven exits



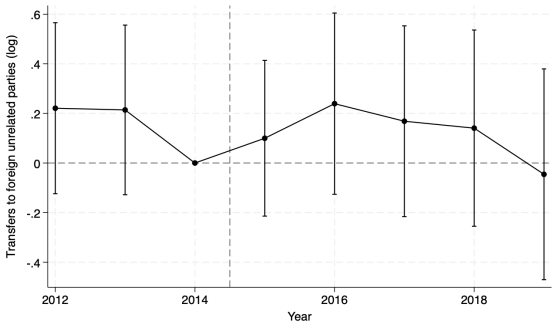
(d) Non-haven entrances

Note: These figures display difference-in-difference estimates for changes in cross-border activity. Estimates in black compare the prominent or inverse-prominent group of exposed firms against the respective group for control firms (e.g. in Panel (a) comparing haven exits for exposed firms against non-haven exits for control firms). Estimates in red compare the activity in the same domicile category for both exposure and control. Confidence intervals are constructed using standard errors clustered on the firm-level.

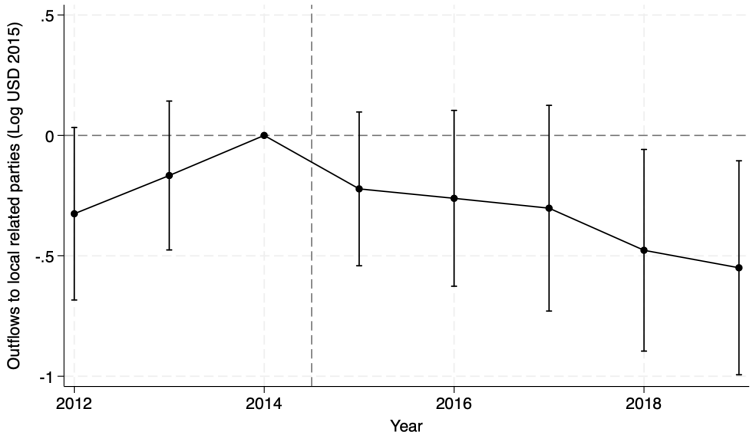
Figure A.12: Log expenses made to parties by foreign/local and related/unrelated status



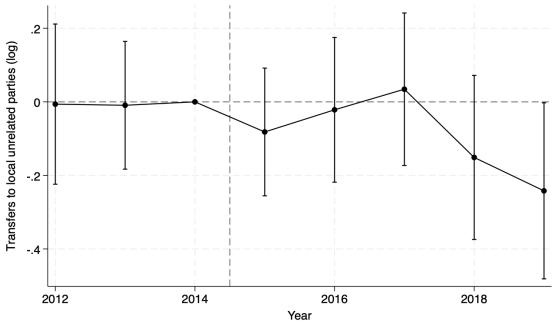
(a) Foreign related parties



(b) Foreign unrelated parties



(c) Local related parties



(d) Local unrelated parties

Note: These figures display difference-in-difference estimates for expenses disaggregated by related counterparty domicile category. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.4: Mechanisms: inflows, outflows, transfers to other entities, expenses
Heterogeneity: exposure conditional on repatriating majority shareholderhip to Ecuador

Panel (a): Cross border flows and expenses

	Percent of outflows to havens	Percent of inflows from havens	Log outflows	Log inflows	Log debt and interest expense	Debt + interest expense revenue share	Log labor expense	Labor expense share of overall expenses
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0949	0.0217	-0.0981	-0.361	-0.155	-0.0184	0.0287	0.00944
	(.0252)	(.0238)	(.142)	(.164)	(.0752)	(.0127)	(.0557)	(.00839)
Year ≥ 2015	0.0217	0.0415	-0.379	-0.136	-0.199	-0.0122	0.108	-0.0169
	(.00988)	(.00818)	(.0516)	(.0749)	(.0292)	(.00509)	(.0214)	(.00342)
Exposure preperiod mean	0.0540	0.307	11.50	11.90	12.80	0.600	11.10	0.227
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	5212	12498	12498	5212	25747	24949	22093	28105
Adjusted R2	0.0182	0.00563	0.0108	0.00676	0.00739	0.00121	0.00384	0.00223

Panel (b): Cross border flows by flow direction and counterparty domicile type

	Haven outflows revenue share	Haven inflows revenue share	Non-haven outflows revenue share	Non-haven inflows revenue share	Any haven outflow	Any haven inflow	Any non-haven outflow	Any non-haven inflow
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0235	0.00877	-0.0397	-0.0226	0.0549	0.0133	-0.0429	-0.0424
	(.0079)	(.00587)	(.00916)	(.0105)	(.0143)	(.00752)	(.0153)	(.0117)
Year ≥ 2015	-0.0119	8.72e-05	0.00336	0.00298	-0.0233	0.00921	0.0119	0.0124
	(.00432)	(.00438)	(.00158)	(.00113)	(.00668)	(.00519)	(.00476)	(.00223)
Exposure preperiod mean	0.0479	0.00788	0.137	0.152	0.189	0.0165	0.321	0.195
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	17749	17749	17749	17749	28523	28523	28523	28523
Adjusted R2	0.00104	8.78e-05	0.00595	0.00217	0.00118	0.000536	0.000867	0.00252

Panel (c): Transactions with companies by relation and foreign status

	Transfers to foreign related parties (revenue share)	Transfers to foreign unrel. parties (rev. share)	Transfers to local rel parties (rev. share)	Transfers to local unrel. parties (rev. share)	Transfers to foreign rel. parties (log)	Transfers to foreign unrel. parties (log)	Transfers to local rel. parties (log)	Transfers to local unrel. parties (log)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.000441	0.000725	0.00154	-0.0185	0.0967	-0.0134	-0.193	-0.0833
	(.00858)	(.00717)	(.00997)	(.0117)	(.144)	(.136)	(.135)	(.0834)
Year ≥ 2015	-0.00572	-0.00439	-0.00867	-0.00760	-0.125	-0.219	0.130	-0.232
	(.00351)	(.00262)	(.00351)	(.004)	(.0502)	(.0529)	(.0673)	(.0312)
Exposure preperiod mean	0.0910	0.0757	0.195	0.252	12.80	12.30	11.50	11.10
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	24949	24949	24949	24949	7060	6662	9414	22340
Adjusted R2	0.000291	0.000268	0.000553	0.000925	0.00208	0.00679	0.00117	0.00748

Note: This table summarizes the difference-in-differences results for dependent variables pertaining to cross border flows, transactions with parties based on counterparty relation and domicile, and select expenses. Exposure firms here are conditioned on having changed their majority domicile to Ecuador in 2015. Dependent variables in Panel (b) use flows with the "prominent" and "inverse-prominent" domicile category of the exposure and control groups respectively in order to control for mean reversion (e.g. comparing haven outflows for exposed firms against non-haven outflows for control firms). Standard errors are clustered on the firm-level.

Table A.5: Mechanisms: inflows, outflows, transfers to other entities, expenses
Heterogeneity: exposure conditional on changing majority shareholderhip to non-havens

Panel (a): Cross border flows and expenses

	Percent of outflows to havens	Percent of inflows from havens	Log outflows	Log inflows	Log debt and interest expense	Debt + interest expense revenue share	Log labor expense	Labor expense share of overall expenses
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0949	0.0217	-0.0981	-0.361	-0.155	-0.0184	0.0287	0.00944
	(.0252)	(.0238)	(.142)	(.164)	(.0752)	(.0127)	(.0557)	(.00839)
Year ≥ 2015	0.0217	0.0415	-0.379	-0.136	-0.199	-0.0122	0.108	-0.0169
	(.00988)	(.00818)	(.0516)	(.0749)	(.0292)	(.00509)	(.0214)	(.00342)
Exposure preperiod mean	0.0540	0.307	11.50	11.90	12.80	0.600	11.10	0.227
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	5212	12498	12498	5212	25747	24949	22093	28105
Adjusted R2	0.0182	0.00563	0.0108	0.00676	0.00739	0.00121	0.00384	0.00223

Panel (b): Cross border flows by flow direction and counterparty domicile type

	Haven outflows revenue share	Haven inflows revenue share	Non-haven outflows revenue share	Non-haven inflows revenue share	Any haven outflow	Any haven inflow	Any non-haven outflow	Any non-haven inflow
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0235	0.00877	-0.0397	-0.0226	0.0549	0.0133	-0.0429	-0.0424
	(.0079)	(.00587)	(.00916)	(.0105)	(.0143)	(.00752)	(.0153)	(.0117)
Year ≥ 2015	-0.0119	8.72e-05	0.00336	0.00298	-0.0233	0.00921	0.0119	0.0124
	(.00432)	(.00438)	(.00158)	(.00113)	(.00668)	(.00519)	(.00476)	(.00223)
Exposure preperiod mean	0.0479	0.00788	0.137	0.152	0.189	0.0165	0.321	0.195
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	17749	17749	17749	17749	28523	28523	28523	28523
Adjusted R2	0.00104	8.78e-05	0.00595	0.00217	0.00118	0.000536	0.000867	0.00252

Panel (c): Transactions with companies by relation and foreign status

	Transfers to foreign related parties (revenue share)	Transfers to foreign unrel. parties (rev. share)	Transfers to local rel parties (rev. share)	Transfers to local unrel. parties (rev. share)	Transfers to foreign rel. parties (log)	Transfers to foreign unrel. parties (log)	Transfers to local rel. parties (log)	Transfers to local unrel. parties (log)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.000441	0.000725	0.00154	-0.0185	0.0967	-0.0134	-0.193	-0.0833
	(.00858)	(.00717)	(.00997)	(.0117)	(.144)	(.136)	(.135)	(.0834)
Year ≥ 2015	-0.00572	-0.00439	-0.00867	-0.00760	-0.125	-0.219	0.130	-0.232
	(.00351)	(.00262)	(.00351)	(.004)	(.0502)	(.0529)	(.0673)	(.0312)
Exposure preperiod mean	0.0910	0.0757	0.195	0.252	12.80	12.30	11.50	11.10
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	24949	24949	24949	24949	7060	6662	9414	22340
Adjusted R2	0.000291	0.000268	0.000553	0.000925	0.00208	0.00679	0.00117	0.00748

Note: This table summarizes the difference-in-differences results for dependent variables pertaining to cross border flows, transactions with parties based on counterparty relation and domicile, and select expenses. Exposure firms here are conditioned on having changed their majority domicile to foreign non-havens in 2015. Dependent variables in Panel (b) use flows with the "prominent" and "inverse-prominent" domicile category of the exposure and control groups respectively in order to control for mean reversion (e.g. comparing haven outflows for exposed firms against non-haven outflows for control firms). Standard errors are clustered on the firm-level.

Table A.6: Mechanisms: inflows, outflows, transfers to other entities, expenses
Heterogeneity: exposure conditional on maintaing majority shareholderhip in tax havens

Panel (a): Cross border flows and expenses

	Percent of outflows to havens	Percent of inflows from havens	Log outflows	Log inflows	Log debt and interest expense	Debt + interest expense revenue share	Log labor expense	Labor expense share of overall expenses
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0949	0.0217	-0.0981	-0.361	-0.155	-0.0184	0.0287	0.00944
	(.0252)	(.0238)	(.142)	(.164)	(.0752)	(.0127)	(.0557)	(.00839)
Year ≥ 2015	0.0217	0.0415	-0.379	-0.136	-0.199	-0.0122	0.108	-0.0169
	(.00988)	(.00818)	(.0516)	(.0749)	(.0292)	(.00509)	(.0214)	(.00342)
Exposure preperiod mean	0.0540	0.307	11.50	11.90	12.80	0.600	11.10	0.227
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	5212	12498	12498	5212	25747	24949	22093	28105
Adjusted R2	0.0182	0.00563	0.0108	0.00676	0.00739	0.00121	0.00384	0.00223

Panel (b): Cross border flows by flow direction and counterparty domicile type

	Haven outflows revenue share	Haven inflows revenue share	Non-haven outflows revenue share	Non-haven inflows revenue share	Any haven outflow	Any haven inflow	Any non-haven outflow	Any non-haven inflow
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.0235	0.00877	-0.0397	-0.0226	0.0549	0.0133	-0.0429	-0.0424
	(.0079)	(.00587)	(.00916)	(.0105)	(.0143)	(.00752)	(.0153)	(.0117)
Year ≥ 2015	-0.0119	8.72e-05	0.00336	0.00298	-0.0233	0.00921	0.0119	0.0124
	(.00432)	(.00438)	(.00158)	(.00113)	(.00668)	(.00519)	(.00476)	(.00223)
Exposure preperiod mean	0.0479	0.00788	0.137	0.152	0.189	0.0165	0.321	0.195
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	17749	17749	17749	17749	28523	28523	28523	28523
Adjusted R2	0.00104	8.78e-05	0.00595	0.00217	0.00118	0.000536	0.000867	0.00252

Panel (c): Transactions with companies by relation and foreign status

	Transfers to foreign related parties (revenue share)	Transfers to foreign unrel. parties (rev. share)	Transfers to local rel parties (rev. share)	Transfers to local unrel. parties (rev. share)	Transfers to foreign rel. parties (log)	Transfers to foreign unrel. parties (log)	Transfers to local rel. parties (log)	Transfers to local unrel. parties (log)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.000441	0.000725	0.00154	-0.0185	0.0967	-0.0134	-0.193	-0.0833
	(.00858)	(.00717)	(.00997)	(.0117)	(.144)	(.136)	(.135)	(.0834)
Year ≥ 2015	-0.00572	-0.00439	-0.00867	-0.00760	-0.125	-0.219	0.130	-0.232
	(.00351)	(.00262)	(.00351)	(.004)	(.0502)	(.0529)	(.0673)	(.0312)
Exposure preperiod mean	0.0910	0.0757	0.195	0.252	12.80	12.30	11.50	11.10
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N
N	24949	24949	24949	24949	7060	6662	9414	22340
Adjusted R2	0.000291	0.000268	0.000553	0.000925	0.00208	0.00679	0.00117	0.00748

Note: This table summarizes the difference-in-differences results for dependent variables pertaining to cross border flows, transactions with parties based on counterparty relation and domicile, and select expenses. Exposure firms here are conditioned on having maintained their majority domicile in tax havens in 2015. Dependent variables in Panel (b) use flows with the "prominent" and "inverse-prominent" domicile category of the exposure and control groups respectively in order to control for mean reversion (e.g. comparing haven outflows for exposed firms against non-haven outflows for control firms). Standard errors are clustered on the firm-level.

Appendix B Data and environmental appendix

Table B.1: Covariate balance of active firms
based on whether they appear in the APS business ownership data

	Firms not present in the APS	Difference relative to main sample
Log revenue	10.20	-1.383
		(.02749)
Gross profit (1000s)	55.67	-21.93
		(3.083)
Has positive gross profit	0.500	-0.278
		(.004347)
Taxable profit (1000s)	21.59	-47.03
		(2.46)
Log taxable profit	6.910	-5.294
		(.04284)
Has positive taxable profit	0.234	-0.537
		(.004257)
CIT liability (1000s)	4.699	-10.29
		(.5386)
Log CIT liability	5.475	-4.470
		(.03738)
Has positive CIT liability	0.220	-0.118
		(.0009365)
CIT rate	0.0511	-0.118
		(.0009365)
Log total assets	10.87	-2.583
		(.03286)
Active firms never filing APS	11585	
Core sample firms	62350	

Note: This table displays results from a series of cross-sectional univariate regressions of 2014 firm business characteristics on an indicator for whether the firm is included in our main sample. Parentheses contain heteroskedasticity-robust standard errors. Firms in these cross-sectional regressions are deemed active in 2014 by having a business income tax declaration with non-zero revenue; firms within this group are further included in the main sample if they also have filed the APS at least once between 2012 and 2014.

Table B.2: Descriptive statistics and ownership of Ecuadorian Firms (2014)

	Mean	SD	p10	Median	p90
Firm Characteristics:					
Total revenue (1000s USD)	1249	4170	4.300	137.4	2361
Log revenue	11.59	2.664	8.366	11.83	14.67
Log taxable profit	8.966	2.532	5.629	9.165	12
Has positive taxable profit	0.778	0.415	0	1	1
CIT liability (1000s)	14.99	55.44	0	0.834	25.15
Log CIT liability	7.451	2.522	4.114	7.649	10.48
CIT rate	0.170	0.0925	0	0.220	0.220
Log total assets	11.55	2.402	8.270	11.67	14.51
Profitability by revenue	0.0927	0.173	0	0.0335	0.231
Terminal ownership:					
Ecuadorian person (%)	83.25	34.46	1	100	100
Foreign person (%)	3.966	17.60	0	0	0
Ecuadorian non-person entity (%)	8.149	24.23	0	0	30
Foreign non-person entity (%)	2.247	14.15	0	0	0
Residual (%)	2.389	15.66	0	0	0
Ownership characteristics:					
Ownership share of plurality owner	0.615	0.300	0.200	0.520	0.998
Number of terminal owners with $\geq 10\%$ ownership	0.927	0.260	1	1	1
Has a person as a weak-majority owner	0.463	0.499	0	0	1
Average chain length to terminal owner	1.054	0.347	1	1	1
Max chain length to terminal owner	1.073	0.447	1	1	1
Ownership reporting compliance:					
Filed APS in 2014	0.988	0.108	1	1	1
APS adds to 100	0.947	0.223	1	1	1
Final beneficial ownership adds to 100	0.786	0.410	0	1	1
Unique firms	62350				

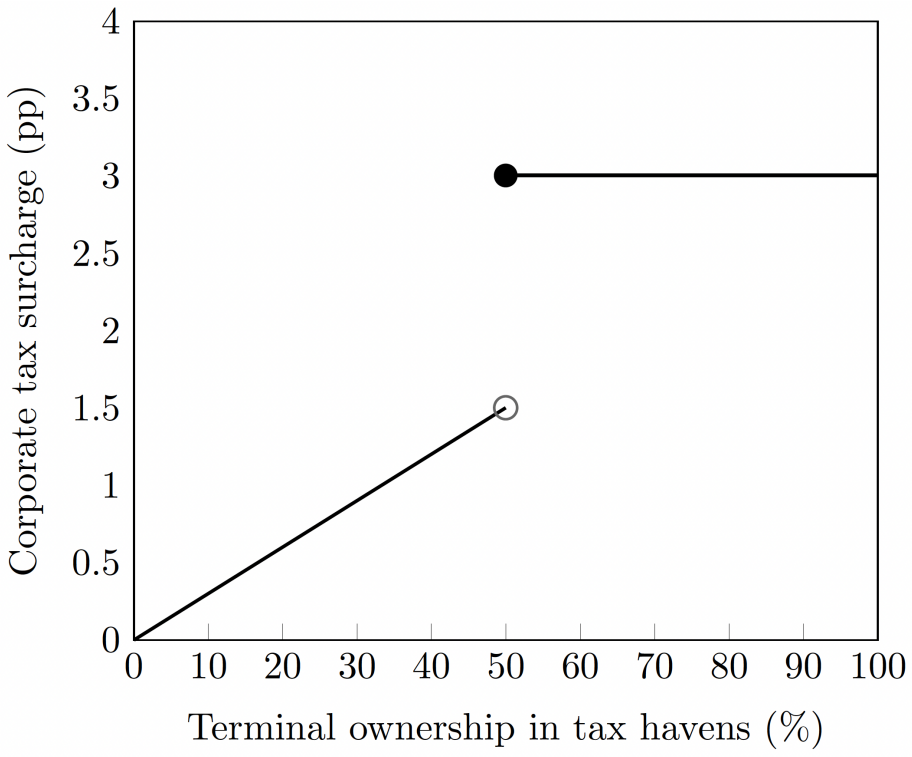
Note: This tables displays descriptive statistics of firms in our sample for 2014 from the F101 business income tax declarations and the APS ownership data.

Table B.3: APS compliance and (non-) observation of beneficial ownership (2014)

	Domestic	T-maj	C-maj	T-min	C-min	Incomplete APS	Non-filers
Ecuadorian person	91.7	5.07	11.20	32.7	63.20	34.1	-
Foreign person	0	38.2	58.70	27.9	21.30	0.924	-
Ecuadorian non-person entity	8.47	1.62	1.67	15.0	11.50	9.50	-
Foreign non-person entity	0	55.50	29.0	24.90	4.43	0.368	-
Residual	-0.145	-0.452	-0.524	-0.543	-0.346	55.10	100
Sum	100	100	100	100	100	100	100
Unique firms	55114	662	3249	230	1144	1626	731

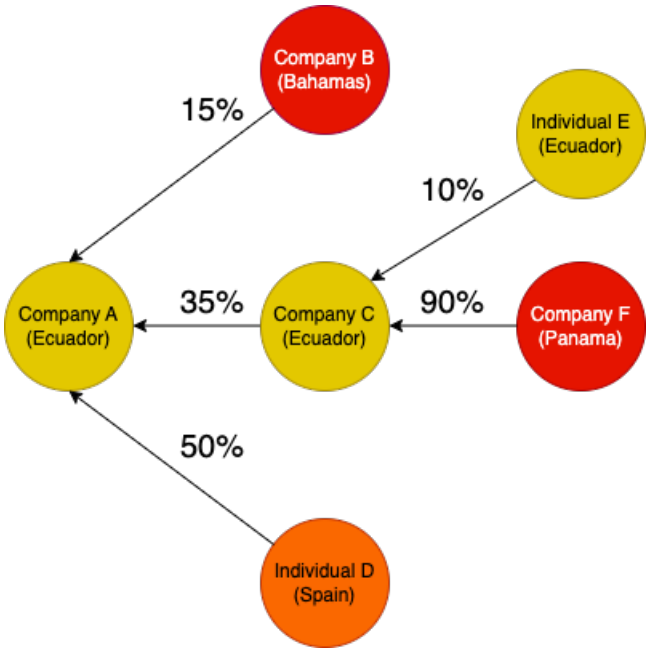
Note: This table tabulates the observation of terminal beneficial ownership of firms in the APS data in 2014, based on their ownership-domicile and filing status and by beneficial owner type. Non-person entities include both companies that cannot by definition serve as terminal beneficiaries as well as non-business entities such as non-profit and non-governmental organization. The residual refers to the non-reported share of "final" ownership in the APS such that terminal ownership adds up to 100%.

Figure B.1: CIT surcharge as a function of tax haven ownership



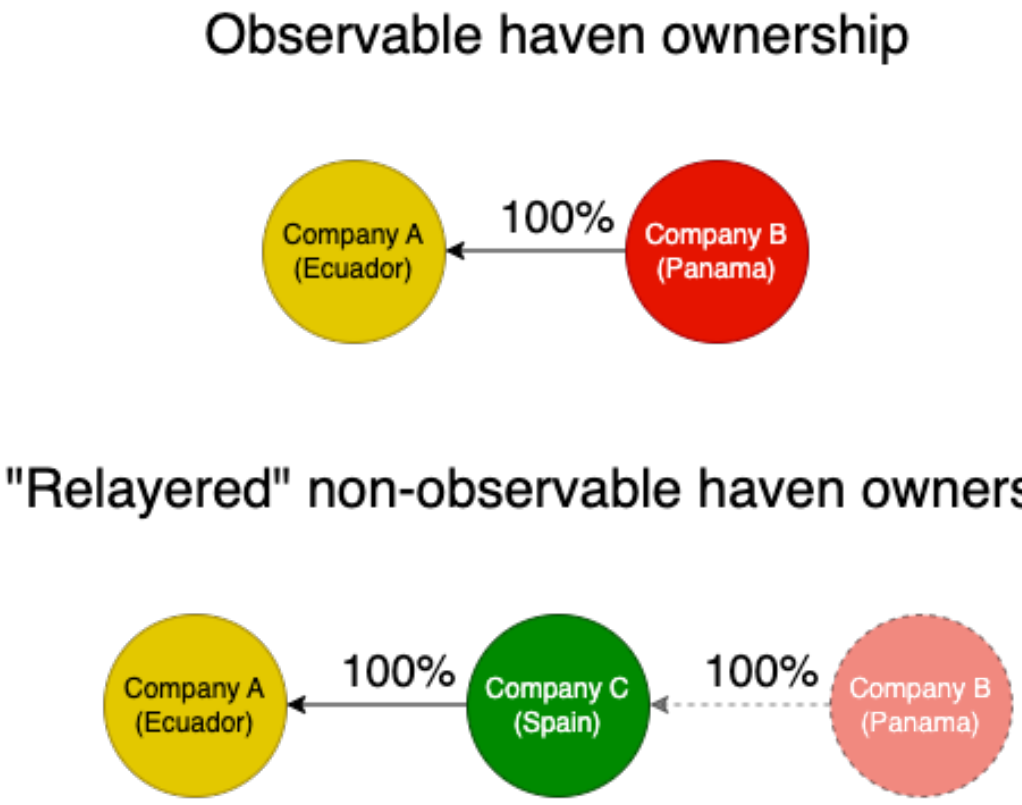
Note: This figure displays the statutory CIT surcharge based on ownership attributable to tax havens.

Figure B.2: Example of tax haven CIT surcharge calculation



Note: this figure gives an illustrative example of how the Ecuadorian tax authorities would calculate the CIT surcharge. Ecuadorian entities are colored in yellow, tax haven entities are colored in red, and foreign non-haven entities are colored in orange. Based on this observed ownership structure, Company A is assigned with effective tax haven ownership of $0.15\% + 35\% \cdot 90\% = 46.5\%$. Company A would therefore face an additional CIT surcharge of $0.465 \cdot 3 = 1.395$pp. Company C sees effective tax haven ownership of 90% and would therefore face a CIT surcharge of 3pp.

Figure B.3: Illustrative example of "re-layering" response



Note: This figure gives an illustrative example of a "relayering" response in our setting. In the above panel, the Ecuadorian tax authorities observe an Ecuadorian company that is 100% owned by a Panamanian company. The bottom panel represents an alternate scenario where the tax authorities observe an Ecuadorian company that is 100% owned by a Spanish company. However, because the Spanish company does not operate in Ecuadorian jurisdiction, it does not report its ownership structure to the Ecuadorian tax authorities, so that the Ecuadorian tax authorities do not observe 100% effective shareholdership of the Ecuadorian company attributable to Panama. In the former case, Company A would be subject to the full 3pp CIT surcharge, whereas in the latter example, Ecuadorian company A would *not* be subject to any CIT surcharge, even though it still maintains effective shareholdership in a tax haven.

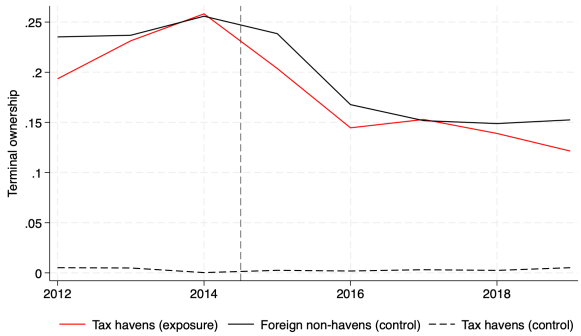
Appendix C Results on minority-foreign firms

Table C.1: Descriptive statistics and ownership characteristics: Minority exposure and control and domestic Ecuadorian Firms (2014)

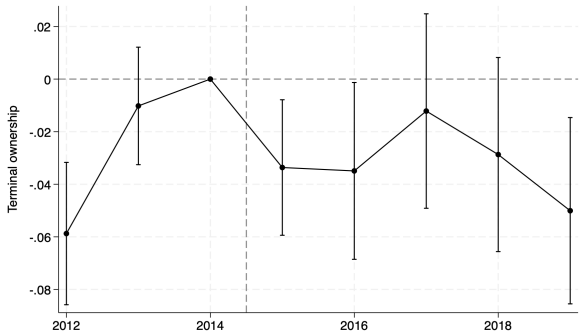
	Exposure	Control	Difference	Domestic	Difference of minority foreign firms v. Domestic
Firm Characteristics:					
Log revenue	13.35	12.59	0.753	11.55	1.144
			(.2281)		(.07225)
Log taxable profit	11.41	10.18	1.232	8.86	1.48
			(.2375)		(.079)
Has positive taxable profit	0.761	0.760	0.000863	0.786	-0.0250
			(.03463)		(.01155)
CIT liability (1000s)	92.82	42.13	50.69	11.69	37.33
			(9.101)		(1.321)
Log CIT liability	9.893	8.661	1.231	7.35	1.48
			(.2375)		(.078)
CIT rate	0.168	0.167	0.000191	0.173	-0.00548
			(.007618)		(.002542)
Log assets	14.02	12.78	1.232	11.40	1.551
			(.2041)		(.06557)
Profitability by revenue	0.130	0.107	0.0227	0.0906	0.0195
			(.01593)		(.004731)
Labor share of costs	0.276	0.285	-0.00938	0.314	-0.0324
			(.02012)		(.02724)
Ownership breakdown:					
Ecuadorian person (%)	32.73	63.17	-30.44	91.38	-32.35
			(2.18)		(.718)
Foreign person (%)	27.94	21.25	6.691	0.00935	22.15
			(1.37)		(.0733)
Ecuadorian non-person entity (%)	14.99	11.46	3.534	8.722	3.218
			(1.891)		(.709)
Foreign non-person entity (%)	24.87	4.461	20.41	0.00176	7.234
			(1.342)		(.07717)
Residual (%)	-0.542	-0.349	-0.193	-0.117	-0.259
			(.441)		(.09279)
Additional ownership characteristics:					
Ownership share of plurality owner	0.404	0.456	-0.0517	0.618	-0.170
			(.01597)		(.008336)
Avg. ult. shareholder chain	1.843	1.127	0.717	1.009	0.215
			(.04312)		(.004324)
Max. ult. shareholder chain	2.415	1.265	1.149	1.014	0.408
			(.07113)		(.006347)
Owned by at least one $\geq$ 10% terminal owner	0.989	0.986	0.00294	0.930	0.0564
			(.0095)		(.007121)
Has a weak-majority person ultimate owner	0.119	0.289	-0.169	0.480	-0.214
			(.03553)		(.01401)
Ownership reporting compliance:					
					(1.663e-14)
Filed APS in 2014	0.955	0.943	0.0111	0.913	0.0320
			(.01294)		(.005546)
APS adds to 100	0.875	0.953	-0.0776	0.984	-0.0420
			(.01883)		(.00362)
Final beneficial ownership adds to 100	0.284	0.616	-0.332	0.839	-0.268
			(.0391)		(.01044)
Unique firms	176	1119		54164	

Note: This tables displays descriptive statistics of firms in our sample for 2014 from the F101 business income tax declarations and the APS ownership data. The first difference column corresponds with a cross-sectional univariate regression of the dependent variable (given by the row) on an indicator for exposure within the set of minority foreign-owned firms; the second difference column (the final column) compares the union of minority exposure and control firms against domestic firms. Parentheses contain heteroskedasticity-robust standard errors.

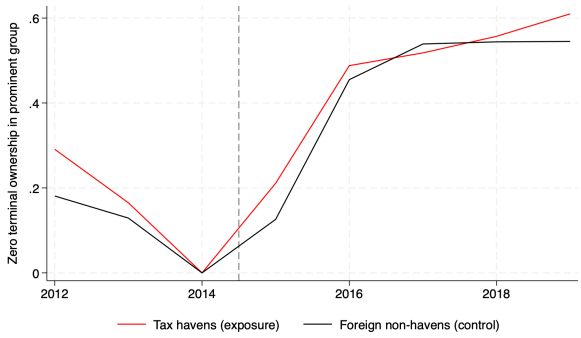
Figure C.1: Tax reform impact on terminal ownership (minority exposure and control firms)



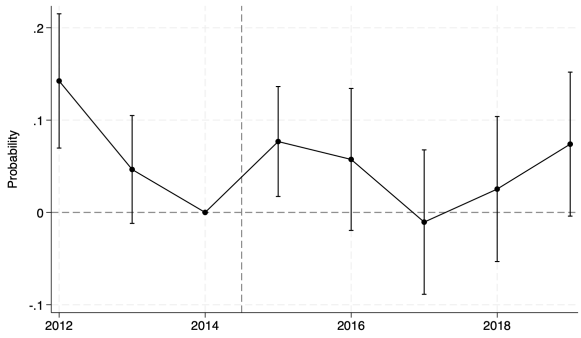
(a) Time series



(b) Ownership in majority domicile



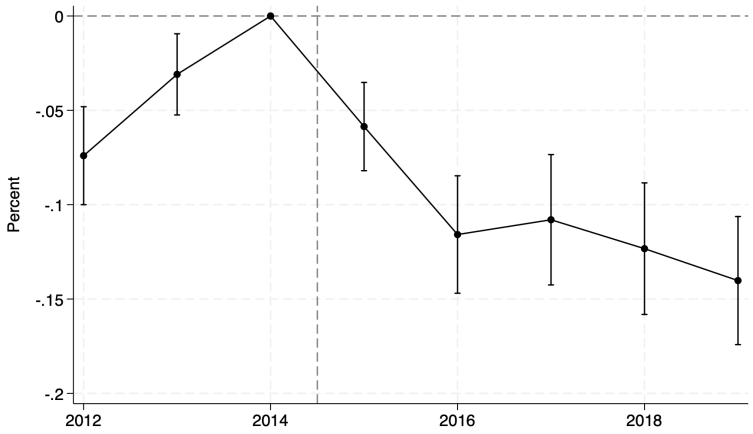
(c) Ownership in majority domicile reduced to zero



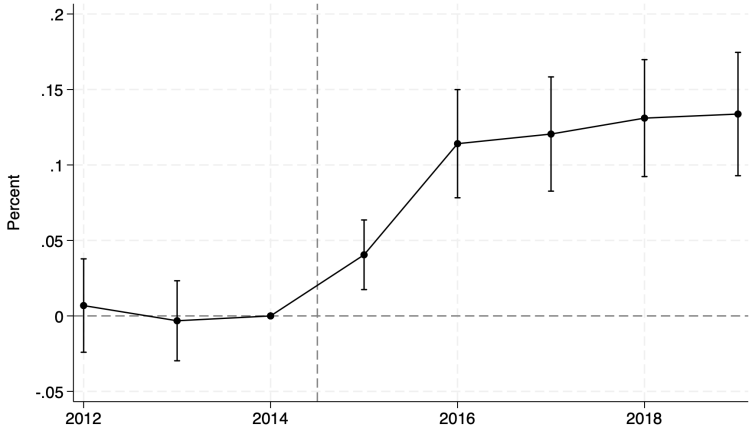
(d) Foreign non-haven and Ecuadorian ownership

These figures display difference-in-difference results that estimate the change observable terminal shareholder domicile per the APS data. The sample here consists of minority-ownership exposure and control firms. Panel (a) plots the time series of outcome variables by group, including tax haven shareholdership for the control group to illustrate the utility of our approach for correcting mean reversion. Panel (b) uses main group shareholderhip as the dependent variable; Panel (c) uses the a binary indicator for main group shareholdership share equals zero; Panel (d) uses inverse group and domestic shareholdership. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure C.2: Difference-in-differences results in minority-group shareholdership: Direct comparisons of haven and foreign non-haven ownership without using mean reversion correction technique



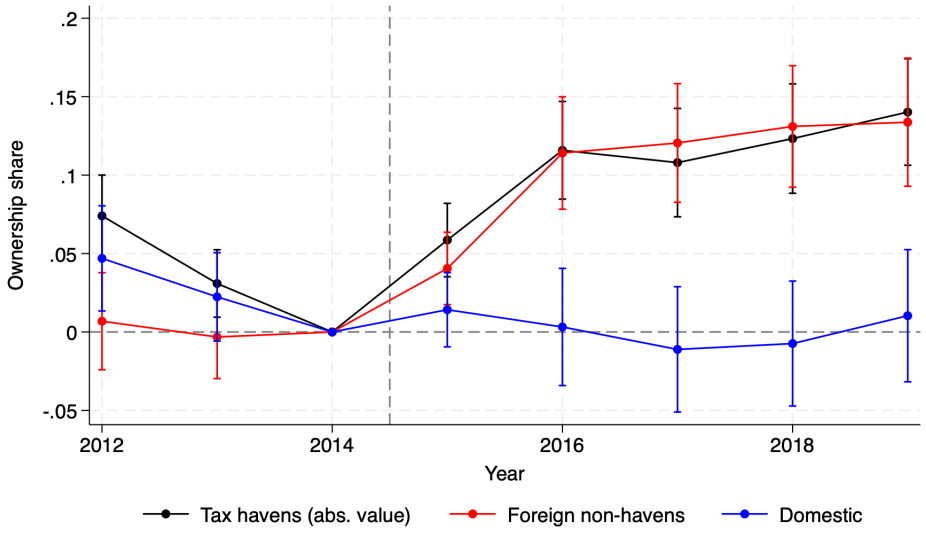
(a) Terminal ownership in tax havens



(b) Terminal ownership in foreign non-havens

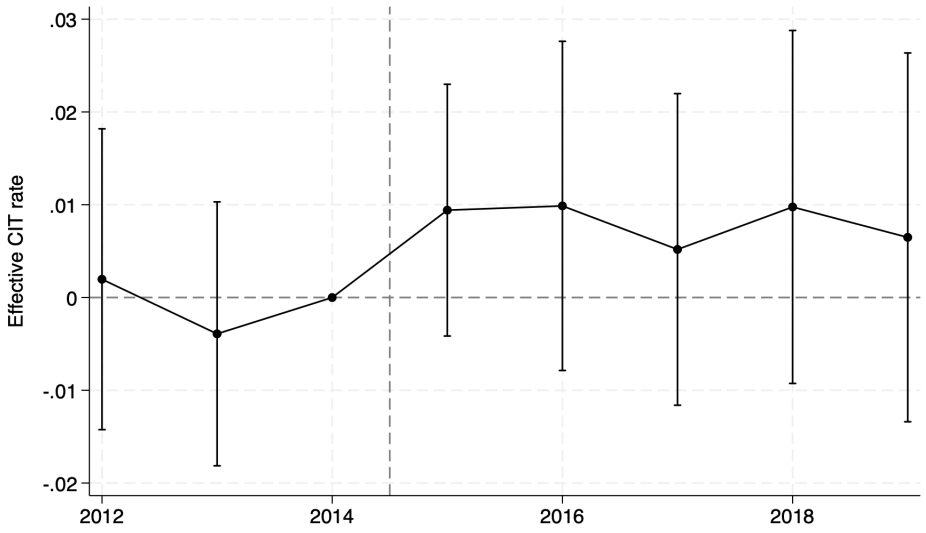
Note: These figures display difference-in-difference results that estimate the change observable terminal shareholder domicile per the APS data. The sample here consists of minority-ownership exposure and control firms. The dependent variables in the designs correspond with the subtitle in each graph and do not feature our "prominent-group comparison" technique for accounting for for potential mean-reversion. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure C.3: Response of foreign haven and non-haven terminal ownership (minority exposure group)



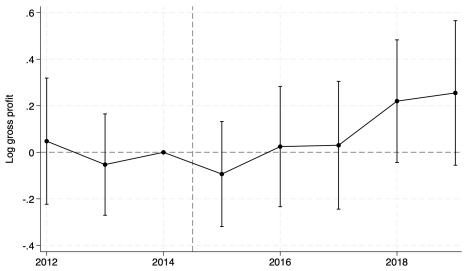
Note: This figure display difference-in-difference results that estimate the change observable terminal shareholder domicile per the APS data. The sample here consists of minority-ownership exposure and control firms. The black line plots the results associated with the design estimated for the absolute value of tax haven ownership. The red and blue lines use foreign non-haven shareholdership and domestic (Ecuadorian) shareholdership, respectively, as the dependent variables. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure C.4: "First stage": change in CIT rate for minority exposure v. control firms

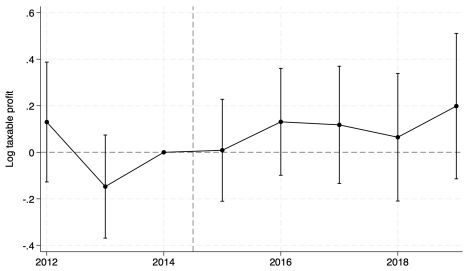


Note: This figure displays the difference-in-difference results for effective CIT rate for exposure versus control firms among the minority exposure subsample. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

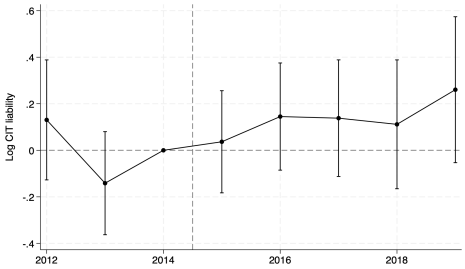
Figure C.5: Impacts on profits and CIT liability



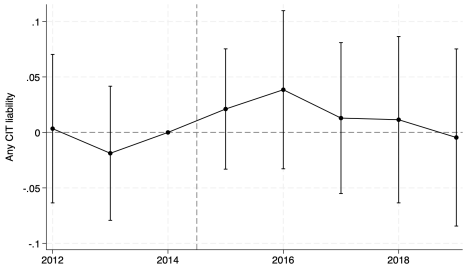
(a) Gross profits



(b) Taxable profits



(c) Log CIT liability

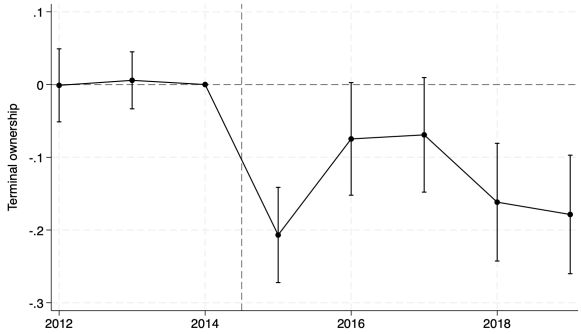


(d) CIT liability (binary)

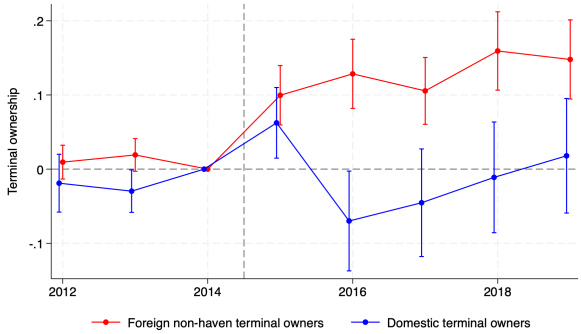
Note: These figures display difference-in-difference estimates that estimate the change in profits and CIT liability for minority-exposed firms relative to that of control firms. Panel (a) uses log gross profits as the outcome variable; Panel (b) uses log taxable profits; Panel (c) uses log CIT liability; Panel (d) uses a binary variable for whether any CIT was paid. The dashed gray vertical line marks the implementation of the CIT surcharge. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Appendix D Robustness of main results by definition of firm exposure

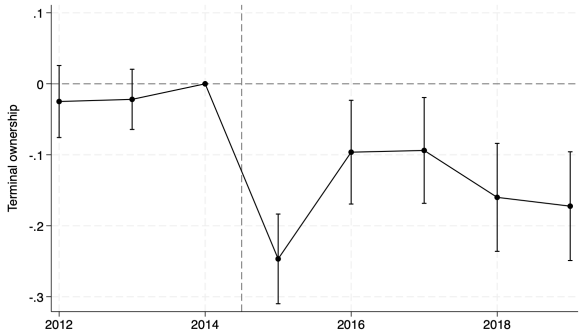
Figure D.1: Impact on reported ownership (minority exposure and control firms)
By geographic definition of firm exposure and control



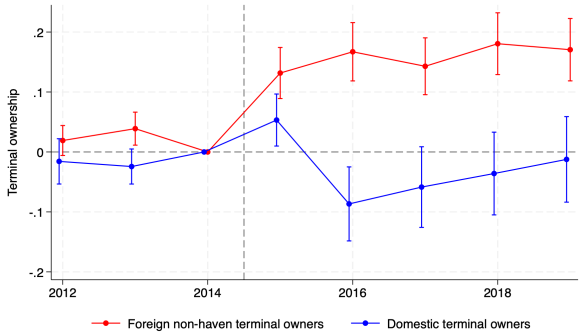
(a) Haven ownership:
Caribbean havens v. Colombia



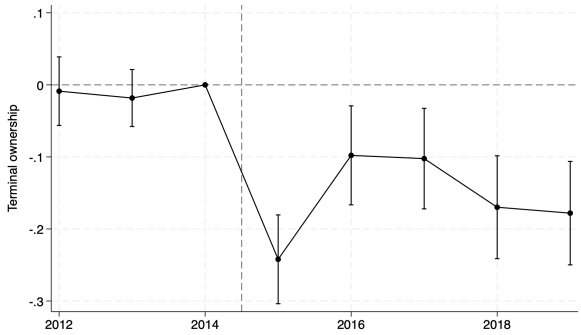
(b) Foreign non-haven and domestic ownership:
Caribbean havens v. Colombia



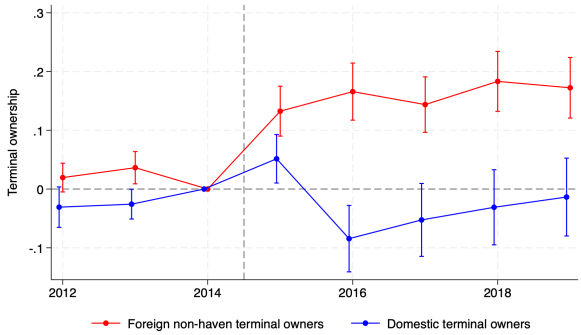
(c) Haven ownership:
All havens v. Colombia



(d) Foreign non-haven and domestic ownership:
All havens v. Colombia



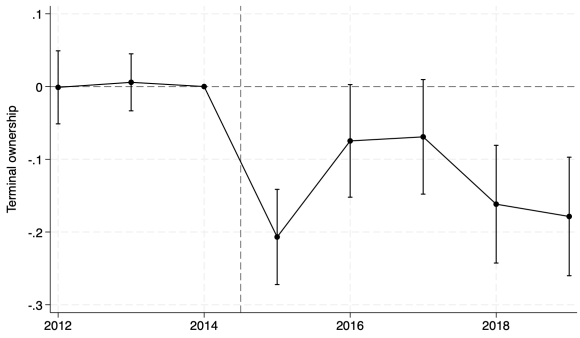
(e) Haven ownership:
All havens v. Latin American non-havens



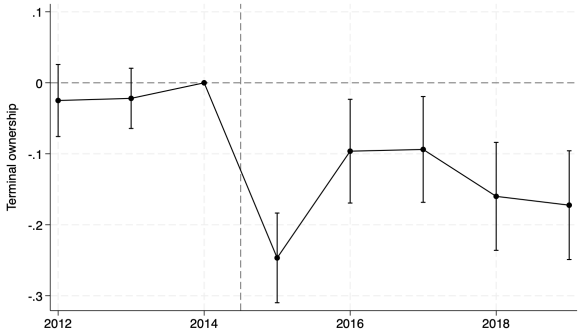
(f) Foreign non-haven and domestic ownership:
All havens v. Latin American non-havens

Note: These figures display difference-in-difference results that estimate the change observable terminal shareholder domicile per the APS data. Each row varies the sample definition that limits the scope of tax havens and non-haven firms considered in the definition of exposure and control according to the label. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

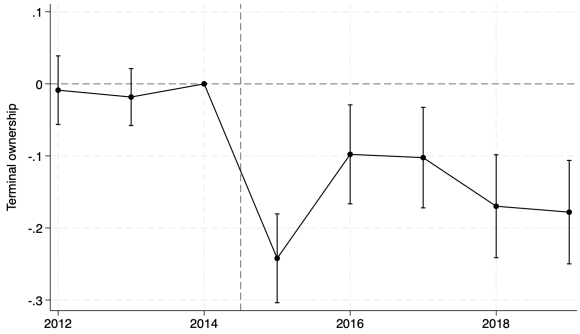
Figure D.2: "First stage": change in CIT rate for exposure v. control firms
By geographic definition of firm exposure and control



(a) Caribbean havens v. Colombia



(b) All havens v. Colombia



(c) All havens v. Latin American non-havens

Note: These figures display difference-in-difference results for effective CIT rate for exposure versus control firms each respective subsample. Each graph varies the sample definition that limits the scope of tax havens and non-haven firms considered in the definition of exposure and control according to the label. The dashed gray vertical line marks the implementation of the CIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table D.1: Robustness of main shareholdership result: Sample definition

	Caribbean havens v. Colombia	Caribbean havens v. Colombia	All havens v. Colombia	All havens v. Colombia	All havens v. Latin American non-havens	All havens v. Latin American non-havens	Treatment corroborated APS	Treatment corroborated APS	Corroborated APS sample	Corroborated APS sample
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposure × Year ≥ 2015	-0.137	-0.144	-0.136	-0.143	-0.147	-0.152	-0.173	-0.177	-0.173	-0.173
	(.03549)	(.03535)	(.03373)	(.03349)	(.03213)	(.03197)	(.02052)	(.02037)	(.03643)	(.0365)
Exposure	0.0344		0.0265		0.0413		0.0251		0.0643	
	(.01757)		(.01721)		(.0158)		(.01192)		(.01646)	
Year ≥ 2015	-0.213	-0.209	-0.213	-0.209	-0.202	-0.200	-0.180	-0.178	-0.181	-0.179
	(.01446)	(.01417)	(.01446)	(.01417)	(.01023)	(.01008)	(.006298)	(.006183)	(.006996)	(.00698)
Constant	0.832		0.832		0.817		0.804		0.803	
	(.009712)		(.009711)		(.006927)		(.004346)		(.005016)	
Firm fixed effects	N	Y	N	Y	N	Y	N	Y	N	Y
Weight (2014 log assets)	N	N	N	N	N	N	N	N	N	N
N	5528	5528	5776	5776	10355	10355	27250	27250	19948	19948
Adjusted R2	0.0950	0.166	0.0979	0.168	0.0791	0.140	0.0692	0.117	0.0564	0.108

Note: This table displays difference-in-difference results for regressions of main-group (tax-haven) shareholdership. Each column varies the sample and fixed effect specification. "Corroborated" refers to the subsample of firms whose APS shareholdership perfectly matches their shareholdership information returns in 2015 (the first year made available in the standard business income tax declaration). Standard errors are clustered on the firm-level.

Appendix E On the Ownership Registry (APS), Direct, and Indirect ownership

All shareholdership linkages observed in the APS reflect one of three possibilities. Consider the shareholdership of a given Ecuadorian firm i and a given shareholder j of company i. In the first scenario 1), shareholder j is itself a company that reports its own shareholdership structure. We can then assign shareholder j's ownership to firm i, weighted by the appropriate shares. The other two scenarios result in a terminal ownership observation: 2) shareholder j is an individual (not a business); 3) shareholder j is a business and does not report its shareholdership structure to the Ecuadorian tax authorities. These latter two shareholder linkages types represent the terminal linkages for company i, and are used to calculate firm i's effective tax haven terminal ownership share. Specifically, for each terminal ownership linkage, the tax authorities multiplies all direct shareholdership amounts until reaching company i; the effective tax haven terminal ownership share is the sum of these indirect ownership amounts over terminal linkages domiciled in tax havens. Figure B.2 gives an illustrative example of two hypothetical Ecuadorian companies' effective tax haven ownership shares and CIT surcharges based on their observed shareholder linkages.

More formally, we can define these ownership relations in terms of a weighted directed graph $G_i = G(V_i, E_i)$ that represents the comprehensive flow of shareholdership into entity i,[25] with nodes/vertices V_i representing entities and edges E_i representing shareholdership linkages that connect two nodes weighted by an amount of direct ownership $s_{jk} \in [0, 1]$ (where the edge tuple (j, k) reflects that j is a direct shareholder of k and s_{jk} reads "j directly owns $100 \cdot s_{jk}$ percent of k"), where $j, k \in \mathcal{N}$, a comprehensive index of entities. We can define the set of *direct owners* $\{i_{\mathcal{D}}\}$ of any entity i based on the bijection $(j, i) \in \{i_{\mathcal{D}}\} \iff s_{ji} \neq 0$, where $\{i_{\mathcal{D}}\} \subseteq V_i$. We also impose the definition that considering all of the edge weights associated with edges $(j, i) \in \{i_{\mathcal{D}}\}$, $\sum_{j \in \{i_{\mathcal{D}}\}} s_{ji} \equiv 1$.

An *indirect owner* of entity i is another entity $k \in \mathcal{N}$ such that $\exists$ some $\{l_1, l_2, \ldots, l_m\} := \mathcal{M} \subseteq \mathcal{V}_i$, $m \geq 1$, where $k \in \{l_{1_{\mathcal{D}}}\}$ for $l_1 \in \mathcal{M}$, $l_1 \in \{l_{2_{\mathcal{D}}}\}$ where $l_2 \in \mathcal{M} \backslash l_1$, and $l_2 \in \{l_{3_{\mathcal{D}}}\}$, where $l_3 \in \mathcal{M} \backslash l_1, l_2$, and $\ldots$, and $l_{m-1} \in \{l_{m_{\mathcal{D}}}\}$ where $l_m \in \mathcal{M} \backslash l_1, l_2, \ldots, l_{m-1}$, and $l_m \in \{i_{\mathcal{D}}\}$. I.e. there exists some chain of direct ownership that sequentially links together companies starting from k to company i where each edge is a direct ownership linkage.

The *indirect ownership share* can be computed here by considering all of the unique pathways $\mathcal{M}_{ji}$ that connect nodes j to i through a series of direct ownership linkages. We can index each pathway $\mathcal{M}_{ji}^c$ as a set of unique edges that follows the above procedure, as well as $\left|\mathcal{M}_{ji}^c\right|$, the number of direct ownership linkage steps in connecting that connect entity j to entity i.

Assume that the graph G_i does not contain ownership cycles that connect two entities $j \neq k$ via $\mathcal{M}_{jk}$ and $\mathcal{M}_{kj}$.[26] We can define the *indirect ownership share* as the sum of the

[25] For simplicity and relevance to our setting, we only consider the shareholderhip that flows *into* entity i as opposed to the shares that entity i owns of other entities, flowing *out* of entity i.

[26] Ownership cycles can be resolved using the limiting sum of the product of their indirect ownership shares within non-cyclical subgraphs, but in practice the process of identifying and reducing such cycles is very cumbersome.

product of direct ownership linkages that connect j to i within a given pathway $\mathcal{M}_{ji}^{c}$ over all of the distinct ownership pathways $\mathcal{M}_{ji}^{c} \in \mathcal{P}_{ji}$ that connect j and i without repeating any edges within a given pathway:

$$s_{ji}^{\mathcal{I}} = \sum_{\mathcal{M}_{ji}^{c} \in \mathcal{P}_{ji}} \prod_{(q,r) \in \mathcal{M}_{ji}^{c}} s_{qr}. \tag{2}$$

We can define the *terminal owners* of entity i as the collection of node-entities $\{i_{\mathcal{U}}\}$ such that $j \in \{i_{\mathcal{U}}\} \iff j \in V_i$ and $\nexists z \in \mathcal{N}$ such that $s_{zj} > 0$. By definition, $\sum_{j \in \{i_{\mathcal{U}}\}} s_{ji}^{\mathcal{I}} = 1$, i.e. the sum of a entity's terminal ownership shares accounts for the entirety of its ownership.

Let us augment the above notation with a year subscript to index time. For each firm year (i,t), we can define i's terminal shareholdership in tax havens as the sum of indirect ownership of company i in year t by terminal owners $j \in \{i_{\mathcal{U}_t}\}$ where j in year t has the characteristic that is is domiciled in a tax haven. More formally yet, we can define three mutually exclusive domicile categories $l \in \{D, F, H\}$ (corresponding with Ecuador/domestic, foreign non-haven, and tax havens respectively) and function $\mathcal{L}(j,t)$ that maps a firm-year to one of these three domicile values. Thus, we can construct a firm i's terminal ownership attributable to shareholders in tax havens in year t as

$$s_{i,t}^{\textit{Ult. haven own.}} = \sum_{\left\{j \in \mathcal{N} | j \in \{i_{\mathcal{U}_t}\},\ \mathcal{L}(j,t) = H\right\}} s_{jit}^{\mathcal{I}}. \tag{3}$$

Lastly, we can also define the indirect-shareholdership weighted terminal owner chain length and maximum ownership chain length as

$$\textit{Avg. ult. ownership chain length}_{it} = \sum_{\{\mathcal{M}_{jit}^{c} \in \mathcal{P}_{jit} | j \in \{i_{\mathcal{U}_t}\}} \left|\mathcal{M}_{ji}^{c}\right| \cdot s_{jit}^{\mathcal{I}} \tag{4}$$

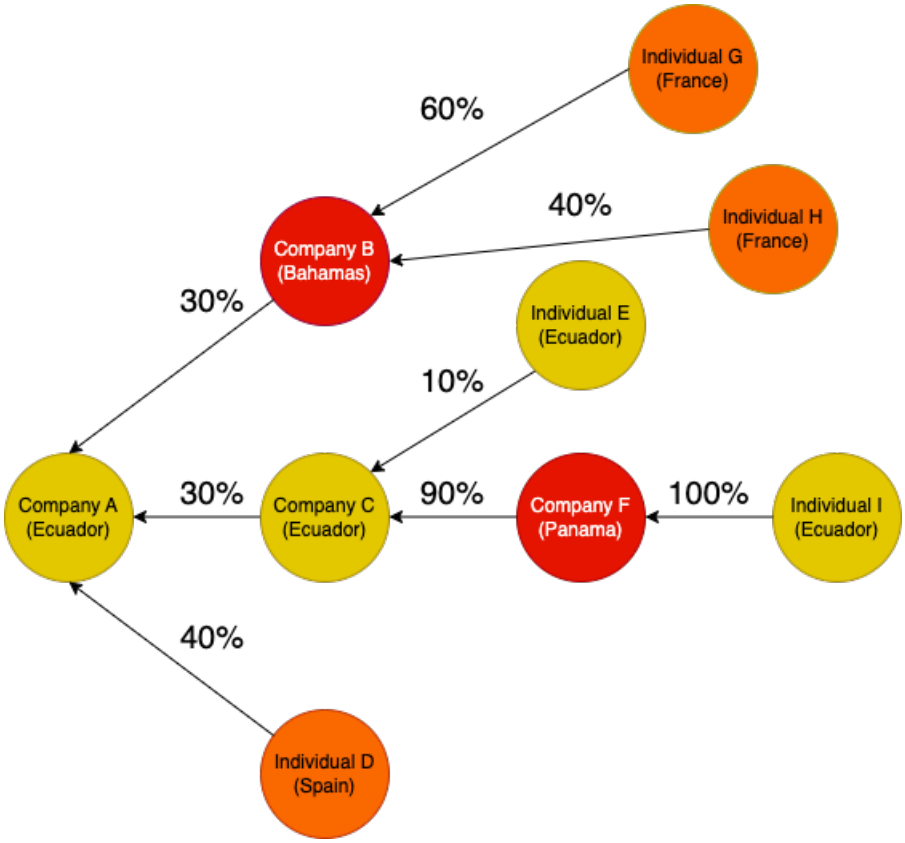
$$\textit{Maximum ult. ownership chain length}_{it} = \max_{\{\mathcal{M}_{jit}^{c} \in \mathcal{P}_{jit} | j \in \{i_{\mathcal{U}_t}\}} \left|\mathcal{M}_{ji}^{c}\right|. \tag{5}$$

Upon observation with non-zero beneficial ownership attributable to tax haven shareholders, Ecuadorian companies see two possibilities. First, a company that does not respond and adjust its shareholdership composition faces the CIT surcharge according to the above description. Of course, this threat of CIT surcharge is non-binding for firms that report non-positive. Figure A.1 shows that the CIT surcharge was binding for firms that remained in tax havens. Alternatively, a company can reduce its observable tax haven terminal shareholdership by either closing out the external shareholdership positions in tax havens or by extending its true beneficial ownership *beyond* the tax haven (in the case that the beneficial owner appears as a non-person entity). If these linkages reflect perfectly controlling, tax strategic relationships the company can simply change the shareholdership positions themselves. Alternatively, if the linkages instead reflect truly arms-length relationships with unrelated shareholder parties domiciled in tax havens, either the shareholders can voluntarily close out their out positions themselves (or similar extend their true beneficial ownership

reporting), perhaps in response to observing that the company in which they are invested faces a relatively higher CIT rate, or the Ecuadorian company can negotiate a sale of said positions back to the firm. We cannot directly observe the *true* nature of the intra-group shareholder relationship (i.e. to what extent the relationships are de facto purely controlling or truly arms-length by unrelated parties). However, we *can* make *some* inference on some of the mechanisms underlying shareholdership responses by observing *how* ownership changes based on the number of shareholder layers/chains and the change in the *kind* of observed terminal ownership (i.e. person versus non-person entity).

E.1 Illustrative examples of ownership graphs

Figure E.1: Example of a simple ownership graph



Note: this graphic illustrates a simple ownership example where no ownership cycles occur and all beneficial ownership is accounted for.

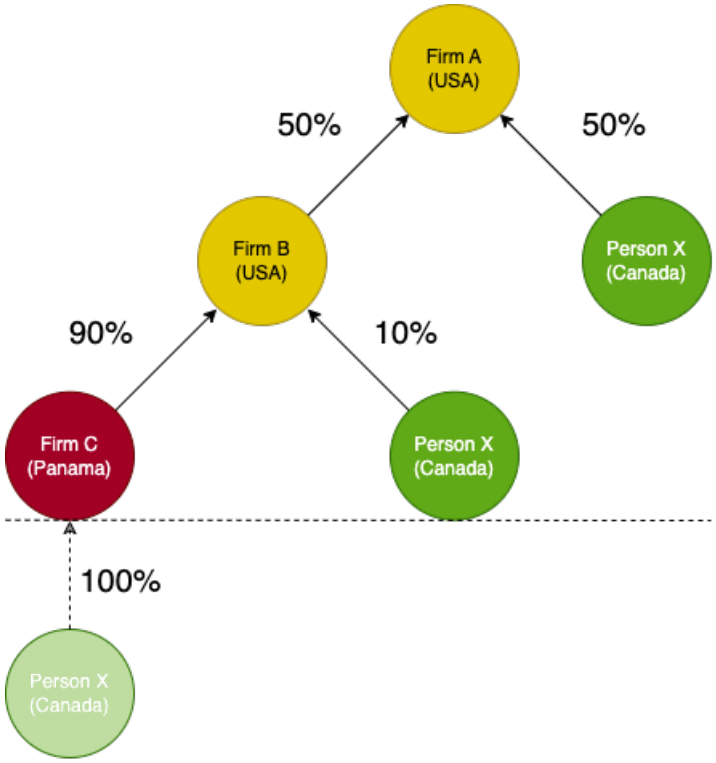
Figure E.1 gives an illustrative example of complete and beneficial business ownership in a simple case with no cyclical ownership or repeated shareholders. Applying the above procedures, we can calculate the indirect and beneficial ownership by and of different entities in the graphic. Here, we place focus on Company A. Note that at every node, all of the direct ownership linkages (arrows leading into an entity) add up to 100%. Also note that the only entities whose ownership is not further allocated to shareholders downstream are individuals.

We can calculate the beneficial ownership shares of each individual by multiplying the ownership shares reflected in direct ownership linkages from an individual to the destination company. For example, Individual G's indirect ownership of Company A is equal to Company B's direct ownership of Company A, mediated by Individual G's direct ownership of Company B: $60\% \cdot 30\% = 18\%$. By a similar process, we can see that Individual H has an effective 12% control over Company A. We can also observe that the group of French beneficial owners, maintain 30% control over Company A. We can also see that Individual I has $100\% \cdot 90\% \cdot 30\%$ of Company A, and Individuals E and D have 3% and 40% respectively. over company A. Similarly as for direct ownership, beneficial ownership must add too 100,

which we can confirm here. Importantly, we can perform this exercise for all companies represented here. For example, individuals G and H are both direct *and* beneficial owners of Company B. As another example, we can see that the ultimate ownership of Company C is allocated 10% to Individual E and 90% to Individual I.

E.1.1 Example of (non-trivial) terminal ownership

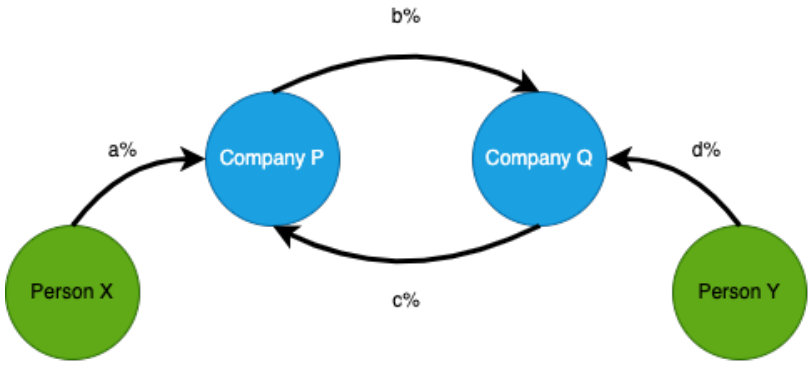
Figure E.2: Example of a terminal ownership



Note: this graphic illustrates a simple ownership example where no ownership cycles occur and all beneficial ownership is accounted for.

Figure E.2 shows a non-trivial example of terminal ownership. We emphasize that this example is *non-trivial* in the respect that Figure E.1 also illustrates terminal ownership insofar as perfect ownership reporting generates perfect coincidence of beneficial and terminal ownership. Figure E.2 illustrates an example where beneficial and terminal ownership diverge. The example shows an ownership scenario of an American firm A, whose direct ownership is event split between a Canadian Person X and another American firm B. Direct ownership of American firm B is split 10% to Canadian person X and 90% to a Panamanian firm C. The ownership structure behind Firm C is depicted in shaded coloring and dashed lines simply to signify an information barrier, so that the shareholdership of Firm C is not observed by the researcher. The true beneficial owner of Firm C is Canadian person X (in full), but the researcher observes no ownership of Firm C. Therefore, in this example, while Firm C is a terminal owner of Firm A (specifically, a terminal owner with 45% indirect own-

Figure E.3: Example of a cyclical ownership arrangement



Note: This graphic illustrates a cyclical ownership arrangement where as a feature of the ownership graph, two companies have direct ownership claims in each other. Direct ownership is defined such that $a, b, c, d \in [0, 1]$ and $a + c = b + d = 1$. The percent signs correspond with these values multiplied by 100.

ership), they cannot serve as a beneficial owner of either Firms B or A. The graphic shows that the true ultimate owner of Firm A, B, and C, is Person X.

E.1.2 Indirect ownership in the context of cyclical ownership

Consider a simple example of cyclical firm ownership, as depicted in Figure E.3. Person X directly owns $100 \cdot a\%$ of Company P and person Y directly owns $100 \cdot d\%$ of company Q. At the same time, Company P owns $100 \cdot b\%$ of Company Q and Company Q in turn owns $100 \cdot c\%$ of company P. Consider all of these numbers to be strictly positive so as to render the example non-trivial.

Identifying direct ownership is straightforward, as by definition, it must be the case that $a + c = 1$ so that all of the direct ownership of Company P is accounted for; as is the case that $b + d = 1$ for Company Q. However, how do we think about the ultimate ownership of Companies P and Q, considering that all such ultimate ownership must either be allocated to Persons X or Y?.

The standard procedure of multiplicatively following direct business-to-business ownership chains until reaching a person appears to fail here, as Company P owns Company Q, who owns Company P, who owns Company Q, etc.

Defining indirect ownership in this cases, and analogous cases with cyclical ownership can be resolved by considering the cyclical ownership between business as an infinite sum. We can express the indirect ownership of Company Q by Company P as $(b + b^2c + b^3c^2 + \ldots) = b \cdot \sum_{n=0}^{\infty}(b \cdot c)^n = b \cdot \frac{1}{1-bc}$ Here, the infinite sum is-well defined by the fact that $b \cdot c < 1$. Likewise, the indirect ownership of Company P by Company Q is defined as $(c + bc^2 + b^2c^3 + \ldots) = c \cdot \sum_{n=0}^{\infty}(b \cdot c)^n = c \cdot \frac{1}{1-bc}$. which is well-defined under an analogous regularity condition. We can then allocate the indirect ownership of Company P by Person Y in a simple manner, just as their direct ownership share in Company Q multiplied by the indirect ownership of Company P by Company Q, which is $d \cdot c \cdot \frac{1}{1-bc}$.

The intuition of this manner of defining indirect ownership consists of repeatedly summing

the iteratively infinite ownership cycles between the two companies. Each additional term in the infinite sum corresponds with an additional iteration in the ownership cycle, which diminishes in size due to the convergent nature of the sum.

We can demonstrate that in this way, the ultimate ownership of both Companies P and Q are well-accounted for and allocated wholly between Persons X and Y. Consider the ultimate ownership of Company P as the sum of the indirect ownership of Persons X and Y:

$$\begin{aligned}
s_{XP}^{\mathcal{I}} + s_{YP}^{\mathcal{I}} &= a \cdot (1 + bc + (bc)^2 + \ldots) + d \cdot c \cdot (1 + bc + (bc)^2 + \ldots) \\
&= a \cdot \sum_{n=0}^{\infty} (b \cdot c)^n + d \cdot c \cdot \sum_{n=0}^{\infty} (b \cdot c)^n \\
&= (a + cd) \cdot \sum_{n=0}^{\infty} (b \cdot c)^n \\
&= \frac{1 - c + c \cdot (1 - b)}{1 - bc} \\
&= \frac{1 - c + c - bc}{1 - bc} \\
&= \frac{1 - bc}{1 - bc} \\
&= 1,
\end{aligned}$$

demonstrating that all of the ultimate ownership of Company P is accounted for between Persons X and Y.

In practice, what does this process look like? As an example, set $a = b = c = d = 0.5$, which clearly satisfies the regularity conditions required of an ownership graph. Without this procedure of iteratively summing over repeated ownership cycles, we might have allocated the ultimate ownership of company P as 50% to Person X and $50\% \cdot 50\% = 25\%$ to Person Y. However, clearly this approach leaves 25% of the ultimate ownership of company P indeterminate and unaccounted-for.

Using the above approach, we can compute the indirect ownership of Company P by Person X as $\frac{0.5}{1-.25} = 66.\overline{6}\% = 2/3$ ownership and that of Person Y as $\frac{0.25}{1-.25} = 33.\overline{3}\% = 1/3$ ownership.

However, in practice, a central empirical difficulty in implementing this procedure is identifying ownership cycles in a computationally feasible and efficient manner, considering that a cycle can be of arbitrary length. Once a cycle is identified, its indirect ownership can be resolved through the above procedure.