The Transparency Tax: Discouraging firm ownership via tax havens in Ecuador

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Abstract

How can countries leverage ownership registries to curb tax haven usage and raise business ownership transparency? We address this question by analyzing Ecuador's business income tax surcharge on firms whose owners are tax havens residents. We estimate a set of difference-in-differences designs that compare the behavior of baseline haven-owned firms against other foreign-owned firms. The reform induced 20 percent of haven-owned firms to report terminal owners outside havens, with new owners predominantly identified as individuals rather than firms, thereby enhancing beneficial ownership transparency. Exposed firms increase tax payments in Ecuador by 17 percent, with no discernible effect on payroll and investment. These findings suggest that pairing a "flashlight" (ownership registry) with a "stick" (tax surcharge) can improve transparency and reduce tax erosion at a limited efficiency cost.

JEL codes: H26, H25, H32, F38

Key words: Tax havens, Beneficial Ownership Registry, Business Income Taxation

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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); Tørsløv, Wier and Zucman (2022); Zucman (2013)). A defining trait of tax havens is secrecy: it is difficult for other countries to secure their cooperation and obtain information on the beneficiaries of haven based entities. Expectations for coordinated reforms to address this challenge are high, but global agreements have failed to fully curb tax havens' influence (Bomare and Collin (2025); Alstadsæter et al. (2023*a*); Bustos et al. (2022)).

In parallel with coordinated global initiatives, as a notable institutional innovation of the past decade many countries have established national ownership registries. These registries document firms' shareholders and, when implemented with sufficient rigor, disclose the ultimate beneficial owner—typically a natural person. Figure A.1 shows that the number of countries that maintain beneficial ownership registry adoption has increased from two in 2015 to 73 in 2025.[1] How can governments leverage these registries to strengthen transparency of offshore ownership? And can they serve as effective tools to reduce tax haven exposure?

We explore this question in the context of Ecuador's pioneering efforts. In 2015 the country raised the corporate income tax rate by 3 percentage points for tax haven-owned firms. The policy relied on the prior implementation of a business ownership registry, as early as 2012, to identify firms subject to the tax surcharge. Using comprehensive administrative data, we employ a difference-in-differences design to compare the reported ownership structure and economic behavior of firms with tax haven owners at baseline, relative to other internationally-owned firms. We find that the reform increased ownership transparency and induced 20% of exposed firms to sever ties with tax havens, including their intermediate ownership. Yet, the majority of exposed firms continued to be tax haven owned and thus paid more corporate taxes–leading to higher revenue collection–without reducing their payroll

[1] Figure C.1 shows the map of countries that adopted a beneficial ownership registry.

and investments in Ecuador.

Few countries have unilaterally attempted to challenge the status quo with tax havens, in part due to a lack of data on the relation between their domestic firms and havens. The foundation of Ecuador's tax surcharge—and of our analysis—is the assembly of a yearly panel of firm ownership covering 2012 to 2019, merged with corporate tax returns and records of all transactions in and out of the country. In 2012, Ecuador was among the first countries seeking to establish a beneficial ownership (BO) registry. BO registries record firms' individual owners, both domestic and foreign, rather than just intermediate corporate owners. However, as in other countries, Ecuador's BO registry sees practical limitations in that many businesses only report intermediate owners, failing to disclose their true beneficial owners. This issue is particularly acute once ownership reaches tax havens. For this reason, Ecuador's surcharge on tax haven ownership can be interpreted to target both business ownership via tax havens and offshore ownership opacity. Moreover, Ecuador's surcharge represents a relevant policy that other countries with BO registries can implement to achieve similar goals.

We start by describing the ownership structures of Ecuadorian businesses as reported in the registry 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 either to an individual or to another firm. We categorize firms in three groups based on the country of their majority terminal owners: in tax havens, in foreign non-havens, and in Ecuador. Tax havens are defined by the Ecuadorian government: a key criteria is a lack of co-operation on ownership transparency. Their definition aligns with other tax haven lists (e.g. Tørsløv, Wier and Zucman (2022)).

At baseline, in 2014, tax haven terminal ownership accounts for 4.1% of aggregate Ecuadorian corporate assets, foreign non-haven ownership for 22.9%, while the remaining 73% corporate assets are domestically-owned. 588 Ecuadorian firms are terminally owned in tax haven countries; Ecuador's main tax haven exposure is to Panama, with 377 majority-owned firms out of 63,000 firms operating in Ecuador. International non-haven ownership is more spread, with about 600-700 majority-owned firms for each of Colombia and the United

States, and 328 for Spain. Beneficial ownership reporting is high for domestic-owned firms, but deteriorates for foreign owned firms: only 70% of non-haven- and 43% of haven-owned firms' terminal ownership can be attributed to individuals.

To evaluate the 2015 tax reform, we employ a difference-in-differences design comparing the ownership and activity of firms with pre-reform majority ownership in tax havens ("exposed firms") to that of firms with majority ownership in foreign non-havens ("control firms"). At baseline, haven-owned Ecuadorian firms display similar revenue, profits, and tax liabilities to internationally-owned firms, but are larger in terms of their assets, and thus display a lower profit-to-asset-ratio. We mainly focus on majority foreign-owned firms, as minority foreign-owned firms are fewer, and faced a different tax surcharge.

The tax surcharge applied to businesses with terminal ownership in tax havens such that it primarily targeted illicit usage of tax havens rather than profit shifting or other tax avoiding usage of tax havens. We hypothesize that the reform might (a) encourage exposed firms to report non-haven terminal owners to escape the tax surcharge; (b) induce ownership disclosure responses mainly from foreign business owners as opposed to from Ecuadorian tax haven users (as disclosure by Ecuadorian tax haven users would *ipso facto* reveal tax non-compliance to the Ecuadorian tax authorities); (c) raise tax collection, mechanically by increasing the tax rate of firms maintaining haven ownership, and behaviorally, by heightening the perceived cost of tax evasion for exposed firms (Bilicka, Devereux and Güceri (2024); Allingham and Sandmo (1972)); (d) and if the use of offshore structures has a productive purpose, increase financing costs and reduce the economic activity of exposed firms in Ecuador (Suárez Serrato, 2019).

First, we analyze whether the tax surcharge–which raised the corporate income tax rate from 22% to a 25%–impacted ownership reporting. We estimate that the reform led to a 12.3 percentage points reduction in terminal haven ownership of exposed firms relative to a 63 percentage points baseline on average over the five years post-reform (a 20% effect size in relative terms). This response is stronger among larger firms and is almost entirely due to the extensive margin: the reform induces an 11.2 percentage points increase in the prob-

ability that a firm will exit terminal 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, and the ownership change is entirely attributable to the reporting of new international owners, rather than Ecuadorian owners. Therefore, the reform enhanced offshore corporate ownership transparency, as more Ecuadorian firms report terminal owners who are individuals from cooperating countries post-reform. We also characterize heterogeneous treatment effects based on pre-reform business characteristics. We find stronger effects of the reform among firms with low initial levels of beneficial ownership declared (i.e. greater opacity), and weaker effects for firms that we observe transacting frequently with tax havens (in the cross border flows data) before the reform.

Since the exposure and control groups are defined by their pre-reform foreign ownership, comparing post-reform tax haven ownership between them risks conflating the reform's impact with mean reversion. Instead, our difference-in-differences design compares the evolution in "baseline ownership": tax haven ownership for exposed firm versus foreign non-haven ownership for control firms. Our design is supported by the lack of pre-reform differential mean reversion between majority haven owned and foreign non-haven owned firms. The results are robust to alternative exposure and control definitions. In particular, comparing Panamanian-owned firms (haven group) to Colombian-owned firms (non-haven group)—which are similar in number and thus less susceptible to mean reversion arising from size differences between haven and non-haven countries—yields comparable results.

Second, we examine whether the change in terminal ownership implies that firms cut their ties to tax havens by transferring ownership, or simply improved the reporting of previously undisclosed terminal owners. Several pieces of evidence support the former explanation. The ownership data reveals an 8-9 percentage points decrease in the probability that a tax haven intermediary appears anywhere in the ownership chain, amount to 70% of our detected effect size for the impact of the reform on tax have terminal ownership. We then explore all cross-border transactions between Ecuadorian firms and foreign entities, using a high quality

dataset collected from Ecuador's currency exit tax. At baseline, exposed firms are more than twice as likely to transact with tax havens compared to control firms. Following the reform, firms that changed terminal ownership report less transactions with tax haven counterparts. The reform thus raised transparency and discouraged business usage of tax havens: a higher proportion of observable owners of Ecuadorian firms are now individuals, and these newly reported owners are citizens of cooperating countries, thus enabling bilateral exchanges of information in the case of litigation.

We further examine this result by trying to separate the roles of the pecuniary cost of the policy (the tax surcharge) and the potential deterrence effect of the reform's impact on ownership transparency. To do so, we measure ownership responses in an alternate sample of minority foreign-owned firms: these firms face a continuously increasing business income tax surcharge from 0 to +1.5 p.p. at 50% tax haven ownership, rather than a set 3 p.p tax increase. We also compare the heterogeneous behavior of firms in our main-sample based on whether they paid positive business income tax in the pre-reform period (and therefore would have anticipated the binding +3pp surcharge). We document a positive relationship between the "surcharge dosage" and the decrease in tax haven ownership. In the back-of-the-envelope calculation, we attribute around 70-80% of the reduction in tax haven ownership to the pecuniary size of the surcharge, rather than the potential "flashlight" effect of ownership transparency, although we cannot rule out the complementarity of these two policies. This response is consistent with prior evidence on limited effects of purely transparency-related policies (Alstadsaeter et al. (2023*b*)).

Third, we measure the impact of the reform on corporate tax payments. A potential shortcoming of the policy is that it only imposes a pecuniary threat to firms reporting positive taxable profits. Around 75% of both exposed and control firms report positive profits at baseline and this likelihood is unaffected by the reform. However, corporate tax payments of exposed firms increase by 17% relative to control firms. Part of this rise is mechanical, stemming from the higher tax rate applied to firms maintaining terminal haven ownership, yet, exposed firms also report a higher tax base, with higher profits. This suggests a beha-

vioral response stemming from an increased perception of detection of tax non-compliance by the tax authorities (Allingham and Sandmo (1972); Becker (1968)). In an analysis separating the sample between firms that remained in tax havens versus those that left, we find this indeed to be the case: exposed firms whose ownership left tax havens increased their reported profits and taxes by around 25%. We conjecture that the reform raised exposed firms' cost of tax evasion—via the direct cost of the surcharge and via a perceived increase in detection probability—leading to improved compliance.

Fourth, we analyze firms' economic activity in Ecuador. Although the previous results are encouraging, some studies have found that a crackdown on tax havens had negative consequences for the domestic activities of haven connected firms (e.g. Suárez Serrato (2019)) by raising the cost of doing business with Ecuador. On the extensive margin, we do not detect changes in the probability of firms being active in Ecuador. We also document precise null effects of the policy on investment, assets, leverage, and payrolls over a five-year post-reform horizon. This null-response could be consistent with a model with fully tax-deductible expenses. The reform seems to have raised ownership transparency and tax revenues at limited efficiency cost.

To rationalize these results, we develop a simple conceptual model. The results are qualitatively consistent with a model akin to Allingham and Sandmo (1972) with heterogeneous fixed costs of tax haven usage where the reform induces an increase in the cost of tax haven usage and an increase in detection probability. This model predicts (1) partial haven exit, (2) a reduction in tax evasion (an increase in profits declared and taxes paid) for all exposed firms, with a greater response for firms exiting haven usage, and (3) no effects on income-generating expenses that are fully deductible.

We conclude by comparing Ecuador's reform to alternative unilateral policy proposals aimed at reducing tax haven usage and offshore tax base erosion. Other policy proposals, namely Neidle (2024), have suggested subjecting companies to a tax on their outflows to tax havens according to their ownership opacity. Our data environment, featuring both information on cross-border flows and on beneficial ownership (and ownership opacity), uniquely

allows us to quantify tax bases relevant for such proposals. We characterize different hypothetical tax bases, ranging over different scenarios of *which firms* (e.g. firms without majority BO disclosure, firms with terminal owners in tax haven, etc.) and which flows (e.g. outflows, dividend flows to tax havens, profits, etc.) are subject to the tax, as well as possible revenue gains given potential behavioral responses.

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 activity. Yet, a share *did* change their reported terminal ownership to foreign non-haven countries. We can summarize the behavior of these firms with a fictional illustration: Condor Construction Corporation (CCC), an Ecuadorian firm, reported Isthmus International Incorporated (III), a Panamanian entity, as its terminal owner in 2014. In 2015, to escape the tax surcharge, CCC, updated its ownership registry to unmask its beneficial owner, Don Diego DelaVega (DDD), a Spanish national subject to Spain's tax on the worldwide income of its citizens, who removed III as an intermediate shareholder. At the same time, CCC reported higher profits in Ecuador potentially because the reform heightened its perceived risk of detection for non-compliance or cooperation of the Ecuadorian tax authorities with the Spanish tax authorities. CCC thus disclosed its beneficial owner, DDD and reduced its tax evasion.

The unilateral policy studied in this paper holds promise. The policy combined a "flashlight" (the ownership registry) and a "stick" (the tax surcharge), which reinforced each other. While large high-income countries dispose of a set of instruments to curb secrecy and tax haven abuses of their own multinationals (e.g. CFC rules), countries without domestic multinationals have few available tools to guard from the negative externalities imposed by tax havens. Ecuador used its new ownership registry to build an incentive based anti-opacity policy. The policy succeeded in inducing better reporting of beneficial owners based in cooperating countries (non-havens), which also helps countries enforce multinational efforts to report activity involving tax havens (OECD (2015)). In case of litigation with a firm, the government is now better positioned to obtain information from the country of citizenship

of the beneficial owner. The implications for the design of anti-haven policies are thus nuanced, but also timely, as beneficial ownership registries are rapidly developing worldwide. Ecuador's tax haven ownership surcharge thus represents a policy that other countries with beneficial ownership registries could implement to similarly discourage 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 BIT surcharge on shareholdership and corporate transparency. Section 5 studies economic activity, financing, and foreign transactions.

1.1 Contributions to the Literature

We provide two main contributions. First, we add to the sparse economic literature on corporate and asset owners ownership transparency. Second, we complement an expanding body of work on curbing tax havens' influence: previous studies focus on multilateral policies in high-income countries; instead we analyze the effects of a unilateral policy in a middle-income country.

The literature on ownership transparency is sparse. One strand studies real estate, an asset class excluded from information exchanges, and that has been shown to facilitate tax evasion and money laundering (Alstadsæter et al. (2022)). It finds that efforts to improve real estate ownership transparency seemed to have been circumvented and to only moderately lower tax evasion (Johannesen, Miethe and Weishaar (2022); Collin, Hollenbach and Szakonyi (2022)). The economic impacts, and incentives, to improve corporate ownership transparency have been even less studied.[2] Bennedsen and Zeume (2017) show that the value of firms connected to tax havens slightly rises when the home country and a tax haven sign a bilateral Tax Information Exchange Arrangements. They argue that this response reflects managers using tax havens to expropriate value at the expense of shareholders (in addition to a tax minimization role). We contribute to this literature by evaluating pecuniary incentives to

[2]A few papers document the globalization of corporate ownership, without finding a large role for secrecy and tax evasion (Fonseca, Nikalexi and Papaioannou (2023); De La Cruz, Medina and Tang (2019)).

improve corporate ownership transparency.[3] We note that a larger policy literature discusses the merits of ownership transparency, and the implementation steps for countries to establish beneficial ownership registries.

A growing body of work focuses on the effects of multilateral policies to reduce tax base erosion (e.g. Casi, Spengel and Stage (2020); Menkhoff and Miethe (2019); Clifford (2019)). These studies find that the mixed effectiveness of anti-haven policies that depend on the capacity of governments to enforce international agreements and leverage new data ((Bomare and Collin (2025); Alstadsæter et al. (2023*a*)). For instance, Fejerskov Boas et al. (2024) show positive tax compliance effects of the implementation of automatic exchange of financial information (AEoI) in Denmark, but these impacts deteriorate in countries with lower administrative capacity (Alstadsæter et al. (2023*a*)).[4] Further, international coordination, can be slow and complex, and since it is consensus driven it often features carve-outs that undermine its effectiveness. Alstadsaeter et al. (2023*b*) conclude that recent information reporting and coordination policies have not substantially reduced offshore tax evasion.

A thinner literature studies *unilateral* anti-haven policies, focused on information reporting mandates, concerning for example profit-shifting and transfer pricing (e.g. Wier (2020); Liu, Schmidt-Eisenlohr and Guo (2020)). These policies reduce tax haven usage, but at both substantial compliance costs (Bustos et al. (2022)), and costs to economic activity (Suárez Serrato (2019)), with unclear net impacts to tax collection. Our setting is informative for countries considering a more direct incentives-based anti-tax haven policy. Related to this paper, Brounstein (2025) 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-earning personal income taxpayers in Ecuador.

Finally, we contribute to the literature documenting tax haven usage. Londoño Vélez and Ávila Mahecha (2024), and Alstadsæter, Johannesen and Zucman (2019) find that tax haven usage is highly concentrated among the richest individuals. Rose and Spiegel (2007)

[3] Alstadsæter et al. (2023*a*) studies how compliance with beneficial ownership reporting and information sharing standards varies across countries, although they do not evaluate how such policies impact ownership.
[4] Taxpayers also substitute towards offshore assets not covered by AEoI, such as real estate (e.g. Bomare and Le Guern Herry (2024))

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 (2019) finds a high level of bunching at zero-profits of multinational companies in the United Kingdom, a higher tax jurisdiction (see also Langenmayr and Liu (2023)). 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' business income tax 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. 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 the International Currency Movement Annex (MID). 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 business-shareholder linkages, including direct ownership percentages as well as indirect ownership percentages for terminal owners, shareholdership tier (the number of ownership layers between a shareholder and the original business), 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 who by April of each year needs to report the firm's shareholders as of December 31 of the prior year.[5] 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. Thus, firms are required to report the ownership 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 points business income tax surcharge, a policy in place since the introduction of the APS in 2012. However, this penalty only applies to nominally incomplete *shareholdership* reporting—and not to incomplete *beneficial* ownership reporting: as long as the Ecuadorian firm reports 100% terminal shareholdership, the business is deemed compliant with reporting standards and avoids the sanction. This omission seems to stem from a matter of practicality: a recognition by the tax administration that reporting beneficial owners might not be within the direct control of an Ecuadorian subsidiary of a foreign firm. 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/corporate entities. The business income tax pertains to the latter. By definition, the registry only reports information on formal firms: at the beginning of our panel in 2012, around 70,000 firms file the F101, rising to over 100,000 by 2019.[6] The

[5]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.

[6]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)). Although we do not include informal firms in our analysis, 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 (2025) in Ecuador; **?**; Alstadsæter, Johannesen and Zucman (2019)).

business tax declarations report observations at the firm-year level. In addition to data on revenues, costs, profits, and tax liabilities, the form also disaggregates certain kinds of costs and revenues and reports on intra-group and affiliate transactions, 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. For this reason, we only include results on outflows as part of our main results. We use these data in Section 5 to study whether companies exposed to the tax haven BIT surcharge change their transaction-behavior with parties in tax havens and foreign non-havens in response to the reform.

We express all monetary values in units real 2014 USD. All monetary variables from the F101 and the MID are winsorized above the 99% percentile; all share variables (e.g. tax haven outflows share of revenue) are winsorized above 1.

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*, 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, which are exempt from the policy we study and we therefore exclude from our analysis. In practice, we rarely observe such alternate non-person beneficial owners.

Therefore, we do not view the exclusion of informal firms as a concern in our setting.

Upon observing a person-owner, we cannot distinguish between true beneficial ownership and "nominee shareholdership" arrangements in which for public privacy purposes, a true owner will allocate nominal ownership to another person but retain effective control and benefit. However, such arrangements have little implication for our purposes, if a tax authority can identify a nominee owner, it can engage in enforcement of tax compliance rules and in litigation. Thus, we use *beneficial owner* to refer to an individual person-owner of a business. We contrast this term with the concept of *terminal* ownership, which corresponds to the last reported owner of a business beyond which no further ownership linkages are reported. This distinction is needed, 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 owners are terminal owners, but not all terminal owners are beneficial owners.[7]

All ownership linkages observed in the APS reflect one of three possibilities. For a fixed year t, consider Ecuadorian firm i and a shareholder j of firm i. In the first scenario 1), shareholder j is itself a firm—either Ecuadorian or foreign—that in turn reports its ownership. We can then assign shareholder j's ownership to firm i, weighted by the appropriate shares and continue observing firm j's shareholders. 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 constitute terminal linkages for firm i in year t. For each terminal ownership link, the tax authority multiplies all direct shareholdership amounts until reaching business i. The tax haven terminal ownership share is the sum of these indirect ownership amounts over terminal linkages in tax havens.[8]

[7] Figure D.1 shows the set inclusion, exclusion, and overlap of the different ownership concepts we employ.
[8] Section D develops more formal graph theoretic definitions of these concepts and discusses several examples of effective ownership calculations.

2.3 The 2015 business income tax surcharge on tax haven ownership

Ecuador taxes business/corporate income on a territorial basis, at a flat 22% rate between 2012-2017, later raised to 25% in 2018.[9] Using the ownership registry (APS), the tax authorities constructed a measure of terminal ownership share by domicile, based on the tax residence of the terminal owners. In June 2015, three years after the introduction of the APS, the administration announced that effective the same year, a BIT surcharge of 3 percentage points would apply to firms with terminal ownership in tax havens, based on the APS reporting terminal ownership as of December 31 of 2015. This reform was not accompanied by other changes that may have affected firms' tax haven exposure. The government also announced that the surcharge would not apply to entities operating in excluded industries, namely the public sector, the non-profit sector, trusts, and in the oil/petroleum sector.

The three percentage points tax surcharge applies to any firm (operating firms of the excluded industries) majority owned in tax havens (50% or more terminal ownership). For firms with minority-ownership in tax havens, a lower surcharge rate would be applied, increasing based on the ownership share in tax havens: the surcharge starts at zero and rises linearly 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 BIT surcharge per percentage point in haven terminal ownership). Upon reaching 50 percent tax haven ownership, the rate jumps discontinuously to 3 percentage points, above which the rate remains constant.[10]

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

[9] The BIT rate is higher for extractive industries, while some preferred industries see a reduction in their statutory rate. The BIT schedule also gives a 10 percentage point reduction for re-investment out of profit. 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.

[10] The BIT surcharge can be written in units of percentage points divided by 100 as

$$PredictedSurcharge_{it} = 0.0003 \cdot S_{it} \cdot \mathbb{1}\{S_{it} < .5\} + .03 \cdot \mathbb{1}\{S_{it} \geq .5\} \tag{1}$$

for terminal tax haven ownership $S_{it} \in [0, 1]$ of Ecuadorian business i in year t. Figure B.1 illustrates the statutory surcharge schedule. See Figure D.3 for an example calculation of the surcharge as well as Section D.1 for additional explanation and examples of terminal and beneficial ownership.

matters and of exchange of information on beneficial ownership, (2) A corporate income tax rate that is below 60% of Ecuador's (thus a BIT 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. In practice, 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)).

2.4 Tax haven usage and who the tax surcharge targets.

Because the tax surcharge deals with terminal ownership in tax havens, we interpret the reform to largely concern illicit usage of tax havens. Note that profit shifting or avoiding usage of tax havens requires any presence in tax havens via intermediaries, not necessarily terminal or beneficial ownership located in tax havens. Rather, illicit usage of tax havens often features leveraging the financial secrecy that havens provide in masking true beneficial ownership—either through non-cooperation of tax havens with information provision or through hosting nominee ownership arrangements that mask true owners. For this reason, readers should understand the reform to target evasive usage of tax havens through its emphasis on ownership transparency and beneficial/terminal ownership.[11]

Prior to the implementation of the reform, we can describe tax evasive usage of tax havens under several different mechanisms. Take the example given by Figure C.2, in which an Ecuadorian Business A owned by a Panamanian entity can evade business income taxation in Ecuador by providing goods and services to another arms-length entity Business B that makes its payments to the Panamanian entity. By not disclosing the net profit to the Ecuadorian tax authorities, Business A evades the Ecuadorian business income tax. Note that the true beneficial owner of Business A could be located in Ecuador (thereby also possibly evading Ecuadorian personal income tax) or be a foreign national (possibly also evading their home country's personal income tax on worldwide income). As another example,

[11] Figure C.2 and Figure C.3 illustrate examples of ownership arrangements that facilitate evasive usage of tax havens. Figure C.4 illustrate examples an avoiding usage of tax havens.

consider Figure C.3 that shows a hypothetical ownership arrangement of an Ecuadorian business by a Spanish national via Panama in 2014. In 2014, Spain levied a top marginal personal income tax rate on worldwide income of 47%. Thus, the Spanish national could operate a Ecuadorian business (possibly in compliance with Ecuador's 22% business income tax), but send net-of-tax profits to the Panamanian account undisclosed to the Spanish tax authorities, thereby evading Spain's worldwide income tax. Typical to these kinds of arrangements, businesses engaged in evasive usage of tax havens tend to exhibit high export intensity and low profitability than other non-evading entities, a hypothesis we validate in Table B.1.

A priori, we expect the tax surcharge to have different effects on beneficial ownership disclosure and continued presence in havens for businesses owned via tax havens by *foreign nationals* versus by *Ecuadorian nationals*. The tax may be more likely to induce beneficial ownership disclosure among foreign nationals. If the Spanish individual discloses to the Ecuadorian government her true beneficial ownership of the Panamanian intermediary, the Spanish authorities still do not necessarily know of this arrangement, although the threat of increased audit or intergovernmental cooperation may induce an additional compliance response of the Ecuadorian business. On the other hand, if the tax haven user were an Ecuadorian individual, she may be less likely to disclose herself as the true owner, as such action could *ipso facto* reveal non-compliance and induce audit by the Ecuadorian tax authorities. In both cases, the impacts of the policy on detection probability and on the cost of haven usage also likely induce a decrease in offshore tax evasion. We explore these possibilities in Section 4.2 and Section 6.

2.5 Sample construction and descriptive statistics

Sample Construction. We construct our sample by combining the APS, CIT, and MID data over the period 2012-2019. We require firms to 1) have filed a Business Income Tax declaration with positive revenue in 2014, 2) not operate in one of the industries exempt from the surcharge, and 3) have filed an APS declaration at least once between 2012 and 2014,

such that firms can be assigned a baseline ownership profile. Our "core sample" consists of 62,350 firms that satisfy these criteria. Table B.2, Table B.3, and Table B.5 compare excluded firms against our core sample, separately, based on not satisfying each respective exclusion criterion. Excluded firms appear approximately an order of magnitude smaller than firms comprising our core sample as measured by assets, revenues, and taxes paid, so we view their exclusion from our analysis as innocuous. Compared to Ecuadorian national statistics, firms in our core sample account for 90% of Ecuadorian BIT payments in 2014. Our data, thus consists of a yearly panel spanning 2012 to 2019, for firms with an attributable ownership, and active in 2014, the baseline reform year.

Descriptive statistics. Table B.1 presents descriptive statistics of Ecuadorian firms that comprise our core sample in 2014. The average (median) firm declares USD 1.9 Million (140,000) in yearly revenue. The mean (median) profitability by assets is 6.2% (4.3%), with 77% of firms reporting positive taxable profits in 2014. Nearly all firms face the standard 22% rate, and on average pay USD 15,000 in corporate taxes.

Table B.1 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 86% of terminal ownership of Ecuadorian firms in our core sample. An additional 4% ownership is attributable to foreign persons. Thus ownership by persons accounts for 90% of the total. Another 8% of terminal ownership is allocated to firms: 6.4% to Ecuadorian non-person entities, and 1.6% to foreign non-person entities, leaving 1.4% of terminal ownership unaccounted for on average for filing firms. These characteristics demonstrate partial non-compliance with the APS's intended beneficial ownership reporting standards. 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, 97% of firms complied with reporting requirements so as to *nominally* account for 100% of their ownership. Yet only 83% of firms reported 100% of their beneficial ownership (such that all terminal owners are individuals).

Our core sample thus consists of a panel of 62,350 firms from 2012 to 2019. Our panel is well-balanced, with 88.4% and 89.8% of firm-years featuring an APS or form F101 filing respectively. Table B.7 shows that balance across all firms declines modestly between 2014 and 2019, with 80% and 78% of firms relative to baseline filing an APS or F101 declaration respectively in 2019. We further explore panel balance, differential attrition, and "extensive-margin" movement in and out of sample in Section 4.2

Tax haven usage and ownership. Table 1 tabulates the foreign terminal ownership of Ecuadorian firms in our core sample by country and ownership threshold (Table A.1 provides analogous results for *all* firms filing the APS). Panel (a) presents tax haven countries, while panel (b) displays all foreign non-haven countries. 163 Ecuadorian-operating firms are entirely owned by entities domiciled in tax havens. As expected, Panama is quantitatively the most important tax haven for Ecuador, with 377 firms majority-terminally-owned.[12] Panama appears seven times more frequently as a majority ownership domicile than the second most common tax haven, the Netherlands, and nearly twenty five times more frequently than the third most common for majority ownership, the British Virgin Islands. In total 584 firms are majority owned by a single tax haven country (4 firms are majority-owned by a combination of tax haven countries, as such they are not accounted for in the second column). The following columns expand the sample to include firms with minority ownership in tax havens, which only moderately increases the number of unique firms. The right-half of the table displays the share of aggregate Ecuadorian corporate assets (and revenue) by location of ownership: 4.07% of all corporate assets in our sample are owned by tax havens of which 1.93% are by Panama. Terminal ownership by persons, that is beneficial ownership, accounts for 1.6% of all Ecuadorian corporate assets, less than a half of the tax haven owned corporate assets. Although we cannot accurately distinguish nominee shareholdership arrangements from true beneficial ownership, we hypothesize that much of the person-attributable shareholdership in tax havens is indeed nominee shareholdership.

[12]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)).

Table 1 Panel (b) displays the same statistics for foreign non-haven countries. In total 3,397 firms are majority-owned in a non-haven country. The most frequent non-haven countries are Colombia and the US, with about 600 firms in each, followed by Spain with 328. Latin American countries complete the ranking of top non-haven ownership locations, similarly in line with previous findings substantiating the role of gravity in predicting bilateral country economic ties. Non-haven countries own 22.9% of Ecuadorian corporate assets in our sample. Just over half of corporate assets owned in foreign non-havens report a beneficial owner.

3 Empirical strategy

Defining exposure and control. To estimate the causal impact of the 2015 BIT surcharge on firm ownership and economic activity, our identification strategy compares Ecuadorian firms with tax haven terminal ownership in 2014, versus firms with foreign *non-haven* terminal ownership in 2014.

We construct an 'exposure' group, considering firms with at least 5% tax haven terminal ownership pre-reform. We define the control group as firms with pre-reform foreign non-haven terminal ownership exceeding 5% *and* tax haven ownership that does not exceed 5%. Thus, by construction the control group should not be directly impacted by the reform.

We distinguish between firms that are terminally foreign-owned on a majority and minority basis. Figure A.2 displays the distribution of terminal ownership of exposure and control firms. Around 75% of firms with international ownership presence are weak-majority foreign-owned, with outsized mass located at precisely 50% and 100% foreign ownership. Table A.2 tabulates observed and residual ownership for firms assigned to different ownership categories. Around 75% of firms with international ownership presence are weak-majority foreign-owned, with outsized mass located at precisely 50% and 100% foreign ownership. The overwhelming majority of firms are owned domestically.

We focus our analysis primarily on firms with majority foreign ownership. We do so for several reasons: First, we anticipate that firms with minority foreign ownership are funda-

mentally different from firms with majority ownership. 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. Second, Table A.2 shows that firms with minority foreign ownership are characterized by much higher unreported ownership residuals than majority foreign-owned (e.g. 0.02% for majority haven-owned versus 4.26% for minority haven-owned). Lastly, Table A.3 shows that minority tax haven firms appear substantially larger than minority foreign non-haven firms by about a factor of four in terms of assets and revenues, potentially undermining credible comparisons. We also circumstantially observe that their ownership trends are less stable potentially undermining our identification strategy. We therefore focus our analysis primarily on firms with majority foreign ownership, although we do briefly invoke minority foreign-owned firms for exploiting the continuous variation in their income tax rate surcharge.

Our final analysis sample thus consists of 588 majority tax haven firms and 3,352 majority foreign non-haven firms.[13] These 3,940 unique firms form our main panel, which are by construction active in 2014. This group exhibits stronger panel balance than the non-international sample, with 93% and 90% balance of majority exposure and control firms respectively between 2012 and 2019.

Table 2 displays descriptive statistics comparing exposure and control firms as well as domestic firms.[14] Panel (a) shows that exposure and control firms appear observably similar by revenue, profits, and taxes paid. However, note that both exposure and control firms are *not* large, by measure of revenue, generating around 400,000 USD in revenue every year. This observation further corroborates the intuition that the surcharge does not target large multinational usage of tax havens, but illicit usage of tax havens, possibly by smaller individual-owned businesses. Yet, exposure firms are three times larger than control firms in terms of assets. They also exhibit about 20% lower labor share of expenses. The table

[13] We observe 195 minority exposure firms and 1,183 minority control firms.

[14] Table B.8 Table B.9 displays more detailed descriptive distributional statistics for majority exposure and control firms.

also shows that exposure firms export 80% more and exhibit 20% lower profitability than control firms. Panel (d) displays characteristics pertaining to foreign outflows by destination category, demonstrating that exposed (control) firms are also more connected to tax havens (foreign non-havens) as measured by their their foreign outflows. These patterns corroborate prior evidence descriptively documenting the profiles and activity composition of firms using tax havens (Tørsløv, Wier and Zucman (2022)).

Panel (b) shows ownership and APS compliance characteristics of exposure, control, and domestically-owned firms. The table illustrates important differences and similarities 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. In terms of shareholdership characteristics, we document higher terminal ownership concentration among majority haven firms as well as longer average ownership chains. Interestingly, we also observe that 10% of majority foreign non-haven firms have at least one intermediary domiciled in a tax haven.[15]

Both groups exhibit very high levels of nominal compliance with APS filing and reporting standards with over 99 percent of firms in both groups filing the APS in 2014 and 98% of their declarations nominally accounting for 100% of their ownership. However, exposure firms appear to report less of their *true* ultimate beneficial owners. Within the major group of comparison, exposed firms only have 43% of their ultimate shareholdership attributable to individuals, whereas control firms report 70% of their ultimate ownership as attributable to people. Moreover, only 33% of exposure firms and 61% of control firms reveal 100% of their beneficial ownership. We observe similar patterns for the minority group firms according to Table A.3. Based on these patterns, we conclude that, descriptively, firms with ownership in tax havens are characterized by greater ownership complexity and opacity than firms with

[15]By definition, these intermediaries report their respective shareholdership profiles, eventually revealing terminal ownership in non-havens.

ownership in foreign non-havens.

Research design. 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.[16]

$$y_{it} = \alpha_i + \delta_t + \sum_{t=2012,\neq 2014}^{2019} \beta_t \cdot Exposure_i Year_t + \varepsilon_{it}, \tag{2}$$

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 category, shareholder type (i.e. person or non-person entity), 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 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 BIT surcharge on outcome y of 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 post- versus pre-reform average difference-in-differences specification. The ITT effect may differ from the Average Treatment on the Treated effect (ATT) of *paying* the BIT 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

[16] While the discontinuity of the BIT surcharge rate at 50% effective tax haven terminal ownership suggests a regression discontinuity (RD) or bunching design, these designs see important implementation problems in our setting. Namely, as Figure A.2 illustrates, the distribution of firm terminal ownership sees little support below 50%. Additionally, the 50% threshold coincides with the standard definition of controlling ownership so that such a discontinuity likely implicates other exclusion violations.

non-positive profit in order to avoid paying any CIT, such that in practice the surcharge will apply to a subset of exposed firms. We later instrument the change in the tax rate with firms' exposure status in order to develop the robustness of our results. 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 compare the evolution of the two groups of firms, under a parallel trends assumption. However, when assessing the reform's impact on ownership structures, mean reversion poses a concern. By construction, the exposure group has over 50% terminal ownership in tax havens, and the control group has over 50% terminal ownership in foreign non-havens and almost no ownership in havens. If we estimate Equation (2) 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 increase (as control firms can hardly further decrease their haven ownership).[17]

To mitigate this concern, we compare ownership shares in firm's 'baseline domicile group', instead of in tax havens. 'Baseline domicile' refers to the residence of the majority terminal ownership at baseline: for exposure firms this is tax havens; for control firms it is foreign non-havens. Thus, to estimate the impact of the reform on terminal ownership, we compare the tax haven ownership share of exposed firms to the international ownership of control firms. We generate the dependent variable:

$$y_{it} = \begin{cases} Tax\ haven\ ownership_{it},\ i \in Treatment, \\ Foreign\ non\text{-}haven\ ownership_{it},\ i \in Control \end{cases} \tag{3}$$

This strategy requires that the extent of mean reversion in ownership from the baseline domicile over time is similar between exposure and control firms. I.e., absent the reform, tax

[17] This kind of mechanical mean reversion issue is common in settings simultaneously involving both 1) defining exposure and control groups based on whether a running variable surpasses a given threshold and 2) studying said running variable as an outcome of interest in of itself, e.g. quantifying the earnings impacts of marginal tax rate changes above a given earnings level (e.g. Kleven et al. (Forthcoming)).

haven ownership for the treatment group would evolve in parallel with non-haven ownership for the control group. This approach more formally corresponds with the counterfactual condition:

$$\mathbb{E}\Big[Haven\ ownership_{it}\Big| i \in Exposure, t \geq 2015, No\ policy\Big] = \mathbb{E}\Big[Foreign\ non\text{-}haven\ ownership_{it}\Big| i \in Control, t \geq 2015, No\ policy\Big]. \quad (4)$$

Under the above assumptions, when we estimate Equation (2) with baseline domicile terminal ownership as the dependent variable, we interpret $\hat{\beta}_{dd}$ to estimate the impact of reform on terminal ownership in tax havens.

Symmetrically, we define the 'inverse domicile group', as the opposite foreign domicile category. For exposure firms, the inverse domicile is foreign non-havens and for control firms, the inverse domicile is tax havens.[18]

We validate our approach through a series of robustness checks and complementary research designs. Section 4.3 considers three alternate definitions of the exposure and control groups. One concern regarding differential mean reversion pertains to the disparity in the number of firms in the two groups of firms and sizes of each respective country group, since there are fewer than 588 majority haven-owned firms versus 3,352 internationally-owned firms. As a result, ownership changes within may group are mechanically more likely for haven firms than foreign non-haven firms. We also demonstrate that placebo exposure and control groups defined in prior years exhibit similar mean reversion. Section 4.5 develops results that exploit the continuous margin variation in firms to the reform via their predicted surcharge.

[18] 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 (below 50%). This could bias upward 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 Section 4 suggest that this possibility is of limited concern.

4 Impact of the Reform on Tax Haven Connections

4.1 Reform Implementation

Was the 3% corporate income tax surcharge applied as planned? Figure A.3 Panel (a), estimates the difference in difference model (Equation (2)), using the effective corporate income tax (CIT) rate as the outcome.[19] On average, the BIT rate of exposed firms increases by one percentage point, relative to that of control firms. This moderate rise could be due in part to an incomplete application of the law or to firms' ex-post response to the reform. Panel (b) plots the BIT rate coefficient, conditioning the sample of exposure firms to those that pay business income tax and maintained ownership in tax havens in 2015: we observe an only modest increase in the effective rate for these firms. Note that for the business income tax rate to apply, a firm must report positive taxable profits, which is the case for between 75-80% of both exposure and control firms at baseline. We later show that that the relative likelihood of reporting positive profits is unaffected by the reform (Section 5 analyzes firms' economic activity further). Panel (c) adds an additional condition that the tax authorities verify firms' terminal ownership ex-post using additional data reporting that only began collection following implementation of the reform. In this latter case, we observe an increase in the effective BIT rate of just under 3 percentage points relative to control firms, that decreases after 2015 likely due to endogenous responses of firms exiting terminal ownership in tax havens which (also supported by the increase in the standard error bars). We conclude that the reform was implemented as intended, although at least at the onset of the reform the tax authorities engaged in some leniency or hesitancy in enforcing the full surcharge.

[19] Table A.11 Panel (a) also reports the first stage in the context of an instrumental variables difference-in-differences design.

4.2 Terminal Ownership in Tax Havens

Figure 1 Panel (a) shows the time series for the '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. Both series slightly rise in pre-reform years, from just below 80% ownership in 2012, to almost 90% in 2014, the year used to define the groups. We attribute this increase to mechanical movement to adhere to our exposure and control definitions. Thereafter, the series continuously decline until the end of the panel. This shape is consistent with some mean reversion in ownership of baseline domicile and expected given our definition of exposure/control as majority owned in 2014 in havens/non-havens. Yet we can approximate the extent of mean reversion using the control group's ownership share behavior post-reform. Indeed, while the two series are similar pre-reform in levels and trends, when the reform is enacted in 2015, the tax haven ownership share of exposed firms falls faster than the foreign non-haven ownership of control firms. A gap of 10 percentage points in baseline domicile ownership opens in 2015, and widens over time, to reach nearly 20 percentage points by 2019.[20] Figure 1 panel (b) plots the yearly coefficients relative to 2014 for baseline domicile ownership from estimating the model in Equation (2).

Figure 1 Panels (c)-(d) show the time series and yearly coefficients for the likelihood that terminal ownership in baseline domicile is zero. These effects are close to those of the average ownership share: terminal ownership relocation away from tax havens occurs on the "extensive margin".

Table 3 Panel (a) summarizes these results by estimating the pre- versus post-reform difference-in-differences with firm and year fixed effects. Odd numbered columns show unweighted coefficients, while even numbered columns weight results by firm assets at baseline. Our main coefficient in Column 1 indicates that the reform induced the exposure group to reduce its baseline domicile ownership by 12.3 percentage points on average during 2015-2019. The confidence interval is relatively tight [-15.6 to -8.4]. Regressions with weights for firm size display significantly larger reductions (Column 2 and Figure A.5). The share

[20] Figure 1 Panel (a) also plots the tax haven ownership share of control firms, which by definition is below 5% at baseline, and hardly changes post reform: control firms do not start reporting ownership in tax havens.

of firms reporting no ownership from their baseline domicile post-reform is 11.2 percentage points higher for exposed firms compared to control firms (Column 3).[21] We interpret the difference-in-differences coefficients as the reform induced change in tax haven ownership.[22] In relative terms, these effects amount to approximately 20% of the exposure firms' counterfactual exit from tax havens.

Ownership transparency. Given the large decline in tax haven terminal ownership, we assess the extent to which ownership is attributable to individuals rather than firms, as intended by the spirit of the law. Figure 1 panel (e) plots the time series of the beneficial ownership share of exposure and control firms. As expected, tax haven owned firms are less transparent at baseline: in 2014 only 43% of their ownership can be attributed to individuals, versus 70% for non-haven foreign owned firms. The beneficial ownership share of the exposure group rises in 2015 and 2016, while the control's is unchanged, thus partially closing the gap. Figure 1 panel (f) shows the event study coefficients. The increase in beneficial ownership estimated from the difference in difference model is 6.8pp, just over a half of the effect of the reform on the change in terminal ownership (Table 3 columns 5-6). Columns (7)-(10) give alternate parameterizations for the change in beneficial ownership, demonstrating that 3pp of the 20% of exposed firms with zero beneficial ownership declared at least some beneficial ownership post-reform, and that 5.5pp of the 44% of firms without 100% of their beneficial ownership disclosed were induced into doing so (Figure A.7 visually show these designs).

[21] 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: $\hat{\beta}_{dd} = \left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} = 0\right] \cdot p_{t\geq 2015,=0} + \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] \cdot p_{t\geq 2015,>0} \implies -.123 \approx -.696 \cdot 0.112 + \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] \cdot (1 - 0.112) \implies \mathbb{E}\left[\hat{\beta}|s_{i,t\geq 2015}^{Ult.\ haven\ own.} > 0\right] = -0.051.$ This calculation implies that there exists relatively little intensive-margin movement in terminal ownership: conditional on not reducing terminal ownership in tax havens to zero, the average exposure firm reduced its terminal ownership in havens by 5.1 percentage points. Figure A.6 shows difference-in-differences designs for log terminal ownership and using Poisson Psuedo Maximum Likelihood estimation.

[22] To highlight the mechanics of our identification strategy, (Figure A.4) shows the difference-in-differences design for a naive regression that uses tax haven instead of baseline domicile ownership as the outcome: the resulting estimate is much larger, and pre-reform trends are not parallel with this outcome.

Mechanisms of ownership change. We then examine the domicile of new terminal owners and to what extent firms maintained *some* persisting presence in tax havens. One of the central issues in regulating tax haven usage is that anti tax haven policy may be easy to circumvent by introducing different ownership layers between these three domicile groups. Therefore, part of investigating this possibility requires evaluating how terminal ownership is reallocated among the two other domicile groups as well as changes in intermediate ownership.

Figure 2, panel (a) plots the resulting average changes in terminal ownership in foreign non-haven and Ecuador: nearly all of the reform induced tax haven ownership was reallocated to foreign non-haven owners as opposed to domestic owners. Table 3 Panel (b), summarizes the difference in difference results. It shows a rise in the inverse foreign domicile of 10.4 percentage points for the exposure group, almost all of the reallocation effect. We interpret this response as full substitution of terminal ownership to foreign non-havens as opposed to Ecuador. Importantly, Table A.4, Figure A.8, and Figure A.9 demonstrate no meaningfully differential attrition on part of exposure firms relative to control firms, indicating that these results are not driven by changes in purely nominal reporting behavior.

Table A.6, Figure A.10 Panels (e) and (f), and Figure A.12 report changes in additional ownership characteristics, showing that beyond the above changes, exposed firms saw increased diffusion in their ownership post reform, an increased number of terminal owners, and reduced concentration of terminal ownership. Additionally, we observe an increase in the average number of ownership layers to reach a terminal owner, perhaps representing an increase in ownership complexity, although this result is not significant (likely due to a mild downward pre-trend in ownership layers).

Given this response, we can infer that the effect of the reform was to induce a mass of firms with terminal owners in tax havens prior to the reform to reveal their *true* person owners, who were domiciled in foreign non-havens.

Did Firms Cut Ties with Tax Havens? Because the reform only considers terminal ownership domiciled in tax havens, it has no statutory bearing on intermediate ownership

in tax havens. However, we are interested in investigating whether usage of intermediaries in tax havens changed as a consequence of the reform.

Figure 2 Panel (b) shows that exposed firms also display changes in their intermediate ownership patterns. The figure plots the difference-in-difference estimates using as the dependent variable an indicator for whether a firm has either any terminal ownership or any wholly-owned intermediaries in its baseline domicile group. This result is juxtaposed by the dashed gray line that estimates a design using as the dependent variable an indicator for whether firm has any terminal ownership in its baseline domicile group. We interpret these two variables, respectively, as the percentage point change in probability that a firm has any substantive presence in tax havens or that a firm has any terminal ownership in tax havens. The figure, along with Table 3 Panel (b) Columns (5)-(6), shows a 7.9pp drop in the probability that exposed firms have *any* substantive presence in tax havens. Columns (7)-(8) show a similar decline in whether exposed firms have any tax haven intermediary, regardless of ownership share.[23] Comparing these result against Table 3 Panel (a) Column (3), we can evaluate that between 70-80% of the effect of firms exiting terminal ownership in havens consists of firms *entirely* exiting any visible presence in tax havens.[24]

Figure A.10 and Table A.6 document further changes to ownership structure, including strict intermediate presence in tax havens, in non-havens, ownership chain length, and number of terminal owners. Panels (a)-(d) shows changed in whether exposed firms have intermediaries in either tax havens or foreign non-havens beyond a given direct-ownership threshold. Table A.6 Column (5) shows a 5.6pp decrease (relative to a 38.7% baseline) in the probability that an exposed firm has any majority-owned intermediary in a tax haven. This

[23] By definition, a lower threshold of direct ownership implies a less-controlling shareholder relationship. For this reason, we are primarily interested in 100%-direct ownership arrangements via intermediaries. However, our results demonstrate robustness to varying this threshold, even to any positive direct ownership amount.

[24] We document more mixed evidence on the change in transactions with tax havens. Table A.5 shows little evidence of an average decrease in either the probability that an exposed firms send funds to a tax haven or tax havens outflows the share of firm revenue. However, Columns (2) and (4) indicate a increase in the probability that firms exhibit a year-to-year decrease in these variables. Additionally, Table 8 Columns (5)-(8) shows firms exiting terminal ownership in tax havens did exhibit a relative decrease in outflows to tax havens. Nonetheless, our measure of tax haven outflows only reflect direct outflows from Ecuadorian firms to entities in tax havens, which would fail to capture other more convoluted methods of directing funds to tax havens (e.g. "round-tripping").

effect is larger, albeit not significant when weighting on firm 2014 assets. Column (7) and Figure A.10 Panel (c) show the estimation results for whether the firm maintains its 2014 plurality terminal owner. While this variable does not directly indicate tax haven usage, it does indicate a true change in shareholdership. On this front, we document a 14pp decrease for exposed firms post-reform, reflecting a 20% relative additional decrease in the probability that an exposed firm has its initial plurality owner *anywhere* in its ownership chain. Lastly, panel (f) shows an aggregate increase in the average ownership chain length, indicating that the reform either revealed pre-existing structures or induced re-structuring toward more convoluted ownership arrangements.[25] These responses indicate that beyond induce an exit in *terminal* ownership in tax havens and an increase in ultimate ownership transparency, the reform also induced some firms to reduce any ownership arrangements involving tax havens.

4.3 Robustness: ruling out differential mean reversion, potential control contamination, and potential confounders

One threat to our main design studying the change in terminal ownership in tax haven ownerships lies in the possibility that our exposure and control groups would experience differential mean reversion absent the reform, a violation to Equation (4).

One reason for this possibility could be that there are simply more foreign non-haven countries than there are tax havens. In a model of stochastic changes in shareholdership over country domicile, it would mechanically be the case that a shareholder in a tax haven is more likely to change to a non-haven than vice-versa. We address this form of mean reversion by performing a similar comparison to as in our main design, however more carefully limiting our definitions of tax havens and non-havens to feature comparisons to more similarly-sized domicile groups. Table 4 and Figure A.14 present analogous estimates to our main results that redefine our exposure and control groups using different geographic criteria for

[25] Figure A.13 disaggregates this response based on firms' ex-post majority terminal ownership domicile. The figure demonstrates that firms that changed their majority terminal ownership domicile to foreign non-havens saw an increase in average chain length by over one layer (or ∼50%) on average, whereas those "repatriating to Ecuador" saw a decrease in their average chain length by around 0.25 layers (∼30%) on average. Exposed firms maintaining majority terminal ownership in tax havens saw no change.

tax havens and foreign non-havens.[26] Table 4 Columns (3)-(4) estimate the change in the terminal ownership only considering Panama and Colombia for the tax haven and foreign non-haven group.[27] The table shows that this re-definition indeed succeeds in aligning the number of firms in each group: we count 663 Colombian firms and 437 Caribbean tax haven firms. Reassuring, Column (3) reports an identical point estimate to as in our main specification. Columns (5)-(6)[28] and (7)-(8) perform an analogous exercise that considers all tax havens versus Colombia as well as all tax havens versus all Latin American non-havens, yielding highly significant results, although they are slightly smaller in magnitude at -8.3 and -9.4pp respectively in the equal-weighting specifications.

Another possible reason for mean reversion could deal with differential "churn" between firms owned in tax havens versus those owned in non-havens. Ownership in tax havens could simply be more short-lasting or constitute a more temporary arrangement. In this case, we could consider a model of terminal ownership following the reform captured by a combination of mean reversion (itself modeled as geometric decay to zero) and a real effect of the reform:

$$s_{it} = y_{i,2014} \cdot (1 - \theta - \phi_g Exposure_i)^{t-2014} \cdot \beta^{Exposure_i Post_t} \cdot \delta_t \cdot \varepsilon_{it},$$

for ε_{it} distributed normally with mean one. This equation imposes a constant mean reversion rate θ common to both groups and an additional constant θ_g that compounds (or decreases) this rate for haven-owned firms. The case $\theta_g > 0$ would imply that haven-owned firms exhibit greater decay or "more churn" than do non-haven-owned firms. This specification could be consistent with the results of Figure 1 and Table 3 that show a continued decrease in tax haven shareholdership well beyond the implementation of the reform.

[26] Table A.7 presents estimates from a series of modified first-degree autoregressions of terminal group ownership between 2013 and 2014 using placebo treatment and control groups defined based on their ownership profiles in 2013. The table shows results for our main definition as well as our alternate geographic definitions, demonstrating a greater amount of decay in main group ownership between 2013 and 2014 for tax haven firms relative to non-haven firms using our main definition. However, in all of each of the alternate geography specifications for defining exposure and control, this difference becomes insignificant.

[27] In this exercise and the other sample re-definitions that follow, foreign countries outside of the re-defined country groups are assigned to a fourth auxiliary domicile category.

[28] The number of control firms differs slightly between Columns (5)-(6) and (3)-(4) in spite of featuring the same control definition: this is because we also define our control firms to exclude terminal ownership in tax havens, which does change between these specifications.

We can estimate forms of equation in logarithms or via Poisson Pseudo Maximum Likelihood Estimation (PPMLE) to yield a coefficient $\hat{\hat{\beta}}$ excised of any dynamic linear time component post reform. Section 6.3 shows the results of this estimation procedure in levels, logarithms, binary specification, and using PPMLE. The results show an effect of the reform that is highly significant, albeit attenuated by around relative to the estimates in Table 3. The estimates in the log specification are not significant however, likely due to the relative importance of extensive-margin movement as we highlight that would not be captured in logarithms. We can use this specification as an overly conservative lower-bound estimate of the impact of the reform that assumes no continued evolution in the effect of the reform (or no effect of the reform on flow exit from tax haven usage).

Ruling out contamination and possible effects of the reform on control firms We argue that the decrease in terminal ownership in foreign non-havens on part of our control group is a mechanical artefact of mean reversion. This is because we defined the control group based on its pre-reform outsized ownership in foreign non-havens. However, we are also interested in ruling out the possibility that the post-reform decrease could also be due to potential exposure of the control group to the reform, prompting "contaminated" control firms to change their terminal ownership characteristics. While the mechanisms of the reform do not penalize terminal ownership in foreign non-havens, perhaps control firms that had some other potential source of tax haven association saw themselves as exposed, and reduced their terminal ownership in foreign non-havens.

To investigate this possibility, we construct several measures of tax haven association and estimate a series of difference-in-differences on our control group of firms to gauge any differential decrease of terminal ownership in foreign non-havens by "quasi-exposed" control firms in the post-reform period. We construct the following indicators for the following characteristics of control: 1) Had any inflow from a tax haven in 2014; 2) Below/above the median in the 2014 distribution of positive haven inflows-to-revenue ratio; 3) Had any outflow to a tax haven in 2014; 4) Below/above the median in the 2014 distribution of positive haven outflows-to-revenue ratio; 5) Had any tax haven intermediary in 2014; 6) Had

a tax haven intermediary in 2014 with 100% direct ownership, at least 50% or 10%, or any positive direct ownership; 7) Was named in the Panama Papers. Table A.8 displays the results of these regressions: In none of the specifications do the control firms with potential association with tax havens exhibit any significant decrease relative to unassociated control firms in the post-reform period. These results lead us to conclude that control firms did not see "contamination" via other potential kinds of association with tax havens.

4.4 Effects of the reform by margins of ex-ante heterogeneity

How did the effect of the reform vary among exposed firms? We identify several margins of ex-ante heterogeneity of interest.

First, we estimate two sets of difference-in-differences designs with multi-leveled treatment. The first set distinguishes exposure firms based on whether they sent money directly to an entity in tax havens in 2014; the second set distinguishes exposure firms based on whether they declared positive profits in 2014. We also estimate a second set of triple difference designs exploring heterogeneous treatment effects based on the share of beneficial ownership already declared in 2014 as well as whether the firm was named in the Panama Papers as part of the leaks published in 2016 by the International Consortium of Investigative Journalists (ICIJ).

Table 5 summarizes the results of this estimation procedure and Figure 3 displays the coefficients over time. Table 5 Column (1) and Figure 3 Panel (a) show a mitigated decrease in tax haven ownership by firms that made an outflow to tax havens in 2014 relative to those that made no outflows to tax havens. This response suggests that the reform had a lesser effect for firms with greater economic ties with havens. Column (2) and Panel (b) show no differential effect of the reform based on whether firms paid BIT in 2014, corroborating other results that firms do not appear to respond in terms of whether they declare taxable profits.

Column (3) and Panel (c) present evidence on heterogeneous treatment effects based on how much beneficial ownership firms already declared prior to the implementation of the reform. Column (3) indicates no effect of the reform for control firms that had substantial

beneficial ownership. However, the estimates indicate that the reform had a substantially mitigated effect for exposure firms that already declared greater amounts of beneficial ownership prior to the reform. We interpret this result to confirm some intuition that true beneficial ownership may be less responsive to the disincentive of locating ownership in tax havens than is nominal, non-beneficial ownership.

Lastly, Column (4) and Panel (d) show results for the triple difference design assessing any differential effect of being in the Panama Papers. Ex-ante, the effects of being named in the Panama Papers offers several objects of interest pertaining to our setting. First, perhaps the publication of the Panama Papers in April 2016 compounded the effect of the reform, with the leak itself serving as a treatment in of itself. There is precedent for studying the Panama Papers from this perspective (e.g. O'Donovan, Wagner and Zeume (2019)). At worst, such a possibility could contaminate our research strategy. In this case, we would observe an additional effect occurring in 2016 upon the release of the Panama Papers, which could possibly also explain the observed continued decline after the initial implementation of reform the reform after 2015. However, because being named in the Panama Papers is likely highly correlated with our measure of exposure—being observed with majority terminal ownership in tax havens, a triple differences design is well suited to separate out the differential effects of these different potential treatment sources. Additionally, we are also interested in assessing whether there was an outsized effect of the reform for exposed firms that were also named in the Panama Papers, perhaps for the reason that such firms may exhibit more unequivocal tax evasive use of tax havens.[29]

However, studying this margin may present some challenges: while Brounstein (2025) finds around 1,000 Ecuadorian individuals and firms in the period 2005 to 2019 named in the Panama Papers, the number of such firms in our sample may significantly diminish. Indeed, of our 588 exposure firms and 3,352 control firms, we only match 14 exposure firms and 38 control firms (although ex-ante we might anticipate a lower match rate for control

[29]Of course, being named in the Panama Papers itself did not indicate tax evasive or otherwise illegal behavior.

firms).[30] While this low match may prevent us from conducting precise inference on differential responses, we anticipate that point estimates will also be informative with respect to the above concerns. To this end, Column (4) and Panel (d) rule out any compelling contamination effect of the Panama Paper on our research design. Neither did the reform have any no outsized effect for firms named in the Panama Papers, nor did the leak event in 2016 itself appear to have any impact on terminal ownership of majority international firms.

4.5 Separating the effect of the surcharge from the effect of transparency

As our last extension to studying the transparency effects of the reform, we are interested in isolating the effect of the strictly pecuniary dimension of the policy. To do so, we can model exposure to the surcharge continuously according to Equation (1). We can then alter our main specification and estimating equation Equation (2) to feature an interaction of the continuous effect of the predicted surcharge and a post-reform indicator:

$$y_{it} = \alpha_i + \delta_t + \sum_{k=2012,\neq 2014}^{2019} \gamma_k \cdot Predicted\ Surcharge_i \cdot Post_t + \varepsilon_{it}. \tag{5}$$

We can estimate Equation (5) to capture the effect of the surcharge while assuming no transparency effect. In doing so, we include minority foreign-owned firms in our estimation sample in order to leverage the continuous variation in the surcharge, recalling that minority exposure firms faced a surcharge of between 0 and 1.5pp. Following this specification, estimators $\{\hat{\gamma}_t\}$ capture the continuous dosage response to the surcharge.[31] We also argue that this design offers yet an additional check against differential reversion between tax haven and foreign non-haven owned firms: beyond an average differential mean reversion

[30] Overall, we can match 9 ICIJ firms with incomplete ownership profiles, 226 firms that are over 95% domestic, and 338 firms excluded from our core sample.

[31] An alternate specification to Equation (5) could also include a fully-interacted difference-in-differences term with binary exposure. While in principle this specification could isolate the continuous dosage effect conditional on any treatment (perhaps akin to a transparency effect in our setting), these two treatment specifications demonstrate high multicollinearity and there indeed exist substantially fewer minority haven firms, thereby exacerbating separate identification of these terms.

between exposure and control firms, differential mean reversion would also have to match the parametric form of the surcharge function, a possibility we find less plausible.

Table 6 summarizes the results from this estimation procedure and Figure 4 shows the estimates over time.[32] We find that the pecuniary surcharge itself enacts an effect on its own: a 1pp ex-ante increase in surcharge through terminal ownership in tax havens induced an addition 2.7pp probability of firms making a full exit from terminal ownership in tax havens. Scaling this effect up by 3 for the majority exposure sample yields a coefficient of 8.1pp accounting for around 70% of the effect size exhibited in Table 3 Column (1). We observe consistently negative effects of the reform across different parameterizations of terminal ownership. However, the implied effect sizes under these other parameterizations account for nearly *all* of the effects observed observed in the binary specification for majority exposed firms from our main specification. The table also indicates significant, but largely attenuated effects for minority exposed firms. This result aligns with prior results emphasizing the role of the pecuniary cost of using tax havens in designing anti-haven policies (Bilicka, Devereux and Güceri (2024); Brounstein (2025)).

5 Effect of the Reform on Reported Economic activity

How might the reform impact tax collection and economic activity of Ecuadorian firms exposed to the surcharge? We discuss hypothesis on plausible effects of the reform on the tax rate, tax base and economic activity.

First, the reform, raises the tax rate for a subset of exposed firms, that maintained terminal ownership in havens. The 3 percentage points surcharge (a 15% increase over a 22 percentage points base rate), should mechanically increase tax payments, absent responses of the tax base.

Second, how might profits be impacted? Beyond transparency, a motivation for the tax surcharge stems from the role that tax havens play in enabling tax base erosion. The

[32] Table A.9 and Figure A.15 show analogous results estimated on the subsample of minority foreign-owned firms.

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. Ex ante, it is thus not evident how the reform might impact reported profits. Three channels are possible: one is that it has no effect on reported profits. Second, that it by regularizing tax haven connections, in exchange of a higher tax rate, and due to a higher rate, exposed firms might further increase tax avoidance/profit shifting. Third, by targeting firms in tax havens, the reform could have raised the perceived cost of tax evasion for exposed firms with links to tax havens (Bilicka, Devereux and Güceri (2024); Allingham and Sandmo (1972)). Finally, by imposing an additional tax and cost on exposed firms, the reform might have led to a real dis-investment of MNEs activity in Ecuador.

Results. We begin our investigation of tax and real firm outcomes by estimating Equation (2) using profit and tax variables. Table 7 and Figure 5 summarize the difference-in-differences designs for these outcomes. Panel (a) reports that on average exposed firms exhibited an increase in gross profits of around 16.6% per year. Additionally, on average, exposed firms ended up paying around 17% more in BIT liability. Importantly, Columns (3)-(4) and (7)-(8) as well as Figure A.16 illustrate that exposure firms do not change *whether* they pay corporate income tax or whether they taxable profits in Ecuador). This increase in BIT liability reflects responses from both firms that ended up facing the BIT 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 BIT payments response represents a quantitatively important dimension of the impacts of the reform. However, our results fail to attain significance when weighting by 2014 assets.

While we cannot precisely distinguish tax evasion in our setting, we identify tax evasive usage of havens as a key focus of the reform. Additionally, the reform is unlikely to induce a decrease in profit shifting, given its emphasis on *ultimate* beneficial ownership rather than on any intermediate presence in tax havens. One possible interpretation of this effect of the policy is that the reform induced a decrease in tax evasion by Ecuadorian business making use of tax havens either 1) to evade the Ecuadorian business income tax themselves

or 2) to evade the worldwide personal income tax of their beneficial owners. Because the policy increases the cost of tax haven usage via the surcharge and possibly via an increase in perceived detection probability, the tax may reasonably induce a decrease in tax evasion via tax havens. Figure A.18 and Table A.10 corroborates this hypothesis, demonstrating an immediate and sustained increase in profitability of exposure firms by around 2pp. This result is particularly compelling considering that exposure firms exhibited 40% lower profitability than control firms prior to the reform.

Table 7 Panel (b) uses an identical design to investigate changes in firm financial outcomes and income-generating expenses pertaining to assets, leverage, investments, and labor expenses. The table characterizes responses on the intensive margin using logarithms. Importantly, these variables (except for investment) see largely positive support in the tax data, suggesting the limited scope for extensive margin response. This said, we also characterize extensive-margin responses in the form of binarized versions of these dependent variables for positive values or signed year-to-year first differences (e.g. any year-to-year decrease in investment).[33] We document precise null-effects on all of these outcomes: we find no impact of the reform on leverage, investment, and on labor expenses.

While in a standard framework, an increase in corporate income taxation would also precipitate a decline in investment and labor demand, it is possible that the transparency effect of the reform dampens these forces in inducing a substitution effect toward Ecuadorian activity and away from tax strategizing effort or simply reflects a nominal reporting response. This response could also be rationalized by fully deductible income-generating expenses (e.g. Kennedy et al. (2024) with full deductibility as $\theta = 1$). Indeed, Table A.11 uses the surcharge effect of the reform as an instrument to estimate the effects of business income taxation on firm financial outcomes. While we obtain a very strong first stage and a strong positive relationship between the tax rate and taxes paid, we obtain null results for other firm outcomes we study, such as gross profits and investment (although we do obtain a significant negative impact of the tax rate on labor expense). We can interpret these null responses as intuitively following from a model of business taxation with fully-deductible expenditures

[33] Figure A.17 displays the visual event-study estimates for these outcomes.

or as corroborating the possibility that the reform itself features an exclusion violation that affects firm activity through channels other than via the tax surcharge, such as transparency and perception of detection or audit by the tax authorities.

Mechanisms. To further explore mechanisms, we disaggregate these responses based exposure firms' ex-post change in their terminal ownership domicile. We assign each firm to an alternate treatment category based on whether its 2015 majority domicile was in 1) tax havens, 2) foreign non-havens, 3) Ecuador, 4) a combination of domicile categories with no majority. We compare these firms against all majority foreign control firms following our main specification, however with this multi-level treatment. These regressions are not to be interpreted causally, but rather describe how firms that changed or maintained terminal ownership in tax havens responded differentially to the reform

Table A.12 displays descriptive statistics for these groups. Of the 588 exposure firms, we identify 424 firms that maintained majority terminal ownership in tax havens, 50 that changed their majority ownership to foreign non-havens, 92 that changed their majority ownership to Ecuador, and 22 non-allocable firms. Firms that repatriate ownership back to Ecuador are smaller than other firms in terms of assets and revenues, whereas firms changing ownership to foreign non-havens and non-allocable firms are larger.[34]

Table 8 reports results from this estimation procedure. Odd numbered columns display results as described above; even numbered columns use a coarser distinction based on whether firms exited terminal ownership tax havens entirely in 2015. Columns (1)-(4) show that firms that left terminal ownership in tax havens exhibited twice as large a response in tax payments and profit declarations (28% and 30%) as did firms that remained in tax havens (although the point estimates themselves are not statistically significantly different). Interestingly, in parsing mechanisms, we find no differential change along these margins in terms of whether firms have any outflow to tax havens in a given year. However, Columns (7) and (8) show that firms that left tax havens exhibited a more negative response in tax havens outflows

[34] Figure A.19 also gives an additional breakdown of the change in the beneficial ownership based on these margins of exposure firms' ex-post majority domicile response.

share of revenue relative to firms that remained in tax havens, suggesting that exiting tax haven ownership may have also been accompanied by a relative decrease in outflows to tax havens.[35]

6 Conceptual model, policy benchmarking and conclusion

6.1 Conceptual model: Reconciling partial haven exit and increase in declared income

How do we reconcile the observation that only some firms exited terminal ownership in tax havens, and even firms that maintained their terminal ownership in tax havens increased their profits declared and taxes paid to the Ecuadorian government? To do so, consider a simplified environment following Allingham and Sandmo (1972) that features a heterogeneous fixed cost of tax haven usage, $\xi \sim F(\xi)$. The policy setting here intuitively motivates this kind of model environment. The reform's emphasis on terminal and beneficial ownership indicates that the policy's focus pertains largely to tax evasion rather than tax avoidance; the kind of activity we study here thus represents illicit usage of tax havens, which thus responds to factors such as subjective detection probabilities and penalties (Becker, 1968). In our setting, agents may theoretically evade the Ecuadorian business income tax (as businesses), Ecuador's personal income tax (as Ecuadorian nationals), or their home country's worldwide personal income tax (as foreign nationals, as suggested by the results in Section 4.2). We can thus interpret detection to indeed correspond with the event that the tax authorities detect tax non-compliance on part of an agent. However, we can also interpret this term more broadly to correspond with general audit of agents' other owned-businesses or cooperation with foreign tax authorities, which is relevant even if the haven-exposed firms stand in compliance with Ecuadorian businesss taxation from the perspective of the Ecuadorian tax

[35] The standard error on this difference is not displayed, however, the difference itself is statistically significant.

authorities.

An individual i with income normalized to one faces a linear income tax rate τ. She makes two decisions: whether to make use of tax havens, as decision $E \in \{0, 1\}$ at cost ξ_i, and what share $e \in [0, 1]$ of her income to underreport to the tax authorities. In this case, reported income is $z := 1 - E \cdot e$. In this setting, we assume that all underreporting occurs via tax haven usage, which is only realized if $E = 1$.

Conditional upon tax haven usage, there is no direct variable cost of evasion. However, the probability of detection by the tax authorities ρ increases in income underreporting. Let $\rho := \rho(e)$ such that $\rho'(e) > 0$, and for simplicity, assume no curvature to this function: $\rho''(e) = 0$. If an individual is caught underreporting by the tax authorities, assume the authorities detect all of e, and is required to pay back the taxes due $\tau \cdot e$ plus a fine proportional to the taxes due $\tau \cdot e \cdot (1 + \theta)$, for $\theta > 0$.

The agent maximizes quasilinear utility in income:

$$\max_{E \in \{0,1\},\ e \in [0,1]} 1 - \tau + \tau E e - \xi E - \rho(e) e \tau (1 + \theta) E \tag{6}$$

In this setting, the agent's latent underreporting e^* is set to maximize a first order condition in e such that $\tau = (\rho'(e^*)e^* + \rho(e^*))\tau(1+\theta)$.[36] We can observe that underreporting on this intensive margin decreases in detection probability and statutory penalty rate and is unaffected by the tax rate and by the fixed cost of haven usage. However, this underreporting is only realized if the individual makes use of tax havens at cost ξ_i. This case occurs if $U(E = 1, e^*) \geq U(E = 0, e^*)$, i.e. that $\xi_i \leq \tau e^* - \rho(e^*)e^*\tau(1+\theta)$. The share of the population that uses tax havens is equal to $P(\xi_i \leq \tau e^* - \rho(e^*)e^*\tau(1 + \theta)) = F\Big(\tau e^* - \rho(e^*)e^*\tau(1 + \theta)\Big)$.

Now consider our policy environment which manifests as a fixed increase in the tax rate, $d\tau$, for agents using tax havens as well as a fixed increase in the perception of detection ρ_γ. For brevity, let $\tilde{\xi} = \xi_i + d\tau$ and $\tilde{\rho}(e) = \rho(e) + \rho_\gamma$.

The agent's problem then becomes:

[36] The interior solution is yields a local maximum for the objective function under the second order condition that $\frac{1}{\rho''(e^*) - 2\rho'(e^*)e^*} < 0$. When the subjective detection probability function $\rho(e)$ has zero curvature (i.e. $\rho''(e) \equiv 0$), this condition is trivially satisfied.

$$\max_{E\in\{0,1\},\ e\in[0,1]} U = 1\cdot(1-\tau+\tau Ee-d\tau\cdot E)-(\xi_i E+\tilde{\rho}(e)e\tau(1+\theta)E)$$
$$= (1-\tau+\tau Ee)-(\tilde{\xi}_i E+\tilde{\rho}(e)e\tau(1+\theta)E), \tag{7}$$

Our decision to model the policy in this manner follows an intuitive mapping of the policy onto this modeling environment. Namely, the three percentage point surcharge augments the income tax rate and is not tied to any *amount* of tax haven usage per se. Recall that agents in our setting aren't underreporting income to the Ecuadorian tax authorities, but rather to the tax authorities of their foreign countries. Therefore, conceiving of Ecuadorian production/income as fixed (and normalized to one), through the lens of the model, the three percentage point surcharge indeed effectively represents an increased fixed cost of haven usage. Holding all else fixed, the reform induces an increase in tax obligation of $1\cdot d\tau\cdot E$, which equals $d\tau$ for haven users. We also interpret the reform to increase agents' subjective detection probabilities, corresponding with an increase in the perceived probability that the Ecuadorian tax authorities might cooperate with foreign authorities or investigate other sources of their activity.

Testable predictions + interpretation of the model. The reform has two effects. The first is to induce a decrease in intensive margin undereporting e^* through its effect on subjective detection probability. The second is to induce an extensive margin exit from haven usage through both the increased fixed cost γ and through the lower benefit of haven usage conditional that $E=1$ due to the decrease in underreporting from the first effect.

Let e_0^* and e_1^* represent agent's optimal underreporting prior to and following the reform (possible censored by E). An agent making use of tax havens prior to the reform that ceases using tax havens has the characteristic that $\xi \leq \tau e_0^* - \rho(e_0^*)e_0^*\tau(1+\theta)$ and that $\tilde{\xi} \geq \tau e_1^* - \tilde{\rho}(e_1^*)e^*\tau(1+\theta)$. Our main result in Column (1) of Table 3 would imply that $P\Big(\xi \geq \tau e_1^* - \gamma - \tilde{\rho}(e_1^*)e_1^*\tau(1+\theta)\Big|\xi \leq \tau e_0^* - \rho(e_0^*)e_0^*\tau(1+\theta)\Big) = \frac{P\Big(\tau e_1^*-\gamma-\tilde{\rho}(e_1^*)e_1^*\tau(1+\theta)\leq\xi\leq\tau e_0^*-\rho(e_0^*)e_0^*\tau(1+\theta)\Big)}{P\Big(\xi\leq\tau e_0^*-\rho(e_0^*)e_0^*\tau(1+\theta)\Big)} = \frac{F(\tau e_0^*-\rho(e_0^*)e_0^*\tau(1+\theta))-F(\tau e_1^*-\gamma-\tilde{\rho}(e_1^*)e_1^*\tau(1+\theta))}{F(\tau e_0^*-\rho(e_0^*)e_0^*\tau(1+\theta))} \approx 0.12$. Here, the increased cost of haven usage and the increased subjective detection probability induces a mass of individuals to exit haven

usage.[37]

This simple set up with heterogeneous evasion costs and a change in the fixed cost of evasion yields an similar result to our empirical observation that although a mass of firms exit tax haven ownership, another mass remain. However, consider an asymmetric cost of disclosure to the Ecuadorian tax authorities by the agent based on whether she is Ecuadorian or a foreign national. If the tax haven user were an Ecuadorian individual, disclosure to the tax authorities may *ipso facto* reveal non-compliance and induce audit. However, for a foreign individual disclosing to the Ecuadorian government her beneficial ownership of the Panamanian intermediary, neither the foreign nor the Ecuadorian authorities necessarily know of the agent's evasion of her home country's personal income tax, although the agent may perceive an increased risk of audit or intergovernmental cooperation. This said, the probability of intergovernmental cooperation in the latter scenario is likely weakly less the probability of audit induced by revealed non-compliance in the former scenario. For this reason, this interpretation of the model corroborates our result from Figure 2 that predominantly foreign nationals, rather than Ecuadorian nationals, disclosure beneficial ownership.

How do we rationalize the increased profit declarations and tax payments among business that maintain terminal ownership in havens? In this case we can consider the fixed increased in the subjective probability of detection $\tilde{\rho}(e) = \rho(e) + \rho_\gamma$.

Note that an individual still using tax havens after the reform is characterized by the first order condition $\frac{\partial U}{\partial e}|_{E=1} = 1 - (1+\theta)(\rho'(e)e + \tilde{\rho}(e)) = 0$. Applying the implicit function theorem to this condition yields an expression for the change in evasion for a perturbation in perceived detection probability from the policy ρ_γ:

$$\frac{\partial e^*}{\partial \rho_\gamma}|_{E=1} = \frac{-1}{2\rho'(e)} < 0. \tag{8}$$

An reported income increases by $\frac{1}{2\rho'(e)}$. The impact of the policy on increased probability of detection induces a decrease in evasion on the intensive margin. Note that "detection" in this case could indeed refer to detection of non-compliance or more broadly to sustained

[37] Figure A.20 graphically illustrates this mechanism for an arbitrary distribution of fixed costs.

investigation into other activities or even cooperation with other national tax authorities (if relevant). An agent engages in illicit activity wants to avoid all of any of these outcomes in our setup.

Ex-ante, we anticipate that individuals entirely exiting haven usage decrease their underreporting more than do those that maintain haven usage, who also exhibit a decrease in haven usage (a hypothesis we investigate and confirm in Table 8). Moreover, if Ecuadorian income-generating expenses (e.g. labor and investment) are fully deductible, the reform does not impact these outcomes (Kennedy et al., 2024). We can see this result, by, instead of normalizing income to one, parameterizing income as the difference between a variable revenue and input costs (e.g. $Y(K, L) - rK - wL$); clearly when expenses are fully deductible, changes in underreporting incentives and behavior only affect *net income*.

Summing up, this model environment generates several testable predictions and implications that we empirically validate and explore:

1. A mass of agents with sufficiently *high* costs of haven usage (lower net benefit) will exit tax haven usage, whereas those with low costs will maintain haven usage. The results from Table 3 imply that around 20% of incumbent tax haven users had fixed costs of haven usage high enough such that the reform induced them to exit haven usage.

2. If the probability of audit upon beneficial disclosure is equal to one for Ecuadorian nationals (by revealing non-compliance), but sufficiently bounded from one for foreign nationals, we should anticipate ownership disclosure responses primarily from foreign nationals. Figure 2 confirms this hypothesis.

3. Both agents that exit and maintain haven usage will decrease their underreporting (and increase taxes paid and profits declared to the Ecuadorian tax authorities), with an *a priori* greater response among those that exited haven usage. Table 8 affirms this prediction, albeit estimated imprecisely.

4. If income-generating expenses (e.g. investment, labor, etc.) are fully-deductible, the reform does not impact these outcomes. Table 7 validates this hypothesis.

5. The results in Table 6 allow us to parse the relative importance of the different channels by which the reform operates: via the pecuniary surcharge "the stick" ($d\tau$) or via the increased perceived detection probability, "the flashlight" (ρ_γ). Our results indicate that we can attribute between 70% and 100% of the effect size to the surcharge itself, as opposed to the transparency effect.

6.2 Policy benchmarking

In this section we compare the reform implemented by Ecuador to alternative anti-opacity policies. In each case we discuss the objectives of the policy, the firms targeted, the size of the tax base concerned, and finally venture on plausible behavioral effects.

We compare tax bases under different scenarios of policies which could have been implemented, which would have applied the tax surcharge to a different tax bases and different types of firms (based on their ownership structure) and discuss their plausible impacts. Table 9 displays aggregates for different tax bases based on different kinds of activities of firms constituting a given degree of ownership opacity or tax haven association.

Subject firms: 1. Policies of minimal deterrence to haven usage. If the objective is to target a lack of ownership transparency, Ecuador's implemented policy is sensible, although somewhat minimal in scope: it imposes a cost on firms whose terminal link is in an uncooperative jurisdiction. This is a minimalist policy for transparency for two reasons: (1) it accepts that Ecuadorian firms can report non-ultimate BOs as long as these intermediate owners are not based in tax havens (thus harming the quality of the BO registry and relying heavily on cooperation). (2) It also accepts that firms can have intermediate ownership and ties to tax havens: these can be issues for transparency and for tax base erosion. We count 24,000 firms that did not declare 100% of their nominal terminal ownership and 19,000 firms that did not file any ownership declaration.

2. Policies of moderate deterrence to haven usage. We thus consider scenarios that are more ambitious: in addition to firms that disclose terminal ownership in a non-

cooperative jurisdiction, the surcharge would apply to any firm that does not disclose full BO ownership. This targeting corresponds to the policy proposal advanced in Neidle (2024) aimed at improving the quality of the UK's BO. Such a reform likely would not extend distinction between nominee and beneficial ownership, although it is likely the case that this distinction may not prove important for tax and law enforcement purposes.

Such policies that target lack of transparency in of itself could be broad in scope. Relative to other hypothetical bases, Table 9 documents a substantial increase in the number of firms that would be subject to a tax penalizing lack of transparency: 40,000 firms failed to declare declare 100% of their beneficial ownership.

3. Policies of greater deterrence to haven usage. Finally, we can consider a maximalist scenario that would impose taxes when firms have any ownership–including intermediate–in tax havens. This kind of scenario would more severely limit the number of firms for whom such a policy would be applicable. 934 firms saw majority terminal ownership in tax havens and 280 firms saw minority terminal ownership in tax havens. Around 2,000 firms see some association with tax havens via a majority-owned intermediary.

Activity tax bases. Second, there is the question of which is the appropriate tax base. Using the profits of Ecuadorian firms presents several limitations: profits can be manipulated—profits could be zero, While we find that profits declared in Ecuador actually rise post-reform, it is possible that other similarly-intentioned policies could encourage further tax base erosion. In his proposal, Neidle (2024) calls for a tax on foreign financial transactions, which we can simulate in the context of Ecuador using the universe of cross-border transactions. Finally, one could consider a minimum tax/penalty based on Ecuadorian revenues or assets. Such a base would likely see less potential manipulation, but at potentially greater distortionary costs.

6.3 Conclusion

We study a unique unilateral anti-tax haven reform in Ecuador that implements a pecuniary penalty on terminal business ownership via tax havens. The rise of and resulting challenges posed by multilateral policy solutions to combat tax haven usage for both tax evasion and avoidance and to circumvent 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 BIT surcharge on tax haven terminal ownership reform represents an innovative incentive based reform to study. Ecuador, a mid-sized middle income country, installed a shareholdership registry (back in 2012) *and* leveraged its new data infrastructure to impose a pecuniary penalty on terminal ownership based in tax havens. This kind of penalty-based reform represents a policy that other countries with beneficial ownership registries could implement to in targeting illicit usage of tax havens. Moreover, given recent results that show limited effectiveness of purely information-oriented policies in mitigating offshore tax evasion (Bomare and Collin (2025); Alstadsæter et al. (2023*a*, 2022)), the Ecuadorian experience could be relevant for other 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 BIT surcharge induced a 12-13pp decrease in tax haven shareholdership among the control group (relative to a baseline of 63%). We document substantial "extensive-margin" movement here, estimating that the BIT surcharge counterfactually induced around 20% of exposed firms into reducing their observable tax haven shareholdership to zero in the post-reform period. We find that a substantial majority of the shareholdership of these firms relocates to foreign non-havens with no net increase in Ecuadorian 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 document a broad decrease in terminal ownership by firms, who by definition cannot truly serve as beneficial owners, and an increase in terminal ownership by persons. This result is crucial for 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 the profit, BIT, and investment/labor/operations responses of affected firms. We find an exciting result that firms exposed to the tax haven surcharge increased their profits declared and BIT payments by more than 15%. These firms are substantially larger than most BIT-paying firms in the Ecuadorian economy, which further substantiates the importance of this response. We argue that by increasing the expected price of haven usage via the direct cost of the surcharge and via the impact of the policy on perceived detection probability the policy induced a decrease in tax evasion (Allingham and Sandmo (1972)). We corroborate this mechanism by showing that exposed firms also exhibited a sharp and sustained increase in their profitability. We further estimate precise null impacts of the reform on assets, investment, labor expense, and firm exit, suggesting that the reform came with relatively little efficiency cost.

We take our results to speak to policy aimed at improving business ownership transparency and discouraging tax haven usage in developing and developed countries (Bilicka, Devereux and Güceri (2024)). In our case, we find positive effects of the "flashlight and stick" combination to both transparency, taxes paid, and reducing tax haven association, at relatively limited real cost to firm activity. 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. Moreover, policies such as Ecuador's are becoming increasingly relevant

as more countries install beneficial ownership reporting registries. 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 BIT 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 leverage new beneficial ownership data to 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 (2014)

		Count of firms by ownership threshold					Terminal ownership of all Ecuadorian firms			
							% of Ecuadorian assets		% of Ecuadorian revenue	
	Country	100%	≥ 50%	> 25%	> 15%	> 5%	All	By persons	All	By persons
Panel (a): Tax havens										
1	Panama	93	377	449	501	513	1.93	1.12	1.66	.896
2	Netherlands	30	62	71	85	90	.57	.119	.693	.139
3	Luxembourg	8	10	11	14	15	.215	0	.196	0
4	Puerto Rico	3	6	7	7	7	.012	.012	.004	.004
5	Curaçao	3	6	6	7	7	.098	0	.039	0
6	Cyprus	3	3	4	5	5	.15	.001	.269	0
7	British Virgin Islands	3	16	22	27	29	.068	.032	.101	.049
8+	All others	14	102	118	125	127	1.02	.314	.592	.121
All	Total	163	584	686	758	780	4.07	1.6	3.56	1.21
	% of all firms in sample	.265	.949	1.11	1.23	1.27				
	% of all assets	1.28	3.48	4.59	6.5	10.2				
	% of all revenue	1.4	3.14	3.76	5.56	6.18				
Panel (b): Foreign non-havens										
1	Colombia	265	668	783	866	900	1.23	.792	1.73	1.08
2	USA	161	597	840	1,051	1,154	3.55	1.76	5.3	2.46
3	Spain	111	328	404	462	485	1.87	1.29	2.01	1.3
4	Peru	70	228	271	306	323	.92	.68	1.05	.674
5	China	52	89	104	113	116	1.23	.339	1.05	.248
6	Venezuela	49	144	172	186	189	.372	.335	.522	.407
7	Argentina	43	118	152	177	184	.234	.192	.337	.277
8+	All others	328	1,151	1,466	1,721	1,824	13.5	7	10.1	4.91
All	Total	1,305	3,397	4,056	4,534	4,702	22.9	12.4	22.1	11.4
	% of all firms in sample	2.12	5.52	6.59	7.37	7.64				
	% of all assets	5.34	24.9	28.2	31.6	33.4				
	% of all revenue	8.43	22.4	26.3	28.9	30.5				

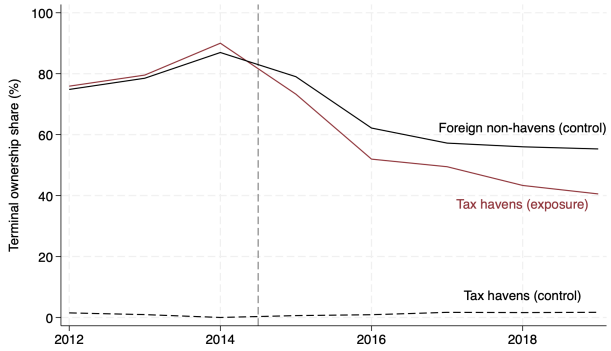
Note: This table uses the APS to tabulate the international terminal owners of Ecuadorian companies in our main sample in 2014 by country. Panel (a) displays the tax havens, and panel (b) the non-haven countries. Firms in sample include all firms that file the APS in 2014. Country rankings are constructed by tabulating the number of firms with 100% terminal ownership within a given country by haven/non-haven status in 2014 (below the column labeled "≥ 50%"). The first five columns count the number of firms with terminal ownership above a specific threshold by country, where the threshold can take the value 100%, 50%, 25%, 15% or 5%. By definition, a single firm can be counted in multiple countries except in the 100% column. The next four columns show the terminal ownership share of Ecuadorian firms for each foreign country, weighted by firms' assets or revenue. The denominator of these terms consists of aggregate assets or revenues reported in the business income tax declarations. This table is discussed in Section 2.5.

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

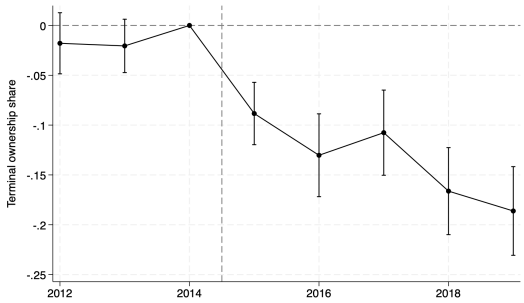
	Exposure	Control	Difference	Domestic firms	Difference of majority foreign firms v. Domestic
Panel (a): Firm Characteristics					
Log revenue	12.7	12.5	.185	11.5	1.06
			(.136)		(.05)
Log taxable profit	10.5	10.3	.156	8.84	1.51
			(.136)		(.052)
Has positive taxable profit	.747	.742	.005	.777	-.035
			(.019)		(.007)
Log CIT liability	8.96	8.81	.15	7.32	1.51
			(.136)		(.052)
Log exports	13.5	12.5	.962	11.8	.803
			(.328)		(.114)
Log assets	13.8	12.8	1.04	11.4	1.52
			(.105)		(.042)
Return on assets	.073	.119	-.046	.136	-.024
			(.007)		(.003)
Labor share of costs	.243	.29	-.047	.315	-.032
			(.011)		(.006)
Panel (b): Ownership characteristics					
Terminal ownership in baseline domicile (%)	90	87	3.05	100	-12.6
			(.761)		(.299)
Ecuadorian person (%)	5.14	11.2	-6.1	93.2	-82.9
			(.581)		(.296)
Foreign person (%)	37.6	59.1	-21.5	.01	55.9
			(1.99)		(.679)
Ecuadorian non-person entity (%)	1.6	1.41	.188	6.76	-5.33
			(.338)		(.151)
Foreign non-person entity (%)	55.4	27.8	27.6	.001	31.9
			(2.06)		(.704)
APS ownership residual (%)	.022	.35	-.328	-.032	.333
			(.205)		(.068)
Ownership share of plurality owner	80.3	68.6	11.8	62.2	8.14
			(1.1)		(.449)
Average share of terminal owner	43.9	42	1.91	39.1	3.15
			(.886)		(.34)
Number of terminal owners	3.37	7.11	-3.73	8.65	-2.1
			(1.17)		(2.01)
Avg. ult. shareholder chain	1.92	1.54	.383	1.01	.584
			(.043)		(.016)
Has a haven strict intermediary	.561	.093	.468	.006	.158
			(.021)		(.006)
Has haven intermediary (if has intermediary)	.891	.273	.617	.658	-.231
			(.02)		(.022)
Panel (c): Ownership reporting compliance					
Filed APS in 2014	.993	.993	0	.989	.003
			(.004)		(.001)
APS adds to 100	.983	.98	.003	.988	-.008
			(.006)		(.002)
Declared any beneficial ownership	.723	.818	-.095	.973	-.169
			(.02)		(.006)
Beneficial ownership declared (%)	42.7	70.3	-27.6	93.2	-27
			(2.07)		(.72)
Declared 100% beneficial ownership	.327	.612	-.285	.873	-.304
			(.021)		(.008)
Panel (d): Cross-border flows					
Any outflow to havens	.177	.151	.026	.051	.104
			(.017)		(.006)
Ratio of haven outflows to revenue	.029	.013	.016	.004	.011
			(.005)		(.001)
Most common industry	Wholesale of goods	Wholesale of goods		Wholesale of goods	
	[27.38]	[32.55]		[24.39]	
2nd most common	Real estate	Professional services		Professional services	
	[19.90]	[14.74]		[13.70]	
3rd most common	Primary sector	Manufacturing		Transport of goods and people	
	[15.14]	[9.40]		[12.30]	
Unique firms	588	3,352		55,675	

Note: This table 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 table is discussed in Section 3.

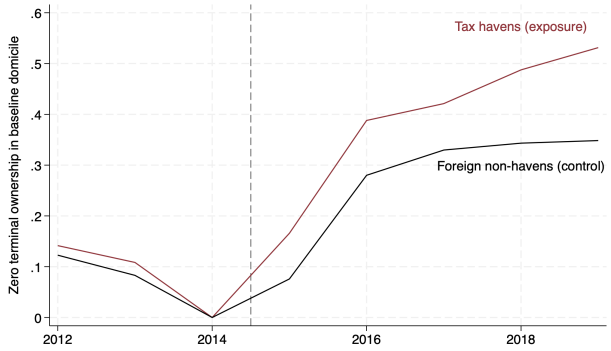
Figure 1: Tax reform impact on terminal ownership patterns



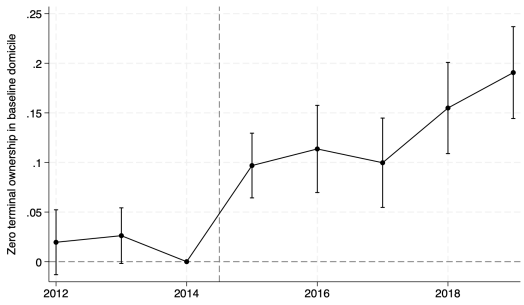
(a) Time series of terminal ownership



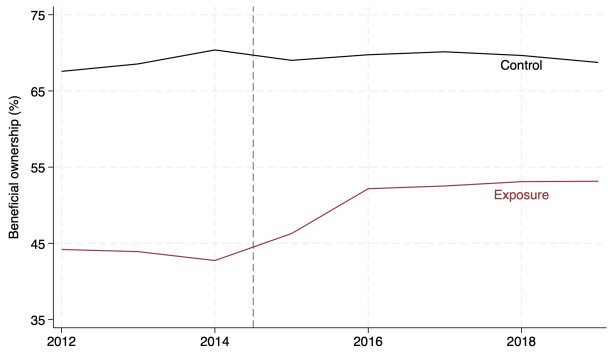
(b) Relative change in terminal ownership (DD)



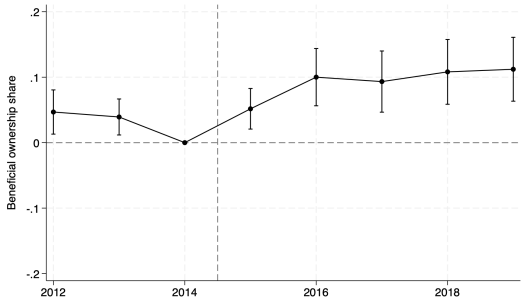
(c) Time series of whether firm has zero terminal ownership in baseline domicile



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



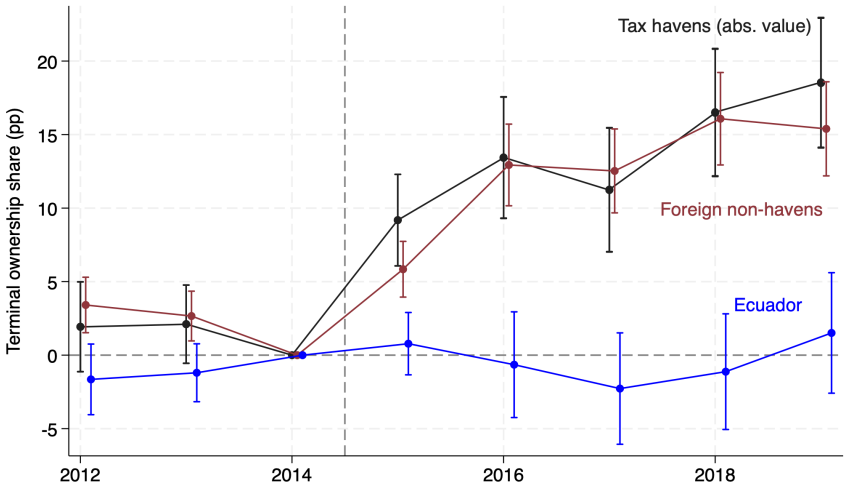
(e) Time series of beneficial ownership



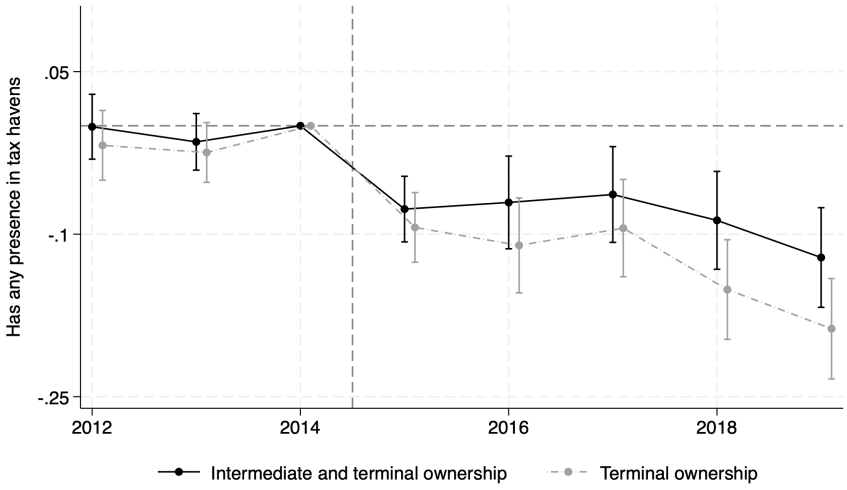
(f) Change in beneficial ownership (DD)

Note: These figures display the time series and the difference-in-differences results estimating the change in ownership by baseline domicile following the 2015 reform. 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. Panel (e) plots the mean share of beneficial ownership by exposure/control group and Panel (f) plots the corresponding difference-in-differences coefficients. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level. This figure is referred to in Section 4.2.

Figure 2: Difference-in-differences:
Tax reform impact on location of terminal ownership and intermediary presence in havens



(a) Change in terminal ownership by country domicile category



(b) Any presence intermediate or terminal presence in tax havens

Note: These figures display difference-in-differences estimates following Equation (2). Panel (a) plots coefficients for terminal ownership changes by country domicile category. The black line plots the absolute value of the coefficients from Figure 1 Panel (b) for juxtaposition with the red line, which estimates the change in terminal ownership in foreign non-havens. The blue line plots the coefficients from a difference-in-differences design that uses Ecuadorian terminal ownership as the main dependent variable. In Panel (b), the solid black dashed line represents estimates using as the dependent variable an indicator for whether a firm has either (1) any terminal owner in the baseline domicile group or (2) any wholly-owned intermediate owner in tax havens. For reference, the dashed gray line plots estimates from a design using as the dependent variable an indicator for whether a firm has any terminal owner in the baseline domicile group. In both panels, the dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level. This figure is referred to in Section 4.2.

Table 3: Difference-in-Differences: Impacts of the reform on ownership structure

Panel (a): Tax haven ownership and beneficial ownership (BO) reporting

	Baseline domicile terminal ownership		Zero terminal ownership in Baseline domicile		Beneficial ownership declared		Any BO declared		100% of BO declared	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposure × Post	-12.30	-23.70	0.112	0.251	6.780	8.860	0.0280	0.0220	0.0550	0.0760
	(1.82)	(5.65)	(.019)	(.059)	(1.79)	(4.34)	(.014)	(.054)	(.019)	(.034)
Constant	69.60	79.80	0.193	0.0660	65.40	40.70	0.792	0.649	0.559	0.192
	(.173)	(.536)	(.002)	(.006)	(.17)	(.412)	(.001)	(.005)	(.002)	(.003)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y	N	Y
N	28,362	28,219	28,362	28,219	28,362	28,219	28,362	28,219	28,362	28,219
Unique firms	3,928	3,901	3,928	3,901	3,928	3,901	3,928	3,901	3,928	3,901
Adjusted R2	0.503	0.401	0.416	0.345	0.654	0.623	0.697	0.740	0.667	0.583

Panel (b): Mechanisms of ownership change

	Terminal ownership in Ecuador		Terminal ownership in inverse domicile group		Has a wholly-owned haven intermediary or haven terminal owner		Any strict intermediary in havens	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Post	0.568	4.320	10.40	15.10	-0.0790	-0.175	-0.0880	-0.0650
	(1.56)	(2.83)	(1.19)	(4.87)	(.019)	(.05)	(.015)	(.032)
Constant	27.30	13.90	1.820	3.480	0.936	0.952	0.899	0.937
	(.148)	(.269)	(.113)	(.463)	(.004)	(.005)	(.003)	(.003)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y
N	28,362	28,219	28,362	28,219	28,368	28,225	11,567	11,536
Unique firms	3,928	3,901	3,928	3,901	3,929	3,902	1,858	1,850
Adjusted R2	0.546	0.568	0.398	0.424	0.366	0.378	0.787	0.693

Note: This table summarizes the difference-in-differences results for our main specification on firm ownership and transparency. Panel (a) displays results pertaining to the change in tax haven ownership and beneficial ownership reporting. Panel (b) assesses the change in terminal ownership in other domiciles as well as mechanisms pertaining to intermediary or otherwise persistent usage of tax havens. The dependent variable in Panel (b) Columns (7)-(8) is only defined for firms with interior intermediaries (i.e. at least one firm separating the terminal owner from the Ecuadorian firm), and therefore has fewer observations. Standard errors are clustered on the firm-level. This table is referred to in Section 4.2.

Table 4: Robustness of terminal ownership response
Panel (a): Robustness by sample definition

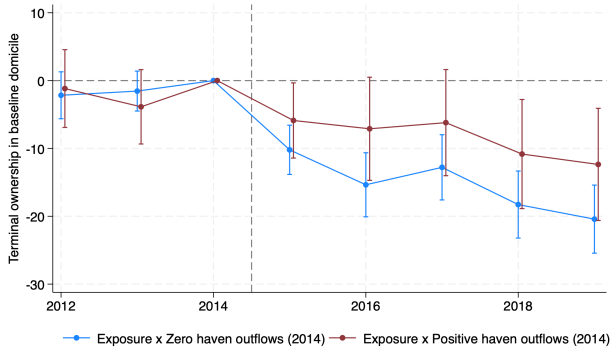
	Main specification		Caribbean havens v. Colombia		All havens v. Colombia		All havens v. Latin American non-havens	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Post	-12.30	-23.70	-12.30	-17.70	-8.340	-16.60	-9.400	-15.70
	(1.82)	(5.65)	(2.42)	(4.79)	(2.18)	(5.68)	(1.97)	(8.34)
Constant	69.60	79.80	67.60	72.90	67.60	75.50	67.10	70.50
	(.173)	(.536)	(.61)	(1.9)	(.646)	(2.71)	(.37)	(2.41)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y
N	28,362	28,219	8,004	7,970	9,080	9,043	14,327	14,262
Unique firms in regression	3,928	3,901	1,098	1,091	1,246	1,238	1,977	1,964
Unique control firms	3,352	3,352	663	663	660	660	1,393	1,393
Unique exposure firms	588	588	437	437	588	588	588	588
Adjusted R2	0.503	0.401	0.518	0.528	0.502	0.475	0.497	0.452

Panel (b): Controlling for continuous differential linear time trends

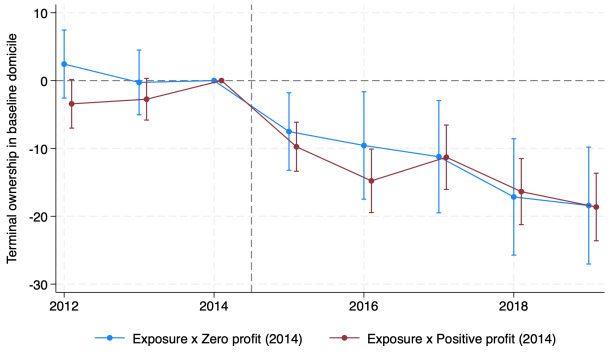
	Levels		Binary		Poisson		Log	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Post	-6.910	-15.30	-0.0549	-0.141	-0.0611	-0.181	-0.0654	-0.0658
	(1.88)	(5.65)	(.0197)	(.0514)	(.0274)	(.0795)	(.0661)	(.256)
Exposure $\times(t-2014)\times$ Post	-2.170	-2.890	-0.0226	-0.0390	-0.0564	-0.0605	-0.0104	-0.0376
	(.563)	(1.47)	(.006)	(.0114)	(.0125)	(.0269)	(.0197)	(.0673)
Exposure $\times(t-2014)$	0.988	0.302	0.00930	0.00560	0.0107	0.00310	0.0206	0.00350
	(.778)	(2.34)	(.0082)	(.0218)	(.0104)	(.0297)	(.0231)	(.0879)
Constant	69.80	79.80	0.808	0.935	4.350	4.420	4.360	4.330
	(.177)	(.546)	(.0019)	(.0053)	(.0025)	(.0064)	(.0041)	(.0117)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y
N	28,368	28,225	28,368	28,225	28,368	2.110e+11	22,530	22,412
Unique firms	3,929	3,902	3,929	3,902	3,929	3,902	3,873	3,848
Adjusted R2	0.503	0.402	0.416	0.349	0.347	0.268	0.287	0.164

Note: This table tests the robustness of our main results. Panel (a) summarizes the change in firms' terminal ownership in their respective baseline domicile group following our main difference-in-differences specification, where each pair of columns features a different geographic definition of tax havens and foreign non-havens. Columns (1) and (2) reproduce the specifications from Table 3 Panel (a) Columns (1) and (2) for ease of comparison. Panel (b) summarizes the change in firms' terminal ownership in their respective baseline domicile group by estimating the equation: $y_{it} = \alpha_i + \delta_t + \beta Treat_i Post_t + \xi(Year_t - 2014) \cdot Treat_i + \gamma(Year_t - 2014) \cdot Post_t \cdot Treat_i + \varepsilon_{it}$. Standard errors are clustered on the firm level. This table is referred to in Section 4.3.

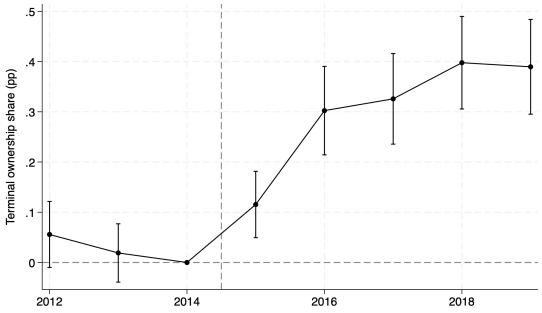
Figure 3: Difference-in-differences:
Terminal ownership responses along margins of ex-ante heterogeneity



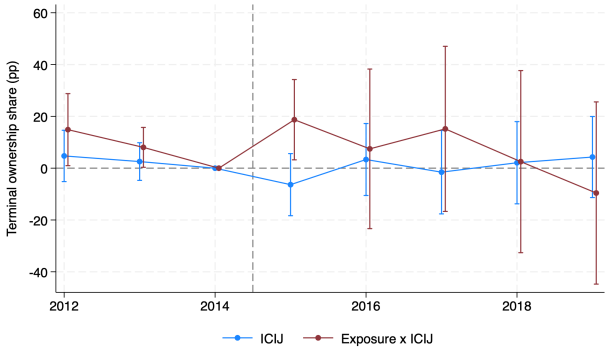
(a) Haven outflow in 2014



(b) Positive profit in 2014



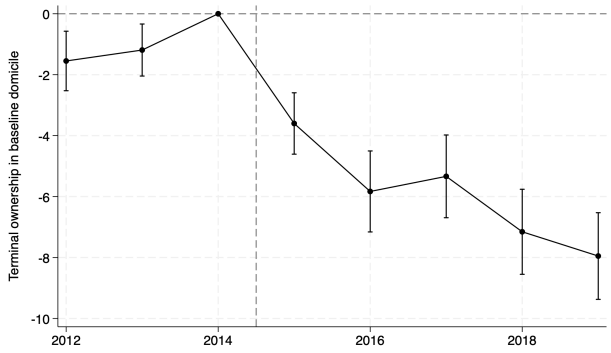
(c) Beneficial ownership declared in 2014 (DDD)



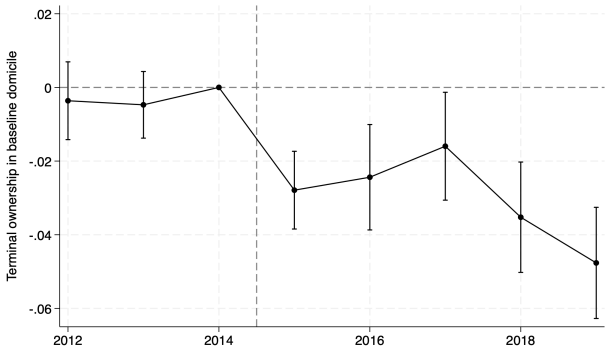
(d) Firms named in the Panama Papers (DDD)

Note: These figures display the impacts of the reform on firms based on different margins of ex-ante heterogeneity. Panels (a) and (b) plot difference-in-difference coefficients using a multi-level treatment specification, where the baseline group consists of control firms. Panels (c) and (d) plot estimates from triple difference designs. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level. This figure is referred to in Section 4.4.

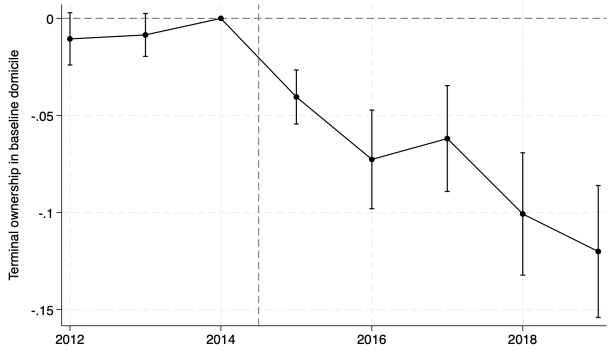
Figure 4: Difference-in-differences with continuous exposure:
The effect of the pecuniary surcharge on terminal ownership in baseline domicile group



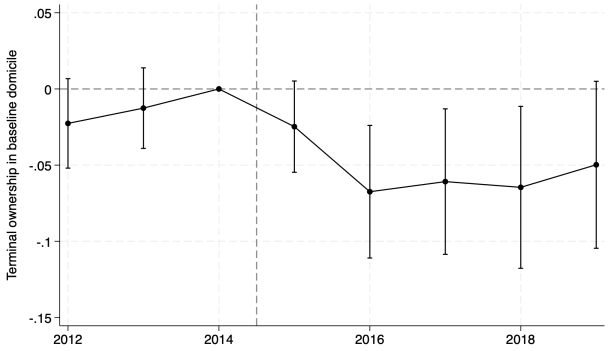
(a) Levels terminal ownership
in baseline domicile



(b) Any terminal ownership
in baseline domicile



(c) Terminal ownership
in baseline domicile (Poisson)



(d) Terminal ownership
in baseline domicile (log)

Note: this figure presents different parameterizations of the change in terminal group ownership as estimated by the continuous difference-in-differences equation $y_{it} = \alpha_i + \delta_t + \gamma \cdot PredictedSurcharge_i Post_t + \varepsilon_{it}$. The dependent variable in all specifications consists of different parameterizations of terminal ownership in baseline domicile group (tax haven terminal ownership for exposure firms and foreign non-haven terminal ownership for control firms). The sample in all plots consists of all majority and minority exposure and control firms in our core sample. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level. This figure is referred to in Section 4.5.

Table 5: Difference-in-differences:
Terminal ownership responses along margins of ex-ante heterogeneity

	(1)	(2)	(3)	(4)
Exposure × Zero haven outflows (2014) × Post	-14			
	(2.07)			
Exposure × Positive outflows (2014) × Post	-6.680			
	(3.46)			
Exposure × Zero profit (2014) × Post		-13.10		
		(3.44)		
Exposure × Positive profit (2014) × Post		-12		
		(2.09)		
Exposure × Post			-28.30	-12.30
			(2.59)	(1.84)
+1pp BO (2014) × Post			-0.164	
			(.013)	
Exposure × +1pp BO (2014) × Post			0.276	
			(.039)	
ICIJ × Post				-2.190
				(6.64)
Exposure × ICIJ × Post				0.248
				(12.7)
Constant	69.60	80.60	76.60	69.70
	(.172)	(.36)	(.58)	(.177)
TWFE	Y	Y	Y	Y
Regression specification	Multi-level treatment	Multi-level treatment	DDD	DDD
N	28,362	28,368	28,362	28,362
Unique firms	3,928	3,929	3,928	3,928
Adjusted R2	0.504	0.456	0.511	0.503

Note: This table summarizes the estimates from a series of regressions summarizing heterogeneous treatment effects of the reform based on different margins of ex-ante heterogeneity. Each column corresponds with a different regression. Standard errors are clustered on the firm-level. This table is referred to in Section 4.4.

Table 6: Difference-in-differences with continuous exposure:
The effect of the pecuniary surcharge on terminal ownership in baseline domicile group

	Levels	Binary	Poisson	Log
	(1)	(2)	(3)	(4)
Projected tax surcharge × Post	-5.020	-0.0270	-0.0680	-0.0380
	(.59)	(.006)	(.011)	(.02)
Constant	65.70	0.920	4.380	4.100
	(.285)	(.003)	(.005)	(.007)
Average majority effect	-15	-0.0820	-0.204	-0.113
	(1.77)	(.019)	(.032)	(.059)
Average minority effect	-3.870	-0.0210	-0.0520	-0.0290
	(.455)	(.005)	(.008)	(.015)
TWFE	Y	Y	Y	Y
N	38,472	38,472	38,472	29,522
Unique firms	5,305	5,305	5,305	5,201
Adjusted R2	0.590	0.359	0.474	0.541

Note: This table presents estimated of the model $y_{it} = \alpha_i + \delta_t + \gamma \cdot PredictedSurcharge_i Post_t + \varepsilon_{it}$. The dependent variable in all specifications consists of different parameterizations of terminal ownership in baseline domicile group (tax haven terminal ownership for exposure firms and foreign non-haven terminal ownership for control firms). The estimation sample here consists of all majority and minority exposure and control firms in our core sample. The rows labeled "average effect" correspond with the point estimate effect evaluated at each group's mean projected tax surcharge. Standard errors are clustered on the firm-level. This table is referred to in Section 4.5.

Table 7: Difference-in-differences: firm financial activity

Panel (a): Profit and taxes

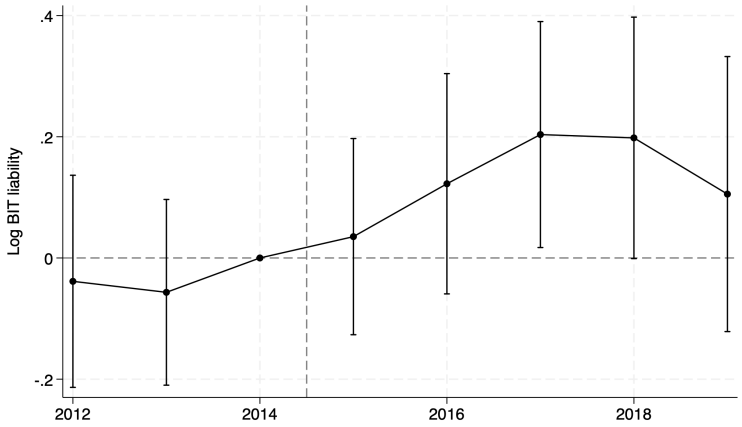
	Business income tax				Gross profit declared			
	Log		Binary		Log		Binary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.158	0.118	0.00300	-0.00200	0.154	0.221	-0.00200	-0.0530
	(.069)	(.122)	(.016)	(.046)	(.072)	(.117)	(.017)	(.053)
Constant	9.120	13.40	0.658	0.830	10.50	14.80	0.643	0.828
	(.006)	(.01)	(.002)	(.004)	(.006)	(.009)	(.002)	(.005)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y
N	18,394	18,359	28,364	28,214	17,910	17,875	28,364	28,214
Unique firms	3,319	3,309	3,926	3,899	3,307	3,297	3,926	3,899
Adjusted R2	0.807	0.858	0.389	0.504	0.788	0.845	0.349	0.401

Panel (b): Assets, leverage, investment, and labor expenses

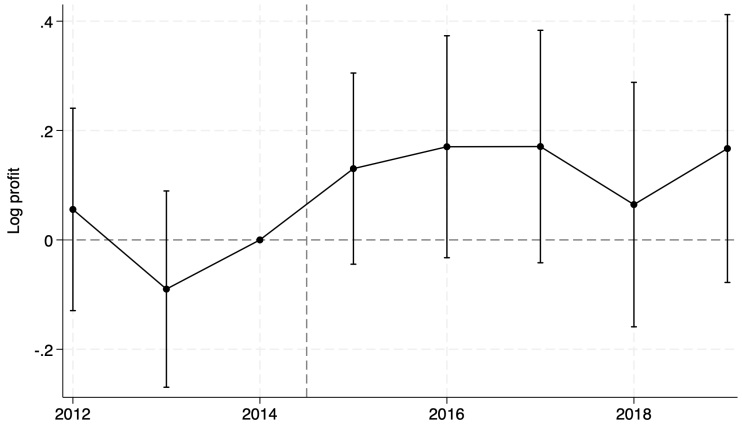
	Log assets	Leverage ratio	Any increase in leverage	Any investment	Any decrease in investment	Log labor expense	Any labor expense	Any decrease in laboor expense
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	-0.0140	0.0760	0.0150	0.0220	0.00200	-0.0270	-0.0230	-0.0760
	(.059)	(.06)	(.019)	(.015)	(.013)	(.054)	(.016)	(.019)
Constant	13	0.762	0.352	0.142	0.101	11.70	0.815	0.324
	(.006)	(.006)	(.005)	(.001)	(.003)	(.005)	(.002)	(.005)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	N	N	N	N	N	N	N
N	28,364	28,364	24,373	28,364	24,373	22,896	28,364	24,373
Unique firms	3,908	3,908	3,840	3,926	3,883	3,628	3,926	3,883
Adjusted R2	0.846	0.407	0.0470	0.523	0.259	0.845	0.494	0.0610

Note: This table summarizes the difference-in-differences results pertaining to profit, taxes, and other firm activity. Differences in sample size across columns are due to presence of zeros in dependent variables in log specifications. Differences in sample sizes across columns come from two sources: specifications with log dependent variables exclude observations with zero-values; specifications that use a signed year-to-year first-difference parameterization of the dependent variable exclude year 2012 by construction. Standard errors are clustered on the firm-level. This table is referred to in Section 5.

Figure 5: Tax reform impact on firm financial activity



Panel (a): Business income taxes



Panel (b): Gross profits declared

Note: These figures display difference-in-differences results pertaining to profit and taxes. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table 8: Difference-in-differences by ex-post ownership domicile response
Firm profit, tax, and haven outflows

	Log taxes paid		Log profit declared		Any haven outflows		Ratio of haven outflows to revenue	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Majority havens post × Post	.127		.12		.03		.014	
	(.083)		(.086)		(.015)		(.007)	
Majority non-havens post × Post	.314		.211		.029		-.003	
	(.179)		(.165)		(.045)		(.01)	
Majority Ecuador post × Post	.071		.144		-.009		-.004	
	(.135)		(.173)		(.026)		(.006)	
No majority domicile in post × Post	.509		.595		.014		.005	
	(.236)		(.306)		(.041)		(.02)	
Remained in havens post × Post		.133		.137		.027		.013
		(.08)		(.083)		(.015)		(.006)
Left havens post × Post		.244		.266		.025		.001
		(.111)		(.128)		(.022)		(.006)
Partial non-majority presence in havens post × Post		.238		-.199		-.088		-.029
		(.418)		(.339)		(.079)		(.019)
Constant	9.12	9.12	10.5	10.5	.178	.178	.021	.021
	(.006)	(.006)	(.006)	(.006)	(.001)	(.001)	(0)	(0)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Ex-post threshold	2015	2015	2015	2015	2015	2015	2015	2015
N	18,391	18,391	17,908	17,908	31,520	31,520	25,042	25,042
Unique firms	3,318	3,318	3,306	3,306	3,940	3,940	3,844	3,844
Adjusted R2	.808	.808	.788	.788	.564	.564	.489	.489

Note: This table summarizes the difference-in-differences results for a multi-leveled treatment specification, where each exposure firm is assigned to a mutually exclusive group based on its country category of terminal ownership domicile in 2015. The control group consists of all majority foreign-owned control firms. In all specifications except Columns (7) and (8), differences relative to "haven-remainers" are not significant on a 5%-level. Standard errors are clustered on the firm-level. This table is referred to in Section 5.

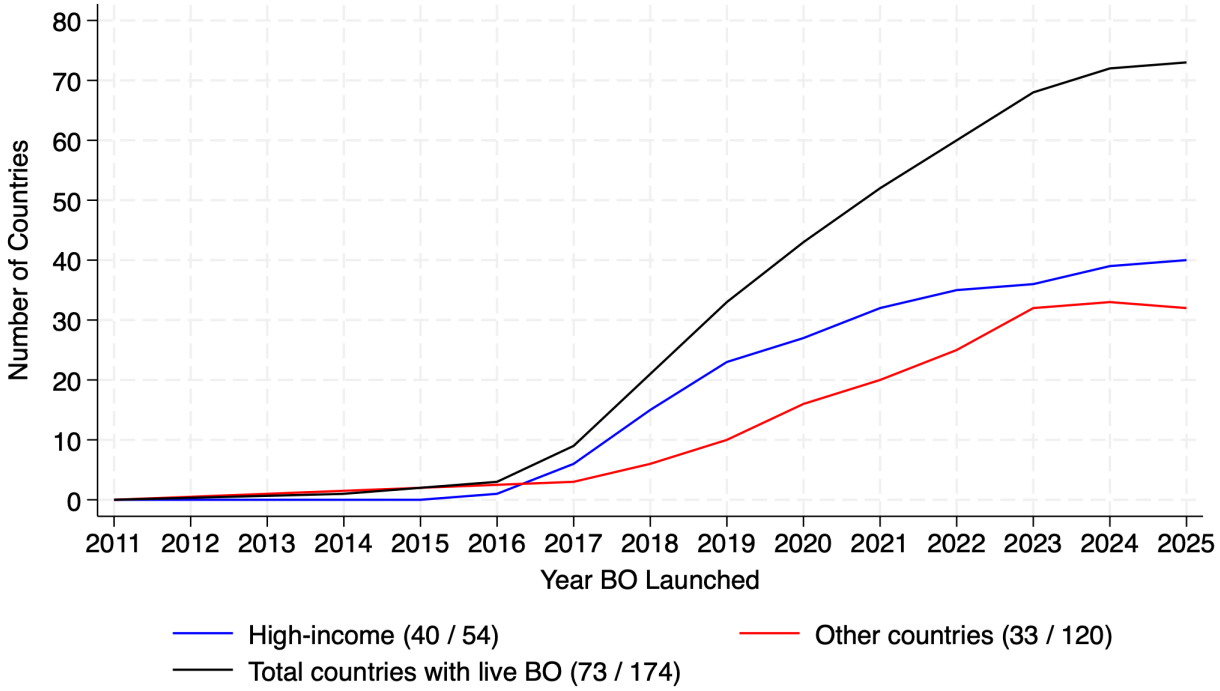
Table 9: Tax benchmarking exercises (2014)

		Activity base (Millions USD 2014)									
Firm base	Number of firms	Assets	Intangible assets	Revenue	Taxable profit	Dividends to havens	All flows to havens	All flows from havens	All dividend outflows	All outflows	All inflows
Majority terminal haven-owned	934	6,641	1,476	5,049	787	71.5	329	32.5	178	1,459	1,039
Majority terminal haven-owned & has ≤ 50% BO declared	549	5,051	1,448	3,971	713	70.9	256	15.7	168	1,127	724
Terminal haven ownership ∈ [.05, .5)	280	8,151	363	3,576	286	1.46	60.3	40.2	34.5	956	216
Has a 100% intermediary in a tax haven	1,192	24,803	5,562	15,285	1,664	80.7	518	53.9	262	5,952	4,361
Has a ≥50% intermediary in a tax haven	2,053	30,137	5,767	20,610	2,147	91.4	734	146	283	7,523	5,349
Has a ≥10% intermediary i n a tax haven	2,292	32,511	5,842	22,787	2,327	91.6	763	152	337	8,131	5,530
Nominal ownership does not add to 100%	24,158	103,749	5,989	49,400	7,518	12.4	328	84.1	647	7,927	4,631
Beneficial ownership (BO) does not add to 100%	40,665	182,648	11,513	107,379	12,353	96.4	1,610	413	1,219	19,725	13,150
Has ≤ 50% BO declared	32,891	156,834	11,067	90,533	11,179	84	1,250	321	1,060	16,113	11,640
Has zero BO declared	25,431	125,584	9,488	67,029	9,651	71.6	853	145	921	9,167	5,993
Did not declare ownership structure	18,786	77,566	845	33,239	5,632	3.22	80	16.8	35.8	1,235	741

Note: This table summarizes hypothetical tax bases given different firms of interest and different taxed activities. Calculations consider all Ecuadorian firms in the administrative tax data environment, not only those considered in our quasi-experimental design. All firm definitions and flows correspond with 2014, the final pre-reform year. In 2014, we observe 132,183 filing a business income tax declaration in Ecuador. This table is referred to in Section 6.2.

Appendix A Additional figures and tables

Figure A.1: Countries with live beneficial ownership registry over time, by Income Group



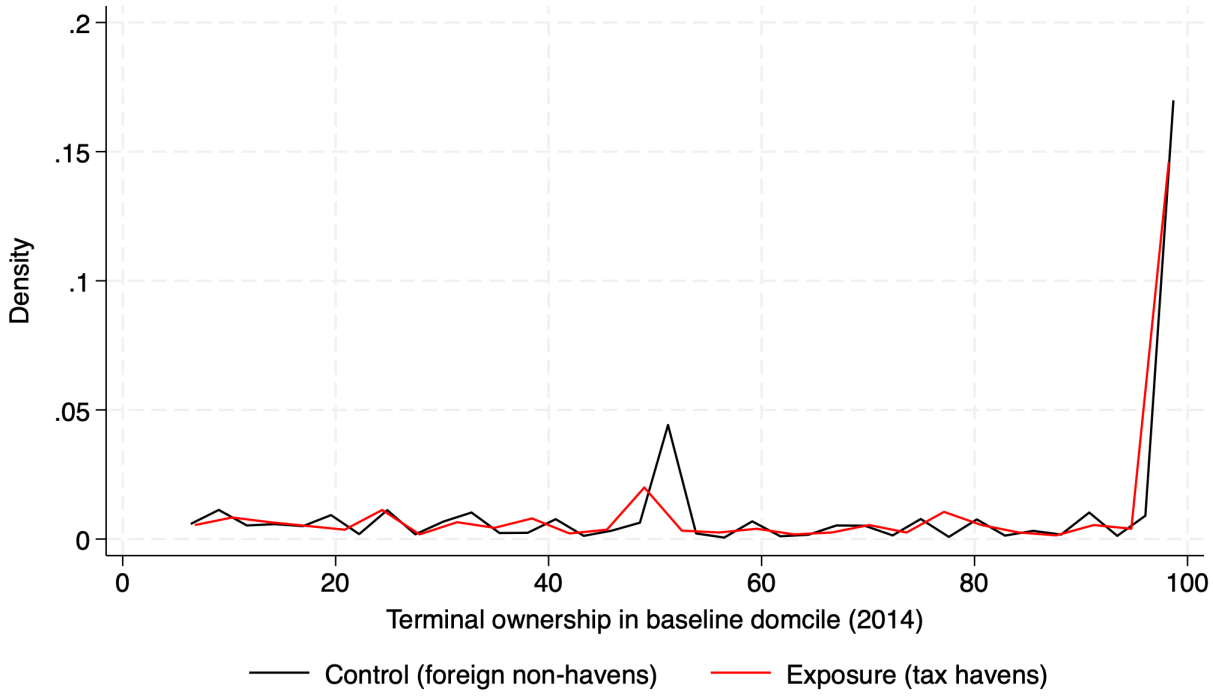
Note: This figure displays time series of the cumulative count of countries that maintain a beneficial ownership registry (BO). High-income and other countries are defined mutually exclusively according to World Bank country classifications of income level for 2024-2025. Data updated as of July 2025, 73 out of 174 (42%) countries with populations exceeding 500,000 have launched a live BO registry. Income classification: High-income (40); Upper-middle income (21); Lower-middle income (9); Low income (2)."

Table A.1: Foreign terminal ownership of Ecuadorian companies (2014)
All firms filing the APS

		Count of firms by ownership threshold					Terminal ownership of all Ecuadorian firms			
							% of Ecuadorian assets		% of Ecuadorian revenue	
	Country	100%	≥ 50%	> 25%	> 15%	> 5%	All	By persons	All	By persons
Panel (a): Tax havens										
1	Panama	188	624	730	797	810	1.08	.617	1.21	.651
2	Netherlands	36	82	95	115	120	.307	.061	.525	.101
3	Luxembourg	10	14	15	19	20	.154	0	.241	0
4	Curaçao	7	12	12	13	13	.734	0	.637	0
5	British Virgin Islands	6	30	37	44	46	.036	.017	.073	.036
6	Hong Kong	5	8	8	8	8	.126	0	.096	0
7	Puerto Rico	4	9	11	12	12	.006	.006	.003	.003
8+	All others	28	171	205	220	225	.621	.195	.574	.094
All	Total	294	951	1,110	1,214	1,245	3.06	.896	3.36	.885
	% of all firms in sample	.222	.719	.84	.918	.942				
	% of all assets	1.11	2.88	3.49	4.5	6.41				
	% of all revenue	1.45	3.13	3.59	4.9	5.35				
Panel (b): Foreign non-havens										
1	Colombia	404	978	1,158	1,293	1,354	.656	.427	1.26	.79
2	USA	335	1,017	1,387	1,700	1,830	2.03	.936	4.11	1.79
3	Spain	228	619	736	832	865	1.05	.672	1.5	.952
4	Peru	167	386	446	495	518	.82	.621	1.06	.494
5	Venezuela	117	319	379	406	411	.429	.182	.458	.296
6	China	84	151	172	188	191	1.55	.175	1.32	.18
7	Argentina	73	179	226	262	269	.166	.102	.3	.201
8+	All others	570	1,867	2,341	2,701	2,844	7.82	3.7	7.72	3.59
All	Total	2,311	5,595	6,628	7,376	7,633	14.5	6.82	17.7	8.3
	% of all firms in sample	1.75	4.23	5.01	5.58	5.78				
	% of all assets	4.85	15.5	17.8	19.7	20.6				
	% of all revenue	7.01	17.9	21	23	24.2				

Note: This table uses the APS to tabulate the international terminal owners of Ecuadorian companies in 2014 by country. Panel (a) displays the tax havens, and panel (b) the non-haven countries. Unlike Table 1 which only includes firms in the core sample, this table considers all firms filing the APS in 2014. Country rankings are constructed by tabulating the number of firms with 100% terminal ownership within a given country by haven/non-haven status in 2014 (below the column labeled "≥ 50%"). The first five columns count the number of firms with terminal ownership above a specific threshold by country, where the threshold can take the value 100%, 50%, 25%, 15% or 5%. The next four columns show the terminal ownership share of Ecuadorian firms for each foreign country, weighted by firms' assets or revenue. The denominator of these terms consists of aggregate assets or revenues reported in the business income tax declarations by firms in our core sample.

Figure A.2: Distribution of 2014 tax haven and non-haven terminal ownership
Among exposure and control firms



Note: This figure shows the 2014 distribution of terminal ownership attributable to owners in foreign non-havens and tax havens for our control and exposure groups respectively. Note that both spikes in density around 50% ownership indeed occur precisely at 50%; visual offset is due to discrepancies in kernel estimation.

Table A.2: APS compliance and (non-) observation of beneficial ownership by geography (2014)

	Incomplete	Domestic	C-majority	C-minority	T-majority	T-minority	Other
Ecuadorian person	27.6	93.2	11.2	62.4	5.14	31.2	85.7
Ecuadorian non-person entity	2.54	6.76	1.41	9.97	1.59	12.3	9.23
Foreign non-haven persons	.0383	.00945	59.1	21	2.03	14.3	4.39
Foreign non-haven non-person entity	.0344	.00107	27.8	4.56	.969	12.1	.341
Haven person	.00153	0	.00439	.0166	35.6	14.8	.264
Haven non-person entity	.00449	0	.0106	.0131	54.4	10.9	.128
Terminal ownership in Ecuador	30.1	100	12.6	72.4	6.73	43.6	94.9
Terminal ownership in havens	.00602	.000671	.015	.0298	90	25.7	.392
Terminal ownership in non-havens	.0727	.0105	87	25.6	3	26.4	4.73
APS ownership residual	69.7	-.0318	.35	1.87	.0218	4.26	0
Unique firms	1,315	55,674	3,351	1,183	588	195	44

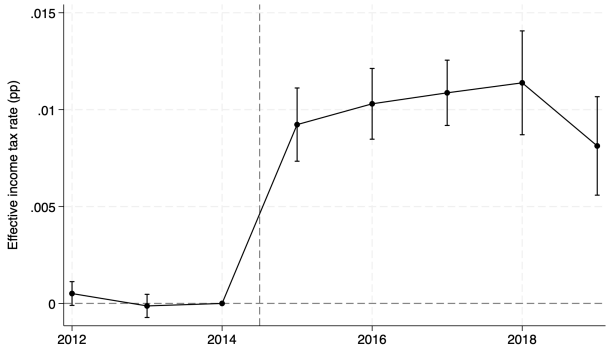
Note: This table tabulates the observation of terminal beneficial ownership of core sample firms in the APS data in 2014, based on their ownership-domicile and filing status and by beneficial owner type. All numbers correspond with percentage points. The 'T' columns refer to firms with terminal ownership in tax havens. The 'C' columns refer to firms with terminal ownership in foreign non-havens (and less than 5% ownership in tax havens). The "Majority" and "Minority" distinctions correspond with whether terminal ownership in each category is at least 50%. 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 terminal ownership in the APS such that terminal ownership adds up to 100%.

Table A.3: Descriptive statistics and ownership characteristics: Minority exposure and control and domestic Ecuadorian Firms (2014)

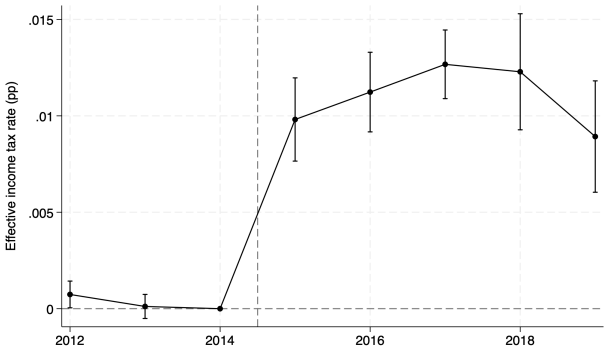
	Exposure	Control	Difference	Domestic firms	Difference of minority foreign firms v. Domestic
Panel (a): Firm Characteristics					
Log revenue	13.6	12.7	.945	11.5	1.31
			(.251)		(.08)
Log taxable profit	11.8	10.3	1.46	8.84	1.68
			(.24)		(.087)
Has positive taxable profit	.785	.752	.032	.777	-.02
			(.032)		(.012)
CIT liability (1000s USD)	317	113	204	18.9	123
			(79.4)		(21.2)
Log CIT liability	10.2	8.79	1.46	7.32	1.68
			(.24)		(.087)
Log assets	14.2	12.9	1.34	11.4	1.7
			(.206)		(.073)
Gross profit margin	.136	.109	.027	.091	.021
			(.017)		(.005)
Labor share of costs	.27	.285	-.015	.315	-.032
			(.019)		(.008)
Panel (b): Ownership characteristics					
Ecuadorian person (%)	31.2	62.4	-31.2	93.2	-35.2
			(2.37)		(.802)
Foreign person (%)	29.1	21	8.03	.01	22.2
			(2.04)		(.465)
Ecuadorian non-person entity (%)	12.3	9.97	2.35	6.76	3.54
			(1.78)		(.601)
Foreign non-person entity (%)	23	4.57	18.4	.001	7.17
			(2.36)		(.472)
Residual (%)	4.26	1.87	2.4	-.032	2.24
			(1.19)		(.353)
Terminal ownership in baseline domicile (%)	25.7	25.6	.118	100	-74.4
			(.982)		(.345)
Ownership share of plurality owner (%)	38.7	44.7	-6.06	62.2	-18.3
			(1.34)		(.555)
Average share of terminal owner (%)	18	25.2	-7.26	39.1	-14.9
			(.99)		(.381)
Number of terminal owners	25.4	18.7	6.77	8.65	11
			(11)		(5.41)
Avg. ult. shareholder chain	2.03	1.18	.846	1.01	.29
			(.087)		(.02)
Panel (c): Ownership reporting compliance					
Filed APS in 2014	1	.996	.004	.989	.007
			(.002)		(.002)
APS adds to 100	.877	.948	-.071	.988	-.05
			(.024)		(.007)
Declared any beneficial ownership	.897	.967	-.07	.973	-.016
			(.022)		(.006)
Beneficial ownership declared (%)	60.3	83.6	-23.3	93.2	-12.9
			(2.83)		(.842)
Declared 100% beneficial ownership	.277	.64	-.364	.873	-.284
			(.035)		(.013)
Panel (d): Cross-border flows					
Any outflow to havens	.308	.159	.149	.051	.129
			(.035)		(.01)
Ratio of haven outflows to revenue	.022	.011	.011	.004	.009
			(.007)		(.002)
Any outflow to non-havens	.585	.411	.174	.187	.249
			(.038)		(.013)
Ratio of non-haven outflows to revenue	.117	.103	.014	.038	.067
			(.017)		(.006)
Most common industry	Wholesale of goods	Wholesale of goods		Wholesale of goods	
	[23.08]	[28.76]		[24.39]	
2nd most common	Real estate	Manufacturing		Professional services	
	[20.00]	[11.51]		[13.70]	
3rd most common	Manufacturing	Real estate		Transport of goods and people	
	[12.82]	[11.17]		[12.30]	
Unique firms	195	1,182		55,675	

Note: This table displays descriptive statistics of minority-foreign-owned 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 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.

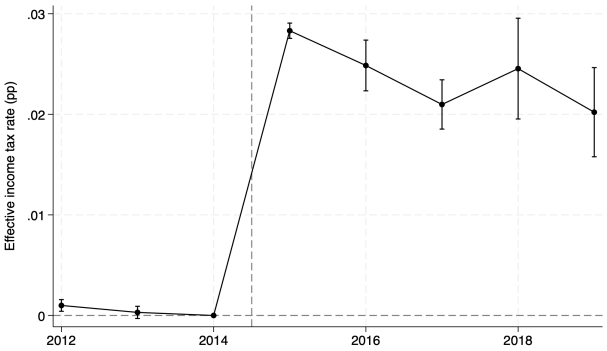
Figure A.3: First stage: Relative change in effective business income tax rate



(a) Simple first stage (DD)



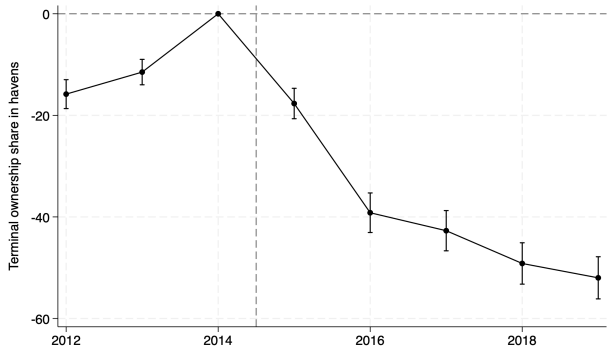
(c) First stage: ex-post conditional on remaining in havens and positive CIT



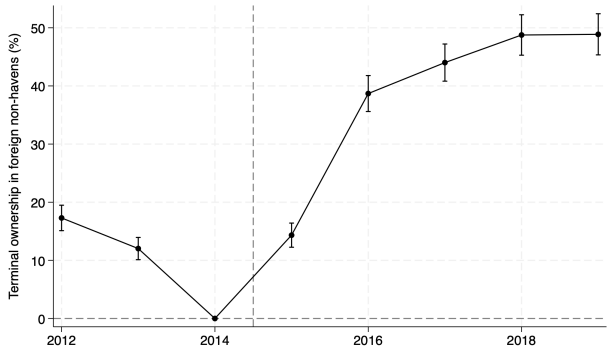
(c) First stage: ex-post conditional on remaining in havens and positive BIT and ex-post verified data

Note: These figures display difference-in-differences results that illustrate components of the "bindingness" of the BIT surcharge among firms that maintain majority shareholdership in tax havens and pay corporate income tax. Panel (a) uses features no additional conditioning beyond our main difference-in-differences specification. Panel (b) conditions exposure firms on having maintained terminal ownership in tax havens in 2015 and facing a positive BIT rate. Panel (c) adds on an additional condition that the terminal ownership data is verified ex-post by the tax authorities. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.4: Difference-in-differences results in shareholdership:
Direct comparisons of haven and foreign non-haven ownership without using mean reversion correction technique



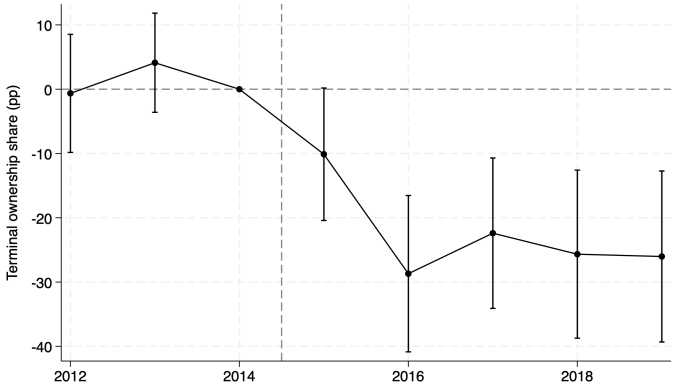
(a) Tax haven terminal ownership



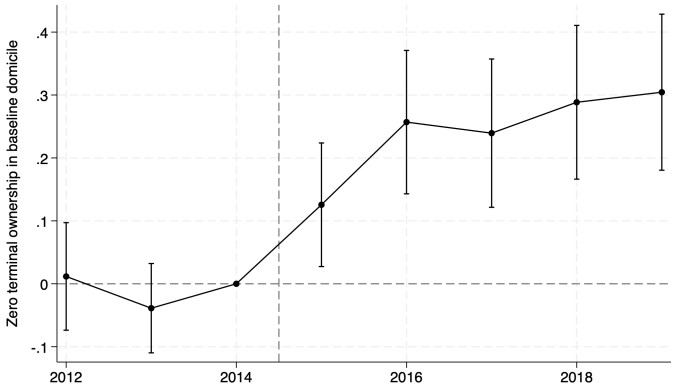
(b) Foreign non-haven terminal ownership

Note: These figures display difference-in-differences 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 BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.5: Difference-in-differences: terminal ownership in tax havens
Weighted by 2014 assets



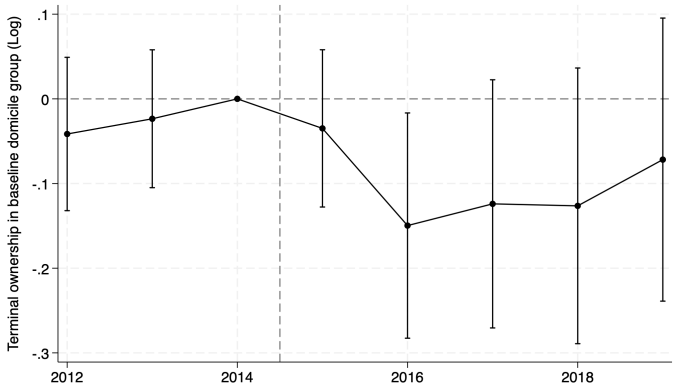
(a) Terminal ownership in baseline domicile



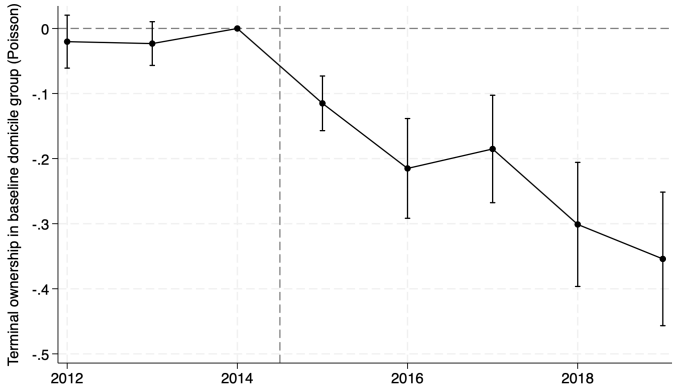
(b) Zero terminal ownership in baseline domicile

Note: These figures display difference-in-differences results for the change in terminal ownership in baseline domicile group between the exposure and control firms, featuring firm analytic weights for 2014 assets. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level.

Figure A.6: Difference-in-differences results in shareholdership: Additional parameterizations of prominent participation



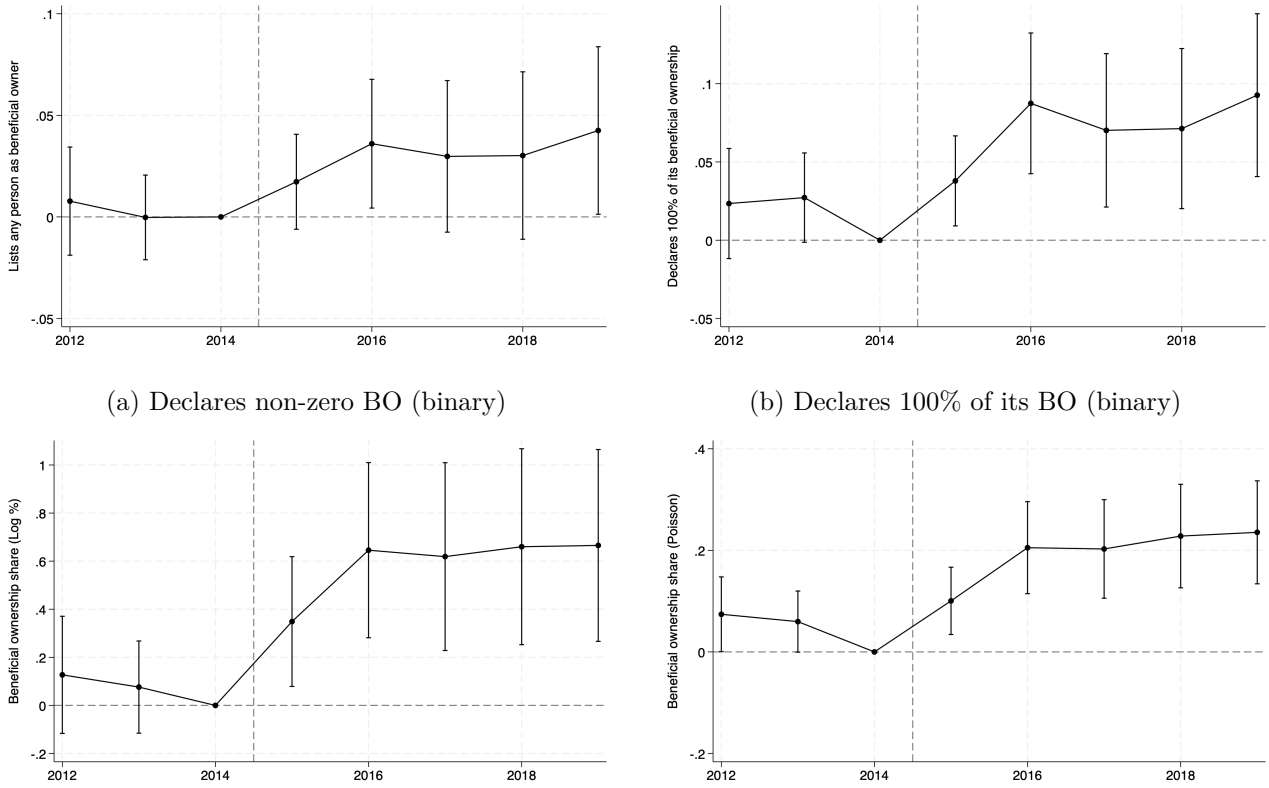
(a) Log



(b) Poisson

Note: These figures display difference-in-differences results for alternate parameterizations for the change in terminal ownership in baseline domicile group between the exposure and control firms in our main specification. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level.

Figure A.7: Additional results on beneficial ownership (BO)



(a) Declares non-zero BO (binary)

(b) Declares 100% of its BO (binary)

(c) Log BO

(d) BO (Poisson)

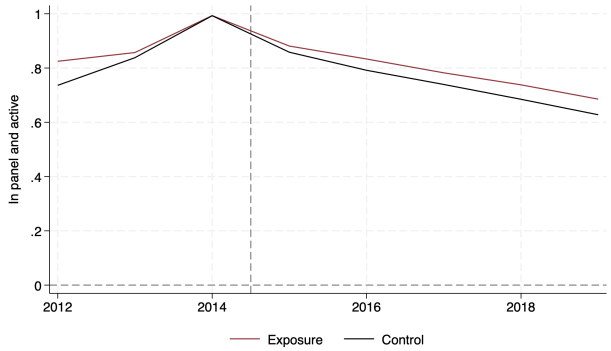
Note: These figures display the difference-in-differences results that estimate the change in beneficial ownership (BO) under different parameterizations. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.4: Panel balance and APS compliance

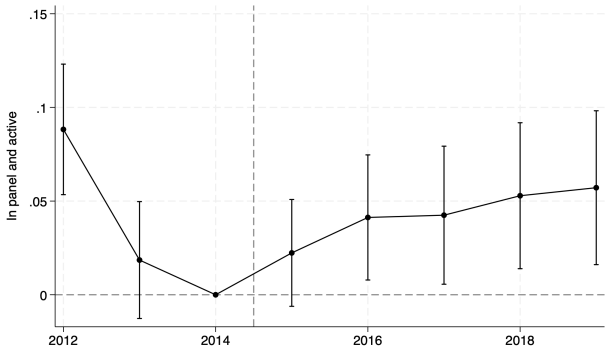
	Filed APS and active		Filed APS		Declared 100% of its nominal ownership		APS ownership residual	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × Year ≥ 2015	0.00800	-0.0170	-0.0150	-0.00400	-0.0120	-0.0130	1.040	1.110
	(.016)	(.016)	(.011)	(.009)	(.008)	(.056)	(.51)	(3.28)
Constant	0.789	0.964	0.900	0.982	0.970	0.821	1.160	2.820
	(.001)	(.002)	(.001)	(.001)	(.001)	(.005)	(.048)	(.311)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N	Y
N	31,512	31,296	31,512	31,296	28,315	28,176	28,315	28,176
Unique firms	3,939	3,912	3,939	3,912	3,925	3,898	3,925	3,898
Adjusted R2	0.408	0.306	0.321	0.250	0.337	0.553	0.192	0.200

Note: this table displays results from a series of difference-in-differences regressions that evaluate the change in various compliance and panel balance measures between our main exposure and control groups. Parentheses contain standard errors clustered on the firm-level.

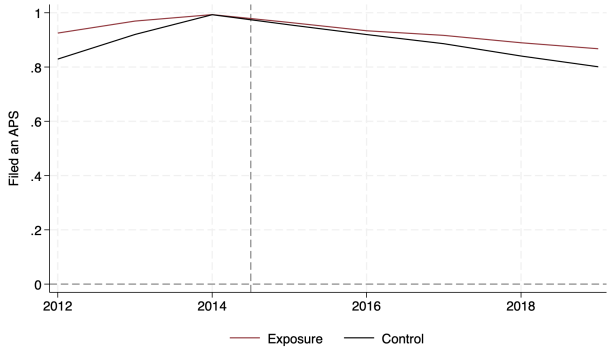
Figure A.8: Panel balance and filing an APS compliance



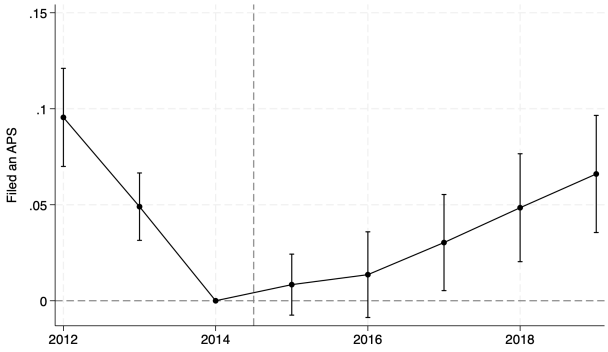
(a) Active in panel (time series)



(b) Active in panel (DD)



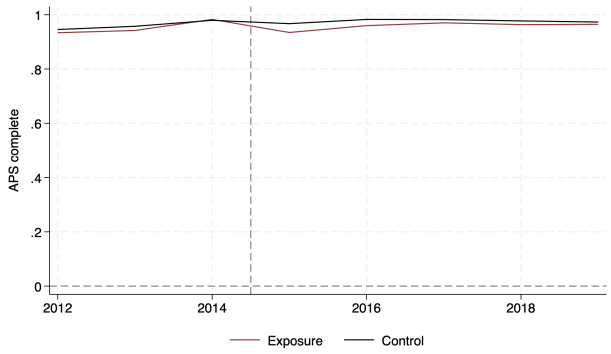
(c) Filed an APS (time series)



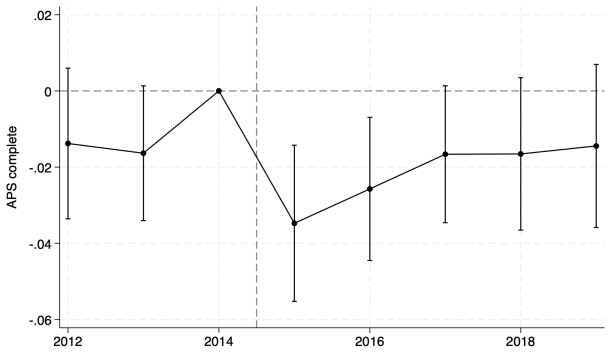
(d) Filed an APS (DD)

Note: These figures display time series averages and difference-in-differences estimates for changes in various measures of panel balance between our main exposure and control groups. "Active in panel" corresponds with an indicator for whether a firm both filed an APS and an F101 business income tax declaration with positive revenue in a given year. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

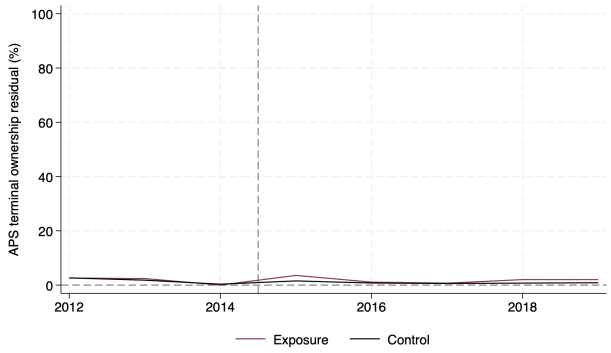
Figure A.9: Incomplete APS and APS ownership residual,
(Conditional on filing)



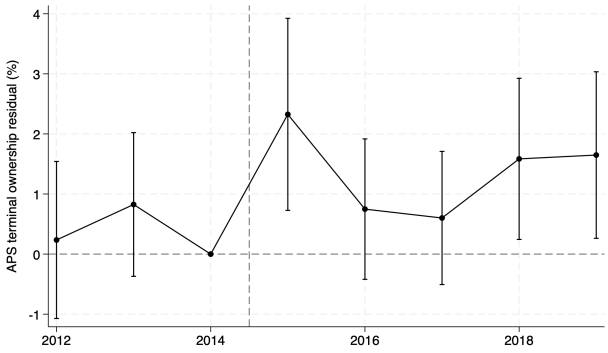
(a) Filed a complete APS conditional on filing (time series)



(b) Filed a complete APS conditional on filing (DD)



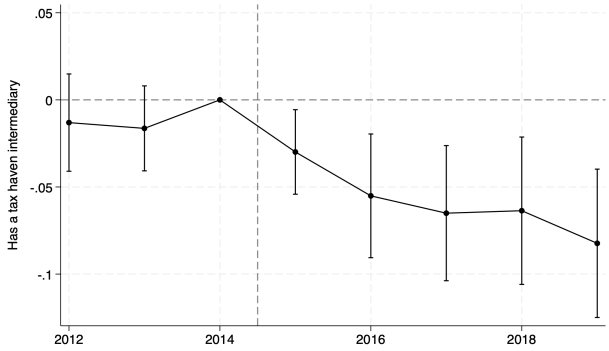
(c) APS ownership residual (time series)



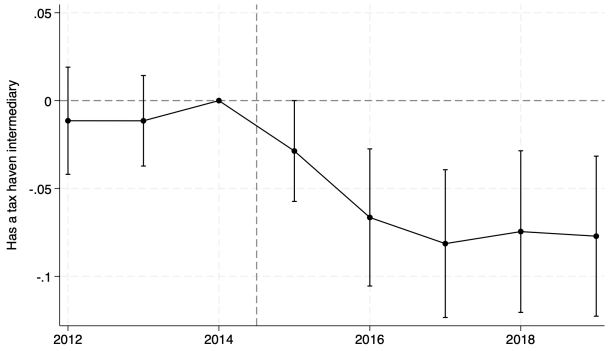
(d) APS ownership residual (DD)

Note: These figures display time series averages and difference-in-differences estimates for changes in additional measures of compliance with ownership reporting standards between our main exposure and control groups. "APS ownership residual" is calculated as 100 minus the total reported terminal ownership for a firm-year. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

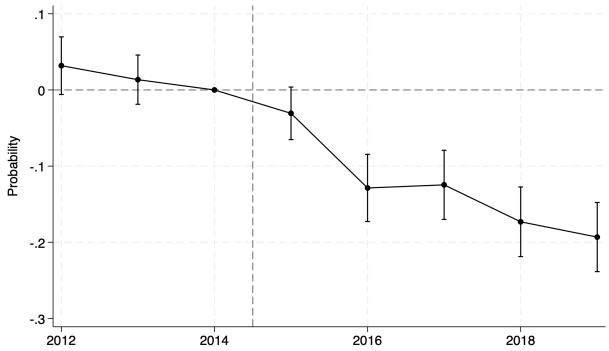
Figure A.10: Difference-in-differences:
Tax reform impact on intermediate and final ownership structure



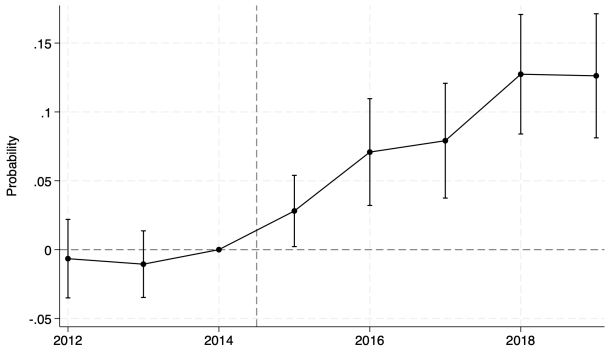
(a) Has an at-least partially-owned haven intermediary



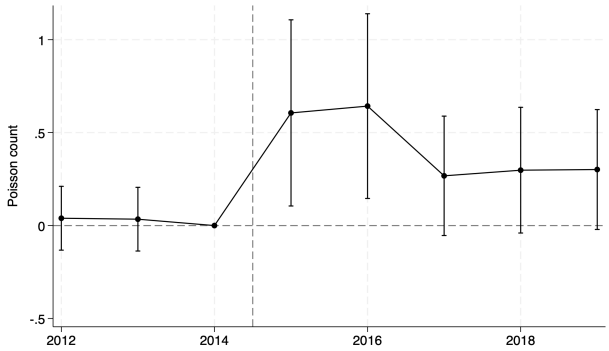
(b) Has a majority-owned haven intermediary



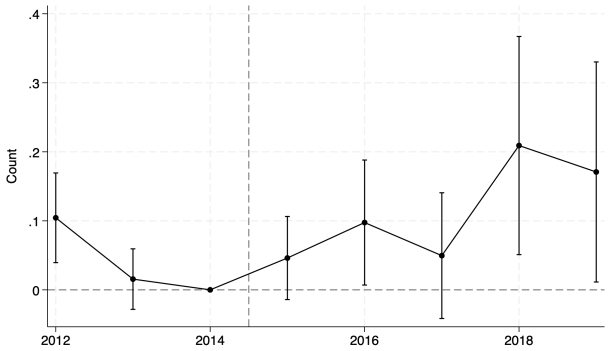
(c) Has its 2014 baseline group plurality shareholder



(d) Has an at-least partially-owned non-haven intermediary



(e) Number of terminal owners (Poisson)



(f) Average ownership chain length

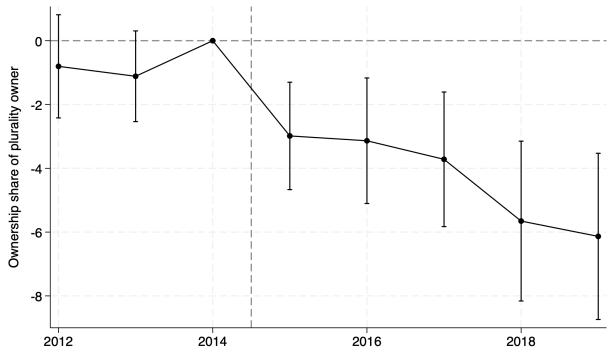
Note: These figures display the difference-in-differences results that estimate the change in intermediate ownership and overall ownership structure following the 2015 reform imposing a higher corporate tax rate on tax haven terminally owned firms. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level.

Table A.5: Difference-in-differences: outflows to tax havens

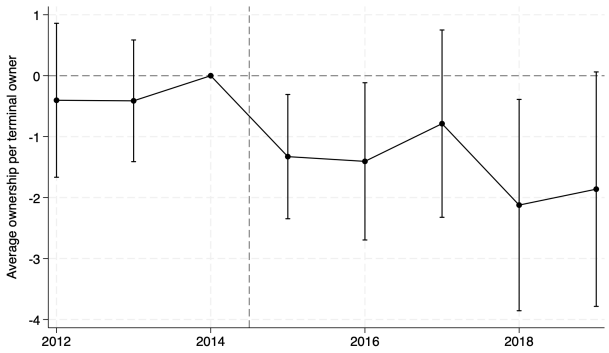
	Any haven outflow	Year-to-year decrease in haven outflows	Haven outflows share of revenue	Year-to-year decrease in haven outflows share of revenue
	(1)	(2)	(3)	(4)
Exposure × Post	0.0230	0.0240	0.0100	0.0290
	(.013)	(.011)	(.005)	(.014)
Constant	0.178	0.0980	0.0210	0.124
	(.001)	(.003)	(0)	(.003)
TWFE	Y	Y	Y	Y
Weight (2014 assets)	N	N	N	N
N	31,512	27,580	25,047	20,724
Unique firms	3,939	3,940	3,844	3,642
Adjusted R2	0.564	0.240	0.489	0.211

Note: This table summarizes the impacts of the reform on different parameterizations of outflows to tax havens following our our main difference-in-differences specification. Variation in observation counts across columns is due to 1) zero revenues for the columns (3) and (4) and 2) unavailability of year 2012 for variables in columns (2) and (4). Standard errors are clustered on the firm-level.

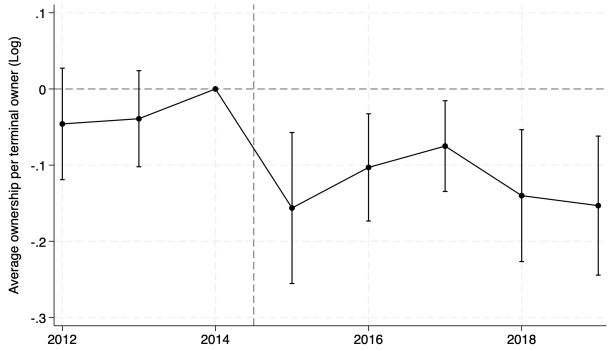
Figure A.11: Results on ownership concentration



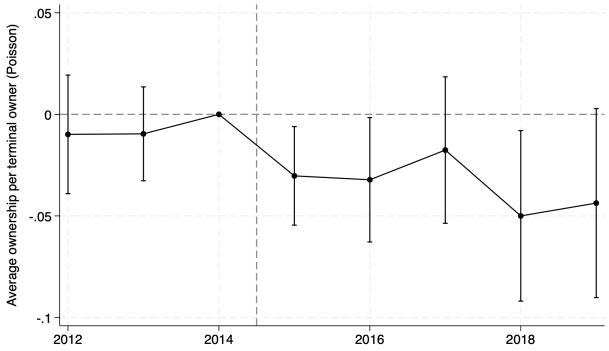
(a) Plurality shareholder share (%)



(b) Average ownership concentration (pp)



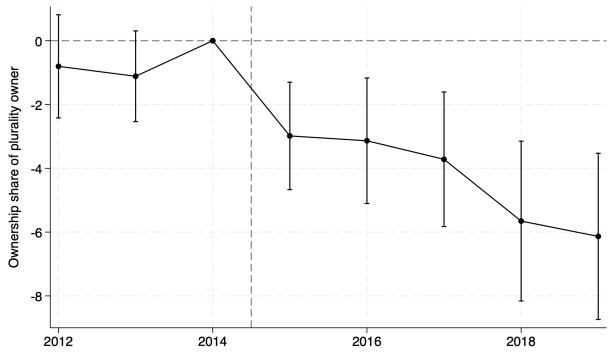
(c) Average ownership concentration (Log)



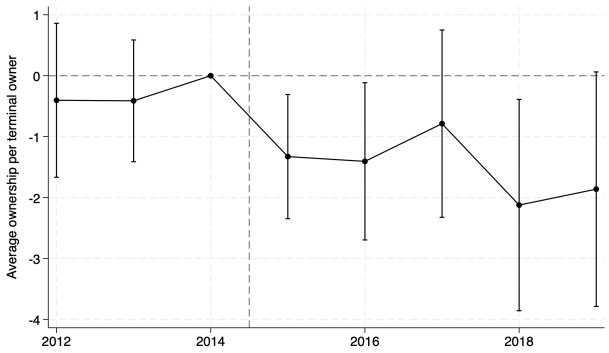
(d) Average ownership concentration (Poisson)

Note: These figures display difference-in-differences coefficients for alternate parameterizations of terminal ownership concentration. Average ownership concentration is defined on the firm-year level as 100 divided by the number of observed terminal owners. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

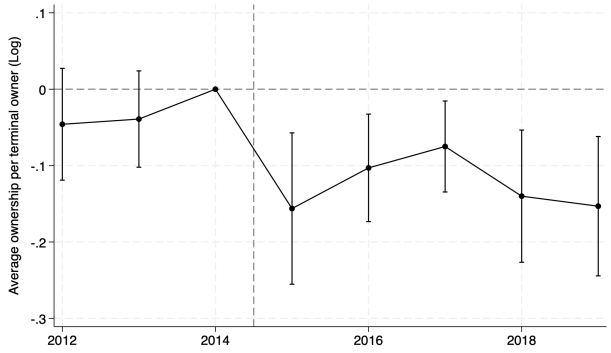
Figure A.12: Results on ownership concentration



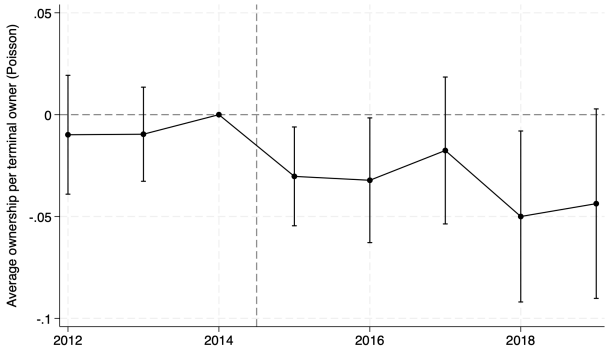
(a) Plurality shareholder share (%)



(b) Average ownership concentration (pp)



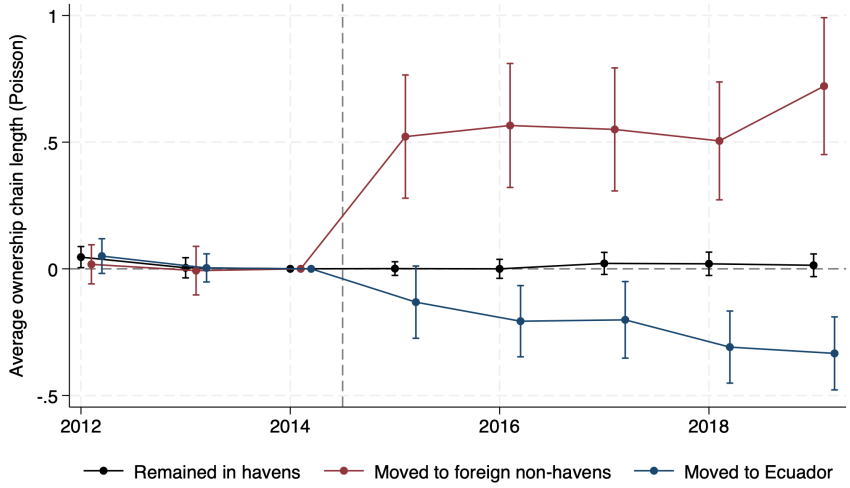
(c) Average ownership concentration (Log)



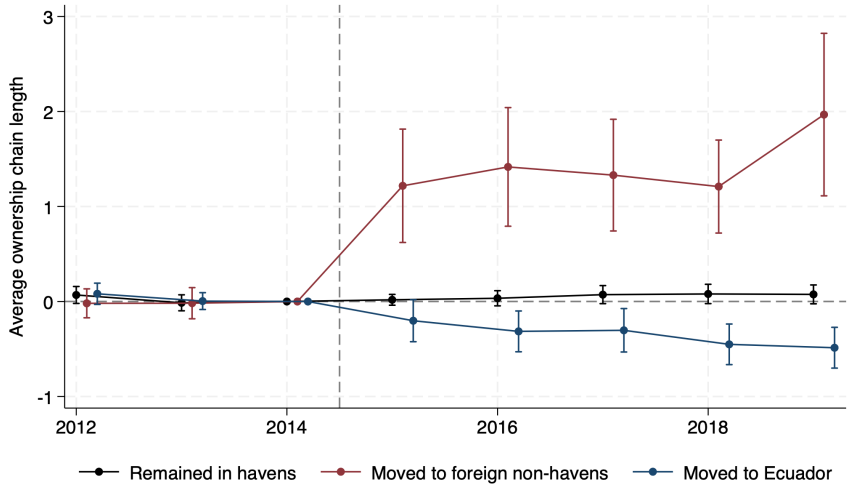
(d) Average ownership concentration (Poisson)

Note: These figures display difference-in-differences coefficients for alternate parameterizations of terminal ownership concentration. Average ownership concentration is defined on the firm-year level as 100 divided by the number of observed terminal owners. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.13: Difference-in-differences:
Average ownership chain length, by ex-post response in terminal owner domicile group



(a) Poisson



(b) Levels

Note: These figures display difference-in-differences estimates following Equation (2), using a multi-level treatment that compares different subsets of exposed firms against all control firms. Subsets of control firms are defined ex-post based on having reallocated majority terminal ownership between 2015 and 2019 to (in red) foreign non-havens, (in navy) Ecuador, or (in black) maintained in tax havens. In both panels, the dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.6: Difference-in-differences: additional mechanisms of ownership change

	Number of terminal owners (Poisson)		Log average terminal ownership concentration		Ownership share of plurality terminal owner		Average ownership chain length
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exposure × Post	0.418	0.0440	-0.0980	-0.299	-3.630	-9.880	0.0740
	(.176)	(.122)	(.034)	(.236)	(.871)	(3.63)	(.046)
Constant	3.890	5.660	3.500	2.360	69.60	68.70	1.650
	(.013)	(.001)	(.003)	(.022)	(.082)	(.344)	(.004)
TWFE	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	Y	N	Y	N	Y	N
N	28,362	-	28,278	28,135	28,280	28,137	28,278
Unique firms	3,928	3,902	3,928	3,901	3,928	3,901	3,928
Adjusted R2	0.870	0.947	0.662	0.725	0.738	0.644	0.719

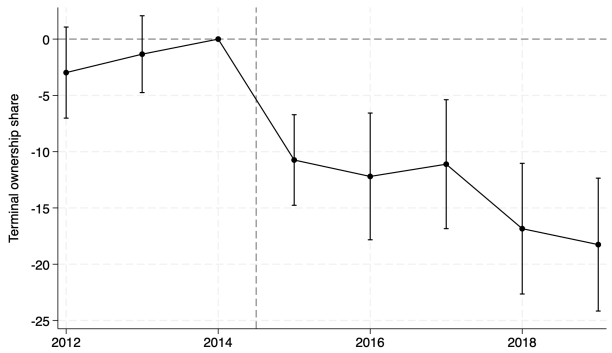
Note: This table summarizes the impacts of the reform on additional ownership characteristics following our our main difference-in-differences specification. Average terminal ownership concentration is calculated as 100 divided by the number of terminal owners. Average ownership chain length is calculated as the average number of ownership layers separating a firm and each of its terminal owners in a given year, weighted by the ownership share of each respective terminal owner. Column (7) omits a weighted specification due to a persistent differential pre-trend. Poisson specifications use frequency weights instead of analytic weights. Standard errors are clustered on the firm-level.

Table A.7: Modified AR1 tests of mean reversion by sample definition: Placebo groups set in 2013

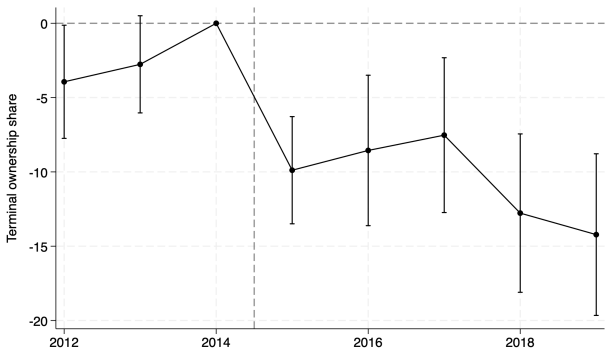
	Main definition	Caribbean havens v. Colombia	All havens v. Colombia	All havens v. Latin American non-havens
	(1)	(2)	(3)	(4)
$y_{i,t-1} \times Haven_{i,2013}$	-0.182	-0.169	-0.144	-0.212
	(.0331)	(.112)	(.105)	(.107)
N	55,322	1,010	1,151	1,819
Adjusted R2	0.686	0.711	0.711	0.655

Note: This table summarizes presents the results of regressions of the form: $y_{it} = \alpha + \xi Haven_{i,2013} + \beta y_{i,t-1} + \gamma\beta y_{i,t-1} Haven_{i,2013} + u_{it}$. In this exercise, we restrict observations to years 2013 and 2014 and construct "Placebo" exposure groups based on firms' 2013 ownership profile according to the geography definition given in the respective column. For brevity, only coefficients $\hat{\beta}$ are presented. Parentheses contain heteroskedasticity-robust standard errors.

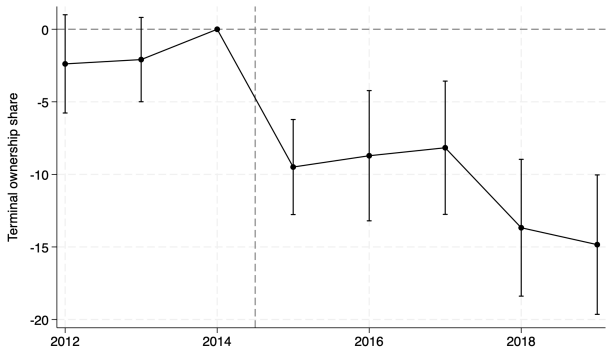
Figure A.14: Difference-in-differences: Terminal ownership in baseline domicile
Robustness by sample definition



(a) Caribbean havens v. Colombia



(b) All havens v. Colombia



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

Note: These figures display the difference-in-differences coefficients estimating the change in terminal ownership in firms' baseline domicile groups. Each panel uses a different definition of tax haven and foreign non-haven to define the exposure and control groups as indicated by its label. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Table A.8: Placebo test for contamination of control group:
Terminal ownership in foreign non-havens

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}\{Haven\ outflows_{i,2014} > 0\} \times$ Post	8.670							
	(1.67)							
Below median positive $\frac{Haven\ outflows_{i,2014}}{Revenue_{i,2014}} \times$ Post		6.670						
		(2.29)						
Above median positive $\frac{Haven\ outflows_{i,2014}}{Revenue_{i,2014}} \times$ Post		10.80						
		(2.22)						
$\mathbb{1}\{Haven\ inflows_{i,2014} > 0\} \times$Post			-0.392					
			(4.63)					
Below median positive $\frac{Haven\ inflows_{i,2014}}{Revenue_{i,2014}} \times$ Post				9.990				
				(5.71)				
Above median positive $\frac{Haven\ inflows_{i,2014}}{Revenue_{i,2014}} \times$ Post				-10.90				
				(6.66)				
Had a wholly-owned haven intermediary in 2014 × Post						11.70	12	
						(3.23)	(3.23)	
Had a $\geq$ 50% haven intermediary in 2014 × Post							1.150	
							(2.53)	
Had a $\geq$ 10% haven intermediary in 2014 × Post							17.70	
							(4.12)	
Had any haven intermediary in 2014 × Post					8.130			
					(1.9)			
ICIJ × Post								-2.180
								(6.64)
Constant	68.50	68.50	69.40	69.40	68.80	69	68.90	69.40
	(.165)	(.164)	(.053)	(.05)	(.125)	(.089)	(.119)	(.038)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	N	N	N	N	N	N	N
N	23,970	23,970	23,970	23,970	23,970	23,970	23,970	23,970
Unique firms	3,340	3,340	3,340	3,340	3,340	3,340	3,340	3,340
Adjusted R2	0.513	0.513	0.511	0.511	0.512	0.512	0.513	0.511

Note: This table summarizes a series of difference-in-differences regressions studying sources of potential exposure of our control group of firms to the reform. All of the regressions only consider control firms, using terminal ownership in foreign non-havens as the dependent variable. Each column corresponds with a different difference-in-differences regression that relative to an omitted reference group, as indicated by the complement of each column's populated rows. For brevity, only the difference-in-differences coefficients are displayed. Standard errors are clustered on the firm level. This table is referred to in Section 4.3.

Table A.9: Difference-in-differences for continuous exposure:
The effect of the pecuniary surcharge on terminal ownership in baseline domicile group:
Minority exposure firms

	Levels		Binary		Poisson		Log	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Projected tax surcharge × Post	-3.180		0.0310		-0.0930		-0.294	
	(2)		(.039)		(.089)		(.077)	
Projected tax surcharge × Ex-post verified × Post		-12.20		-0.239		-0.577		-0.298
		(5.39)		(.099)		(.403)		(.282)
Constant	20.70	24	0.695	0.890	3.310	3.440	3.140	3.110
	(.14)	(.349)	(.003)	(.007)	(.006)	(.016)	(.004)	(.012)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y
N	10,110	10,104	10,110	10,104	10,110	10,104	7,000	6,992
Unique firms	1,377	1,376	1,377	1,376	1,377	1,376	1,329	1,328
Adjusted R2	0.471	0.455	0.453	0.355	0.426	0.414	0.564	0.560

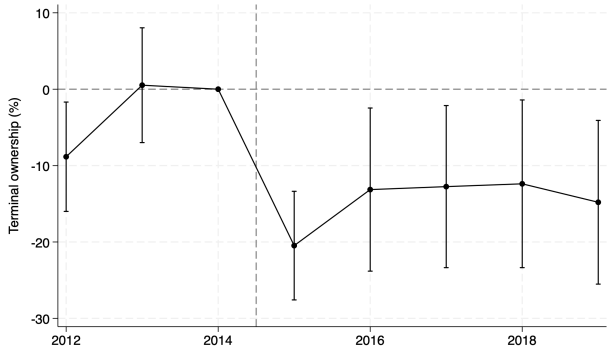
Note: This table presents estimated of the model $y_{it} = \alpha_i + \delta_t + \gamma \cdot PredictedSurcharge_i Post_t + \varepsilon_{it}$. The dependent variable in all specifications consists of different parameterizations of terminal ownership in baseline domicile group (tax haven terminal ownership for exposure firms and foreign non-haven terminal ownership for control firms). The estimation sample here consists of only minority exposure and control firms in our core sample. The even-numbered columns feature an additional interaction indicating whether firms' tax haven presence was ex-post verified by the tax authorities, which we argue indicated a more credible administration of the surcharge. Other coefficients are omitted for legibility. Standard errors are clustered on the firm-level.

Table A.10: Difference-in-differences: profit breakdown

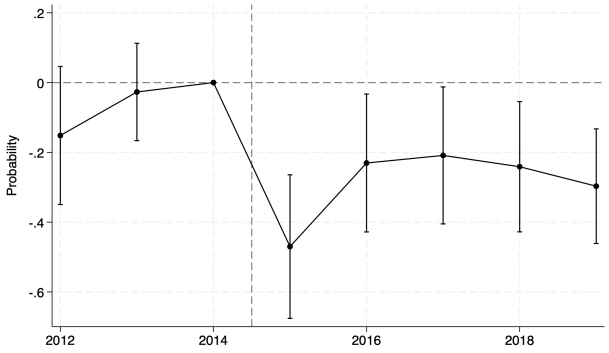
	Revenue		Expenses		Profitability	
	Levels	Log	Levels	Log	$\frac{Profit_{it}}{Revenue_{it}}$	$\frac{Profit_{it}}{Assets_{it}}$
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure × Year ≥ 2015	328,542	0.0110	292,004	-0.00400	0.0140	0.0190
	(240,521)	(.07)	(220,056)	(.066)	(.006)	(.004)
Constant	5,434,402	12.90	5,086,320	12.80	0.0970	0.0850
	(22,734)	(.006)	(20,800)	(.006)	(.001)	(0)
TWFE	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	N	N	N	N	N
N	28,364	25,047	28,364	26,265	25,047	27,630
Unique firms	3,926	3,844	3,926	3,886	3,844	3,908
Adjusted R2	0.943	0.758	0.942	0.803	0.534	0.382

Note: Note: This table summarizes the difference-in-differences results pertaining to revenues and expenses. Differences in sample size across columns are due to presence of zeros in dependent variables in log specifications. Standard errors are clustered on the firm-level.

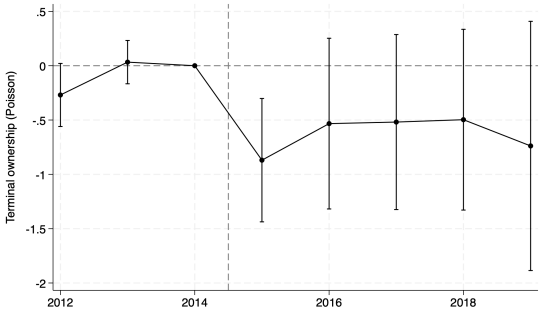
Figure A.15: Difference-in-differences for continuous exposure:
The effect of the pecuniary surcharge on terminal ownership in baseline domicile group:
Minority exposure firms



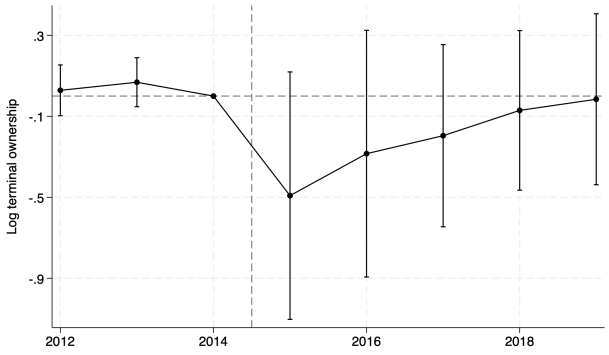
(a) Levels terminal ownership
in baseline domicile



(b) Any terminal ownership
in baseline domicile



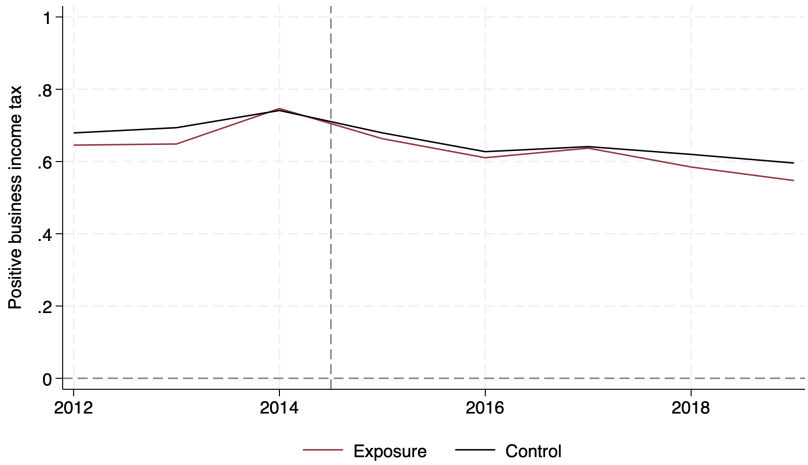
(c) Terminal ownership
in baseline domicile (Poisson)



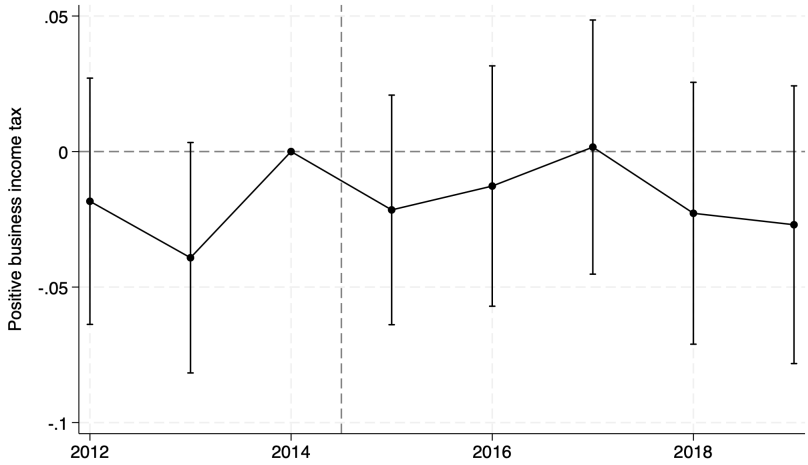
(d) Terminal ownership
in baseline domicile (log)

Note: this figure presents different parameterizations of the change in terminal group ownership as estimated by the continuous difference-in-differences equation $y_{it} = \alpha_i + \delta_t + \gamma \cdot PredictedSurcharge_i Post_t + \varepsilon_{it}$. The dependent variable in all specifications consists of different parameterizations of terminal ownership in baseline domicile group (tax haven terminal ownership for exposure firms and foreign non-haven terminal ownership for control firms). The sample in all plots consists only of foreign minority-owned exposure and control firms. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level.

Figure A.16: Positive BIT payment (extensive margin)



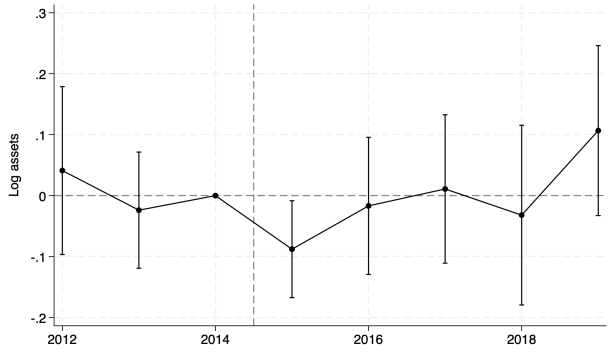
(a) Positive BIT liability (time series)



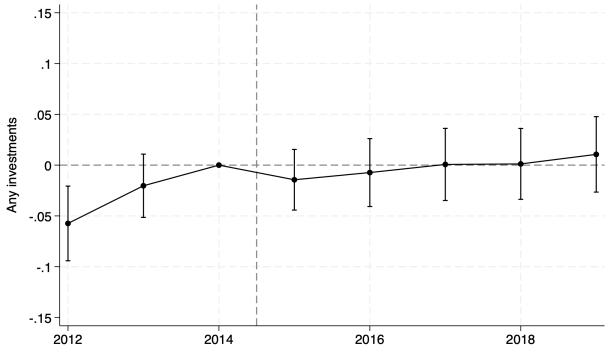
(b) Positive BIT liability (DD)

Note: These figures display difference-in-differences results that illustrate components of the "bindingness" of the BIT surcharge among firms that maintain majority shareholdership in tax havens and pay corporate income tax. Panel (a) uses exposure firms with positive BIT obligation in the exposure group; Panel (b) uses exposure firms with positive BIT and majority tax haven shareholdership 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 BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

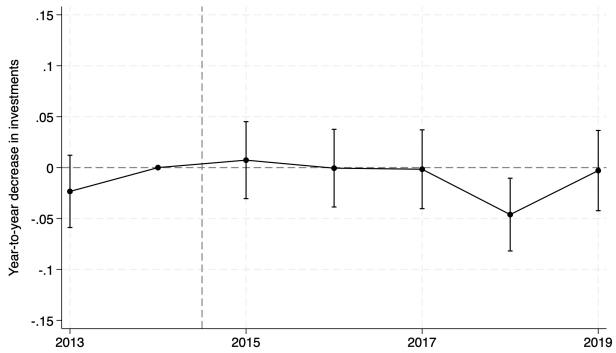
Figure A.17: Tax reform impact on firm financial activity



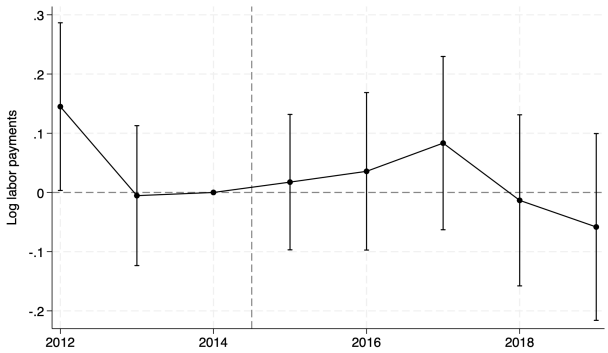
(a) Total assets



(b) Any new investments



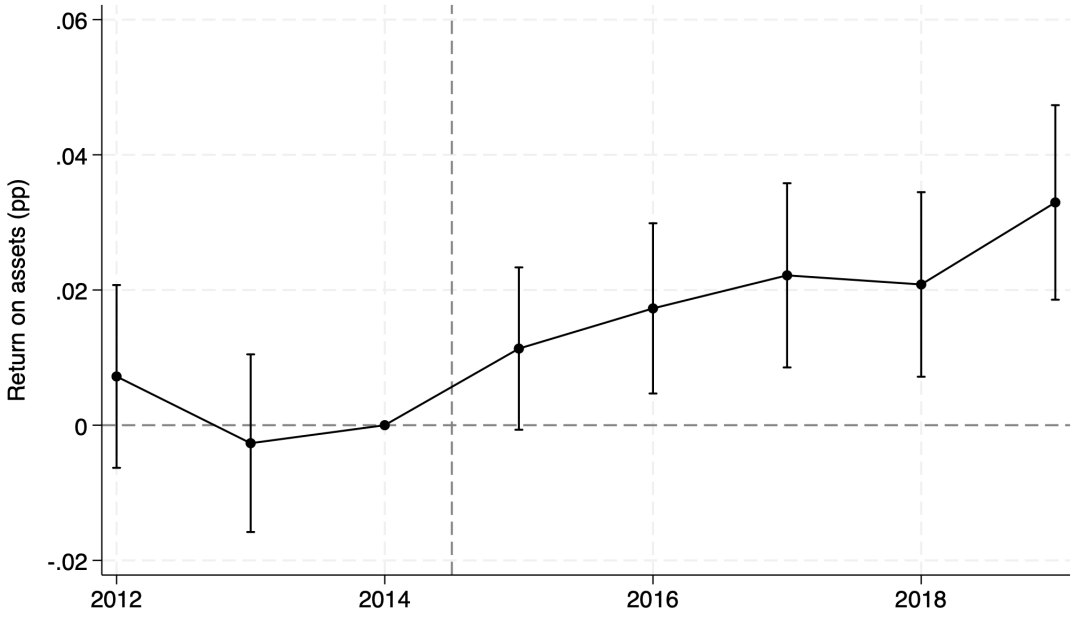
(c) Any year-to-year decrease in investments



(d) Labor expense

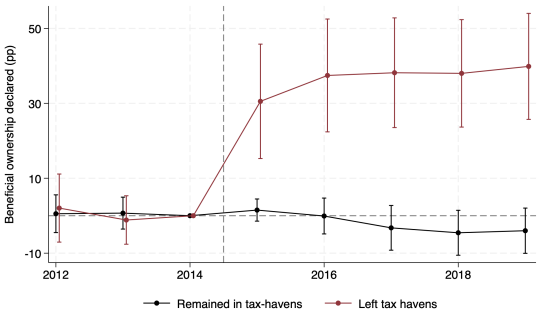
Note: These figures display difference-in-differences results pertaining to revenue-generating expenses. Panel (c) begins in 2013 because the dependent variable takes year-to-year first differences. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

Figure A.18: Tax reform impact on return on assets

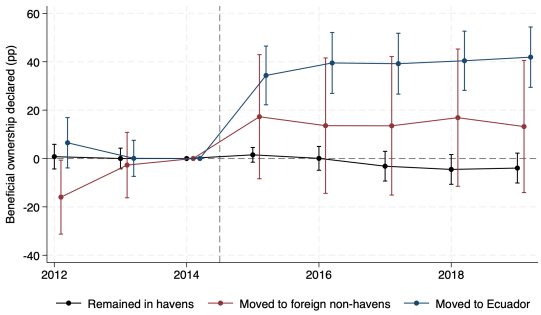


Note: This figure displays the difference-in-differences results for return on assets. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals are constructed using standard errors clustered on the firm-level.

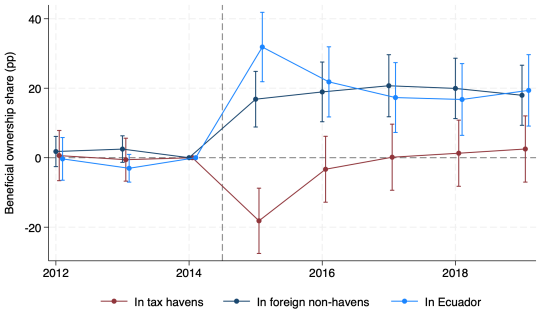
Figure A.19: Breakdown of beneficial ownership (BO) response



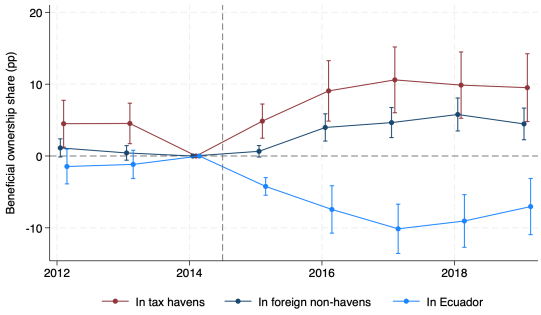
(a) BO revealed, by having left havens



(b) BO revealed, by ex-post domicile



(a) BO by country type
Among firms exiting haven ownership (pp)



(b) BO by country type
Among firms remaining in haven ownership (pp)

Note: These figures display for a series of difference-in-differences designs that evaluate the change in beneficial ownership declared (and the domicile of beneficial ownership) conditional on firms' ex-post majority domicile of terminal ownership. In all specifications, firms exposure firms are defined to a category based on the domicile of their 2015 terminal ownership and compared against all majority foreign control firms. The dashed gray vertical line marks the implementation of the BIT surcharge. Confidence intervals use standard errors clustered on the firm-level.

Table A.11: IV results: impact of business taxation on firm activity

Panel (a) First stage

	τ		$\ln \tau$		$\ln(1-\tau)$	
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted surcharge × Post	.0044	-.0002	.0184	-.0008	-.0058	.0002
	(.0003)	(.0004)	(.0012)	(.0017)	(.0004)	(.0005)
Predicted surcharge × Ex-post verification × Post		.009		.0378		-.0118
		(.0005)		(.002)		(.0006)
TWFE	Y	Y	Y	Y	Y	Y
F-statistic	118	317	114	339	118	309
N	18,256	18,256	18,249	18,249	18,256	18,256
Unique firms	3,314	3,314	3,313	3,313	3,314	3,314
Adjusted R2	.377	.407	.369	.399	.386	.418

Panel (b): IV results

	Log CIT payments			Log gross profit		Log investment		Log assets		Log labor payments	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
τ	9.09										
	(3.68)										
$\ln \tau$		2.19		1.24		2.1		-.262		-1.44	
		(.881)		(.92)		(3.17)		(.451)		(.671)	
$\ln(1-\tau)$			-6.9		-4.02		-6.47		.839		4.59
			(2.8)		(2.93)		(9.74)		(1.44)		(2.13)
TWFE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weight (2014 assets)	N	N	N	N	N	N	N	N	N	N	N
N	18,249	18,249	18,249	16,934	16,939	2,657	2,657	18,185	18,191	16,480	16,485
Unique firms	3,313	3,313	3,313	3,202	3,202	675	675	3,300	3,301	3,041	3,042

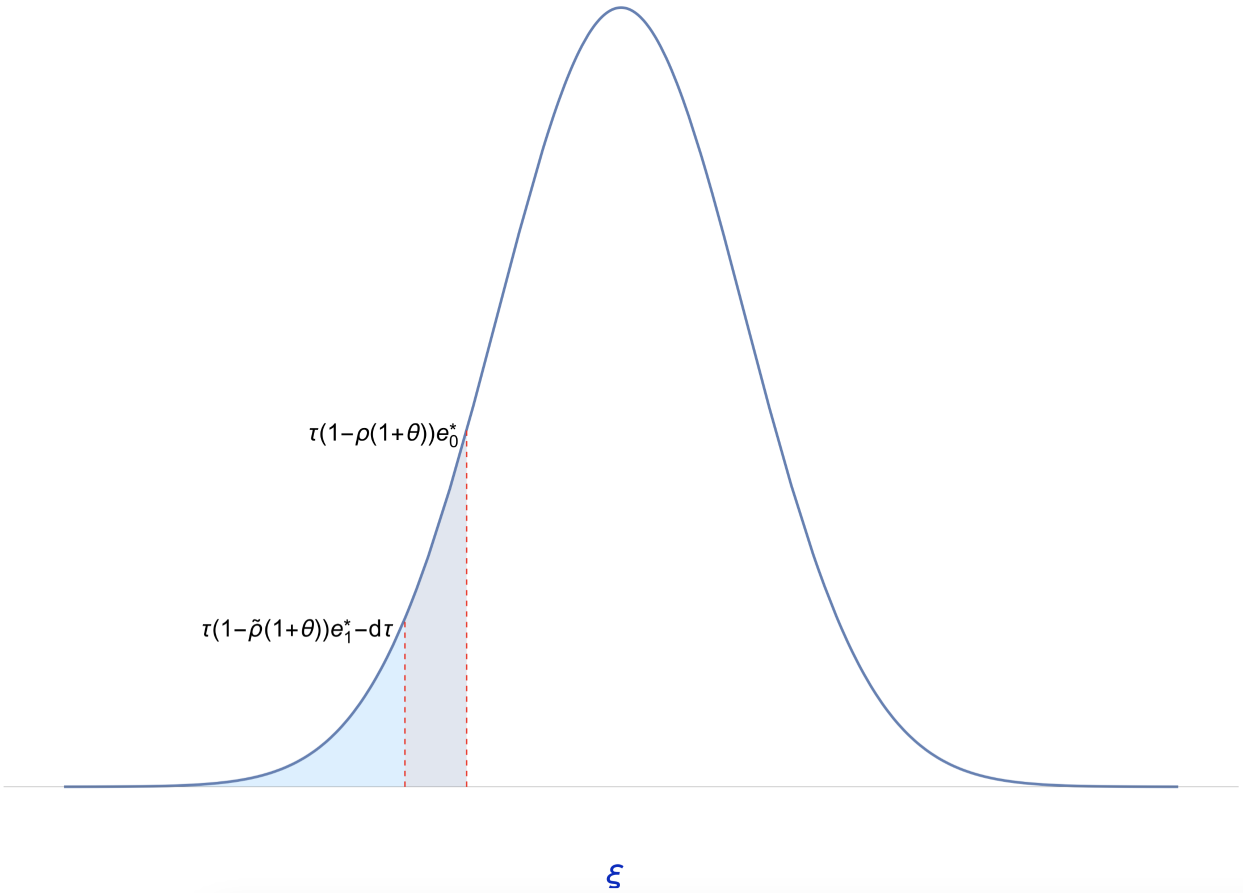
Note: This table presents IV difference-in-differences results. Panel (a) presents first stage results, where odd columns use the interaction of predicted surcharge and a post-reform indicator as the instrument, and even columns also include an interaction for ex-post verification of terminal ownership in tax havens. All of the IV difference-in-differences results in Panel (b) use this latter specification. Standard errors are clustered on the firm-ID level.

Table A.12: Descriptive statistics of firms by ex-post majority ownership domicile (2014)

	Remained in havens	Majority in foreign non-havens		Majority in Ecuador		Other	
	Mean	Mean	Difference	Mean	Difference	Mean	Difference
Log assets	13.9	14.6	.688	12.7	-1.15	14.5	.573
			(.298)		(.301)		(.41)
Log revenue	12.7	13.9	1.24	12	-.721	13.9	1.2
			(.408)		(.306)		(.699)
Labor share of costs	.248	.171	-.077	.27	.0218	.183	-.0652
			(.029)		(.0301)		(.0444)
Log gross profit	10.3	11.1	.777	9.96	-.383	11.7	1.33
			(.432)		(.344)		(.488)
Log CIT liability	8.95	9.54	.588	8.3	-.657	10.3	1.38
			(.423)		(.304)		(.47)
CIT liability (1000s USD)	130	105	-24.5	19.3	-110	129	-.215
			(57)		(35.8)		(85)
Any outflow to havens	.245	.32	.0747	.12	-.126	.227	-.018
			(.0692)		(.0398)		(.0918)
Ratio of haven outflows to revenue	.049	.0407	-.00827	.012	-.0369	.0412	-.00777
			(.0225)		(.0103)		(.027)
Number of firms	424	50		92		22	

Note: This table reports 2014 descriptive statistics for firms based on their 2015 ex-post terminal ownership domicile response. "Remained in havens", "Majority in foreign non-havens", and "Majority in Ecuador" indicate treatment firms with a majority of its terminal ownership attributable to each respective domicile group in 2015. Because these categories do not partition the space of ownership, 22 exposure firms are in a non-allocable "Other" category. "Difference" columns estimate the difference in 2014 of each respective group and variable relative to firms that remained in havens, with heteroskedasticity-robust standard errors in parentheses.

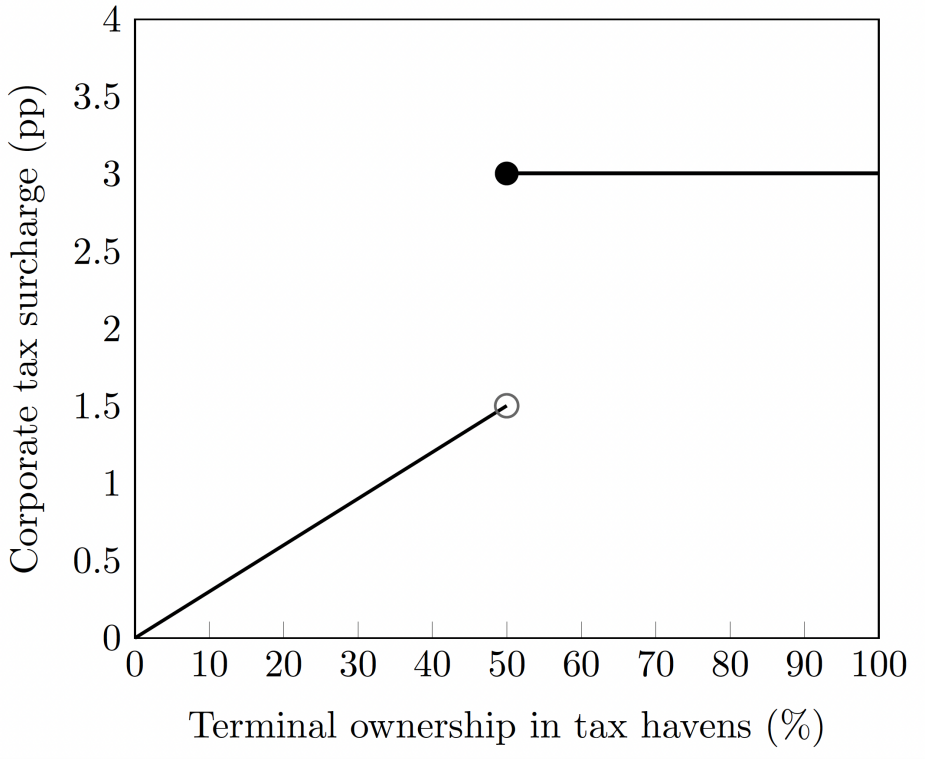
Figure A.20: Cutoff points for haven usage based on fixed costs ξ



Note: This figure shows a conceptual illustration for an arbitrary distribution of fixed costs of tax haven usage ξ. In the baseline scenario, for an interior optimum underreporting share e^* and induced audit rate $\rho(e^*)$, all individuals with fixed costs less than $\tau(1-\rho(1+\theta))e^*$ make use of tax havens. In the case corresponding with the policy, individuals with fixed costs in the region less than the baseline upper bound and greater than $\tau(1-\tilde{\rho}(1+\theta))e^* - d\tau$ (corresponding with the shaded darker blue region), are induced to exit tax haven usage, where all individuals with fixed costs less than this latter amount (in the shaded light blue region) maintain their tax haven usage.

Appendix B Data and environmental appendix

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



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

Table B.1: Descriptive statistics and ownership of Ecuadorian Firms (2014)

	Mean	SD	p10	Median	p90	p99	Count	N
Firm Characteristics:								
Revenue (1000s USD)	1,929,413	16,843,744	4,300	137,447	2,361,029	30,412,296	62,350	62,350
Log revenue	11.6	2.68	8.37	11.8	14.7	17.2	62,350	62,350
Log taxable profit	8.98	2.56	5.63	9.16	12	14.8	48,065	62,350
Has taxable profit revenue	.771						62,350	62,350
CIT liability (1000s USD)	29,311	622,357	0	834	25,154	424,830	62,350	62,350
Log CIT liability	7.46	2.55	4.11	7.65	10.5	13.3	48,060	62,350
CIT rate	.22	.00392	.22	.22	.22	.22	48,073	62,350
Log assets	11.6	2.42	8.27	11.7	14.5	17.2	61,354	62,350
Gross profit margin	.0927	.173	0	.0335	.231	.993	62,350	62,350
Labor share of costs	.312	.922	0	.223	.743	1	61,823	62,350
Terminal ownership:								
Ecuadorian person (%)	85.8	32.1	8.92	100	100	100	62,350	62,350
Foreign person (%)	3.65	16.8	0	0	0	100	62,350	62,350
Ecuadorian non-person entity (%)	6.42	22.1	0	0	6.25	100	62,350	62,350
Foreign non-person entity (%)	1.63	11.9	0	0	0	99	62,350	62,350
Residual (%)	1.4	11.1	0	0	0	90	61,619	62,350
Ownership characteristics:								
Ownership share of plurality owner	61.3	30.2	20	52	99.8	100	62,283	62,350
Average share of terminal owner	38.4	19.7	8.33	50	50	100	62,283	62,350
Number of terminal owners	8.99	392	2	2	10	78	62,350	62,350
Avg. ult. shareholder chain	1.05	.347	1	1	1	2.98	62,283	62,350
Ownership reporting compliance:								
Filed APS	.988						62,350	62,350
Declared 100% nominal ownership	.967						61,619	62,350
Declared any beneficial ownership	.96						62,350	62,350
Beneficial ownership declared (%)	89.8	27.7	50	100	100	100	62,350	62,350
Declared 100% beneficial ownership	.829						62,350	62,350
Cross-border flows:								
Any outflow to havens	.0773						62,350	62,350
Ratio of haven outflows to revenue	.0198	1.46	0	0	0	.145	62,350	62,350
Any inflow from havens	.0097						62,350	62,350
Ratio of haven inflows to revenue	.0316	3.61	0	0	0	0	62,350	62,350
Any outflow to non-havens	.262						62,350	62,350
Ratio of non-haven outflows to revenue	29	4,608	0	0	.144	.87	62,350	62,350
Any inflow from non-havens	.122						62,350	62,350
Ratio of non-haven inflows to revenue	259	58,249	0	0	.00453	1.34	62,350	62,350

Note: This table displays descriptive statistics of firms in our core sample for 2014 from the form F101 business income tax declarations, the APS ownership data, and the MID cross-border flows data.

Table B.2: 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
Revenue (1000s USD)	2,115	186
		(1,086)
Log revenue	10.3	-1.28
		(.046)
Gross profit (1000s USD)	459	306
		(311)
Log gross profit	8.13	-.821
		(.068)
Log taxable profit	6.9	-2.08
		(.113)
Has taxable profit revenue	.071	-.7
		(.003)
CIT liability (1000s USD)	81.1	51.8
		(68.1)
Log CIT liability	5.54	-1.92
		(.106)
CIT rate	.217	-.003
		(.001)
Log assets	9.59	-1.97
		(.042)
Gross profit margin	.118	.025
		(.004)
Labor share of costs	.368	.056
		(.007)
Any outflow to havens	.142	-.105
		(.012)
Ratio of haven outflows to revenue	.001	-.004
Any outflow to non-havens	.526	-.312
		(.017)
Ratio of non-haven outflows to revenue	.009	-.041
		(.001)
Active firms never filing APS	14,830	
Core sample firms	62,350	

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 core 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 core sample if they also have filed the APS at least once between 2012 and 2014.

Table B.3: Covariate balance of active firms
based on whether operate in an excluded industry

	Firms in excluded industries	Difference relative to main sample
Revenue (1000s USD)	1,252	-678
		(590)
Log revenue	10.3	-1.32
		(.031)
Gross profit (1000s USD)	278	125
		(170)
Log gross profit	8.12	-.839
		(.046)
Log taxable profit	6.85	-2.12
		(.077)
Has taxable profit revenue	.08	-.691
		(.002)
CIT liability (1000s USD)	50.7	21.4
		(37.2)
Log CIT liability	5.41	-2.06
		(.075)
CIT rate	.218	-.002
		(0)
Log assets	10.8	-.726
		(.03)
Filed APS in 2014	.392	-.596
		(.002)
APS adds to 100	.803	-.166
		(.003)
Beneficial ownership (BO) declared (%)	74.2	-15.7
		(.303)
100% of BO declared	.622	-.208
		(.004)
Ownership share of plurality owner (%)	50.9	-10.4
		(.312)
Avg. ult. shareholder chain	1.01	-.041
		(.002)
Any outflow to havens	.108	-.139
		(.008)
Ratio of haven outflows to revenue	.001	-.004
		(.000)
Any outflow to non-havens	.491	-.347
		(.012)
Ratio of non-haven outflows to revenue	.01	-.039
		(.001)
Firms excluded based on industry	27,234	
Core sample firms	62,350	

Note: This table displays summary statistics and results from a series of cross-sectional univariate regressions of 2014 firm business characteristics on an indicator for whether the firm operates in an industry exempt from

Table B.4: Summary statistics for excluded industry firms by industry

Industry	N	Log revenue		Log gross profit		Log assets	
		Mean	SD	Mean	SD	Mean	SD
Entities with social mission	50	11.2	2.03	7.13	2.38	11.4	2.21
Trusts	3734	10.3	4.53	10.6	3.28	12.5	2.94
Investment funds	10	13.7	1.47	12.9	1.53	16.2	1.51
Non-profit entities	22681	10.2	2.73	7.73	2.87	10	2.8
International organizations	16	11.4	3.18	8.36	3.17	11.7	2.83
Petroleum industry	59	17.2	2.48	16.9	1.37	17.8	2.63
Public sector	665	11.8	3.43	10.2	3.77	12.7	3.98
Estates	19	11.5	2.3	9.87	1.72	12.9	1.07

Note: This table displays summary statistics for firms based on their specific industry excluded from the business income tax surcharge.

Table B.5: Covariate balance of core sample v. inactive firms

	Firms without revenue in 2014	Difference relative to main sample
Assets (1000s USD)	441	-1,513
		(229)
Log assets	8.5	-3.06
		(.017)
Liabilities (1000s USD)	126	-1,184
		(110)
Log liabilities	9.27	-1.66
		(.029)
Debt ratio	69.5	66.2
		(33.2)
Log taxable profit	4.91	-4.07
		(.594)
Has taxable profit revenue	0	-.771
		(.002)
Filed APS in 2014	.311	-.677
		(.001)
Filed APS in 2012-2014	.379	-.621
		(.001)
APS adds to 100	.941	-.028
		(.001)
Terminal ownership in havens (%)	.678	-.264
		(.048)
Beneficial ownership (BO) declared (%)	86.9	-3.03
		(.169)
100% of BO declared	.804	-.026
		(.002)
Avg. ult. shareholder chain	1.02	-.031
		(.002)
Any haven exit	.109	-.138
		(.007)
Any non-haven exit	.618	-.22
		(.011)
Inactive firms	58,248	
Core sample firms	62,350	

Note: This table displays summary statistics and results from a series of cross-sectional univariate regressions of 2014 firm business characteristics on an indicator for whether the firm is excluded from our core sample on grounds of not having filed a business income tax declaration with positive revenue in 2014. Parentheses contain heteroskedasticity-robust standard errors.

Table B.6: Covariate balance of core sample v. firms with incomplete APS

	Mean	Difference
Log revenue	11.6	.052
		(.086)
Log assets	12.6	1.08
		(.08)
Filed APS in 2014	.915	-.075
		(.008)
Percent declared (%)	30.3	-69.6
		(1)
Terminal ownership in havens (%)	.006	-.946
		(.037)
Terminal ownership in havens (% of declared)	.6	-.4
		(.2)
Terminal ownership in foreign non-havens (%)	.073	-5.32
		(.085)
Terminal ownership in foreign non-havens (% of declared)	5	-.5
		(.7)
Terminal ownership in Ecuador (%)	30.1	-63.5
		(.957)
Terminal ownership in Ecuador (% of declared)	94.4	0.9
		(.7)
Beneficial ownership (BO) declared (%)	27.6	-63.6
		(.925)
Beneficial ownership (BO) declared (% of declared)	88.7	-2.5
		(.9)
Avg. ult. shareholder chain	1.11	.06
		(.017)
Has a haven strict intermediary	.078	.059
		(.007)
Has a haven strict intermediary (conditional on having an intermediary)	.372	-.13
		(.031)
Any outflow to havens	.09	.013
		(.008)
Ratio of haven outflows to revenue	.008	-.011
		(.006)
Any outflow to non-havens	.213	-.05
		(.011)
Firms with incomplete ownership declarations	1,315	
Core sample firms with complete declarations	61,035	

Note: This table displays summary statistics and results from a series of cross-sectional univariate regressions of 2014 firm business characteristics on an indicator for whether the firm filed an APS whose terminal ownership added to less than 100%. The sample consists of our core sample of firms. Variables including "(% of declared)" pertain to ownership characteristics normalized by the amount of overall terminal ownership declared. Parentheses contain heteroskedasticity-robust standard errors.

Table B.7: Panel balance of the core sample

Year	Filed APS	Complete APS (Conditional on filing)	Filed F101	Filed F101 with positive revenue	Filed both APS and F101	Filed APS and F101 With positive revenue
2012	.823	.95	.836	.737	.821	.726
2013	.914	.956	.929	.839	.912	.827
2014	.988	.967	1	1	.988	.988
2015	.956	.972	.969	.873	.948	.857
2016	.897	.987	.921	.788	.881	.76
2017	.872	.986	.885	.737	.857	.721
2018	.827	.99	.868	.714	.813	.674
2019	.795	.991	.781	.632	.731	.598

Note: This table tabulates various measures of panel balance for our core sample over time relative to the full count of 62,350 firms in 2014.

Table B.8: Descriptive statistics majority exposure firms (2014)

	Mean	SD	p10	Median	p90	p99	Count	N
Firm Characteristics:								
Revenue (1000s USD)	6,239,985	23,293,255	8,793	410,006	13,348,707	96,955,267	588	588
Log revenue	12.7	3.05	9.08	12.9	16.4	18.4	588	588
Log taxable profit	10.5	2.6	7.03	10.4	13.7	16.2	439	588
Has taxable profit revenue	.747						588	588
CIT liability (1000s USD)	110,280	631,148	0	2,908	134,250	2,044,385	588	588
Log CIT liability	8.96	2.6	5.52	8.92	12.2	14.7	439	588
CIT rate	.22	.0000123	.22	.22	.22	.22	439	588
Log exports	13.5	2.87	9.8	14.1	16.8	18.7	81	588
Log assets	13.8	2.31	10.8	13.9	16.7	18.5	585	588
Gross profit margin	.122	.214	0	.0326	.392	.985	588	588
Return on assets	.0921	.368	0	.015	.214	.917	585	588
Labor share of costs	.243	.246	0	.154	.633	.935	587	588
Terminal ownership:								
Ecuadorian person (%)	5.14	11.8	0	0	21	50	588	588
Foreign person (%)	2.03	8.21	0	0	3	50	588	588
Ecuadorian non-person entity (%)	1.59	7.63	0	0	.0161	50	588	588
Foreign non-person entity (%)	.969	6.16	0	0	0	49.3	588	588
Residual (%)	.0218	4.62	0	0	0	.5	584	588
Terminal ownership in baseline domicile (%)	90	16.6	56.3	99.9	100	100	588	588
Ownership characteristics:								
Ownership share of plurality owner	80.3	24.2	49.5	98	100	100	588	588
Average share of terminal owner	43.9	19.6	14.3	50	50	100	588	588
Number of terminal owners	3.37	3.76	2	2	7	18	588	588
Avg. ult. shareholder chain	1.92	.965	1	2	3	4.97	588	588
Ownership reporting compliance:								
Filed APS	.993						588	588
Declared 100% nominal ownership	.983						584	588
Declared 100% beneficial ownership	.327						588	588
Cross-border flows:								
Any outflow to havens	.231						588	588
Ratio of haven outflows to revenue	.0615	.426	0	0	.0694	1.1	588	588
Any inflow from havens	.0374						588	588
Ratio of haven inflows to revenue	.259	5.92	0	0	0	.539	588	588
Any outflow to non-havens	.442						588	588
Ratio of non-haven outflows to revenue	2.33	47	0	0	.437	4.43	588	588
Any inflow from non-havens	.381						588	588
Ratio of non-haven inflows to revenue	96.5	1,661	0	0	.883	79.3	588	588

Note: This table displays descriptive statistics of majority exposure firms in 2014.

Table B.9: Descriptive statistics of majority control firms (2014)

	Mean	SD	p10	Median	p90	p99	Count	N
Firm Characteristics:								
Revenue (1000s USD)	7,091,598	38,647,103	8,676	349,673	9,955,425	137,679,589	3,352	3,352
Log revenue	12.5	3.03	9.07	12.8	16.1	18.7	3,352	3,352
Log taxable profit	10.3	2.78	6.96	10.3	13.8	16.3	2,486	3,352
Has taxable profit revenue	.742						3,352	3,352
CIT liability (1000s USD)	117,535	838,522	0	2,222	125,291	1,993,614	3,352	3,352
Log CIT liability	8.81	2.76	5.45	8.82	12.3	14.8	2,485	3,352
CIT rate	.22	.00497	.22	.22	.22	.22	2,486	3,352
Log exports	12.6	2.67	9.17	12.5	16	18.6	564	3,352
Log assets	12.8	2.56	9.53	12.9	16	18.5	3,330	3,352
Gross profit margin	.104	.188	0	.0342	.282	.982	3,352	3,352
Return on assets	223	9,101	0	.0402	.337	.98	3,330	3,352
Labor share of costs	.29	.27	.00467	.217	.707	.992	3,333	3,352
Terminal ownership:								
Ecuadorian person (%)	11.2	18.2	0	0	50	50	3,352	3,352
Foreign person (%)	59.1	41.3	0	70	100	100	3,352	3,352
Ecuadorian non-person entity (%)	1.44	7.32	0	0	0	50	3,352	3,352
Foreign non-person entity (%)	27.8	42.4	0	0	100	100	3,352	3,352
Residual (%)	.365	4.28	0	0	0	14.2	3,328	3,352
Terminal ownership in baseline domicile (%)	87	19.1	50	99.9	100	100	3,352	3,352
Ownership characteristics:								
Ownership share of plurality owner	68.5	27.2	33	65	100	100	3,352	3,352
Average share of terminal owner	42	20.9	14.3	50	50	100	3,352	3,352
Number of terminal owners	7.12	67.2	2	2	7	70	3,352	3,352
Avg. ult. shareholder chain	1.54	1.02	1	1	2.96	5.92	3,352	3,352
Ownership reporting compliance:								
Filed APS	.993						3,352	3,352
Declared 100% nominal ownership	.979						3,328	3,352
Declared 100% beneficial ownership	.612						3,352	3,352
Cross-border flows:								
Any outflow to havens	.177						3,352	3,352
Ratio of haven outflows to revenue	.155	5.44	0	0	.0087	.489	3,352	3,352
Any inflow from havens	.031						3,352	3,352
Ratio of haven inflows to revenue	.37	13.9	0	0	0	.0541	3,352	3,352
Any outflow to non-havens	.55						3,352	3,352
Ratio of non-haven outflows to revenue	8.09	176	0	.00326	.568	9.98	3,352	3,352
Any inflow from non-havens	.379						3,352	3,352
Ratio of non-haven inflows to revenue	4,700	251,177	0	0	.843	78	3,352	3,352

Note: This table displays descriptive statistics of majority control firms in 2014.

Table B.10: Demonstration of haven and non-haven flows:
Majority exposure and control firms observed in the MID (2012-2014)

	Exposure	Control
Haven flows		
Share of years with a haven outflow	.203	.163
Any haven outflow	.298	.245
Average haven outflows to revenue ratio	.0368	.0154
Share of years with a haven inflow	.0295	.0261
Any haven inflow	.0544	.0504
Average haven inflows to revenue ratio	.00934	.00541
Non-haven flows		
Share of years with a non-haven outflow	.426	.492
Any non-haven outflow	.56	.629
Average non-haven outflows to revenue ratio	.108	.163
Share of years with a non-haven inflow	.35	.327
Any non-haven inflow	.498	.494
Average non-haven inflows to revenue ratio	.152	.148

Note: This table summarizes the cross-border financial flows for with havens and non-havens for majority exposure and control firms. All dependent variables are constructed using years 2012-2014.

Table B.11: Panel balance over time by subsample

Year	Incomplete	Domestic	C majority	C minority	T majority	T minority	Other
2012	1047	40142	2467	953	485	157	40
	[.87]	[.729]	[.742]	[.809]	[.83]	[.805]	[.909]
2013	1089	45944	2809	1032	504	172	40
	[.905]	[.834]	[.844]	[.876]	[.863]	[.882]	[.909]
2014	1203	55088	3327	1178	584	195	44
	[1]	[1]	[1]	[1]	[1]	[1]	[1]
2015	1055	47715	2876	1060	518	180	42
	[.877]	[.866]	[.864]	[.9]	[.887]	[.923]	[.955]
2016	566	42499	2653	971	490	178	38
	[.47]	[.771]	[.797]	[.824]	[.839]	[.913]	[.864]
2017	622	40294	2478	906	460	169	38
	[.517]	[.731]	[.745]	[.769]	[.788]	[.867]	[.864]
2018	506	37736	2295	864	434	163	36
	[.421]	[.685]	[.69]	[.733]	[.743]	[.836]	[.818]
2019	455	33327	2104	805	403	152	34
	[.378]	[.605]	[.632]	[.683]	[.69]	[.779]	[.773]

Note: This table tabulates the balance of the core panel by subsample. Hard brackets give the proportion of firms present in the subsample relative to 2014.

Table B.12: Movement in and out of sample

Year	Incomplete & missing	Firms with majority domestic ownership	Firms with majority ownership in foreign non-havens	Firms with terminal ownership in foreign non-havens $\in [.05, .5)$	Firms with majority ownership in havens	Firms with terminal ownership in havens $\in [.05, .5)$	Other
2012	98953	89689	4826	1755	1032	276	64
	[1.19]	[.856]	[.877]	[.948]	[1.09]	[.948]	[.914]
2013	90836	97517	5076	1787	1014	292	73
	[1.09]	[.931]	[.923]	[.965]	[1.07]	[1]	[1.04]
2014	83199	104733	5500	1851	951	291	70
	[1]	[1]	[1]	[1]	[1]	[1]	[1]
2015	77280	110373	5857	1851	889	267	78
	[.929]	[1.05]	[1.06]	[1]	[.935]	[.918]	[1.11]
2016	75164	114310	4940	1269	689	191	32
	[.903]	[1.09]	[.898]	[.686]	[.725]	[.656]	[.457]
2017	69885	119795	4801	1197	684	204	29
	[.84]	[1.14]	[.873]	[.647]	[.719]	[.701]	[.414]
2018	66849	122838	4847	1230	615	186	30
	[.803]	[1.17]	[.881]	[.665]	[.647]	[.639]	[.429]
2019	60383	129215	4933	1256	585	188	35
	[.726]	[1.23]	[.897]	[.679]	[.615]	[.646]	[.5]

Note: This table displays counts of firms in the raw APS data based on their allocable terminal ownership category. Hard brackets give the proportion of firms present in the subsample relative to 2014.

Table B.13: Movement in and out of ownership category (APS forwarded)

Year	Incomplete & missing	Firms with majority domestic ownership	Firms with majority ownership in foreign non-havens	Firms with terminal ownership in foreign non-havens $\in [.05, .5)$	Firms with majority ownership in havens	Firms with terminal ownership in havens $\in [.05, .5)$	Other
2012	98954	89686	4834	1747	1033	275	66
	[1.38]	[.778]	[.805]	[.878]	[1.01]	[.902]	[.88]
2013	85683	102311	5332	1849	1046	298	76
	[1.19]	[.887]	[.888]	[.929]	[1.02]	[.977]	[1.01]
2014	71861	115334	6006	1990	1024	305	75
	[1]	[1]	[1]	[1]	[1]	[1]	[1]
2015	58094	128245	6736	2113	1023	299	85
	[.808]	[1.11]	[1.12]	[1.06]	[.999]	[.98]	[1.13]
2016	45796	141816	6208	1622	874	232	47
	[.637]	[1.23]	[1.03]	[.815]	[.854]	[.761]	[.627]
2017	33379	154053	6338	1621	909	249	46
	[.464]	[1.34]	[1.06]	[.815]	[.888]	[.816]	[.613]
2018	20569	166450	6690	1716	882	239	49
	[.286]	[1.44]	[1.11]	[.862]	[.861]	[.784]	[.653]
2019	5298	181224	7085	1797	888	247	56
	[.0737]	[1.57]	[1.18]	[.903]	[.867]	[.81]	[.747]

Note: This table displays counts of firms in the raw APS data based on their allocable terminal ownership category. Hard brackets give the proportion of firms present in the subsample relative to 2014.

Table B.14: Movement in and out of ownership category (APS forwarded)
Among firms filing F101 and in an included industry
Panel (a): Counts

Year	Incomplete/missing	Domestic	C-majority	C-minority	T-majority	T-minority	Other
2012	5528	75880	4518	1563	988	249	62
	[1.38]	[.85]	[.875]	[.93]	[1.1]	[.95]	[.925]
2013	4704	83641	4763	1599	970	270	71
	[1.17]	[.937]	[.922]	[.952]	[1.08]	[1.03]	[1.06]
2014	4020	89261	5166	1680	902	262	67
	[1]	[1]	[1]	[1]	[1]	[1]	[1]
2015	3449	96562	5614	1698	846	250	73
	[.858]	[1.08]	[1.09]	[1.01]	[.938]	[.954]	[1.09]
2016	2450	101295	4789	1197	632	186	32
	[.609]	[1.13]	[.927]	[.713]	[.701]	[.71]	[.478]
2017	1777	104857	4602	1134	641	197	28
	[.442]	[1.17]	[.891]	[.675]	[.711]	[.752]	[.418]
2018	1933	110042	4661	1146	573	178	32
	[.481]	[1.23]	[.902]	[.682]	[.635]	[.679]	[.478]
2019	1245	106827	4549	1120	520	174	37
	[.31]	[1.2]	[.881]	[.667]	[.576]	[.664]	[.552]

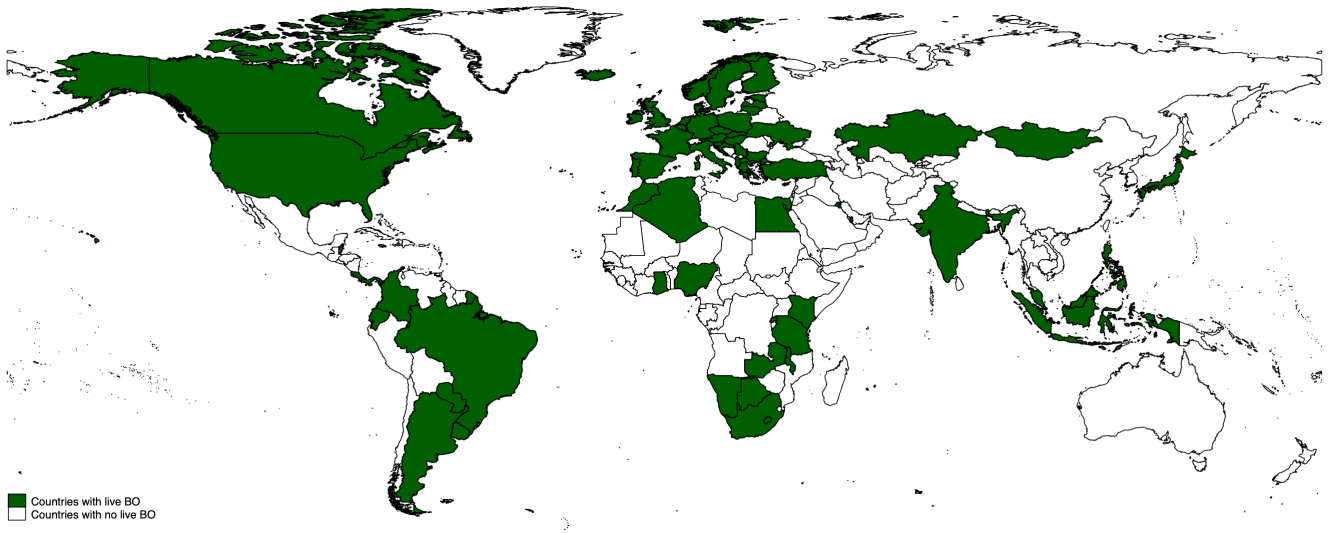
Panel (b): Assets, revenue, and profits

Year	Incomplete/missing			C-majority			C-minority			T-majority			T-minority		
	Assets	Rev.	Profit	Assets	Rev.	Profit	Assets	Rev.	Profit	Assets	Rev.	Profit	Assets	Rev.	Profit
2012	.93	1.03	1.1	.999	.907	.822	.925	.989	.792	.99	1.15	.87	.787	.924	.888
2013	1.02	1.1	1.08	.947	.913	.772	.945	.925	.881	1.06	1.21	.992	.862	.986	.959
2014	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2015	.866	.859	.816	1.03	.925	.795	1.03	.896	.847	1.11	1.03	.821	.871	.791	.752
2016	.638	.306	.249	1.38	1.08	1.05	1.36	.92	.825	1.2	1.02	1.07	.869	.853	.614
2017	.652	.279	.249	1.65	1.22	1.87	1.37	.886	.853	1.37	1.29	1.42	.42	.857	.636
2018	.646	.269	.246	1.58	1.15	1.25	1.74	1.04	.995	1.28	1.08	1.2	.533	1.3	1.62
2019	.699	.244	.252	1.64	1.12	1.32	1.88	1.11	.995	1.37	1.19	1.53	.59	1.27	1.54

Note: This table displays results on extensive margin counts of different geographic ownership categories within the entire Ecuadorian administrative data environment including active firms in industries exposed to the reform (abstracting from the core sample used in the main text). Panel (a) tabulates counts; Panel (b) weights these counts by assets, revenues, and profits, relative to the total in 2014.

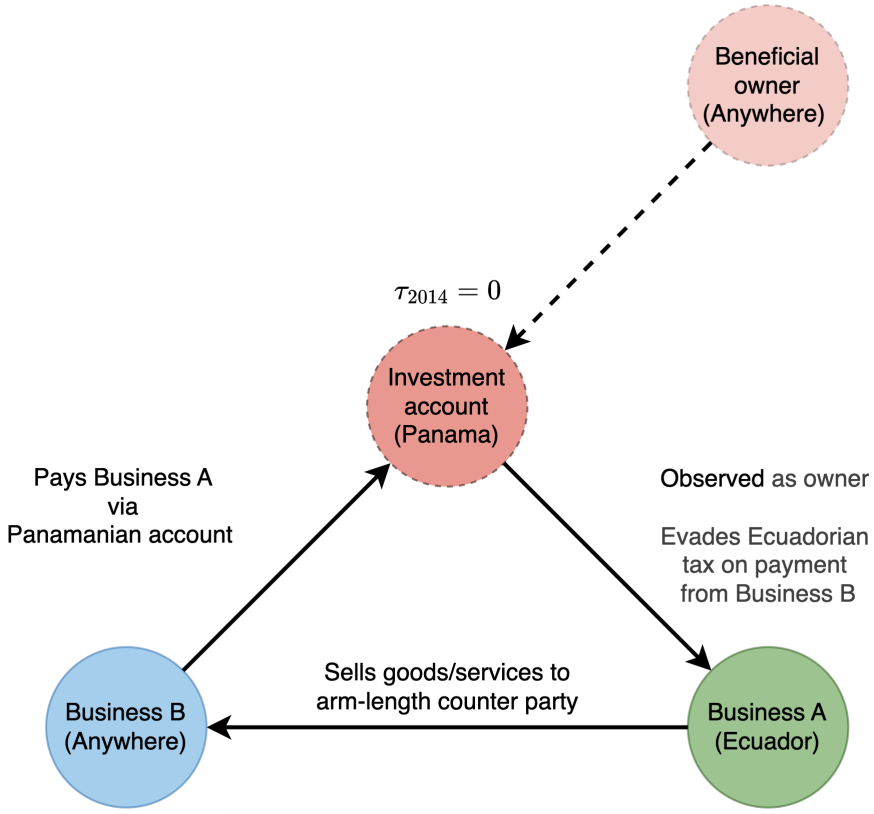
Appendix C Supplementary materials

Figure C.1: Countries with live beneficial ownership registries (2025)



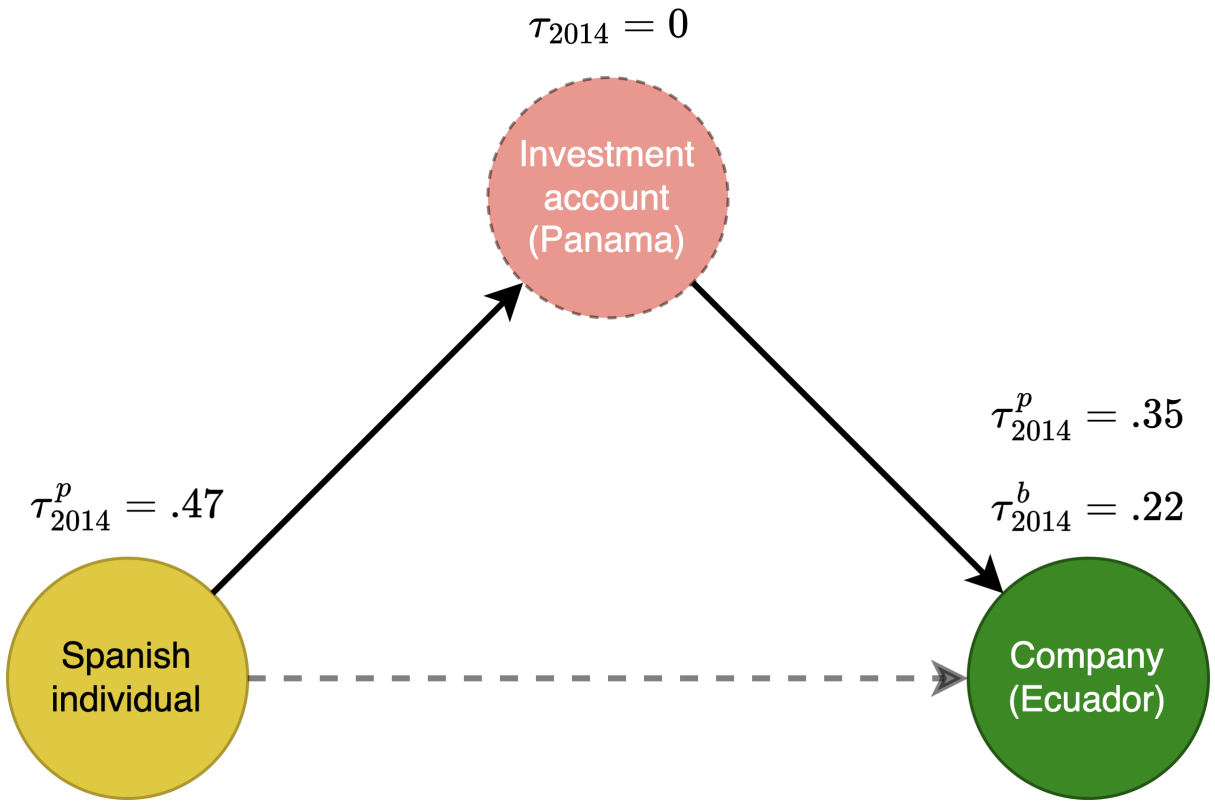
Note: This figure maps countries that maintain a beneficial ownership registry. Data are updated as of July 2025.

Figure C.2: Illustration of Ecuadorian business income tax evasion via tax havens



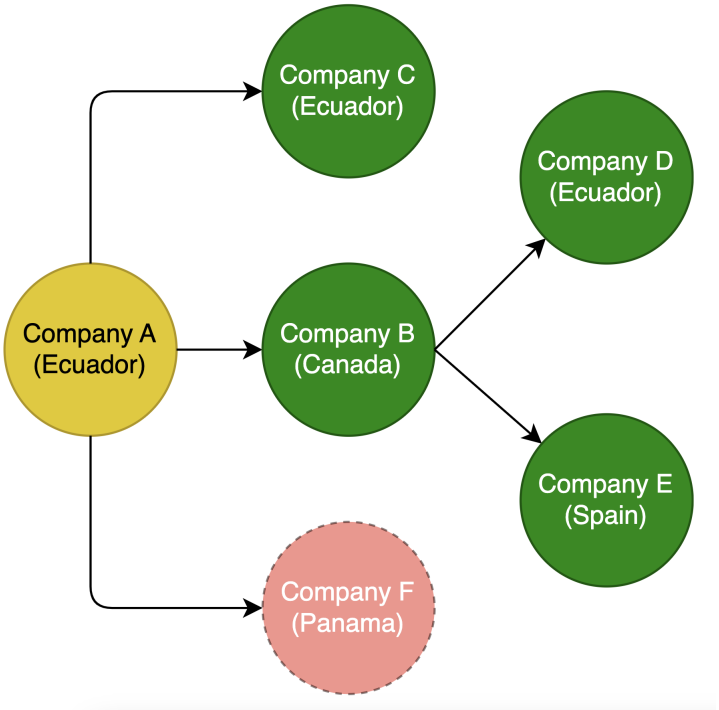
Note: This figure illustrates a generic example of evasive usage of a tax haven. In this example, an Ecuadorian Business A provides goods or services to Business B (located in Ecuador or abroad), with an agreement that Business B pays Business A via a Panamanian account that owns Business A. In this example, the beneficial owner of Business A and the Panamanian account can be located anywhere. By not reporting income paid to the Panamanian account for goods/services provided to Business B, Business A evades the Ecuadorian business income tax.

Figure C.3: Illustration of offshore evasion arrangement via tax havens of foreign personal income tax on worldwide income



Note: This figure illustrates evasive usage of a tax haven. In this example, a Spanish national owns an Ecuadorian-operating business via a Panamanian intermediary. The business pays Ecuadorian business income tax, sending remaining profits to the Panamanian account. Leverage financial secrecy protections, the Spanish individual can evade the Spain's tax on worldwide income. τ^{p}_{2014} and τ^{b}_{2014} give top marginal personal and business income tax rates, respectively, in 2014 for each respective country.

Figure C.4: Illustration of an offshore avoidance arrangement via tax havens



Note: This figure illustrates tax-avoiding usage of a tax haven. In this example, a multinational group has disbursed ownership across many jurisdictions. One such arbitrary linkage corresponds with an intermediary based in Panama that is of arbitrary ownership tier. In this case, profits can be generated in any jurisdiction and located within the Panama, the low tax jurisdiction, using profit shifting technology to maximize post-tax profit of the multinational group.

Appendix D 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 business i. In the first scenario 1), shareholder j is itself a business 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 business 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 business i; the effective tax haven terminal ownership share is the sum of these indirect ownership amounts over terminal linkages domiciled in tax havens. Figure D.3 gives an illustrative example of two hypothetical Ecuadorian companies' effective tax haven ownership shares and BIT 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,[38] 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 ..., 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 $\mathcal{M}_{kj}$.[39] We can define the *indirect ownership share* as the sum of the

[38] 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.

[39] Ownership cycles can be resolved using the limiting sum of the product of their indirect ownership shares

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:

$$s_{ji}^{\mathcal{I}} = \sum_{\mathcal{M}_{ji}^{c} \in \mathcal{P}_{ji}} \prod_{(q,r) \in \mathcal{M}_{ji}^{c}} s_{qr}. \tag{9}$$

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

$$s_{i,t}^{\textit{Ult. haven own.}} = \sum_{\left\{j \in \mathcal{N} | j \in \{i_{\mathcal{U}_t}\},\ \mathcal{L}(j,t) = H\right\}} s_{jit}^{\mathcal{I}}. \tag{10}$$

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

$$\textit{Avg. ult. ownership chain length}_{it} = \sum_{\{\mathcal{M}_{jit}^{c} \in \mathcal{P}_{jit} | j \in \{i_{\mathcal{U}_t}\}\}} \left|\mathcal{M}_{ji}^{c}\right| \cdot s_{jit}^{\mathcal{I}} \tag{11}$$

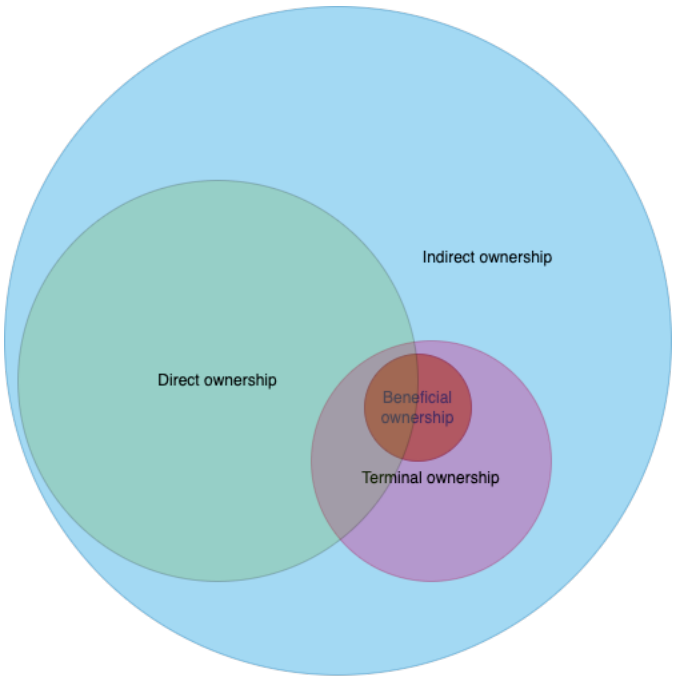
$$\textit{Maximum ult. ownership chain length}_{it} = \max_{\{\mathcal{M}_{jit}^{c} \in \mathcal{P}_{jit} | j \in \{i_{\mathcal{U}_t}\}\}} \left|\mathcal{M}_{ji}^{c}\right|. \tag{12}$$

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 BIT surcharge according to the above description. Of course, this threat of BIT surcharge is non-binding for firms that report non-positive. Figure A.3 shows that the BIT 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,

within non-cyclical subgraphs, but in practice the process of identifying and reducing such cycles is very cumbersome.

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 BIT 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).

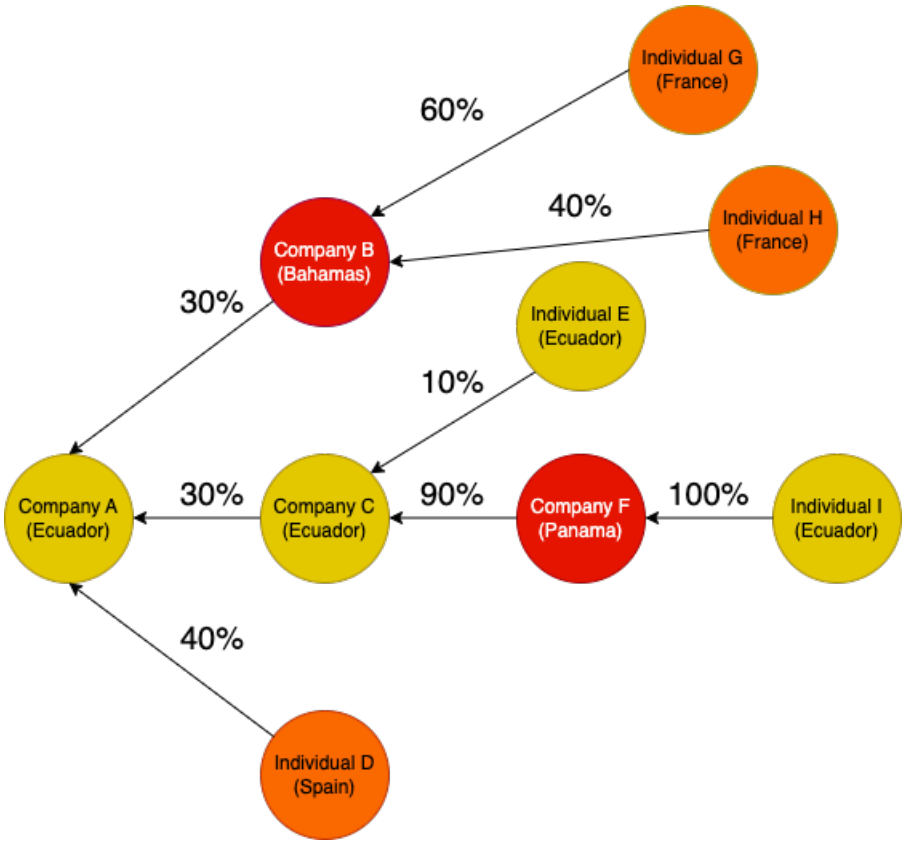
Figure D.1: Venn diagram illustrating the set-relationships of different ownership definitions



Note: This figure is a Venn diagram illustrating the set inclusion, exclusion, and overlap of the four ownership concepts we employ here. Areas correspond with ordinal size. The concept of "intermediate ownership" is not pictured here, which corresponds with the complement of beneficial ownership within indirect ownership. The figure also does not consider nominee ownership in which another person nominally serves as an owner-intermediary on behalf of a *true* beneficial owner.

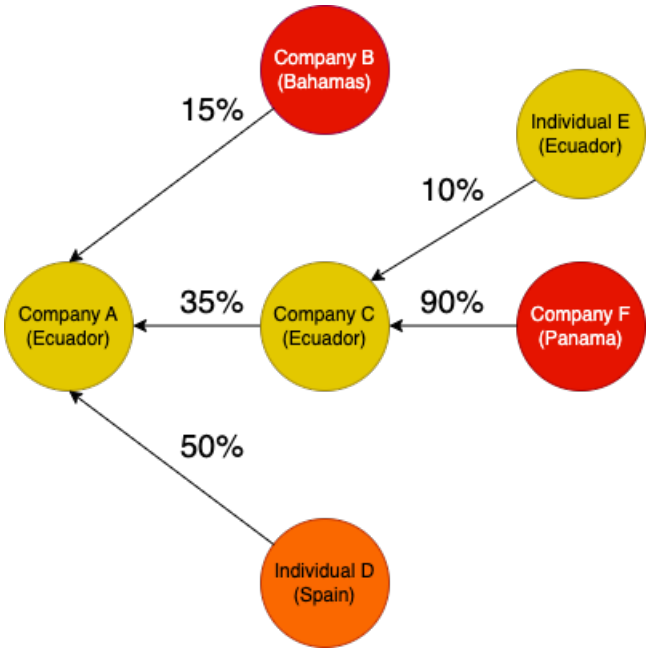
D.1 Illustrative examples of ownership graphs and BIT surcharge calculations

Figure D.2: 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 D.3: Example of tax haven BIT surcharge calculation



Note: this figure gives an illustrative example of how the Ecuadorian tax authorities would calculate the BIT 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 BIT surcharge of $0.465 \cdot 3 = 1.395$pp. Company C sees effective tax haven ownership of 90% and would therefore face a BIT surcharge of 3pp.

Figure D.2 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.

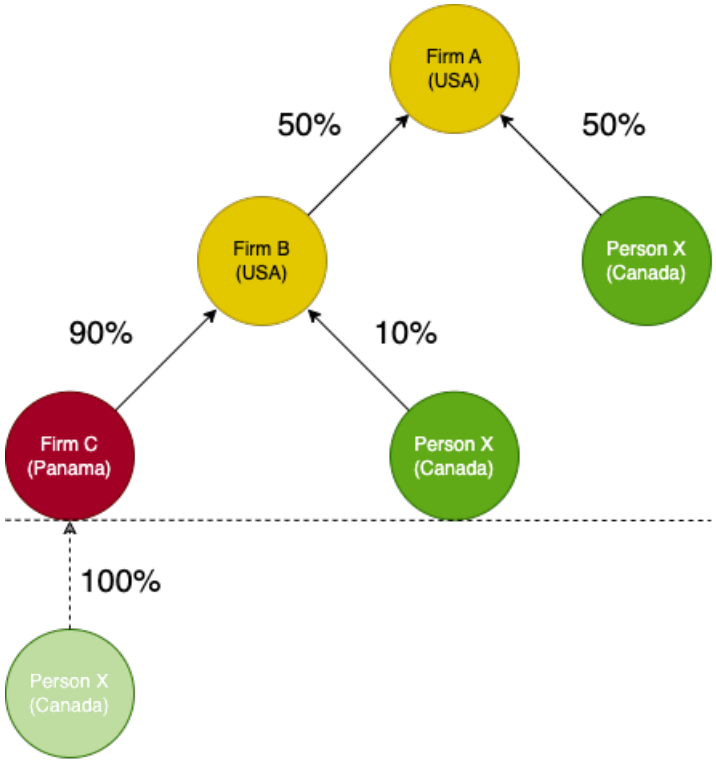
We can calculate the beneficial ownership shares of each individual by multiplying the ownership shares reflected in direct ownership linkages from an individual to the destination company. For example, Individual G's indirect ownership of Company A is equal to Company B's direct ownership of Company 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 of 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.

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

Figure D.4 shows a non-trivial example of terminal ownership. We emphasize that this example is *non-trivial* in the respect that Figure D.2 also illustrates terminal ownership insofar as perfect ownership reporting also generates perfect coincidence of beneficial and terminal ownership. However, Figure D.4 illustrates an example where beneficial and terminal ownership diverge.

The example shows an ownership scenario of an American firm A, whose direct ownership is evenly 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 ownership), 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.

Figure D.4: Example of terminal ownership



Note: this graphic illustrates an ownership arrangement where only the ownership relationships in transparent filling and below the dashed lines are unobserved to the researcher.

D.1.2 Indirect ownership in the context of cyclical ownership

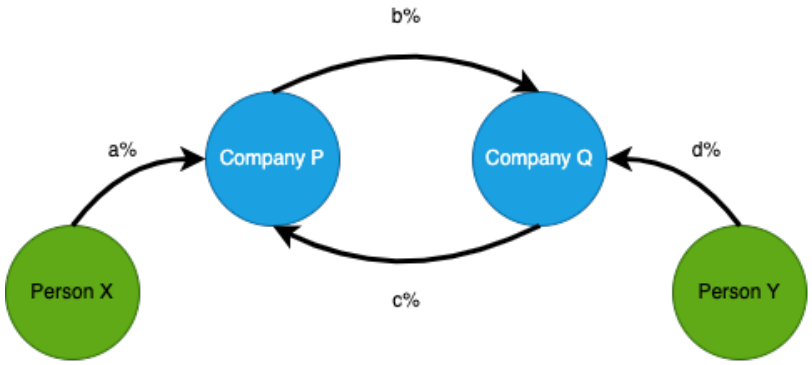
Consider a simple example of cyclical firm ownership, as depicted in Figure D.5. Person X directly owns $100 \cdot a\%$ of Company P and person Y directly owns $100 \cdot d\%$ of company Q. At the same time, Company P owns $100 \cdot b\%$ of Company Q and Company Q in turn owns $100 \cdot c\%$ of company 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 case 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 $(b + b^2c + b^3c^2 +$

Figure D.5: 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.

$\ldots) = b \cdot \sum_{n=0}^{\infty}(b \cdot c)^n = b \cdot \frac{1}{1-bc}$ 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 is 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:

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

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, and that an ownership chain could feature an arbitrary number of ownership cycles. Once a cycle is identified, its indirect ownership can be resolved through the above procedure.