

# Can Wealth Taxation Work in Developing Countries? Quasi-Experimental Evidence from Colombia\*

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### Abstract

This paper studies individual responses to wealth taxes and wealth tax enforcement using Colombian tax return microdata from 1993 to 2016 linked with the leaked “Panama Papers.” We estimate elasticities of reported wealth with respect to (one minus) the wealth tax rate, exploiting discrete jumps in wealth tax liability and reforms varying exemption cutoffs and tax rates. We find clear evidence of immediate bunching responses to wealth taxes; individuals lower their reported wealth to reduce their tax burden. These immediate responses predominantly reflect avoidance and evasion, such as misreporting wealth items subject to less third-party reporting. In our main analysis, the short-term elasticity of reported wealth is two, and behavioral responses reduce revenues by up to one-fifth of projected revenues. We complement this analysis by studying offshore sheltering in Colombia’s most relevant tax havens. We show that offshore entities are predominantly used by the wealthiest taxpayers at least in part to hide assets from the tax authority. Finally, we show that better enforcement helps recover tax on offshore wealth. A voluntary disclosure scheme taking place between 2015 and 2017 encouraged evaders to disclose 1.7 percent of GDP in hidden wealth. Two-fifths of individuals in the wealthiest 0.01 percent disclosed under the scheme—disproportionately reporting concealed foreign assets—and, as a result, pay more taxes. Halfway through the scheme, the Panama Papers news story broke, shocking perceived detection probabilities and raising disclosures by more than 800 percent. This, possibly coupled with harsher noncompliance sanctions, contributed to improving wealth tax collection and enhancing tax progressivity at the top.

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# 1 Introduction

Recently, wealth taxation has received renewed interest, with some calling for the reintroduction of progressive annual wealth taxes to raise revenue and curb rising inequality in several developed countries (Piketty, 2014). In the developing world, distributional concerns have coupled with the need to improve tax collection by moving away from regressive indirect taxes—such as value-added taxes, on which these countries often heavily rely—towards more progressive direct taxation. However, wealth taxes may be difficult to enforce if wealthy individuals shelter assets to (legally) avoid and (illegally) evade them.<sup>1</sup> For instance, annual wealth taxes, which are taxes on the stock of financial and non-financial assets net of liabilities, might induce individuals to conceal their assets offshore and trigger capital flight to tax havens. Sheltering offsets wealth tax progressivity and diminishes its redistributive appeal. Avoidance and evasion also affect the resource cost of raising taxes and drain government revenues needed for social spending and state capacity building, stifling development. Indeed, concerns over efficiency costs and enforcement explain governments’ frequent reluctance to impose recurrent individual taxes on net wealth (OECD, 2018), despite little empirical evidence on responses to wealth taxes.

Estimating responses to wealth taxation is challenging. First, measuring assets and debts of rich individuals is hard because few countries collect administrative data on wealth. Only a handful of countries currently levy personal wealth taxes, prompting researchers to resort to survey data to measure wealth.<sup>2</sup> Yet survey data often does not cover the very top of the distribution (Saez and Zucman, 2016); this is a vexing exclusion, given wealth is highly concentrated at the top. In addition, observing assets held offshore can be an elusive feat in an increasingly globalized world (Alstadsater, Johannesen and Zucman, 2018). Second, even if a country taxes wealth, finding exogenous variation in tax rates to compellingly identify behavioral responses is difficult. Inter alia, tax rates and bases are usually not randomized by the tax authority, and reforms that introduce large changes in tax rates or bases are rare events. Third, it is inherently challenging to reliably measure sheltering responses to taxation. For instance, quantifying the strategic obfuscation of wealth through anonymous shell corporations is difficult because secrecy is precisely what makes these corporations attractive. This has particularly affected the small number of studies estimating responses to wealth taxes.<sup>3</sup> Moreover, the previous findings from Europe may not hold in developing countries, where enforcing taxes is severely challenging (Pomeranz, 2015; Slemrod, 2017) and income and wealth can be exceptionally concentrated at the top (Alvaredo, Chancel,

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<sup>1</sup>We henceforth use the term “sheltering” as a general description of all evasion and avoidance behaviors.

<sup>2</sup>The number of OECD countries levying personal wealth taxes dropped from 12 in 1990 to 3 in 2018 (Norway, Spain, and Switzerland). Yet even in countries levying wealth taxes, wealth can often only be observed for taxpayers above the exemption threshold.

<sup>3</sup>A handful of studies have recently emerged exploring behavioral responses to wealth taxes in Sweden (Seim, 2017), Denmark (Jakobsen, Jakobsen, Kleven and Zucman, 2018), Switzerland (Brulhart, Gruber, Krapf and Schmidheiny, 2017), Holland (Zoutman, 2015), and Spain (Durán-Cabé, Esteller-Moré and Mas-Montserrat, 2017). They find small savings responses but large avoidance responses (e.g., asset recomposition) as well as underreporting of assets less covered by third-party reporting.

Piketty, Saez and Zucman, 2018). The feasibility of wealth taxes in the presence of offshore tax evasion and weaker enforcement capacity thus remains largely unknown.

We overcome these three empirical challenges and contribute to the estimation of behavioral responses to wealth taxes and enforcement initiatives using data from Colombia. Colombia provides a unique opportunity to study these issues thanks to its extensive administrative tax microdata on the assets and debts of wealthy individuals, its numerous wealth tax policy changes since 2002, and its recent enforcement efforts to improve compliance among the rich. Our panel data covers all income and wealth tax filers between 1993 and 2016, that is, over 20.5 million observations (taxpayer-years). Critically, we observe individual wealth holdings before and after reforms are adopted for both taxpayers affected and unaffected by these reforms. This is because Colombian taxpayers annually report their taxable and non-taxable *wealth* in their *income* tax statements.<sup>4</sup> For example, end-of-year wealth stored in bank deposits, equity, voluntary pension funds, life insurances, business assets, real estate, vehicles, and liabilities are annually reported by income taxpayers to the tax authority.

We exploit quasi-experimental variation in wealth tax rates introduced by multiple reforms across time, as well as discontinuities in the wealth tax schedule, to overcome the second challenge and identify individual responses to tax policy. Since 2002, Colombia has reformed its wealth tax five times, modifying both the exemption threshold and the tax rates, which over our period of study ranged from 0 to 6 percent. These represent very large policy experiments relative to those examined in previous studies.<sup>5</sup> Furthermore, the Colombian wealth tax schedule has assigned each bracket of net worth an *average* tax rate, creating discontinuous jumps in tax liability at bracket cutoffs, i.e., tax notches.<sup>6</sup> For instance, in 2010, an income taxpayer reporting 999.999 million pesos (USD 520,830) in wealth was exempt from the wealth tax, while a taxpayer reporting an additional peso owed 1 percent of all taxable net wealth, i.e., a tax bill of 10 million pesos (USD 5,208.3).

We first leverage this variation in tax rates across brackets and time to estimate bunching responses to wealth taxation, following the methods developed by Saez (2010), Chetty, Friedman, Olsen and Pistaferri (2011), and Kleven and Waseem (2013). Our approach identifies the elasticity of substitution between truthfully reporting individual wealth holdings to the tax authority. If individuals do not respond to tax rates, reported wealth will be distributed smoothly around notch points. If, instead, individuals endeavor to avoid the jump in tax liability by reporting just

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<sup>4</sup>This is done to calculate the minimum income tax base or “presumptive income,” which is based on net worth. As its name suggests, there is a legal presumption that a taxpayer’s taxable income is no less than a fixed share of her net worth reported the previous year (e.g., 3.5 percent in 2018). Presumptive taxation is often used in developing countries to simplify tax calculations and combat tax avoidance or evasion.

<sup>5</sup>Assuming the return to wealth is 6.6 percent, a wealth tax rate of 6 percent implies a 90.9 percent tax on the *return* to wealth. In contrast, the top wealth tax rate was between 1 and 2.5 percent in the studies from Europe.

<sup>6</sup>Although theory suggests such discontinuities in the tax schedule should be avoided, notches exist in many settings, and especially in tax systems in both the developed (Brulhart et al., 2017) and the developing world (Bachas and Soto, 2018; Kleven and Waseem, 2013). A common justification for notches is that they facilitate calculation of tax liability, are more salient, and are possibly more easily understood than kinks (Slemrod, 2013).

below the notch points, there will be excess mass just below the cutoffs and missing mass just above them. The quantity of bunching suggests the responsiveness of reported wealth to the tax policy. Importantly, because we observe individual wealth reported before and after a tax notch is introduced, we do not rely on assumptions about the counterfactual density to estimate behavioral responses (Blomquist and Newey, 2017; Kleven, 2016).

We find large and immediate bunching responses to wealth tax notches, providing clear evidence that individuals understand and respond to the incentives created by the tax schedule. In our main analysis, the marginal buncher would have reported 21 percent more wealth in the absence of the wealth tax notch. Our estimated elasticity suggests that a one percent increase in (one minus) the wealth tax rate raises reported wealth by 2 percent. Applying this elasticity throughout the wealth distribution implies bunching responses generate revenue losses of up to one-fifth of the mechanically projected revenue. We conclude that, in the short run, the Colombian wealth tax rate remains below its revenue-maximizing rate. In the long run, however, individuals may overcome frictions and adjust their real behavior (e.g., savings, bequests, emigration). This could result in larger distortions from wealth taxation.

Unlike earnings responses to income taxes, which potentially conflate real and sheltering responses, bunching in the distribution of reported wealth predominantly reflects sheltering. It is difficult for individuals to immediately bunch below the notch points using real responses (e.g., investment) because wealth partly depends on asset prices, which are highly uncertain and fluctuate throughout the year (Jakobsen et al., 2018). Moreover, in Colombia, avoidance and evasion opportunities have been rampant and tax enforcement has been relatively weak. For instance, there is limited systematic crosschecking of items reported in the wealth tax return using third-party reported information.<sup>7</sup> This enables tax evasion either by underreporting the value of assets not subject to third-party reporting or by providing untruthful accounts of nonexistent liabilities. Indeed, a compliers analysis (Imbens and Rubin, 1997) shows that individuals who responded to wealth taxes by bunching below the exemption cutoff achieved this by artificially inflating their liabilities and underreporting business assets not subject to third-party reporting.

Importantly, individuals at the top of the wealth distribution have access to sophisticated tax sheltering strategies and may reduce their tax burden by offshoring assets to tax havens. To observe offshore sheltering in Colombia’s most relevant tax havens, we exploit data from the so-called Panama Papers.<sup>8</sup> Thanks to the publication of the leaked microdata by investigative reporters and cooperation with the Colombian tax authority, we are able to match the Panama Papers microdata to our individual tax records. In addition to the names of shareholders of entities

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<sup>7</sup>The limits to enforcement based on third-party information have also been documented in other settings (Carrillo, Pomeranz and Singhal, 2017; Paulus, 2015; Pomeranz and Vila-Belda, 2018).

<sup>8</sup>This leak documents offshore entity incorporation in Panama and over 20 other jurisdictions. However, geographic proximity and political stability contributed in making Panama the most popular destination for foreign assets owned by Colombians, after the United States. Even before the leak, Colombians were almost 15 times as likely to report owning foreign assets in Panama than in the Virgin Islands or Switzerland.

incorporated between 1977 and 2016 by Mossack Fonseca—hitherto one of the world’s five largest wholesalers of offshore secrecy—the leaked microdata includes the incorporation date for each entity. This allows us to study the impact of wealth tax changes on the dynamics of offshore entity incorporation and tax sheltering at the top.

We find that the reintroduction of annual wealth taxes in Colombia coincides with a period marked by a tenfold increase in Colombian offshore entities. These entities were predominantly used by very wealthy Colombians: the wealthiest 0.01 percent is 24 times as likely to be named in the Panama Papers than the wealthiest 5 percent.<sup>9</sup> We use an event study design to test whether individuals obfuscate their assets through offshore entities by comparing reported assets before and after incorporation. We find taxpayers reduce the assets they report to the tax authority by 10.9 percent immediately after incorporating an offshore entity. Because Colombia’s residence-based tax system requires reporting all foreign assets, this drop is consistent with wealth obfuscation for the purpose of minimizing the tax burden.

Can better enforcement recover tax on hidden wealth and crack down on offshore evasion? To address this question, we evaluate Colombia’s voluntary disclosure program, which sought to encourage evaders to disclose hidden wealth by awarding tax incentives to any unreported asset and/or nonexistent liability divulged in 2015, 2016, or 2017.<sup>10</sup> Disclosers waived past income and wealth tax liabilities but faced an explicit penalty of 10–13 percent on the value of disclosed wealth. Evaders who did not come forward faced higher fines if caught cheating.

The program encouraged disclosures worth 1.73 percent of GDP. Disclosing under the scheme rises sharply with wealth: individuals in the top 0.01 percent were 55 times as likely to disclose under the scheme than those in the top 5 percent. In all, two-fifths of individuals in the wealthiest 0.01 percent admitted to prior noncompliance and disclosed hidden wealth.<sup>11</sup> Most hidden wealth had been concealed abroad, concomitant with the pervasiveness of offshore tax evasion at the top.<sup>12</sup> Using a difference-in-differences approach that compares outcomes between disclosers and non-disclosers across time, we show that the scheme is associated with a long-term rise in wealth and income tax compliance. Disclosers report 49.2 percent more wealth, as well as significantly more capital income from asset ownership (foreign income, interest income, and capital gains) three years after first disclosing hidden wealth. As a result, they pay 39 percent more income

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<sup>9</sup>Note that these rankings are built using (taxable and nontaxable) wealth reported in tax statements, and thus prone to mismeasurement due to underreporting and tax evasion.

<sup>10</sup>Amnesties and voluntary disclosure schemes have increasingly been implemented to incentivize reporting foreign asset holdings and recover tax on offshore investments (Langenmayr, 2017; OECD, 2010, 2015). Many countries have put them in place to take advantage of the momentum gained by the availability of whistleblower data and information on financial assets and income held abroad, and increased cooperation between tax authorities.

<sup>11</sup>Top 0.01 percent individuals are almost three times as likely to disclose under these schemes in Colombia than in Norway and Sweden, despite the longer existence of such schemes in Scandinavia (Alstadsater, Johannesen and Zucman, forthcoming).

<sup>12</sup>We analyze how accounting for concealed offshore wealth affects measured wealth inequality. A conservative correction shows that the top 1 percent share of total wealth rises from 40.6 to 43.2 percent. Because offshore wealth is extremely concentrated at the top, the wealthiest 0.1 percent share rises from 15.9 to 19.1 percent.

taxes relative to nondisclosers, further raising tax liability for the wealthiest taxpayers.

Crucially, two events increased the perceived risk of detection and punishment for failing to disclose hidden wealth. First, halfway through the voluntary disclosure program, the Panama Papers news story broke, and the names of Mossack Fonseca’s clients were thrust into the public spotlight. The Colombian tax authority reacted by scrutinizing Mossack Fonseca and its clients, contacting taxpayers named in the leak and requesting documentation of their offshore activities and transactions. Three weeks after the leak, the governments of Colombia and Panama announced a tax information exchange agreement between the two countries. Second, in December 2016, Colombia criminalized tax evasion for the first time. Tax evaders could face up to nine years in prison.

We exploit the exogenous timing of the Panama Papers and compare outcomes between wealth tax filers named (treated) and not named (control) in the leak before and after it occurred. Our difference-in-differences approach shows the leak induced a ninefold increase in disclosures under the voluntary disclosure scheme and more than a fifteenfold increase in disclosures of foreign assets.<sup>13</sup> Consequently, taxes paid by these individuals more than doubled after the leak. Unfortunately, the criminalization of evasion coincides with the last year evaders could come forward and disclose under the scheme. Although one-half of participants disclosed in the last year, we cannot causally attribute this increase solely to this harsher punishment of tax evasion.

Overall, we interpret our findings as evidence that greater enforcement improves wealth tax collection. Wider coverage of third-party reporting, if coupled with systematic cross-validation of reported information and increased scrutiny of high net worth taxpayers, helps strengthen enforcement capacity in developing countries. Furthermore, policies to promote financial transparency and encourage foreign asset reporting are particularly important to curb offshore sheltering at the top of the distribution. Voluntary disclosure schemes are tools that may aid the tax authority in collecting new information about offshore assets and income, and in generating more revenue from wealthy taxpayers. For such programs to be effective in improving compliance in the shorter and longer term, stricter enforcement needs tough noncompliance sanctions and a credible threat of detection, for example, by exploiting an automatic exchange of tax information and whistleblower data. With better enforcement, wealth taxes can complement progressive income taxes to reinforce progressivity and address inequality in contexts where the elites are difficult to tax.

The remainder of this paper is organized as follows. Section 2 briefly discusses previous literature. Section 3 describes the institutional context and our data. Section 4 presents bunching responses to personal wealth taxes. Section 5 exhibits offshore sheltering and responses to enforcement efforts to recover tax on offshore wealth. Section 6 analyzes the implications of wealth concealed offshore for the study of inequality. Finally, Section 7 concludes.

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<sup>13</sup>One-fourth of individuals named in the leak, and 46 percent of those in the top 0.01 percent, disclosed wealth immediately after the leak.

## 2 Literature Review

Our paper contributes to the literatures on behavioral responses to wealth taxes, offshore tax evasion, the compliance effects of enforcement policies and, more generally, tax design in developing countries. We briefly review previous work on these topics.

**Behavioral responses to wealth taxes:** There is a burgeoning empirical literature on the behavioral effect of wealth taxes in Europe (Brulhart et al., 2017; Durán-Cabé et al., 2017; Jakobsen et al., 2018; Seim, 2017; Zoutman, 2015). These papers find that wealth taxes trigger small savings responses but large sheltering responses, such as recomposing from taxable to non-taxable wealth and underreporting assets subject to little third-party reporting.

Specifically, Seim (2017) exploits a kink in the Swedish wealth tax schedule and finds net-of-tax-rate elasticities of taxable wealth of 0.09–0.27, driven by evasion and avoidance rather than changes in savings. Jakobsen et al. (2018) find a similar elasticity exploiting a kink in the Danish wealth tax schedule. Durán-Cabé et al. (2017) find that Catalan taxpayers shift their wealth composition from taxable to non-taxable assets following the re-introduction of the Spanish net wealth tax in 2011. Zoutman (2015) uses a difference-in-differences approach exploiting the 2001 Dutch capital income and wealth tax reform, and estimates that a 1 percent increase in the wealth tax of 1.2 percent leads to a modest drop in household savings of 0.10–0.17 percent. Finally, Brulhart et al. (2017) find that a 0.1 percentage-point increase in wealth taxes in Switzerland lowers wealth holdings by 3.4 percent in their cross-canton comparison and 2.3 percent in their within-Bern, across-municipality comparison.<sup>14</sup>

We are the first to shed light on the effects of wealth taxes in a developing country, where income and wealth are generally more unequally distributed and enforcement capacity is weaker. We are also the first to provide empirical evidence of offshore sheltering as a potential response to wealth taxation. Because wealthy individuals in developing countries have access to the same financial-services and wealth-management industries than their developed country counterparts (Harrington, 2016), our results inform about the potential of offshore sheltering in response to wealth taxes in the developed world. We also contribute by providing evidence of immediate responses to both small and large wealth tax *changes* and by comparing the behavior of very wealthy and less wealthy taxpayers in response to wealth taxes. Finally, our estimation strategy allows us to identify the wealth items individuals who bunch below the cutoffs manipulate in response to wealth taxes, thus enabling us to advance in disentangling real versus sheltering responses.<sup>15</sup>

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<sup>14</sup>Closely related to this literature are a series of studies on the impact of estate taxation on wealth holdings, reviewed in Kopczuk (2009) and Kopczuk (2013), which find modest elasticities of the taxable base of estates with respect to the tax rate of 0.1–0.2.

<sup>15</sup>We argue that because wealth tax eligibility and rates are determined by taxable *and* non-taxable net worth in our setting, shifting from taxable to non-taxable assets is a second-order strategy for Colombian taxpayers.

**Offshore sheltering and the global crackdown on tax havens:** A nascent strand of the literature focuses on tax evasion, globalization, and the obfuscation of wealth by the global rich through offshore structures—companies, trusts, and funds—in tax havens (Alstadsater et al., 2018; Johannesen and Zucman, 2014; Zucman, 2013, 2014, 2015). A closely related strand of the literature studies how effective has the global wave of crackdowns on tax havens been in fostering tax compliance and raising tax revenue. Specifically, studies have explored significant changes in the international tax environment, including enhanced cross-country information exchange agreements (Johannesen, Langetieg, Reck, Risch and Slemrod, 2018), reporting requirements (Johannesen and Larsen, 2016), and rules on bank secrecy in tax matters (Johannesen and Zucman, 2014).<sup>16</sup> Recently, a handful of empirical studies have emerged evaluating tax enforcement initiatives like amnesties and voluntary disclosure programs (Alstadsater et al., forthcoming; Bayer, Oberhofer and Winner, 2015; Langenmayr, 2017) that have accompanied these enforcement initiatives.

We shed light on the interactions between enforcement initiatives, credible threats of detection, and tough noncompliance sanctions in deterring evasion and encouraging compliance. Specifically, we are the first to show how the rise in perceived detection probabilities induced by Panama Papers leak incentivized tax evaders to acknowledge prior noncompliance, disclose assets concealed abroad, and pay more taxes. We also exploit the exogenous timing of tax evasion criminalization and argue that it potentially further incentivized tax evaders to regularize their tax affairs.

**Public finance in developing countries:** A growing literature focuses on tax design and compliance in low- and middle-income countries, where the issues of compliance and enforcement are especially critical (Slemrod, 2017). While most previous studies in the public finance and development literature focus on avoidance and evasion by firms (Bachas and Soto, 2018; Brockmeyer and Hernandez, 2016; Carrillo et al., 2017; Naritomi, 2016; Pomeranz, 2015), we study the behavior of individuals and, specifically, high net worth individuals. Our population of interest is particularly relevant in these contexts, given the historical difficulty of taxing elites, in part due to their persistence in power through the capture of political and economic institutions, including tax policy (Acemoglu and Robinson, 2012).<sup>17</sup>

## 3 Institutional Context and Data

### 3.1 Wealth Taxes in Colombia

Colombia is an upper middle income country, with GDP per capita of 14,154 US dollars at purchasing power parity in 2016.<sup>18</sup> Total tax revenues represent 19.8 percent of GDP, while recurrent

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<sup>16</sup>Relatedly, several states in the United States have established programs to publicly shame tax delinquents (Pérez-Truglia and Troiano, 2015).

<sup>17</sup>In particular, (Alvaredo and Londoño-Vélez, 2014) show that rich Colombians are remarkably difficult to tax.

<sup>18</sup>World Bank, International Comparison Program database.



taxes on personal net wealth have constituted 0 to 0.27 percent of GDP between 2002 and 2017 (see Figure A.1).<sup>19</sup> In addition to annual taxes on net worth, Colombia levies other taxes on capital (e.g., property tax, inheritance tax) and capital income (e.g., rental income, realized capital gains).<sup>20</sup> An income Gini coefficient of 51.1 and a top 1 percent income share of 20 percent place Colombia as one of the most unequal countries in the world (Alvaredo and Londoño-Vélez, 2014).

Direct taxes on income and wealth are collected by the central government tax authority, *Dirección de Impuestos y Aduanas Nacionales* (DIAN, for its Spanish acronym). Income and wealth taxes in Colombia are individually based and have never allowed joint filing for married couples. The tax authority records *wealth* information in *income* tax statements because there is presumptive income taxation based on net worth.<sup>21</sup> Income taxpayers are required to annually self-report end-of-year financial assets (e.g., cash, bank deposits, stocks, bonds, unlisted securities, financial assets held abroad), non-financial assets (e.g., real estate, land, large durables, non-corporate business assets, non-financial assets held abroad), and debt (e.g., mortgages, inter-personal debts).<sup>22</sup> Self-reporting assets is crucial because it provides taxpayers with sheltering opportunities. Income taxpayers reporting (taxable and nontaxable) net worth above a cutoff are eligible for the wealth tax and file a separate tax statement. The exemption cutoff has been very high and excludes more than 99 percent of adults from the wealth tax, thus applying only to the wealthiest individuals.<sup>23</sup>

Colombia has a long tradition of taxing net wealth of firms and individuals, as detailed in Appendix C. Recurrent wealth taxes were first introduced in 1935 and kept in place until 1992. A decade after its abolition, President Uribe Vélez reintroduced wealth taxation in 2002 to finance *Seguridad Democrática*—the administration’s security effort against drug trafficking, guerrilla, and paramilitary groups—and earmarked its revenues for defense and security expenditures. The wealth tax is levied on taxable net worth, that is, net worth minus allowances (e.g., the value of principal residence below a cutoff, the net equity value of stock owned in domestic companies).<sup>24</sup>

The wealth tax was initially designed as a piecewise linear schedule, with each bracket asso-

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<sup>19</sup>As a comparison, in 2016 this share was 0.18 percent in Spain, 0.22 percent in France, 0.43 percent in Norway, and 1.0 percent in Switzerland (OECD, 2018).

<sup>20</sup>Inheritances and *inter vivos* gifts are taxed as irregular income at a progressive rate similar to the regular income tax before 2012 and, starting 2013, at a flat tax rate of 10 percent.

<sup>21</sup>The presumptive income tax is calculated using net worth reported the previous year, subtracting two allowances. The tax rate was 6 percent in 1999–2006, and 3 percent in 2007–2016.

<sup>22</sup>A pervasive informal sector, outdated cadastral values, and high filing thresholds imply that only a fraction of tax units (adults aged 20 and above) file income tax returns in Colombia (Alvaredo and Londoño-Vélez, 2014). For instance, in FY 2016, all but 6.6 percent of tax units were excluded from filing income taxes.

<sup>23</sup>In 2017, only 0.2 percent of tax units had non-zero wealth tax liability; a much smaller fraction than in OECD countries. For instance, Brulhart et al. (2017) report that in the canton of Bern, 30 percent of all taxpayers and 41 percent of married households had a non-zero wealth tax liability over the 2001–2011 period. In Norway, around 11 percent of taxpayers were subject to the wealth tax in 2016, while in France it was around 1 percent of tax households that year (OECD, 2018).

<sup>24</sup>Specifically, the value of shares in domestic companies multiplied by the Net Present Value (NPV, that is, the ratio of net to gross wealth) rate can be deducted from the wealth tax base. This allowance was created to avoid double wealth taxation for firms and individuals.

ciated with a fixed *average* tax rate. Figure 1, Panel (a), provides an illustration using the wealth tax schedule in 2010. That year, individuals reporting net worth below 2010 1 billion pesos (2010 USD 520,830) were exempt from the wealth tax. Individuals reporting an additional peso paid 1 percent of their taxable net wealth, that is, a tax bill of USD 5,208. This wealth tax rate increases from 1 to 1.4 percent at 2 billion pesos in reported wealth, 1.4 to 3 percent at 3 billion pesos, and 3 to 6 percent at 5 billion pesos. The notches in the wealth tax schedule produce discontinuous jumps in tax liability at these bracket cutoffs (see Figure A.2) and create very strong incentives to bunch below the notch points.

A series of reforms in the last two decades modified the tax rates and bracket cutoffs. Figure 1, Panel (b), plots the evolution of the statutory wealth tax schedule across time. In 2003, individuals with net worth below 2003 3 billion pesos were exempt from the wealth tax, while individuals with 3 billion pesos or more in reported wealth were taxed at 0.3 percent of their taxable wealth. In 2006, this tax rate was raised to 1.2 percent between 2006 and 2009, to be levied on taxable wealth reported in 2006. In 2010, the eligibility cutoff was reduced to 2010 1 billion pesos, and four separate notches were introduced at 1,000 million pesos, 2,000 million pesos, 3,000 million pesos, and 5,000 million pesos, as detailed above. Finally, in 2014, a reform kept the eligibility notch but replaced the last three notches with kinks.

While income is largely covered by third-party reporting in Colombia, there is only partial third-party reporting of wealth. Most financial wealth is subject to third-party reporting: end-of-year savings and checking account balances, loans, bonds, deposits, listed equities, voluntary pension contributions, and mortgage debt are reported by financial institutions (banks, investment funds, and insurance companies). In contrast, non-financial assets such as real estate and vehicles are subject to less third-party reporting; while taxpayers should report the same values as in the property and vehicle taxes, this information is not systematically cross-verified by the tax authority. Finally, several wealth components have virtually no third-party reporting, such as cash, large durables, unlisted equities, non-corporate business assets (e.g., inventories), inter-personal debts, and—until recent developments in tax information exchange agreements with other countries—assets held abroad.<sup>25</sup>

The number of third-party reporting institutions, as well as the coverage of reported items, has been subject to significant changes over the past years. In 2006, Colombia established the list of public and private institutions required to provide third-party reports, and allowed uploading these reports through its newly-created online web portal, *sistema Muisca*. In 2012, the tax authority sought to further improve tax technology (e.g., Resolutions 111–118 from October 31 2012, Law 1607/2012), expanding the coverage of third-party reports and requiring this information be submitted online. Since then, taxpayers have been granted online access to all their third-party

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<sup>25</sup>Foreign assets are reported in the personal income and wealth tax returns. Since 2015, taxpayers also report them in a separate tax statement, number 160. In recent years, Colombia has signed a number of information exchange treaties. By 2018, more than 100 countries, including the United States, had information exchange treaties with Colombia.

reported information.<sup>26</sup>

Unfortunately, these improvements have not mechanically enhanced enforcement. The few staff handling third-party reports and the tax technology available are not enough to systematically cross-check items reported in the wealth tax return using available third-party reported information. Unlike some OECD countries, there is no dedicated unit for managing the tax affairs of high net worth taxpayers (OECD, 2017). Moreover, the fact that taxpayers self-report their wealth in aggregate form in a single box in the income tax return (“gross wealth”) makes detecting the sources of year-to-year wealth changes more difficult. The tax authority carries out randomized audits and requests documentation for all reductions in wealth holdings that are not evidently compatible with changes in other positions of the tax return. However, we are not aware of the exact number of wealth tax audits performed nor the number of verification or audit activity for high net worth taxpayers, as the tax authority discloses relatively limited information regarding its verification and audit actions.<sup>27</sup> This offers scope for tax evasion through underreporting or altogether failing to report assets, or fabricating liabilities.<sup>28</sup> To our knowledge, no rigorous estimates of the extent of wealth tax evasion exist for Colombia.

Regarding the issue of valuation, the value of some assets reported in tax records is often below its corresponding market values, defined as the price at which an asset would be traded in a competitive market. For instance, real estate is reported at cadastral values. In Colombia, as in many developing countries, cadastres are typically outdated; updating cadastres requires massive fieldwork and labor-intensive operations, as Colombia—unlike OECD countries—does not use values from transactions to estimate property values.<sup>29</sup> As a result, cadastral values today represent between 60 and 70 percent of market values.<sup>30</sup> Moreover, unlisted equities are recorded at the price at which they are bought rather than their market price. For other illiquid assets that are infrequently traded and therefore hard-to-value, including artwork and high-value jewellery, insured values could be used instead of market values; in practice, underreporting is rampant.<sup>31</sup>

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<sup>26</sup>Note, however, that there is no return pre-filing and that taxpayers are not currently required to neither file nor pay their taxes electronically (OECD, 2017).

<sup>27</sup>This opacity may be optimal from a policy perspective if taxpayers overestimate audit probabilities (Bérgolo, Ceni, Cruces, Giacobasso and Perez-Truglia, 2018). Anecdotally, audit efforts are focused on the corporate and value-added taxes, which generate more revenue. Overall, however, the number of completed audits per 100 active taxpayers is extremely low in Colombia compared to OECD countries. In 2015, this number was 0.38 for the personal income tax, 1.68 for the corporate income tax, and 0.54 for the value added tax (OECD, 2017). No such information is available for the wealth tax.

<sup>28</sup>One way of fabricating a liability is to report a debt contract with a friend or relative such that the debt is held by someone whose wealth placed them above the threshold while the asset was held by someone located below.

<sup>29</sup>Property transaction data is limited and, when available (e.g., real estate sales are reported by notaries), it usually suffers from underreporting due to tax avoidance.

<sup>30</sup>By law, cadastral values must represent at least 60 percent of market values (Law 1450/2011). Historically, Bogota has updated cadastral values closer to market values more systematically than other cities in Colombia.

<sup>31</sup>The incentives for individuals to own wealth through an entity rather than directly strengthened in recent years because the wealth tax for firms was progressively phased out starting 2015, to be completely eliminated by 2018 (Law 1739/2014). However, this will affect individuals mostly after 2018, i.e., after our period of study.

## 3.2 Data

Our data come from four main sources. Our first dataset is administrative tax microdata from the personal income tax in Colombia. We have gained access to individual-level tax declarations covering the universe of income tax filers between FY 1993 and FY 2016. These comprise 20.5 million observations (taxpayer-years) in a longitudinal panel of taxpayers. Our records contain information on the majority of items recorded in individual income tax declarations, such as income and wealth holdings by December 31, a four-digit economic activity code, and a geographic location code. Income can be decomposed roughly between wages, self-employment income, interest income, other capital income, and irregular income (inheritances, *inter vivos* gifts, long-term capital gains, lotteries). Wealth can be decomposed between assets and liabilities for all taxpayers and across all years. Before 2004, assets are further decomposed as follows: (i) cash, deposits in savings or checkings bank accounts, certificates of deposit, and other investments (e.g., bonds, life insurance, voluntary retirement fund); (ii) accounts receivable; (iii) stocks and contributions; (iv) inventories; (v) fixed assets (e.g., real estate, land ownership, vehicles, boats); and (vi) other assets (e.g., jewelery, art, industrial and intellectual property rights). In 2004, the income tax return was modified, and this level of wealth disaggregation is only required for taxpayers keeping records.<sup>32</sup> This subset of taxpayers business owners and others involved in retail and other commercial ventures, and represent 10–15 percent of income taxpayers every year.

Tax records in Colombia have very little demographic information of taxpayers. Although neither date of birth nor sex are reported to the tax authority, we reverse-engineer this information using taxpayers’ national ID numbers (*cédula de ciudadanía*) and names, exploiting an institutional characteristic of national ID number assignment by the National Registrar’s Office (*Registraduría Nacional del Estado Civil*).<sup>33</sup> We are able to assign sex to some 99.5 percent of taxpayers.

The second dataset is the individual-level wealth tax returns for all filers in wealth tax years from 2002 to 2017 (forms 420 and 440; see Figures B.3 and B.4). Individuals with reported net worth above a cutoff in the income tax statement are required to submit a wealth tax return. For these individuals, and a handful of voluntary filers, this dataset includes the decomposition of taxable and non-taxable net wealth, and wealth tax liability. Between 2015 and 2017, Colombia offered tax benefits to tax evaders voluntarily disclosing hidden assets and inexistent liabilities. Information on these disclosures is also available in our data.

The third dataset is the individual-level information return on foreign assets. Since 2015, all income taxpayers owning any foreign asset must file a separate information tax reform. Tax

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<sup>32</sup>Indeed, separate income tax returns are introduced in 2004 for individuals required and not required to keep records (tax forms 110 and 210, respectively—see Figures B.1 and B.2), and the wealth decomposition is available only for the former group. Figure A.3 plots this wealth decomposition in FY 2016.

<sup>33</sup>Before October 1, 2003, men were assigned national ID numbers 1–19,999,999 and 70,000,000–99,999,999, while women were assigned numbers 20,000,000–69,999,999. After October 1, 2003, individuals aged 18 and under (i.e., those born after 1985) were assigned ID numbers 1,000 million and above with no differentiation across genders. For these individuals, we impute sex based on taxpayer names wherever possible.

filers report the type of asset held abroad, the location of the asset, and the value of the foreign asset (the level of disaggregation of this information depends on the value of assets owned). These records have also been made available to us.

The last dataset comes from three massive leaks published by the International Consortium of Investigative Journalists (henceforth ICIJ). The largest one comes from Panamanian law firm Mossack Fonseca (i.e., the “Panama Papers”). Around one-third of the offshore entities were incorporated through Portcullis TrustNet (now Portcullis) and Commonwealth Trust Limited (i.e., the “Offshore Leaks”). The remainder come from a *trouve* of data from the official corporate registry of the Bahamas (i.e., the “Bahamas Leak”). These microdata cover nearly 40 years—from 1977 through to early 2016—and link to individuals and companies in more than 200 countries and territories. The information includes, *inter alia*, the names of the real owners of offshore entities, the entity contact postal address, the entity incorporation and inactivation dates.

Regrettably, the ICIJ dataset has a number of limitations. First, it is restricted to offshore entities created by only the handful of laws firms and offshore service providers mentioned above. Second, not every officer of a company that appears in the Panama Papers, the Offshore Leaks, and the Bahamas Leaks shows up in the public database. This is either because information about ownership cannot easily be extracted in a systematic manner, or because the law firm or offshore service provider failed to collect the necessary information about the real owners of companies.<sup>34</sup> Indeed, anonymity and the strategic veil of secrecy is precisely what makes offshore corporations so attractive to some. Thus, the information in the data should provide a lower bound to the number of entities used by Colombians and other individuals abroad. Third, information on the amount of wealth stored in the offshore entity or taxes evaded is not included. There are legitimate reasons to create a company in an offshore jurisdiction, and many law-abiding individuals declare them to their tax authorities when it is required. For instance, during the more violent 1990s and early 2000s, wealthy Colombians may have preferred safekeeping their wealth abroad. The investigations conducted by the tax authorities are still ongoing.

Despite these limitations, the Panama Papers provide valuable information on the extent to which Colombian citizens—law-abiding or otherwise—use offshore entities. We merge these data with administrative income and wealth tax records using individual names. The Panama Papers included information from 1,752 shareholders of offshore entities with a personal or entity contact address in Colombia, and we are able to match 1,208 individuals to their tax records using personal names, i.e., a match rate of 70 percent. This is partly thanks to the naming custom involving two surnames—a paternal surname, followed by a maternal surname—often practiced in Colombia. The pool of unmatched individuals represents cases where the full name does not uniquely identify an individual in the tax records, or where the individual—whether required to or otherwise—did not file an income tax record in Colombia between 1993 and 2015.

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<sup>34</sup>Indeed, not all offshore entities can be traced to actual persons. For this reason, a sizeable amount of offshore entities are assigned to the Bahamas, the British Virgin Islands, etc. (Alstadsater et al., forthcoming).

## 4 Bunching Responses to Wealth Taxes

In this section, we leverage quasi-experimental variation in wealth taxes introduced by the notched tax schedule and the tax reforms described in Section 3 to estimate the elasticity of net wealth with respect to the net-of-wealth tax rate. To fix ideas, consider the 2010 wealth tax reform depicted in Figure 1, which lowered the exemption threshold from 3 to 1 billion pesos (2010 USD 1,562,400 to 520,830). Taxpayers previously exempt from the wealth tax suddenly faced average wealth tax rates of 1 or 1.4 percent if reporting 1 to 2 billion pesos and 2 to 3 billion pesos, respectively. The result of this policy change is presented in Figure 2, which plots taxpayer density by bins of reported net worth in 2009 (before the reform) and 2010 (after the reform). The gray curve shows the distribution of taxpayers is smooth in the absence of wealth taxes, while the blue curve shows the introduction of the two tax notches results in the immediate emergence of excess (missing) masses below (above) the notch points. This bunching identifies a direct behavioral response to wealth taxes. As explained before, immediate bunching in wealth—a stock—mainly reflects reporting since, *inter alia*, asset prices are not controlled by the taxpayer. This motivates our model of wealth underreporting, which we describe below.

### 4.1 The Elasticity of Reported Wealth: Theory and Evidence

Building on Kleven and Waseem (2013) and Almunia and Lopez-Rodriguez (2018), we propose a stylized model to examine the problem of utility-maximizing individuals that can underreport their wealth to shelter their fortune from taxation and incur a resource cost. We use this framework to analyze how individuals respond to a discontinuous increase in wealth tax liability—a tax notch—at an arbitrary reported wealth threshold. The model yields testable implications on the expected effects of wealth taxation on individuals’ reporting decisions.

#### 4.1.1 Conceptual Framework

Consider an economy with a continuum of individuals of measure one. Individuals derive utility from their (latent) true wealth  $W$ , and the government levies a proportional tax  $\tau$  on reported wealth  $W_r$ . The wealth tax liability implies a proportional (average and marginal) tax rate and reported wealth, such that  $T(W_r) = \tau W_r$ . Since the tax authority does not perfectly observe true wealth, individuals may attempt to misreport their wealth to reduce their tax burden, such that  $0 \leq W_r \leq W$ . Misreporting wealth implies a (direct and indirect) resource cost, which is captured by the convex cost function  $C(1 - W_r/W) \cdot W$ . This function captures the intuition that the cost of misreporting is rising in the share of unreported wealth  $1 - W_r/W$  and that, holding this share constant, the misreporting cost is rising in wealth. For example, it is more costly to misreport 10 percent of wealth for an individual owning 1 billion dollars than one owning 1 million dollars.

We initially assume this cost function is the same for all individuals, but relax this assumption

later. A positive wealth tax rate  $\tau > 0$  depresses  $W_r$  below  $W$ , with the strength of the effect determined by elasticity  $e$ , the parameter of interest. Intuitively, if  $e \rightarrow 0$ , then individuals report their true wealth ( $W_r \rightarrow W$ ), while if  $e \rightarrow \infty$ , individuals report no wealth at all ( $W_r \rightarrow 0$ ). Recall that, under some conditions,  $e$  serves as a sufficient statistic for tax revenue, welfare, and optimal taxation (Chetty et al., 2011; Saez, 2010).

If elasticity  $e$  and resource cost function  $C(\cdot)$  are the same for all individuals, then all the variation in reported wealth  $W_r$  will be due to differences in  $W$ . There is a smooth distribution of wealth  $W$  in the population captured by a distribution function  $F(W)$  and a density function  $f(W)$ . We denote  $H_0(W_r)$  and  $h_0(W_r)$  the distribution and density functions for reported wealth associated with the baseline linear tax system. Given a smooth tax system (i.e., no notches and no kinks), the smooth wealth distribution converts into a smooth reported wealth distribution.

Suppose that a proportional tax notch is introduced at reported wealth cutoff  $W_r^*$  so that  $T(W_r) = \tau W_r + \Delta\tau \cdot W_r \cdot \mathbb{1}(W_r > W_r^*)$  where  $\Delta\tau$  is the proportional tax notch and  $\mathbb{1}(\cdot)$  is an indicator for being above the cutoff. Figure A.4, Panel (a), illustrates the implications of a proportional tax notch in a budget set diagram with two individuals, L and H, who have “low” and “high” wealth, respectively. Individual L chooses reported wealth  $W_r^*$  under both tax regimes, while individual H is the marginal buncher: she chooses reported wealth  $W_r^* + \Delta W_r^*$  before the tax change and is exactly indifferent between reducing her reported wealth to bunch at  $W_r^*$  (which reduces the expected tax burden but implies a resource cost), or remaining at the interior point  $W_r^I$  and facing higher taxes. As a result, L (H) has the lowest (highest) pre-notch reported wealth among those who locate at the notch point. Every individual between L and H locates at the notch point: all individuals who had reported wealth in the interval  $(W_r^*, W_r^* + \Delta W_r^*)$  before the introduction of the notch will bunch. There is a hole in the post-notch density distribution as no individual is willing to locate between  $W_r^*$  and  $W_r^I$ , as depicted in Figure A.4, Panel (b).<sup>35</sup>

Since there is a direct mapping between the true wealth distribution  $f(W)$  and the pre-notch reported wealth distribution  $h_0(W_r)$ , we can define the number of bunching individuals at the notch point as

$$B = \int_{W_r^*}^{W_r^* + \Delta W_r^*} h_0(W_r) dW_r \approx h_0(W_r^*) dW_r^* \quad (1)$$

where the approximation assumes that the counterfactual density  $h_0(W_r)$  is roughly constant on the bunching segment  $(W_r^*, W_r^* + \Delta W_r^*)$ . The number of bunching individuals depends positively on the increase in taxes at the notch and negatively on the resource cost of sheltering wealth from taxation.

We now consider two extensions of this baseline model, namely, heterogeneity in elasticities and in the resource cost of sheltering wealth from taxation.

<sup>35</sup>To simplify the exposition, Figures A.4 and 3 assume that the notch is associated with a small change in the *marginal* wealth tax rate above the cutoff, so that intensive responses by those who stay above the notch can be ignored. This implies that pre- and post-notch densities coincide above  $W_r^* + \Delta W_r^*$ .

**Extension 1: Heterogeneity in Elasticities.** If there is heterogeneity in elasticities  $e$ , the tax notch creates different incentives to bunch for individuals with the same latent wealth  $W$ . An important point is that, unlike kinks, notches often create a region of strictly dominated choice  $(W_r^*, W_r^* + \Delta W_r^D]$  in which it is possible to increase individual utility by moving to notch point  $W_r^*$ , making these choices dominated under any parametric form for individual preferences (Kleven and Waseem, 2013).<sup>36</sup> The dominated range therefore represents a lower bound on the wealth reporting response to tax notches under any compensated elasticity in this frictionless model.

Behavioral responses can be characterized as in the baseline model detailed above at each elasticity level: the bunching segment at elasticity  $e$  is given by  $(W_r^*, W_r^* + \Delta W_{r,e}^*)$ , where  $\Delta W_{r,e}^*$  is increasing in  $e$  and equals  $\Delta W_r^D$  for  $e = 0$ .<sup>37</sup> If  $e > 0$ , the bunching interval will be larger than the region of strictly dominated choice ( $\Delta W_r^* > \Delta W_r^D$ ). The post-notch density is therefore empty in the strictly dominated range, as depicted in Figure A.4, Panel (c). It then increases gradually—the elasticity being too low for some individuals to bunch—until converging with the pre-notch density at  $W_r^* + \Delta W_{r,e}^*$ . With heterogeneity, the bunching method estimates the *average* response in the population  $E[\Delta W_{r,e}^*]$ . Excess bunching at the notch is then

$$B = \int_e \int_{W_r^*}^{W_r^* + \Delta W_{r,e}^*} \tilde{h}_0(W_r, e) dW_r de \approx h_0(W_r^*) E[\Delta W_{r,e}^*] \quad (2)$$

where  $\tilde{h}_0(W_r, e)$  represents the joint reported wealth-elasticity distribution in the baseline without a notch, and  $h_0(W_r) \equiv \int_e \tilde{h}_0(W_r, e) de$  represents the unconditional reported wealth distribution in the baseline case.<sup>38</sup>

**Extension 2: Heterogeneity in Costs of Sheltering Wealth (Frictions).** Individuals may face different resource cost functions  $C(\cdot)$  through various channels. For instance, assets owned by individuals may be more or less covered by third-party reporting and therefore more or less manipulable. They might also depend on individuals' access to the offshore wealth management industry, preferences (e.g., risk aversion, honesty), misperception, adjustment costs, or inattention. As a result, individuals with the same underlying wealth  $W$  will face different incentives to bunch. If an individual has a prohibitively high resource cost, she might not react to the tax notch because the (perceived or real) costs of misreporting are higher than the expected tax savings of bunching. This implies that a fraction of individuals with  $W \in (W_r^*, W_r^D]$  who would move to the notch point  $W_r^*$  in the absence of these resource costs stays above it, as illustrated in Figure 3, Panel

<sup>36</sup>The width of the dominated range  $\Delta W_r^D$  is defined such that reported wealth level  $W_r^* + \Delta W_r^D$  ensures the same level of net-of-tax wealth  $W - T(W_r)$  as the notch point  $W_r^*$ , that is,  $(1 - \tau - \Delta\tau)(W_r^* + \Delta W_r^D) = (1 - \tau)W_r^*$ . Therefore  $\Delta W_r^D = \Delta\tau \cdot W_r^* / (1 - \tau - \Delta\tau)$ .

<sup>37</sup>See proof in Appendix D.

<sup>38</sup>The approximation assumes that the counterfactual density is locally constant in reported wealth (but not elasticities).



(a). Frictions also imply some individuals that respond do not bunch *exactly* at the notch point, thus creating a diffuse excess mass rather than a point mass at  $W_r^*$ . For instance, because wealth is a stock and not a flow, it is arguably more costly to respond to the notch and more difficult to locate precisely below the notch (inter alia, asset prices are not controlled by the taxpayer).<sup>39</sup>

Our approach leverages the strong incentives created by tax notches to quantify the response that would be observed if individuals overcame optimization frictions, that is, if sheltering wealth from taxation were costless. Denote  $a(W_r, e)$  the share of individuals at reported wealth level  $W_r$  and elasticity  $e$  with sufficiently high resource costs that they are unresponsive to the notch. We then have excess bunching

$$B = \int_e \int_{W_r^*}^{W_r^* + \Delta W_{r,e}^*} (1 - a(W_r, e)) \tilde{h}_0(W_r, e) dW_r de \approx h_0(W_r^*) (1 - a^*) E [\Delta W_{r,e}^*] \quad (3)$$

where the approximation assumes a locally constant counterfactual density and, in addition, a locally constant share of individuals with “large” resource costs,  $a(W_r, e) = a^*$  for  $W_r \in (W_r^*, W_r^* + \Delta W_{r,e}^*)$  and all  $e$ .<sup>40</sup> Then,  $E [\Delta W_{r,e}^*]$  is the average “structural” response not affected by frictions while  $(1 - a^*) E [\Delta W_{r,e}^*]$  is the average observed response attenuated by resource costs.

We estimate the share of individuals with prohibitively large resource costs  $a^*$  from the strictly dominated range  $(W_r^*, W_r^D]$ . Because we know from Appendix D that even individuals with  $e = 0$  should be bunching in the dominated range, any remaining mass in that segment must be the result of high resource costs:  $a^* \equiv \int_{W_r^*}^{W_r^D} h(W_r) dW_r / \int_{W_r^*}^{W_r^D} h_0(W_r) dW_r$ . The reported wealth response that would materialize if individuals overcame resource costs is then proportional to  $B/(1 - a^*)$ . This means that the larger the number of bunching individuals  $B$  and the smaller the hole in the dominated region (i.e., the higher the share of non-bunchers  $a^*$ ), the larger the response to tax notches. Further, note that because the utility gain of bunching at the notch point, for a given elasticity  $e$ , is monotonically *decreasing* in  $W_r > W_r^*$ ,  $a^*$  *increases* on bunching segment  $(W_r^*, W_r^* + \Delta W_{r,e}^*)$  and converges to zero at  $W_r^* + \Delta W_{r,e}^*$ . This implies that estimating  $a^*$  from the dominated range *understates* average resource costs, *overstates* the share of bunchers  $1 - a^*$ , and therefore provides a *lower bound* of the response  $\Delta W_r^*$  that would materialize in the absence of resource costs. This is what Kleven and Waseem (2013) denote the “bunching-hole method.”

If, instead, none of the missing mass can be explained by low elasticities (i.e., elasticities are homogeneous at  $e = \bar{e}$ ) and it is all driven by frictions, then the “structural” response  $\Delta W_r^*$  corresponds to the reporting response of the marginal buncher H. This  $\Delta W_r^*$  can be determined as the point of convergence between observed and counterfactual distributions:  $W_r^* + \Delta W_r^*$  is estimated as the point where excess mass is exactly equal to missing mass, as we describe below.

<sup>39</sup>An alternative interpretation is that taxpayers explicitly avoid bunching *exactly* at the notch if they believe doing so increases the likelihood of auditing. Under this interpretation, bunching farther away from the notch is not reflective of frictions but rather risk aversion or an explicit strategy to pass undetected.

<sup>40</sup>The assumption that the proportion of non-bunchers  $a^*$  is locally constant is conservative: the importance of resource costs is likely increasing with the distance from the notch point, and thus so is  $a^*$ .

This represents an *upper bound* on the average “structural” response  $\Delta W_r^*$ .

### 4.1.2 Identification

We can uncover the elasticity  $e$  given knowledge of the notch parameters,  $\tau$  and  $\Delta\tau$ , and the reporting response  $\Delta W_r^*$ . This elasticity can be non-parametrically identified without relying on a specific utility functional form, or it can be identified assuming some additional parametric structure. We present the former approach below, and develop the structural approach in Appendix D.<sup>41</sup> Specifically, we apply the reduced-form approach described in [Kleven and Waseem \(2013\)](#) and Kleven’s online technical note to relate the wealth reporting response  $\Delta W_r^*$  to the change in the *implicit* marginal tax rate between  $W_r^*$  and  $W_r^* + \Delta W_r^*$  created by the notch.<sup>42</sup> Treating  $\Delta W_r^*$  as if generated by a hypothetical kink  $1 - t^*$  between  $W_r^*$  and the tangency point of individual H’s indifference curve  $I(W_r)$  assuming  $W_r^I \approx W_r^* + \Delta W_r^*$  (i.e., the interior incentives are small), it can be shown that

$$e_R \equiv \frac{\Delta W_r^*}{W_r^*} \cdot \frac{1 - t^*}{\Delta t^*} \approx \left( \frac{\Delta W_r^*}{W_r^*} \right)^2 \cdot \left( \frac{1 - \tau}{\Delta\tau} \right) \cdot \frac{1}{2} \quad (4)$$

### 4.1.3 Estimation

Figure 3, Panel (b) illustrates the bunching estimation to obtain the reporting response  $\Delta W_r^*$  and corresponding elasticity. We follow previous bunching studies and slice the data into bins of reported net worth and count the number of taxpayers located in each bin to generate an empirical density  $h(W_r)$ . The counterfactual distribution  $h_0(W_r)$  is obtained from a regression of the following form

$$c^j = \sum_{i=0}^p \beta_i \cdot (W_r^j)^i + \sum_{i=W_r^l}^{W_r^u} \gamma_i \cdot 1[W_r^j = i] + \eta^j \quad (5)$$

where  $c^j$  is the number of individual taxpayers in bin  $j$ ,  $W_r^j$  is the reported net worth level in bin  $j$ , and  $p$  is the order of the polynomial. The excluded range  $[W_r^l, W_r^u]$  corresponds to the area that is affected by the notch point either because of excess or missing mass. The counterfactual distribution is estimated as the predicted values from specification (5) omitting the contribution of the dummies in the excluded range, that is,  $\tilde{c}^j = \sum_{i=0}^p \hat{\beta}_i \cdot (W_r^j)^i$ . Excess bunching and missing mass are estimated as the difference between the observed and counterfactual bin counts in the relevant reported net worth ranges,  $\hat{B} = \sum_{j \in [W_r^l, W_r^*)} (c^j - \tilde{c}^j)$  and  $\hat{M} = \sum_{j \in [W_r^*, W_r^u]} (\tilde{c}^j - c^j)$ .

The lower limit  $W_r^l$  is determined both visually and exploiting pre-reform data. The upper limit  $W_r^u = W_r^* + \Delta W_r^*$  is estimated by imposing the restriction that the excess bunching equals

<sup>41</sup>Reduced-form elasticities are somewhat larger than structural elasticities, as the former provide an approximation (upper bound) of the true structural elasticity. [Kleven and Waseem \(2013\)](#) show that, given the size of the notch  $\Delta\tau/(1 - \tau)$  and a true functional form for utility, the bias of the reduced-form approach is determined by the percentage reporting response  $\Delta W_r^*/W_r^*$ .

<sup>42</sup>See derivations in Kleven’s online technical note [here](#).

the missing mass,  $\hat{B} = \hat{M}$ . This is equivalent to assuming that all responses to the tax notch are on the intensive margin. Starting from a low initial value of the upper bound  $W_r^u \approx W_r^*$  and an initial estimate of the counterfactual  $\hat{c}^{j0}$ , the upper bound is increased in small increments and the counterfactual reestimated every time until  $\hat{M}^k = \hat{B}^k$ .<sup>43</sup> The estimated upper bound  $W_r^u$  is the counterfactual reported wealth of the marginal taxpayer that responds to the tax change. Total excess bunching  $\hat{b}$  is then  $\hat{B}$  relative to the counterfactual.<sup>44</sup>

#### 4.1.4 Evidence from the 2010 Wealth Tax Reform:

We begin illustrating the effect of wealth taxation on reported net worth using the 2010 wealth tax reform. Recall that, as depicted in Figure 1, this reform lowered the wealth eligibility threshold from 3 billion pesos (2010 USD 1,562,490) to 1 billion pesos (2010 USD 520,830), and created four distinct tax brackets. Individuals likely exempt from the wealth tax prior to 2010 were now taxed at a rate of 1 percent if reporting between 1 and 2 billion pesos, or 1.4 percent if reporting between 2 and 3 billion pesos. This was a one-time tax.

For our wealth bunching estimation, Panels (a) and (b) in Figure 4 plot the distribution of individuals around the first and second notches, respectively. The red vertical line marks the notch point in each panel. The gray line is the counterfactual distribution, estimated as a fifth-order polynomial, as specified in (5). The estimated parameters are displayed separately. The following patterns emerge from these panels. First, the notches are associated with large and sharp bunching just below the cutoff and missing mass above the cutoff. For the first notch, the excess mass  $\hat{b}$  is 4.9 times the counterfactual, meaning there is 4.9 times the expected density in the absence of the notch. The estimated standard error of  $\hat{b}$  is 0.17 with an implied  $t$ -statistic of 28.82, so the null hypothesis of no bunching at the notch is rejected at the 1 percent level.<sup>45</sup> For the second notch, the excess mass is 4.3 times the counterfactual (the standard error is 0.37). Second, behavioral responses are significantly attenuated by large optimization frictions: 43 percent and 57 percent of individuals in dominated regions do not bunch in response to the first and second notch, respectively. This implies that the degree of bunching absent these frictions  $B/(1 - a^*)$  is 1.75 and 2.33 times larger than observed bunching, respectively.

We now turn to the estimation of reported wealth responses  $\Delta W_r^*$ , combining the nonparametric evidence with the conceptual framework from Section 4.1.1. We bound these responses and

<sup>43</sup>In the empirical application there is a finite number of bins, so we impose the condition that the absolute difference between  $\hat{B}$  and  $\hat{M}$  be “close” to zero, i.e.  $|\hat{B} - \hat{M}| < 0.03$ .

<sup>44</sup>Standard errors are calculated by a bootstrap of the entire estimation procedure. We draw 1,000 random samples with replacement, and define the standard error of the estimated excess bunching  $\hat{b}$ , share  $\hat{a}^*$ , reported wealth response  $\Delta \hat{W}_r^*$  (lower and upper bounds), reduced-form elasticity estimate  $\hat{e}_R$ , and structural elasticity estimate  $\hat{e}_S$  (developed in Appendix D) as the standard deviation in the distribution of estimates of each variable.

<sup>45</sup>Figure A.5 shows heterogeneity in bunching across samples with different opportunities to shelter wealth from taxation (capital rentiers, wage-earners, and all other taxpayers). The figure shows that bunching is most pronounced among capital rentiers and least pronounced among wage-earners, who arguably have less sheltering opportunities than other taxpayers (Jakobsen et al., 2018).

elasticities as previously detailed: a lower bound is obtained from the bunching-hole method based on  $B/(1 - a^*)$ , while an upper bound is obtained from the response of the marginal buncher (i.e., the point of convergence between counterfactual and observed distributions). Table 1 presents the estimated parameters. For each reform year, the table shows the notch point (column 2), whether this notch is also the wealth tax exemption threshold (column 3), the average tax rate jump (column 4), the size of the dominated range (column 5), the share of taxpayers in dominated ranges that are unresponsive to the tax notch (column 6), the lower and upper bounds on the reporting responses (columns 7 and 8, respectively), and the bounds on the elasticities based on the reduced-form formula (4) (columns 9 and 10).

Table 1 shows that, if individuals in the dominated region overcame optimization frictions, the reported wealth response would be 110 million pesos, that is, 11 percent higher than the first notch point or 5.5 percent higher than the second notch point. Further, under a smooth tax system, the marginal buncher around the exemption cutoff would have reported net worth 1,200 million pesos, i.e., 20 percent higher than the threshold. The tax revenue loss implied by bunching represents 2010 USD 20.6 million, a loss equivalent to 3.5 percent of their personal wealth tax revenues collected that year. For the second notch, the marginal buncher would report net worth up 2,180 million pesos, i.e., 9 percent higher than the notch point. The corresponding tax revenue loss is 2010 USD 2 million or 0.3 percent of personal wealth tax revenues collected that year. These responses are all highly statistically significant.

The implied elasticities of reported net worth with respect to the net-of-tax rate can be obtained by applying the reduced-form approximation (4). These elasticities are 0.6 using the bunching-hole method and 2.0 using the convergence method, and both are statistically significantly different from zero at the 1 percent level. This latter elasticity implies that, for the marginal buncher, a 1 percent increase in the net-of-tax rate raises reported wealth by 2 percent. In contrast, elasticities obtained from the second notch are smaller (between 0.37 and 1.0), but only precisely estimated using the bunching-hole method.

An advantage of our setting is that we observe wealth before and after tax policy changes for those affected and not affected by them. This enables us to test key assumptions for the bunching procedure to identify behavioral responses. Panels (c) and (d) in Figure 4 compare the counterfactual densities from cross-sectional data and specification (5) (black line) with the counterfactual density using pre-reform data from 2009 when there are no notches or kinks (gray line). The figures confirm that, first, the distribution of reported net worth is smooth in the absence of wealth tax notches. Second, our estimated parameters are robust to using this counterfactual distribution of reported net worth. For the first notch, estimates using the 2009 distribution as counterfactual density are somewhat larger (e.g.,  $\hat{W}_r^u$  is 1250 versus 1200), but mostly not statistically significantly different. Specifically, upper-bound  $\Delta W_r$  and corresponding elasticities are not statistically different, while lower-bound  $\Delta W_r$  and corresponding elasticities are different at the 5 percent level. For the second notch, none of the differences are statistically significant.

Interestingly, taxpayers appear to remain bunched below the exemption cutoff several years after the reform, even though there is no wealth tax during those years. Figure A.6 plots the distribution of reported wealth in 2009 through 2012, that is, two years after the 2010 wealth tax reform. The figure confirms that the excess mass below the exemption cutoff remains two years after the reform, albeit its magnitude decreases with time. In particular, individuals continue to reduce their reported wealth in *real* terms to avoid passing the threshold of (current) 1,000 million pesos.

Finally, as in other bunching papers, extensive responses and multiple notches are two main concerns we would potentially have to deal with.<sup>46</sup> First, extensive responses could occur if taxpayers reduced their reported wealth below the filing requirement. However, this is very unlikely in our setting because the filing cutoff is sufficiently below the notches. Moreover, the income tax filing requirement also depends on total income received, as well as card expenditures. Therefore, we observe extensive margin responses only if an individual manipulated reported income, wealth, and card expenditures altogether below the filing cutoffs, which is unlikely in the short term.<sup>47</sup> Second, the presence of multiple notches may become an issue if bunchers are jumping more than one notch at a time. Although the conceptual framework allows us to deal with such scenarios, empirical implementation is made more difficult as bunching and missing masses are no longer matched at each notch separately. Luckily, the panel structure of our data allows us to test how big of a concern this is, and Figure 6 suggests only a handful of bunchers are jumping more than one notch at a time.

#### 4.1.5 Evidence from Other Wealth Tax Reforms in 2003–2014:

We now exploit variation introduced by reforms taking place in 2003, 2006, 2010, and 2014 to compare bunching responses and elasticities across wealth levels, notch sizes, and notch saliency. The results, displayed in Table 1 and Figure 5, can be summarized as follows. First, frictions are abundant and imply that between 35 percent and 74 percent of individuals in the dominated range do not respond to the wealth tax notch. This provides direct evidence that optimization frictions significantly constrain behavioral responses, and implies that excess bunching would be 1.54 to 3.85 times larger if taxpayers overcame such frictions. Second, reported wealth responses are very large at all notches and almost always precisely estimated. While these responses vary from 4 percent (= 120/3000) to 21 percent (= 210/1000) across all years, they are often not statistically significantly different from each other. For instance, in 2010, the reported wealth

<sup>46</sup>Note that an additional practical problem that is common in the bunching literature is the higher frequency in the reporting of “round numbers.” However, as Figures 4 and 5 demonstrate, our data does not display “round-number” problems often present in other applications.

<sup>47</sup>We test for extensive margin responses to tax notches by checking whether the probability of disappearing from our sample the year of the tax reform is smooth around the tax notch using bins of pre-reform net worth (bin size is current 10 million pesos). Specifically, we use `rdrobust` command from Cattaneo, Calónico and Titiunik (2014) and confirm that the probability of dropping from the sample the year the tax reform is introduced is smooth around notches for all years (not reported).

response from the marginal buncher is not statistically different between the first and second notches. The largest responses, in percentage terms, come from the bottom notches, that is, the less wealthy taxpayers. These responses are triggered by relatively small tax notches (e.g., 0.05 percent in 2014), which mechanically translates into large elasticities for this group of individuals. This implies that elasticities are generally decreasing in reported wealth.<sup>48</sup> For example, in 2010, the upper-bound reduced-form elasticity estimated from the first notch is statistically significantly different from the equivalent elasticities estimated from the third and fourth notches.

Decreasing bunching elasticities contrast with the conventional wisdom that wealthy taxpayers, who have access to more aggressive avoidance opportunities, are very responsive to taxation. First, taxpayers may be more elastic to more salient notches; the first notch determining the wealth tax exemption cutoff is arguably the most salient notch. Second, bunching estimates local elasticities driven by the sample of compliers around the tax notch. As the next section shows, individuals in the top brackets have a larger share of their wealth in the form of listed equities and portfolio securities covered by third-party reporting, which are harder to underreport.<sup>49</sup> Third, while bunching captures an immediate response to wealth taxation in our context, some sophisticated tax sheltering schemes, such as setting up an offshore shell company, may not be used as an instantaneous response to wealth taxes—even for an individual with access to the offshore wealth management industry. Interestingly, the elasticities we estimate for the wealthiest individuals are more similar to those estimated in Sweden (Seim, 2017) and Denmark (Jakobsen et al., 2018), a point we will return to in Section 4.3.

## 4.2 Misreporting Wealth Subject to Less Third-Party Reporting

As explained previously, the instantaneous responses we documented above in wealth—a stock—suggest these are mainly reporting responses to taxation. In this section, we exploit our panel microdata as well as variation in the incentives to bunch introduced by a wealth tax reform to identify the type of assets and debts taxpayers manipulate to place themselves exactly below the notch point.

Ex ante, it is unclear which type of wealth (e.g., financial, non-financial) should be more responsive to taxation. Financial wealth is presumably more liquid and easier to adjust to tax changes; however, it is also generally subject to more third-party reporting and thus harder to misreport. In contrast, non-financial assets such inventories and real estate have values that are harder to “mark to market” for tax authorities (Brulhart et al., 2017). In Colombia, inventories in particular are subject to no third-party reporting, which implies taxpayers may be more likely

<sup>48</sup>Decreasing bunching elasticities have also been documented in other settings studying earnings (Kleven and Waseem, 2013; Saez, 2010) and firm revenue (Bachas and Soto, 2018) responses to tax kinks and notches.

<sup>49</sup>Table A.2 confirms that taxpayers around the last notch have twice the share of assets in stocks than taxpayers in the first notch. Moreover, taxpayers who respond to the last notch by bunching below the cutoff have a different wealth composition than those remaining above it; specifically, they have a smaller share in stocks.

to manipulate them (Chetty, Friedman and Saez, 2013; Chetty et al., 2011). In all, the question of what wealth items respond to taxes, locating taxpayers below the cutoffs is an empirical one.

To fix ideas, Figure 6 compares taxpayer density across reported net worth bins for individuals filing in 2008 and 2009 (i.e., a smooth tax schedule) in Panel (a), and 2009 and 2010 (i.e., a notched tax schedule) in Panel (b). Darker bins represent higher relative taxpayer density (bins are re-weighted by total number of taxpayers in that column). Panel (a) shows that taxpayers report owning similar amounts of wealth from year to year in the absence of wealth tax notches, although there is year-to-year variation that is not necessarily related to changes in the wealth tax schedule. This stands in striking contrast with the pattern plotted in Panel (b), which shows the presence of two horizontal darker areas just below the 1,000 million and 2,000 million marks in 2010. These darker areas corresponds to individuals above the notch points in 2009 who report wealth just below the cutoffs immediately following the reform.

We identify and characterize individuals that bunch in response to wealth tax notches using a compliers analysis in the spirit of Imbens and Rubin (1997). We pool individuals filing income tax returns before and after the wealth tax reform (specifically, 2008 through 2010). In our setting, “compliers” are represented by the subpopulation of individuals who respond to wealth taxes by bunching below the cutoffs, i.e., the bunchers. Always-takers represent individuals who locate below the notch even in the absence of wealth taxes, while never-takers represent individuals who do not bunch in spite of wealth taxes. Tax filer  $i$  is located in the bunching region  $B_{it}$  if she reports wealth between  $W_r^l$  and the tax notch  $W_r^*$  in year  $t$ . Because being located in the bunching region can occur in the absence of wealth taxes, individuals with  $B_{it} = 1$  are a mix of compliers and always-takers, as illustrated in Figure A.7. Tax filers located above  $W_r^*$  are the never-takers. We exploit the variation over time in the likelihood of being located in the bunching region due to the introduction of wealth taxation, and characterize bunchers using the following IV specification:

$$Y_{it} = \alpha_1 + \gamma_1 t + \beta_1 B_{it} + \epsilon_{it} \tag{6}$$

where  $Y_{it}$  is the amount of debt or asset type (e.g., bank deposits, real estate, inventories) expressed as a share of total assets reported that year,  $t$  is a time trend that accounts for changes in wealth composition,  $B_{it}$  is an indicator for being located in the bunching region, and  $\epsilon_{it}$  is the error term. Because the incentives to bunch are exogenously shocked by the wealth tax reform,  $B_{it}$  is instrumented with a post reform dummy  $Z_{it} = \mathbf{1}(t = 2010)$ . Standard errors are clustered at the taxpayer level to account for serial correlation.

A limitation of this analysis is that, while debt is reported by all taxpayers, the decomposition of asset types is available only for the subsample of taxpayers keeping records, as explained in Section 3.2. These taxpayers, who represent 17.5 percent of our estimation sample, they report six categories of assets: fixed assets (e.g., real estate, land), stocks and contributions, inventories,

bank deposits, accounts receivable, and other assets.<sup>50</sup>

Table 2 presents the results separately by each wealth category, focusing on taxfilers around the first notch. Column (1) plots the average outcome of compliers in the absence of wealth taxes. The table shows most assets of bunchers are fixed assets such as real estate and land (52.7 percent). The rest is composed of, in decreasing order, stocks and contributions (17 percent), inventories (10.9 percent), bank deposits (8.6 percent), accounts receivable (6.6 percent), and other assets (3.8 percent). Liabilities represent 9.4 percent of total assets. Column (2) plots the behavioral response of bunchers to wealth taxes in percentage points. The results suggest bunchers inflated their liabilities by 35 percent ( $= 0.033/0.094$ ). While our data does not allow decomposing debt by type, anecdotal evidence suggests bunchers fabricate interpersonal debt, that is, debt owed to friends or family members rather than financial institutions. In addition, bunchers underreport inventories by 22 percent ( $= -0.024/0.109$ ). As explained before, inventories are not subject to third-party reporting, making their misreporting more likely to pass undetected by the tax authority.

Column (3) suggests that, relative to bunchers, taxpayers located in the bunching region in the absence of wealth taxes (always-takers) own a larger fraction of their wealth in non-financial assets like real estate and land, and a lesser fraction in stock. Column (4) suggests that taxpayers who do not bunch in response to wealth taxes (never-takers) are very similar to bunchers in observable wealth.

We thus conclude that individuals immediately respond to wealth taxes by manipulating the reported values of their assets and liabilities to artificially place themselves just below the tax notch. This response is particularly strong among assets that are subject to little third-party reporting. Again, the large magnitude of the bunching responses in a very short amount of time points towards sheltering rather than real responses to wealth taxes. Specifically, when enforcement capacity is weak, wealth reported to the tax authority instantly falls upon taxation—even if tax rates are relatively small.

### 4.3 Interpretating Wealth Elasticities and Short-Term Revenue Loss

To put our estimated elasticities into perspective, we first compare them to those of previous studies. As an illustration, our bunching estimation using the 2010 eligibility cutoff shows the elasticity of reported wealth with respect to the net-of-tax rate is 2. Consistent with tax notches being more

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<sup>50</sup>Figure A.8 plots the density of record-keeping taxpayers by reported wealth in 2010 and shows that, under a smooth tax system, the marginal buncher would have reported net worth up to 23 percent higher than the threshold. Despite significant bunching, these taxpayers face stronger resource costs of sheltering (arguably due to the adjustment costs imposed by record keeping), and bunch less often than other taxpayers:  $\hat{a}^*$  is 0.53 compared to 0.43, and  $\hat{b}$  is 3.99 compared to 4.90 (but neither difference is statistically significant). Moreover, the excess mass is less diffuse for these individuals, i.e., the bunching segment  $[W_r^l, W_r^*]$  is smaller. This suggests that, conditional on bunching, business owners keeping records are better able to target the cutoff than taxpayers not keeping records, possibly because they have somewhat more control over their reported values of wealth.



salient than kinks, our elasticity is an order of magnitude larger than estimates exploiting kinks in the wealth tax schedule (Jakobsen et al., 2018; Seim, 2017). In fact, the elasticities from these studies are similar to those we derive for wealthier taxpayers (specifically, in the third and fourth notches in 2010, and in 2003 or 2006, when the exemption cutoff was larger). Instead, our elasticity of 2 is closer to that found using a difference-in-differences approach in Catalonia: Durán-Cabé et al. (2017) find that taxable wealth drops by 1.5 percent one year after the reintroduction of the wealth tax, and by 6.4 percent three years after.<sup>51</sup> Lastly, our elasticities are an order of magnitude smaller than the elasticity of 34.7 estimated using cross-canton comparisons in Switzerland by Brulhart et al. (2017).<sup>52</sup>

Importantly, a positive tax on wealth affects the return to wealth. For instance, a 1 percent tax on wealth corresponds to a 20 percent tax on capital income, assuming a rate of return on wealth of 5 percent. Wealth taxes can therefore be interpreted as isomorphic to taxes on capital income. In particular, the elasticity of wealth is equivalent to the elasticity of capital income multiplied by a factor of  $(1 - \tau_W)/r(1 - \tau_K)$ :

$$\epsilon_K = \epsilon_W \cdot \frac{r(1 - \tau_K)}{1 - \tau_W} \quad (7)$$

where  $\epsilon_K$  is the elasticity of capital income,  $\epsilon_W$  the elasticity of wealth,  $r$  the rate of return on wealth,  $\tau_K$  the capital income tax rate, and  $\tau_W$  the wealth tax rate.<sup>53</sup> In our example,  $\tau_W = 0.01$ ,  $r = 0.05$ ,  $\tau_K = 0.2$ , and  $\epsilon_W = 2$  from our main analysis imply  $\epsilon_K = 0.08$ . Thus, our relatively large elasticities with respect to  $1 - \tau_W$  translate into fairly small conventional elasticities with respect to  $1 - \tau_K$ .<sup>54</sup>

In addition, our estimated wealth elasticities enable us to recover the revenue loss due to short-term behavioral responses to wealth taxes, as well as the short-run revenue-maximizing wealth tax rate. We apply the framework laid out in Saez, Slemrod and Giertz (2012) to our tax notches in order to evaluate the efficiency cost of a wealth tax reform. Starting from an *average* tax rate  $\tau$  for taxpayers with reported wealth above  $W_r^*$ , increasing the top tax rate by  $\Delta\tau$  mechanically raises revenue by  $dM = NW_r\Delta\tau$  where  $N$  is the number of taxpayers in that bracket and  $W_r$  the average wealth in that bracket.

Taxpayers react to wealth tax notches by bunching below the cutoffs. These behavioral responses reduce reported wealth by  $\Delta W_r = W_r \cdot \sqrt{2 \cdot e \cdot \frac{\Delta\tau}{(1-\tau)}}$ , where  $e$  is the elasticity of reported wealth with respect to the net-of-tax rate. Using equation (4) for  $\Delta W_r$ , taxpayers' behavioral

<sup>51</sup>Note that elasticities estimated using difference-in-differences designs are often an order of magnitude larger than bunching estimates. The differences in elasticities stemming from these two approaches have been the subject of discussions in Aronsson, Jenderny and Lanot (2017); He, Peng and Wang (2018); Kleven and Schultz (2014).

<sup>52</sup>Brulhart et al. (2017) report a semi-elasticity of taxable wealth with respect to the wealth tax rate of 34.5. With the average wealth tax rate being 0.476 percent, this implies an elasticity of taxable wealth with respect to the net-of-tax rate of 34.7 ( $= 34.5/(1 - 0.00476)$ ).

<sup>53</sup>See derivation in Appendix E.

<sup>54</sup>Brulhart et al. (2017) provide a verbal description linking wealth elasticities and capital income elasticities.

responses reduce tax revenue by  $dB = -N\Delta\tau\Delta W_r = -N\Delta\tau W_r\sqrt{2 \cdot e \cdot \frac{\Delta\tau}{(1-\tau)}}$ . Hence, the total effect on tax revenue is

$$\begin{aligned} dT &= dM + dB \\ &= N\Delta\tau W_r - N\Delta\tau W_r\sqrt{2 \cdot e \cdot \frac{\Delta\tau}{(1-\tau)}} \\ &= NW_r\Delta\tau \left( 1 - \sqrt{2 \cdot e \cdot \frac{\Delta\tau}{(1-\tau)}} \right) \end{aligned}$$

For instance, in FY 2006,  $\tau = 0$ ,  $\Delta\tau = 0.012 \times 4 = 0.048$ , and the upper bound of  $e$  is 0.36 (see Table 1). This means that, based on our elasticity estimate, at most 18.6 percent of the projected tax revenue increase is lost through behavioral responses. Further, we estimate that the largest loss of tax revenues due to behavioral responses occurred in FY 2014 (21 percent, using the highest elasticity estimated from the first notch). We thus conclude that at most 21 percent of the projected tax revenue increase is lost due to short-term responses to wealth taxation.

Finally, what do our results imply for the revenue-maximizing (marginal) wealth tax rate? Again using our highest elasticity estimate from Table 1, the highest revenue-maximizing wealth tax rate is  $1/(1 + a \cdot e) = 1/(1 + 1.676 \times 4.41) = 11.9$  percent, where we have estimated  $a = \frac{E[W_r|W_r > W_r^*]}{E[W_r|W_r > W_r^*] - W_r^*} = 1.676$  among individuals with reported wealth above notch point  $W_r^*$  of 1,000 million pesos in FY 2014. This suggests Colombia is below its short-run revenue-maximizing wealth tax rate. Note, however, that this revenue-maximizing wealth tax rate regards short-run responses only. In the short run, past savings decisions are fixed and estimated behavioral responses capture mostly sheltering responses to wealth taxes. However, in the long run, individuals overcome frictions and adjust their saving, investment, migration, and bequest decisions. As a result, real responses may generate larger distortions in the long run. With the observed elasticity increasing in time, the long-run revenue-maximizing wealth tax rate is likely well below 11.9 percent.

## 5 Recovering Tax on Offshore Wealth

Wealthy individuals often have access to sophisticated tax sheltering strategies, such as concealing assets in offshore shell corporations in tax havens.<sup>55</sup> In this section, we study this more aggressive form of sheltering as well as enforcement policies to curb offshore evasion and recover tax on offshore wealth. Specifically, we test whether a recent voluntary disclosure scheme encouraged evaders to admit prior noncompliance, disclose (at least part of) their hidden wealth, and pay more taxes. We exploit the exogenous timing of the Panama Papers leak to test the effect of this shock in perceived detection probability and public shaming on disclosures and tax revenue.

<sup>55</sup>In addition to obscuring wealth in offshore structures to dodge taxes, firms can also dodge taxes by using shell corporations to inflate costs and expenses, and artificially shift profits to tax havens.

## 5.1 Offshore Sheltering: Evidence from the Panama Papers

We begin by exploiting the leaked Panama Papers microdata. While this data includes information about Mossack Fonseca’s clients and offshore entities incorporated in Panama and twenty other jurisdictions, Panama represents a particularly desirable destination for wealthy Colombians to hold assets offshore: Panama offers geographic proximity, the convenience of Spanish as the official language, as well as political stability. For these and other reasons, Panama has constituted Colombians’ most preferred destination for holding reported foreign assets, after the United States (see Figure A.9). Panama is also Colombia’s most relevant tax haven. Even before the leak, Colombians were almost fifteen times as likely to report owning foreign assets located in Panama than in the Virgin Islands or Switzerland.<sup>56</sup> Thus, the information offered by the Panama Papers is highly relevant to study offshore sheltering by Colombians.

The number of Colombian offshore entities incorporated by Mossack Fonseca rose tenfold between 2002 and 2015, that is, since the reintroduction of wealth taxes. Figure 7, Panel (a), plots the evolution of the top wealth tax rate in Colombia between 1995 and 2015 (dashed blue line) and the flow of Colombian offshore entities incorporated by Mossack Fonseca every year (solid black line). The two lines closely trail each other. In particular, the flow of incorporated offshore entities appears to rise with the top statutory wealth tax rate in Colombia. It rose in 2006, when the wealth tax rate quadrupled from 0.3 to 1.2 percent; in 2010, when the top wealth tax rate skyrocketed to 6 percent; and in 2014, following the reintroduction of progressive wealth taxes that year.<sup>57</sup> The flow of new incorporations remained particularly high since 2010, reaching a peak of 270 new incorporations in 2015 and a cumulative total of 1,784 entities since 1973.

As an illustration, Figure 7, Panel (b) compares the flow of new offshore entities incorporated by individuals from the United States, Brazil, Venezuela, and Mexico. As far as we can observe in the Panama Papers and the Offshore Leaks, Colombians would appear to have a more frequent incorporation of offshore structures, even relative to more populous countries like Brazil, Mexico, or the United States.<sup>58</sup> Figure A.10 extends this comparison with more countries and confirms that Colombia’s stark increase in the relative flow of offshore entities cannot not replicated elsewhere.<sup>59</sup>

Who are the shareholders of offshore entities created by Mossack Fonseca? We merge the microdata from the Panama Papers to our individual income tax returns using personal names,

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<sup>56</sup>Trusts are less prevalently used in Latin America than in Anglo-Saxon countries. For those reluctant to loose control over their assets (for instance, due to mistrust in others or in the rule of law), foundations represent an attractive alternative. Catering to the Latin American elite, Panama has made the foundation form one of its specialties within the offshore industry (Harrington, 2016).

<sup>57</sup>An alternative (but not necessarily mutually exclusive) explanation for the more frequent incorporation of offshore entities by Colombians through Mossack Fonseca could be supply-driven if, for instance, Mossack Fonseca decided to more aggressively lure its Colombian clients into creating offshore entities in recent years.

<sup>58</sup>To the extent that Colombians may use other asset management firms not included in these leaks or located in other offshore financial centers, such as Switzerland or Hong Kong, this figure represents a lower bound on offshoring.

<sup>59</sup>The only other Latin American country with a similarly large flow of offshore entity incorporation is Uruguay, included in the European Union’s 2017 “Grey List” due to concerning tax practices.

as detailed in Section 3.2. Table 3 presents descriptive statistics for the universe of taxpayers we observe between tax years 1993 and 2016 (Column 1) and for taxpayers that appear in the Panama Papers leak (Column 2).<sup>60</sup> Between 1993 and 2016, we observe more than 3.3 million taxpayers, that is, around 9.54 percent of the total number of tax units.<sup>61</sup> On average between 1993 and 2016, individuals filed income taxes in Colombia for 6.2 years. The 1,208 income taxpayers we identify in the Panama Papers filed income taxes for 15.8 years on average, that is, 2.5 times longer than those who do not appear in the Panama Papers. Tax filers in the Panama Papers are more likely to be male and to be born after 1985 (these differences are statistically significant). They are also twice as likely to be “capital rentiers,” a broad activity code that refers to taxpayers receiving returns from capital ownership but has often also included dependents and taxpayers without an economic activity. Tax filers in the Panama Papers are also more likely to be wage-earners, and less likely to report another activity codes (e.g., business-owners).

The most striking differences between taxpayers named and not named in the Panama Papers leak are in their average wealth and capital gains. Even if underreporting to the tax authority, individuals named in the leak are more than seven times as wealthy as others. More than two-thirds of them are among the wealthiest 1 percent of adults in Colombia, and over one-fourth are among the top 0.1 percent. To further illustrate this point, Figure 8, Panel (a), shows that the probability of appearing in the Panama Papers rises steeply with wealth. This probability is 0.02 percent for P95–P99 individuals with average reported net worth between 0.14 and 0.41 billion pesos (USD 47,261–136,869), 0.1 percent for the next wealthiest group, and 1.7 percent for individuals in the top 0.01 percent of net worth (these differences are statistically significant). That is, one in sixty individuals in the wealthiest 0.01 percent are identified in the Panama Papers. Therefore, even if underreporting their wealth to the tax authority, Colombians in the Panama Papers are among the wealthiest individuals in the country.

Did individuals obscure their assets in these opaque offshore structures? Admittedly, many of the activities carried out through offshore entities are perfectly legal, and there are security-related and other legitimate reasons for a Colombian to store wealth offshore. However, Colombia’s residence-based tax system requires taxpayers report all assets held domestically and abroad.<sup>62</sup> Thus, any decrease in reported assets after opening an offshore entity is suggestive of wealth obfuscation for the purposes of evading taxes. To test for this possibility, we use an event study design that compares reported assets across individuals before and after incorporating an offshore entity. Let  $W_{it}$  be the value of assets reported to the Colombian tax authority by taxpayer  $i$  in

<sup>60</sup>Tax filers having incorporated their offshore entities before 2000 (only a handful) are given an entity incorporation date of 2000 to preserve their anonymity.

<sup>61</sup>As noted in Section 3, only a fraction of tax units are required to file income taxes in Colombia due to high exemption thresholds, outdated cadasters, and a pervasive informal sector.

<sup>62</sup>For tax purposes, a taxpayer is defined as a resident if she (a) spent 183/365 days in Colombia; (b) is a Colombian diplomat living abroad; (c) is a Colombian citizen that either (c.1) has a spouse/permanent partner or a dependent that is resident, (c.2) generates at least 50 percent of income/property/assets in Colombia, (c.3) has not established foreign residency, or (c.4) has residence in a tax haven, as defined by the National Government.

FY  $t$ , and define the year in which individual  $i$  incorporated an offshore entity through Mossack Fonseca as  $e_i$ . Define  $D_{it}^k = \mathbb{1}(t = e_i + k)$  as an indicator variable that equals 1 if event  $e_i$  took place  $k$  years ago and 0 otherwise. In our main specification,  $k \in [-5, 1]$ , to avoid dropping the significant number of offshore entities incorporated in the later years of our sample, as depicted in Figure 7.<sup>63</sup> The event study specification then takes the following form:

$$W_{it} = \alpha_i + \gamma_t + \sum_{k=-5}^1 \beta_k D_{it}^k + u_{it} \quad (8)$$

where  $\alpha_i$  and  $\gamma_t$  are individual and year fixed effects, respectively, and  $u_{it}$  is the error term. We cluster standard errors at the individual level because individual-specific errors are likely to be serially correlated.

Figure 9, Panel (a), plots the  $\beta_k$  in specification (8) over time and provides estimates of the mean assets in “event time” after having taken out individual- and year-specific effects. The figure shows there are no pre-event trends: reported assets are not affected by offshore entity incorporation before it actually occurs, which lends some support against the strict exogeneity assumption of the timing of the event.<sup>64</sup> Moreover, the figure suggests that the value of total assets reported to the tax authority drops by 10.9 percent the year the taxpayer incorporates an offshore entity (the  $t$ -statistic is -2.38).<sup>65</sup> A joint  $F$  test on post-event years 0 and 1 strongly rejects the null hypothesis that the coefficients are equal to zero ( $p = 0.0088$ ).

In addition to the small sample problem due to few taxpayers in the Panama Papers, the large standard errors in Figure 9, Panel (a), suggest there might be heterogeneous effects of opening an offshore entity on reported assets. Panel (b) splits the sample by above- and below-median assets reported in event time  $k = -5$ . The figure shows that the immediate drop depicted in Panel (a) is driven by the wealthiest 50 percent of individuals in the Panama Papers. For these individuals, reported assets fall by 13.7 percent the year of offshore entity incorporation (the  $t$ -statistic is -2.02).<sup>66</sup> In contrast, for the bottom 50 percent, reported assets are *increasing* leading up to the event, with the trend breaking upon entity incorporation and the event having no statistically significant impact on reported assets.<sup>67</sup>

<sup>63</sup>As a robustness check, Figure A.11 plots  $\beta_k$  coefficients for different event time windows.

<sup>64</sup>A joint  $F$  test on pre-event years -5 to -2 cannot reject the null hypothesis that the coefficients are equal to zero ( $p = 0.8389$ ).

<sup>65</sup>We test whether opening an offshore is associated with a drop in either reported income or income taxes owed by substituting  $W_{it}$  for these variables in specification (8). Large standard errors do not allow us to reject the null hypothesis of no statistically significant differences across event time in either case (not reported).

<sup>66</sup>A joint  $F$  test on post-event years 0 and 1 for above-median taxpayers strongly rejects the null hypothesis that the coefficients are equal to zero ( $p = 0.0327$ ).

<sup>67</sup>A joint  $F$  test on pre-event years 2 through 5 cannot reject the null hypothesis that the coefficients are jointly equal to zero ( $p = 0.3852$ ), and neither can a joint  $F$  test on post-event years 0 and 1 ( $p = 0.2542$ ).

## 5.2 A Voluntary Wealth Disclosure Scheme

Announced in December 2014, Colombia’s voluntary wealth disclosure program gave tax evaders the chance to admit prior noncompliance and come clean with the tax authority by December 31, 2017 (Article 35, Law 1739/2014).<sup>68</sup> Tax filers could voluntarily disclose their hidden wealth (e.g., underreported or unreported foreign or domestic assets) and inexistent liabilities in the wealth tax return filed in 2015, 2016, and 2017.<sup>69</sup> Unlike voluntary disclosure programs put in place across OECD countries (OECD, 2015), Colombia allowed disclosers to waive unpaid income and wealth taxes from past years. Instead, disclosers paid a one-time explicit penalty of 10, 11.5 or 13 percent of the value of the disclosed assets and liabilities if disclosed in 2015, 2016, or 2017, respectively.<sup>70</sup> Disclosers also paid wealth taxes upon disclosure, and could face higher presumptive income taxes the following year. If caught misreporting after 2018, individuals would face monetary penalties worth 200 percent of owed taxes.<sup>71</sup>

The voluntary disclosure program encouraged 11,927 individuals to disclose 15.76 trillion pesos (USD 5.28 billion), equivalent to 1.73 percent of GDP, in hidden assets and inexistent liabilities between 2015 and 2017. Specifically, 11,050 individuals disclosed assets worth 14.76 trillion pesos (USD 4.95 billion); 87 percent of previously undeclared assets were reported to be located abroad (1.4 percent of GDP). Liabilities worth 999.86 billion pesos (USD 335.08 million) were declared inexistent by 1,380 individuals; 97.6 percent of which was (mis-)reported to be in Colombia. The government collected 1.93 trillion pesos (USD 647.23 million) in penalty revenues, equivalent to 0.21 percent of GDP.

To compare disclosers and non-disclosers across the three years in which the disclosure scheme took place, Table 4 presents descriptive statistics for individuals who filed a wealth tax return in either 2015, 2016, or 2017, and also filed an income tax immediately before the scheme.<sup>72</sup> This subsample includes 66,308 individuals—55,098 of whom never disclosed hidden assets or inexistent liabilities between 2015 and 2017 (Column 1), and 11,210 of whom did (Column 2). Despite facing higher penalties, most disclosers revealed their wealth in 2017, i.e., the year the

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<sup>68</sup>The 2015–2017 wealth disclosure program represents Colombia’s first comprehensive effort to encourage evaders to regularize their tax affairs by disclosing hidden assets and fake debts. In 2003, taxpayers voluntarily disclosing hidden assets and/or fake debt were subject to harsher tax treatment (Article 6, Law 863/2003, ruled constitutional by *Sentencia C-910/04*). Subsequent attempts to encourage such disclosures in 2012 and 2013 were blocked by the Constitutional Court, arguing evaders were being given overly generous tax benefits (Article 163, Law 1607/2012, ruled unconstitutional by *Sentencia C-833/13*). Because disclosers were charged a penalty, the 2015–2017 voluntary disclosure program was ruled constitutional on August 26, 2015 (*Sentencia C-551/15*).

<sup>69</sup>Disclosers reported their hidden assets and inexistent liabilities in separate boxes in the wealth tax return (form 440, see Figure B.4), which we use to identify program participants.

<sup>70</sup>See Figure A.12 for a timeline of the events taking place around the voluntary disclosure program.

<sup>71</sup>The government’s communication strategy explicitly did not encourage repatriation of capital invested abroad, by expressly stating that the aim of the program was *not* to have disclosers repatriate their offshore assets but rather to have them declare such assets to the tax authority for income and wealth tax purposes.

<sup>72</sup>93.6 percent of program participants filed personal income taxes immediately before the scheme (i.e., FY 2013).

program window expired.<sup>73</sup> Otherwise, the table suggests that while disclosers and non-disclosers are similar in demographic characteristics, disclosers are almost 20 percent more likely to self-report their economic activity code as either capital renters or wage-earners than any other category. Crucially, disclosers are eight times more likely to appear in the Panama Papers than non-disclosers. Indeed, 37.5 percent (453 of 1,208) of taxpayers identified in the Panama Papers admitted past noncompliance and participated in the voluntary disclosure program, a point we return to in Section 5.3.<sup>7475</sup>

Further, Table 4 suggests that, even before disclosures, disclosers are wealthier than non-disclosers: the latter have on average 2.84 billion pesos (2017 USD 950,909) in assets, while the former have 3.29 billion (2017 USD 1,102,095) in assets, i.e., 16 percent more wealth. The same is true for net worth. To further illustrate this point, Panel (b) in Figure 8 plots scheme participation by net worth (FY 2013 net worth including disclosures). The figure suggests that the probability of disclosing hidden wealth under the scheme rises with wealth, with two-fifths of the wealthiest 0.01 percent admitting prior noncompliance and disclosing wealth (gray dashed line).<sup>76</sup> Unsurprisingly, individuals identified in the Panama Papers are significantly more likely to disclose wealth under the scheme across all wealth levels, with 71.4 percent of those in the wealthiest group disclosing under the scheme (black solid line).

What are the magnitudes of these disclosures? Figure 10, Panel (a), shows that the size of disclosures rises with wealth: disclosures represent 0.01 percent of wealth for individuals in P95–P99 and 15.3 percent of wealth for the top 0.01 percent. In other words, 15.3 percent of wealth of the top 0.01 percent had been concealed from the tax authority, with foreign assets representing the lion’s share of concealed wealth. Panel (b) reproduces this estimate for disclosers only and shows that, on average, disclosures represent around 30 percent of wealth for all but the top group; for whom disclosures amount to 37.5 percent of wealth. For the wealthiest group, foreign assets represent 85 percent of disclosures and 31.9 percent of their wealth. These figures thus confirm

<sup>73</sup>As discussed in Section 5.3, this could be due to procrastination (Benzarti, 2017) or in reaction to the tougher penalties for tax evasion adopted in December 2016, punishing tax evaders with prison sentences of up to nine years (a similar attempt in 2014 had been shut down by Congress).

<sup>74</sup>Not all taxpayers identified in the Panama Papers participated in the voluntary disclosure program. First, being a client of Mossack Fonseca does not imply tax evasion. In Colombia and most other countries, it is legal to own offshore accounts, as long as they are duly declared on tax returns. Thus, tax-compliant client may have already been reporting their offshore entity to the Colombian tax authority. Second, the Panama Papers included Colombians having incorporated their offshore entity as far back as 1973; thus, some taxpayers could have deactivated their offshore entity by the time the disclosure scheme was introduced (and allegedly no longer hold assets offshore). Finally, risk-loving taxpayers may have chosen not to participate in the disclosure scheme and continue evading.

<sup>75</sup>Disclosers are not more likely to have displayed past bunching behavior—defined as being located in the bunching region  $[W_r^l, W_r^*)$  in FY 2003, 2006, or 2010—than non-disclosers. In fact, disclosers are 5 percentage points *less* likely to appear in the bunching region, and this difference is statistically significant.

<sup>76</sup>Figure A.13 plots scheme participation by pre- and post-disclosure net worth (that is, net worth in FY 2013 excluding and including disclosures). Ranking taxpayers by pre-disclosure wealth, only 0.05 percent of adults in P95–P99 disclosed under the scheme, while 10.3 percent of P99.9–P99.95 did so—and this difference is statistically significant. Disclosure probability continues to rise by wealth group, with one in four of the wealthiest 0.01 percent admitting prior noncompliance and disclosing under the scheme.

offshore asset obfuscation had been the primary strategy for tax evasion by the rich in Colombia.<sup>77</sup>

We have shown that taxpayers participating in the scheme disclosed foreign and domestic assets. Of direct tax policy interest is the effect these disclosures had on income reported and subjected to tax. We study capital income reporting behavior by linking the disclosure information with individuals’ income tax returns, and compare outcomes between disclosers and never-disclosers around the time of first disclosure. To maximize the number of post-disclosure years for which we can observe reporting behavior, we focus on individuals who first disclosed in 2015.<sup>78</sup> Specifically, we compare outcomes using a balanced sample of 44,958 taxpayers—1,777 of whom first disclosed in 2015 and 43,181 of whom never disclosed—using the following difference-in-differences regression specification:

$$\log(y_{it}) = \alpha_i + \gamma_t + \beta \cdot \mathbb{1}(\text{Post} \times \text{Discloser}) + \nu_{it} \quad (9)$$

where  $\log(y_{it})$  is a log-approximation (the inverse hyperbolic sine transformation) of outcome  $y$  reported by individual  $i$  in year  $t$ ,  $\alpha_i$  and  $\gamma_t$  are individual and year fixed effects, respectively,  $\mathbb{1}(\text{Post} \times \text{Discloser})_{it}$  is the interaction term that equals 1 for disclosers after disclosure and 0 otherwise, and  $\nu_{it}$  is the error term.<sup>79</sup> We cluster standard errors at the individual level because individual-specific errors are likely to be positively serially correlated. The  $\beta$  coefficient is our main parameter of interest and identifies the percentage change in reported outcomes of disclosers relative to non-disclosers before and after the disclosure scheme. For instance, we expect  $\beta$  to be positive and statistically significant if foreign and domestic assets that generate taxable income and had not previously been reported are now being reported for tax purposes.

Figure 11, Panel (a), plots the event study coefficient and corresponding 95 percent confidence intervals from specification (9) using reported gross and net wealth as the outcome variable. In both series, the difference in the outcome between disclosers and non-disclosers is close to zero and not statistically significant before disclosure, thus validating the parallel trend assumption of our

<sup>77</sup>Table A.3 compares the location and type of assets reported by wealth tax filers who reported foreign assets in 2017. The table shows wealth tax filers who disclosed under the scheme in 2015–2017 are 63.6 percent more likely to report owning foreign assets in tax havens (e.g., Barbados, Bermuda, Cayman Islands, Monaco, Panama, Switzerland, the Virgin Islands) than those who did not disclose under the scheme. Disclosers are significantly more likely to report owning foreign financial assets than non-disclosers, with this difference being particularly large for portfolio securities and trusts. In contrast, disclosers are significantly less likely to report owning foreign non-financial assets (real estate and vehicles).

<sup>78</sup>Note that, compared to individuals who first disclosed in 2016 or 2017, our main estimation compares individuals who disclosed hidden wealth to the tax authority in the absence of (1) the Panama Papers leak, and (2) harsher punishment for evaders. That is, it is a selected sample of tax evaders responding to the tax benefits awarded by the disclosure scheme. Table A.5 and Figure A.14 present results equivalent to Table 5 and Figure 11 but for taxpayers first disclosing hidden wealth in 2016.

<sup>79</sup>To accommodate zeros in the dependent variable, we follow Johannesen et al. (2018) and use the inverse hyperbolic sine transformation, which is preferred when using administrative data and focusing on high-income groups. For positive ranges of  $y_{it}$ , the  $\beta$  coefficient in specification (9) can be interpreted exactly as if we were using a log specification, i.e., as the difference between reported log wealth reported at time  $t$  and reported log wealth had disclosure not occurred. As a robustness exercise, Table A.4 presents results using different functional form specifications.



difference-in-differences specification. Moreover, in both series, the outcome reported by disclosers on their tax return jumps sharply in 2015 relative to non-disclosers. The larger rise for net worth is expected, as disclosers not only disclose assets but also fake liabilities. Importantly, there is no sign that gross and net wealth decrease after the initial surge: the two outcomes remain higher three years after policy rollout. Table 5 presents the corresponding  $\beta$  coefficients for gross and net wealth in columns (1) and (2), respectively. The table suggests disclosers report around 33.38 percent ( $= 100 \times (e^{0.288} - 1)$ ) more assets and 49.2 percent ( $= 100 \times (e^{0.4} - 1)$ ) more wealth relative to non-disclosers after the scheme is introduced.

As discussed above, if individuals are disclosing hidden assets, they should also be reporting the capital income (e.g., domestic interest income, capital gains) received by asset ownership. This, coupled with presumptive income taxes on net wealth, imply tax compliant disclosers should also pay more income taxes. Importantly, 2015 disclosers were required to truthfully report their income in the tax—not calendar—year of their disclosure; 2015 wealth disclosers affect FY 2015 income tax returns, i.e., calendar year 2016 in Figure 11.<sup>80</sup> We thus expect any effect on capital income reporting to emerge starting 2016. Panels (b) through (d) plot the event study coefficients for regular and irregular income categories. Panel (b) plots interest income, total gross income, taxable income, and income taxes owed. Panel (c) plots dividends and foreign income, which are reported as separate income categories starting in 2014. Panel (d) plots irregular income, a category that combines long-term realized capital gains, inheritances, and *inter vivos* gifts. Again, the figures suggest there is no difference in the trend of income categories prior to disclosure, followed by a large increase in reported capital income starting 2016.<sup>81</sup>

Table 5 presents the associated difference-in-differences coefficients and associated standard errors in Columns (3)–(12). The table shows that disclosers report 174.6 percent ( $= 100 \times (e^{1.01} - 1)$ ) more foreign income and 51.6 percent ( $= 100 \times (e^{0.416} - 1)$ ) more interest income than non-disclosers once the disclosure scheme is introduced.<sup>82</sup> In all, the total amount of income reported increases by 14.1 percent ( $= 100 \times (e^{0.132} - 1)$ ), raising taxable income by the same amount. This translates into 39 percent ( $= 100 \times (e^{0.329} - 1)$ ) more regular income taxes owed. Reported irregular income net of costs also increases by 38 percent ( $= 100 \times (e^{0.322} - 1)$ ), such that disclosers are paying more irregular income taxes than non-disclosers after policy rollout.<sup>83</sup>

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<sup>80</sup>Article 39, Law 1739/2014.

<sup>81</sup>There is no impact on dividend income, presumably because dividends—which are subject to third-party reporting—should have already been fully reported.

<sup>82</sup>It should be noted that interest income should be expected to increase if disclosers repatriate their offshore assets upon disclosure.

<sup>83</sup>These spillover results are robust across different functional form specifications, as shown in Table A.4. With the inverse hyperbolic sine function, however, some of the aforementioned effect may be due to changes in reporting from zero to positive amount. Because this extensive margin of capital income reporting is of interest, Table A.4 estimates equation (9) substituting the outcome for a binary variable indicating whether the taxpayer reported any positive value of the dependent variable. We find a 4.4 percentage point increase in the probability of reporting any positive foreign income, a 1.8 percentage point increase in reporting any positive interest income, and a 1.2 percentage point increase in owing any income tax (see Figure A.15). We also detect some extensive margin impacts on reported irregular income.

Our results therefore indicate that disclosures were associated with large increases in capital income reporting and income taxes owed. For instance, prior to the voluntary disclosure scheme, noncompliant taxpayers underreported capital income by not reporting returns to foreign assets. Upon disclosure, disclosers report all (or at least more of) their true capital income and also pay more income taxes. Our results thus rule out substitution towards legal income tax avoidance; on the contrary, wealth disclosers are disclosing more capital income and paying more taxes on that income relative to non-disclosers once the disclosure scheme is introduced.

As a result of the higher taxes paid by disclosers, the overall progressivity of the tax system increased. Figure 12, which plots the effective tax rate (income and wealth taxes as a share of net wealth) by wealth group, shows that, first, the progressivity of the tax system is limited in the absence of wealth taxes. The effective tax rate hovers just over 1 percent regardless of wealth: on average, the top 0.01 percent paid the same share in taxes as the top 5 percent of the distribution. This lack of progressivity at the top has been replicated in the Colombian income tax system, where the richest 0.01 percent of individuals pay less than 4 percent of their income in income taxes and social security contributions (Alvaredo and Londoño-Vélez, 2014).<sup>84</sup> Second, the reintroduction of progressive wealth taxes between 2014 and 2017 raised the effective tax rate for the wealthiest 0.05 percent of individuals, i.e., those above the exemption threshold. This suggests wealth taxes can complement progressive personal income taxes in reinforcing tax progressivity at the top. Third, the penalties associated with program participation further raised the effective tax rate from 1.4 percent to 2.6 percent for the wealthiest 0.01 percent. The voluntary disclosure program thus appears to have been an effective way to reduce evasion and generate more revenue from the wealthiest tax filers.

### 5.3 Shocks in Incentives to Comply

Two events increased the perceived risk of detection and the punishment for failing to disclose hidden wealth. First, on April 3, 2016—that is, one month before the 2016 filing season—the Panama Papers news story broke, and the names of Mossack Fonseca’s clients were thrust into the public spotlight.<sup>85</sup> The Colombian tax authority reacted by scrutinizing Mossack Fonseca and its clients, contacting taxpayers named in the leak and requesting documentation of their offshore activities and transactions.<sup>86</sup> Taxpayers named in the Panama Papers were allowed, and in fact encouraged, to participate in the disclosure program. Three weeks after the leak, the

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<sup>84</sup>Further, public spending does little to reduce inequality in Colombia (OECD, 2013).

<sup>85</sup>Colombians mentioned in the Panama Papers scandal involved businessmen, politicians, members of congress, lawyers, and journalists. The leak drew media coverage and public interest in the matter. As an illustration, Figure A.16 plots the number of times individuals in Colombia searched for the term “Panama Papers” on Google.

<sup>86</sup>The first formal charges of illicit enrichment, fraud, money laundering, among others, would not be filed by Colombia’s district attorney’s office against individuals related to the Panama Papers until October 4, 2017. Later that month, a number of individuals would be sent to house arrest. See Figure A.12 for a timeline of events taking place between 2014 and 2017.

governments of Colombia and Panama announced a tax information exchange agreement between the two countries.<sup>87</sup> The agreement involved on-demand and automatic exchanges of information starting June 2017 and 2018, respectively. These events arguably raised the perceived threat of detection. Second, in December 2016, Colombia criminalized tax evasion for the first time. Tax evaders could face sentences of up to nine years in prison.<sup>88</sup>

Unfortunately, the timing of the criminalization of tax evasion coincided with the last year taxpayers could come forward and disclose under the scheme before it expired. Indeed, while most participants disclosed this final year (see Figure A.17), we cannot attribute this as a causal response to the harsher punishment of tax evasion. For example, taxpayers may have procrastinated and waited until just before the program window expired to disclose.

Instead, we focus on the first event and examine the effect of the Panama Papers leak and subsequent actions taken by the Colombian authorities on disclosures and taxes paid. We exploit the exogenous timing of the Panama Papers and compare outcomes between wealth tax filers named (treated) and not named (control) in the leak before and after it occurred, using the following OLS specification:

$$y_{it} = \alpha + \gamma \mathbb{1}(\text{In Panama Papers})_i + \lambda \mathbb{1}(\text{After Leak})_t + \beta \cdot \mathbb{1}(\text{DID})_{it} + \mu_{it} \quad (10)$$

where  $y_{it} = 1$  is the outcome of interest,  $\beta$  the parameter of interest, and  $\mu$  the error term. Because the leak was unanticipated by both taxpayers and the Colombian tax authority, we can interpret  $\beta$  as identifying the causal response to the higher perceived detection probability induced by the Panama Papers leak.

Figure 13 plots the probability of first disclosing under the scheme by wealth group, year, and whether or not the taxpayer is named in the leak. The figure shows that the Panama Papers leak substantially raised disclosures of hidden wealth among those whose names were leaked to the media. Interestingly, however, the leak does not appear to have raised disclosures among taxpayers unnamed in the leak. Hence, we do not find empirical support to the claim that the leak itself deters evasion or improves tax compliance among wealthy individuals.

Table 6 presents the results from specification (10). Column (1) suggests that the Panama Papers leak raised willingness to disclose hidden wealth by 27.4 percentage points. On a basis of 3.3 percent for wealth tax filers not appearing in the Panama Papers before the leak, this translates into a more than 830 percent increase in wealth disclosures induced by the Panama Papers. Column (2)

<sup>87</sup>This announcement came after lengthy negotiations dating from 2014. On October 7, 2014, the deadline for Panama to sign an information exchange treaty with Colombia expired, leading Colombia to declare Panama a tax haven (Decree 1966/2014). Financial transactions with Panama would thus be taxed at withholding at 33 percent in lieu of 10 percent. A diplomatic crisis between the two countries ensued, leading Colombia to remove Panama from its list of tax havens on October 21, 2014 (Decree 2095/2014).

<sup>88</sup>Evaders caught underreporting their assets or overreporting their liabilities over 7,250 monthly minimum wages (2017 5.66 billion pesos or USD 1.9 million) could face between 48 and 108 months in prison, and pay a penalty worth 20 percent of the value of the hidden or misreported assets or liabilities (Article 338 of Law 1819/2016).

shows that disclosures of hidden foreign assets increased more than fifteenfold ( $= .296/.0192$ ). As a result, Column (3) shows wealth taxes increased by 29.8 percent ( $= 100 \times (e^{0.261} - 1)$ ). Including disclosure penalties raises taxes paid to 134 percent ( $= 100 \times (e^{0.85} - 1)$ ), as shown in Column (4).

## 6 Implications for the Study of Wealth Inequality

We end with a brief discussion of our findings for the study of wealth inequality. For this purpose, we combine tax records and survey data and analyze how wealth inequality is affected by accounting for unreported offshore wealth.

In Colombia, measuring top wealth shares (e.g., the fraction of total wealth held by the top 1 percent) faces challenges due to severe data limitations. Unlike in many developed countries, there is no aggregate wealth measure to construct the total amount of wealth in Colombia (i.e., the denominator in top wealth shares). We cannot compute aggregate wealth as the total wealth reported in tax records because, as discussed, less than 6 percent of tax units file taxes. This implies that we must refer to survey data to capture wealth for non-filers, which is a second-best alternative and has limitations of its own (Saez and Zucman, 2016). Further, offshore wealth may remain underreported in tax records for the purposes of reducing the tax burden. To the extent that wealthier individuals are disproportionately likely to hold foreign assets, our measures of top wealth shares will underestimate inequality if we do not account for unobserved offshore wealth. Section F in the Appendix describes in detail these issues and how we deal with each of them. We argue that our measures will likely be biased downward, meaning that, in addition to interpreting our estimates as a first, albeit imperfect attempt at measuring wealth inequality in Colombia, they should also be considered potentially conservative.

We estimate that the top 1 percent today has 40.6 percent of total wealth in Colombia (Figure 14, Panel (a)). Given the richest 1 percent has 20 percent of total income, wealth in Colombia is twice as unequally distributed as income (Alvaredo and Londoño-Vélez, 2014). In fact, this baseline estimate places Colombia as one of the most unequal countries for which similar wealth inequality measures exist, second only to the United States, from whom the top 1 percent owns 41.8 percent of total wealth.<sup>89</sup> Interestingly, the similarity between Colombia and the US in terms of income inequality is reproduced again in terms of wealth inequality (Alvaredo and Londoño-Vélez, 2014).

Further up the wealth hierarchy, we find that the top 0.1 percent has 15.85 percent of total wealth (Figure 14, Panel (b)). This is less than the United States' equivalent share of 22 percent (Saez and Zucman, 2016). Even further up, the top 0.01 has 6.01 percent of total wealth in

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<sup>89</sup>Applying the capitalization method to income tax microdata, Saez and Zucman (2016) estimate that the top 1 percent had 41.8 percent of total wealth in 2012. Using household survey data, the wealthiest 1 percent of households are estimated to own 42.5 percent of total wealth (Balestra and Tonkin, 2018). Further, comparing our estimates with measures of household wealth inequality from the OECD Wealth Distribution Database, Colombia appears to be twice as unequally distributed as France, Luxembourg, and Norway.

Colombia, which is in fact roughly half of the United States' equivalent share of 11.2 percent. Therefore, while Colombia and the United States share similar top 1 percent shares, wealth is less concentrated at the extreme top of the distribution in Colombia than in the United States.<sup>90</sup>

As we have discussed, offshore wealth may be continue to be underreported in tax records, despite recent enforcement initiatives to encourage reporting foreign assets. Indeed, while the 2015–2017 voluntary disclosure program incentivized some taxpayers to disclose (at least part of) their assets hidden in tax havens, it is likely that other individuals continue choosing to conceal their fortunes from the tax authority. We would therefore like to put bounds on the total amount of offshore wealth that could potentially remain hidden abroad, and analyze the implications for the measurement of wealth inequality.

We begin from the macro estimate for total offshore wealth by Colombians from [Alstadsater et al. \(2018\)](#). Using fiduciary deposits data from the Central Bank of Switzerland in 2003–2004 as well as cross-border bank deposits data from offshore financial centers in 2007, [Alstadsater et al. \(2018\)](#) estimate that total offshore wealth by Colombians is 9.0 percent of GDP. This places Colombia just below the world average of 9.8 percent of GDP kept offshore. Adding up total offshore wealth reported by individuals in the tax return for foreign assets amounts (tax form #160), offshore assets represented 2.8 percent of GDP in FY 2017. That is, less than one-third of the baseline measure of offshore wealth is reported to the tax authorities.<sup>91</sup> This means that 6.2 percent of GDP remains concealed offshore.

Who owns this unreported offshore wealth? Our estimates, using data from the Panama Papers, the 2015–2017 voluntary disclosure scheme, and foreign asset information returns, all show that offshore wealth is extremely concentrated at the top. Specifically, the disclosure scheme shows that 99 percent of disclosed offshore wealth is owned by the wealthiest 1 percent, with the wealthiest 0.01 percent owning 58 percent of disclosed offshore wealth (see Figure F.2). We assume that the distribution of *unreported* offshore wealth is similar to the distribution of offshore wealth disclosures made during the 2015–2017 disclosure program by each net wealth group, and recompute top wealth shares accordingly.

Note, however, that the estimate from [Alstadsater et al. \(2018\)](#) is based mostly on data from 2007, that is, a period preceding hefty wealth taxation in Colombia. As Figure 7 illustrated, some individuals may have responded to the high wealth tax rates by obscuring their wealth offshore. This implies that basing our estimate from [Alstadsater et al. \(2018\)](#) represents a lower bound on unreported offshore wealth. To construct an upper bound, we assume that the increase in unreported offshore wealth is one-half the rise in the stock of offshore entities created by Mossack Fonseca between 2007 and 2015. This inflates our measure of unreported offshore wealth to 15

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<sup>90</sup>Furthermore, we estimate that the wealth-to-income ratio  $\beta = W/Y$  is 213 percent in Colombia. This is half the equivalent estimate for the United States, where household  $\beta$  is 430 percent ([Saez and Zucman, 2016](#)), but similar to Mexico, where  $\beta$  is 237 percent. In fact, Colombia's wealth-to-income ratio today is similar to that in Germany, Canada, and Italy in the 1970s.

<sup>91</sup>Half of this amount (1.4 percent of GDP) was disclosed thanks to the voluntary disclosure scheme.

percent of GDP, placing offshore wealth owned by Colombians—both reported and unreported, expressed as share of GDP—above the equivalent shares owned by Americans, Frenchmen, and Germans.

Figure 14 shows that conservatively accounting for unreported offshore wealth increases our estimates for top 1 percent share by three percentage points, from 40.64 to 43.17 percent.<sup>92</sup> The upper bound raises this share to 46.4 percent, as reported in the last bar of Panel (a). The resulting increase in measured top 0.1 percent shares is even more dramatic, from 15.85 percent to 19.06–23.17 percent, as reported in Panel (b). Therefore, accounting for unreported offshore wealth places Colombia’s top share estimates closer to those of the United States at the very top.

## 7 Conclusion

Progressive wealth taxation has received renewed interest as a way to raise revenue and address wealth inequality. However, the desirability of levying wealth taxes depends on how individuals respond to them, an empirical question few papers have examined due to the major challenges regarding measurement and identification. While a handful of studies have recently estimated behavioral responses to wealth taxes in Europe, it is unclear what policy implications, if any, their findings have for developing countries.

We contribute to this discussion by providing the first empirical evidence of behavioral responses to wealth taxes and enforcement policy in a developing country. We exploit extensive administrative tax microdata on the assets and debts of wealthy individuals linked with microdata from the Panama Papers leak to observe offshore sheltering. We identify responses leveraging quasi-experimental variation in wealth tax rates from discontinuities in the wealth tax schedule as well as numerous tax policy reforms taking place since 2002.

We find clear evidence that individuals respond to wealth taxes and enforcement initiatives. Taxpayers immediately bunch below tax notches to alleviate their wealth tax burden, predominantly by artificially inflating their debt and underreporting assets less covered by third-party reports. Taxpayers also transfer their wealth to neighboring tax havens to hide assets from the tax authority. We find that better enforcement improves wealth tax collection. In spite of these behaviors, we find that enforcement policy can improve wealth tax collection. A voluntary disclosure scheme that took place in Colombia between 2015 and 2017 encouraged evaders to disclose (at least part of) their concealed wealth and pay more taxes.

Our results point to the critical importance of investing in tax enforcement capacity in developing countries. Expanding the coverage of third-party reporting, coupled with a systematic cross-validation of reported information and increased scrutiny of high net worth taxpayers, are

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<sup>92</sup>Intuitively, given that the wealth-to-income ratio  $\beta = W/Y$  for Colombia is 213 percent, and that unreported wealth is 6.2 percent of GDP and is owned solely by the top 1 percent, then the top 1 percent share of total wealth corrected for hidden wealth is almost 3 percentage points higher.

first-order concerns in improving tax compliance. Further, policies to encourage the reporting of foreign assets are particularly important to curb offshore sheltering at the top of the distribution. As such, voluntary disclosure schemes represent tools to help the tax authority collect new information about offshore assets and income, and to generate more revenue from wealthy taxpayers. For such programs to be effective in improving compliance in the short and long term, stricter enforcement must be coupled with tough noncompliance sanctions and a credible threat of detection, for instance, by exploiting the automatic exchange of tax information and whistleblower data.

A key challenge is getting tax havens to cooperate and provide information about foreign owned financial assets in their jurisdictions. Understanding the effectiveness of recent initiatives, like the United States Foreign Account Tax Compliance Act (FATCA), is therefore paramount. With better enforcement, wealth taxes can complement progressive income taxes, enhancing progressivity and addressing inequality in contexts where elites are difficult to tax.

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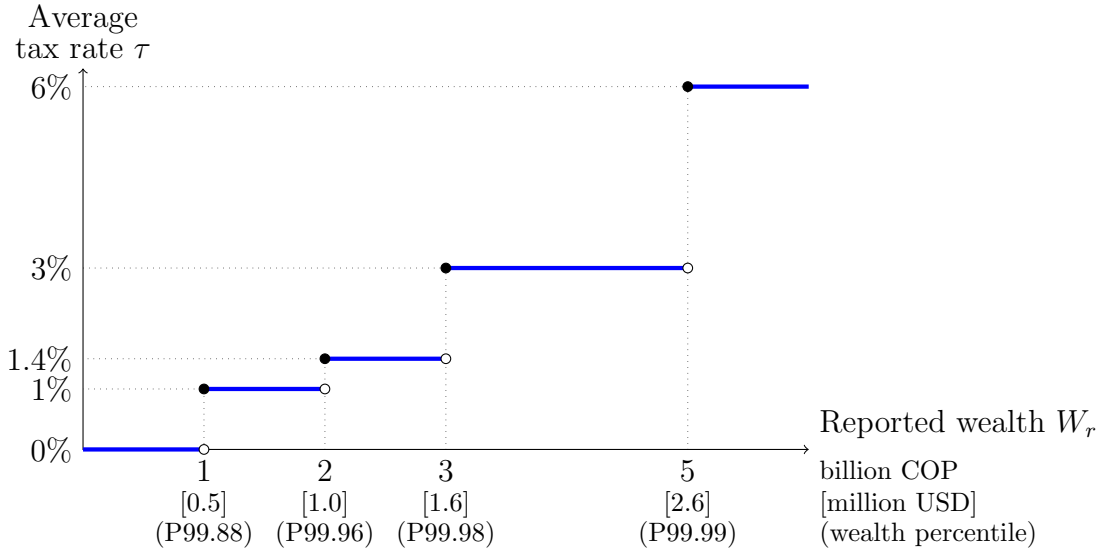
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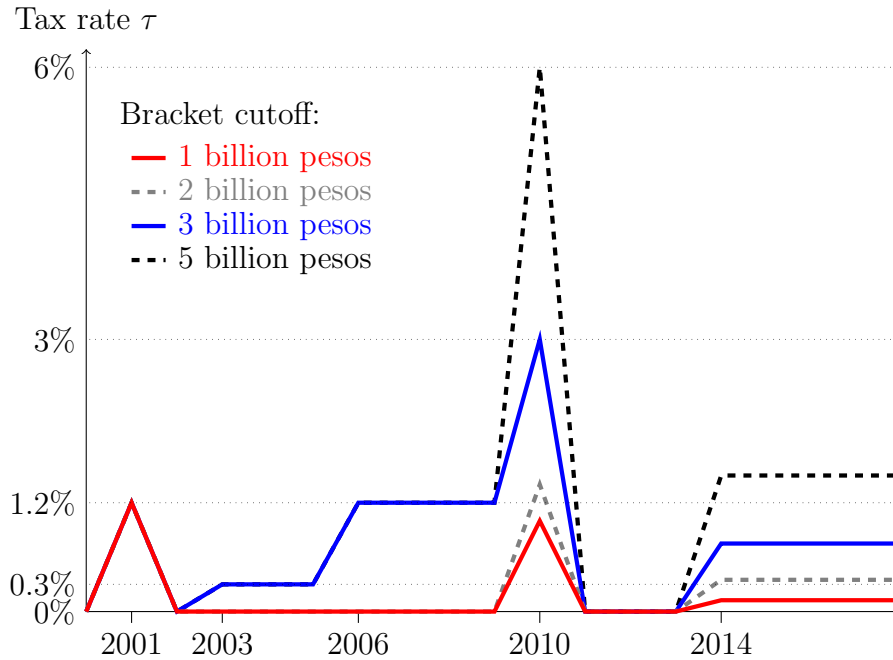
# Figures and Tables

Figure 1: The Personal Wealth Tax Schedule in Colombia

(a) Average Tax Rate as a Function of Reported Net Wealth (FY 2010)

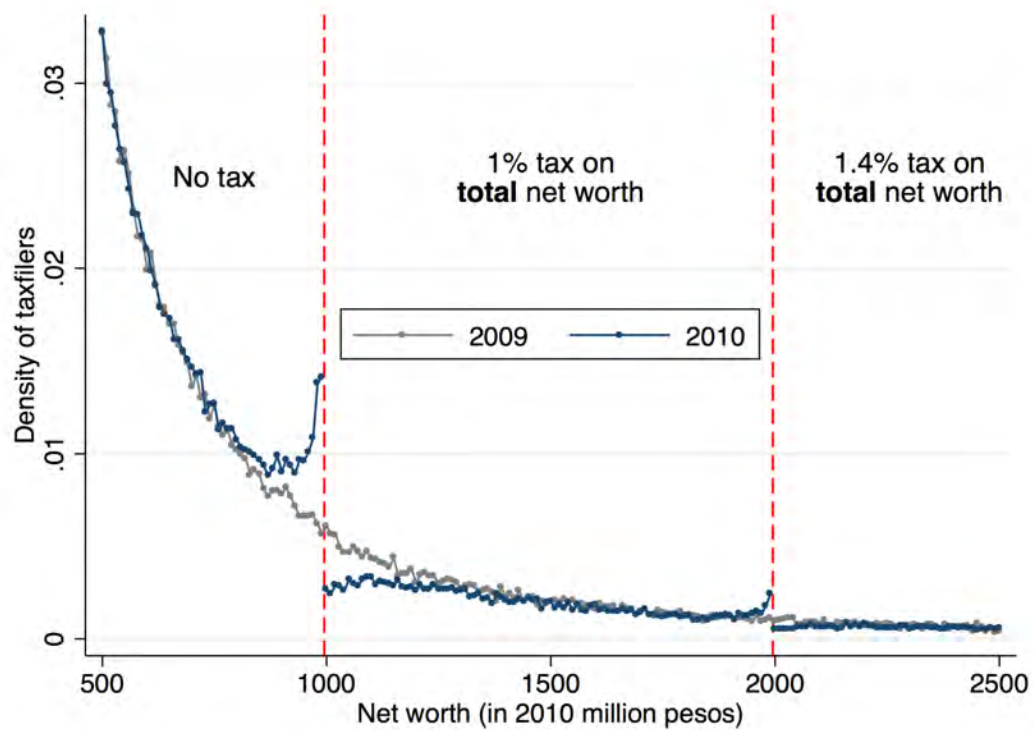


(b) Evolution of Statutory Annual Wealth Tax Rates by Bracket Cutoff



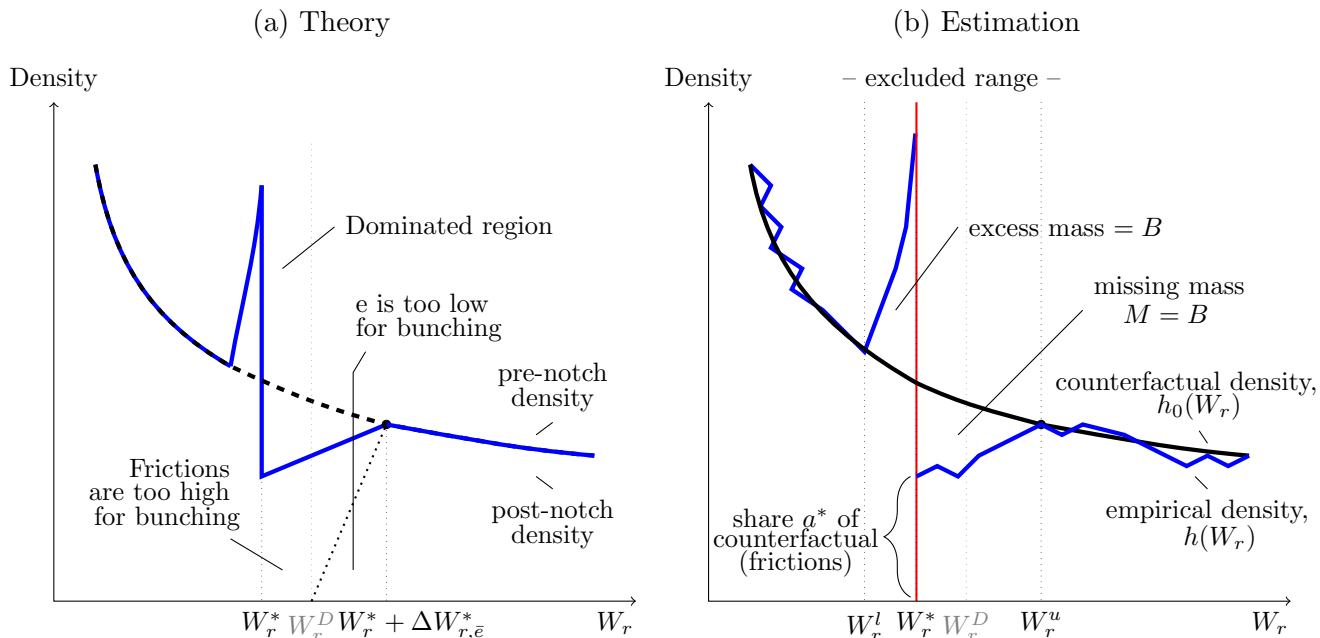
*Notes:* These figures depict the personal wealth tax schedule for Colombia. Panel (a) plots the tax schedule in FY 2010. Each bracket of reported net wealth  $W_r$  is associated with a fixed average tax rate  $\tau$  on taxable net wealth. That year, the wealth tax brackets affected the top 0.12%, top 0.04%, top 0.02%, and top 0.01%, respectively. Panel (b) plots the statutory wealth tax rate between FY 2000 and FY 2018. Wealth tax eligibility is determined using (taxable and non-taxable) net worth in all years but 2001, when it is determined using gross wealth. For 2007–2009, eligibility is established in 2006. In 2015–2018, eligibility is established in 2014. Tax brackets are expressed in current values for all years except 2004 and 2005 (2003 pesos). The tax schedule refers to average tax rates for all brackets in FY 2001–2010. In FY 2014–2018, only the first bracket is an average tax rate; the rest are marginal rates. *Source:* Table A.1

Figure 2: Distribution of Reported Net Worth in 2009 (Before Reform) and 2010 (After Reform)



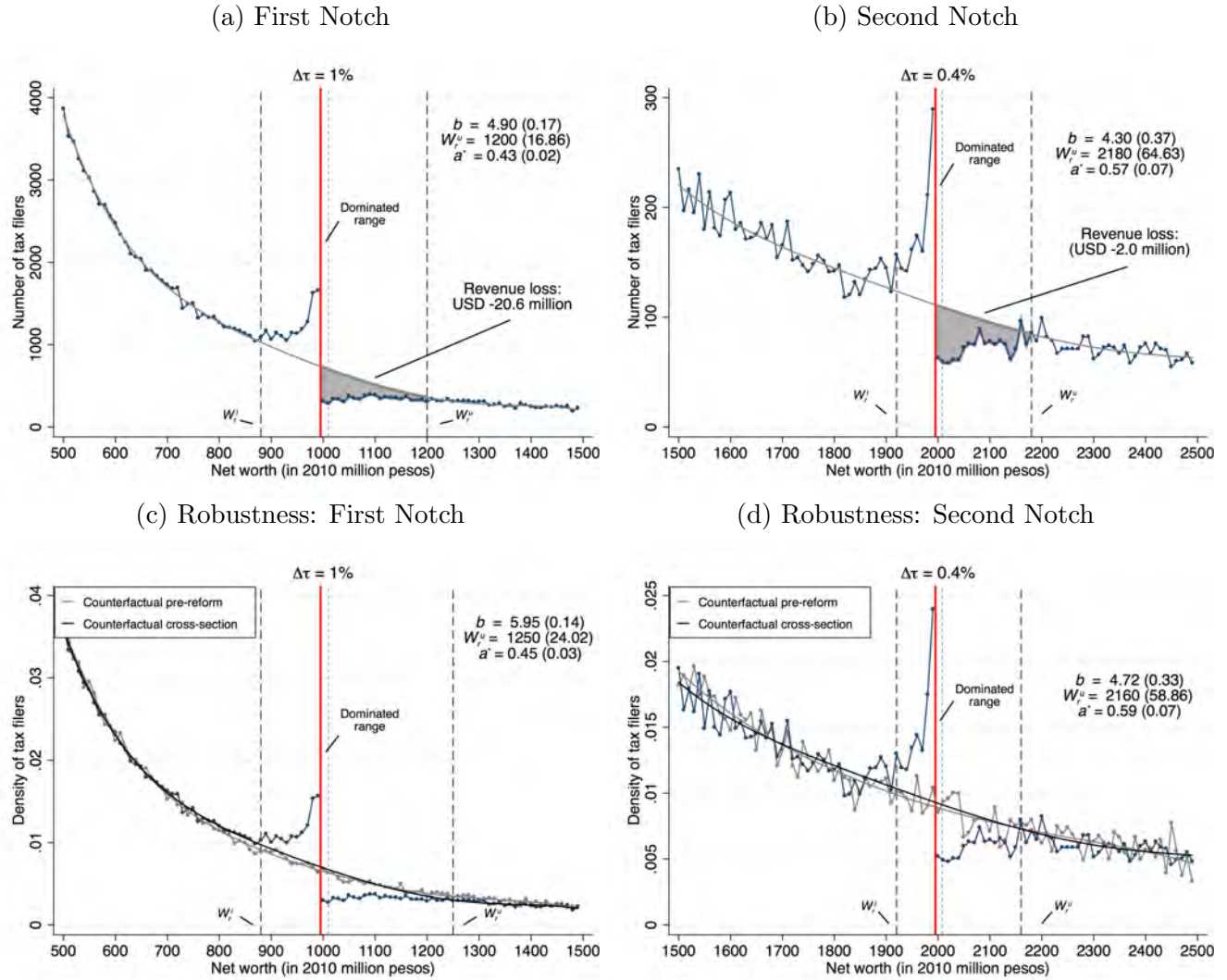
*Notes:* This figure overlays the distribution of tax filers by reported net wealth before and after a reform introduced two wealth tax notches at 1 and 2 billion pesos (red vertical lines), as depicted in Figure 1. These notches imply that wealth tax liability jumps discontinuously, as illustrated in Figure A.2. The figure shows that the distribution of individuals is smooth in the absence of wealth tax notches (2009). The two notches result in the immediate emergence of excess mass below the notch points, and corresponding missing mass just above them (2010). This observed bunching of taxpayers below the notch points is a direct behavioral response to wealth taxation. Bin width is 2010 10,000,000 pesos (2010 USD 5,208.30 in 12/31/2010). *Source:* Authors' calculations using administrative data from DIAN.

Figure 3: Bunching Theory and Estimation: Density Distribution of Reported Wealth



*Notes:* These figures illustrate the bunching approach to a proportional tax notch ( $\Delta\tau > 0$ ) that discontinuously raises tax liability for those reporting wealth above  $W_r^*$ . For simplification, this notch is associated with a small change, such that intensive responses by those who stay above the notch can be ignored. Panel (a) depicts the theoretical effect of this notch on the density distribution of reported net wealth in the presence of heterogeneous elasticities and optimization frictions. Before the notch, the distribution of reported wealth is smoothly decreasing around the cutoff (dashed black line). A group of individuals responds to the notch by underreporting wealth below  $W_r^*$ . The notch thus generates excess mass at  $W_r^*$  and corresponding missing mass between the interval  $(W_r^*, W_r^* + \Delta W_r^*)$  (solid blue line). Some individuals in the range  $(W_r^*, W_r^D]$  cannot bunch below the notch point due to high optimization frictions (to compare this result with the baseline case of no frictions and homogeneous elasticities, see Figure A.4). Panel (b) illustrates the bunching estimation. The blue line represents the (hypothetical) empirical density of taxpayers. The black solid line represents the counterfactual density, which is estimated by either fitting a flexible polynomial to the empirical density and excluding observations in a range  $[W_r^l, W_r^u]$ , or by using observed pre-reform density. We denote  $W_r^u$  as the net worth of the marginal buncher, obtained with the point of convergence method such that the excess mass ( $B$ ) below  $W_r^*$  and the missing mass ( $M$ ) above  $W_r^*$  are equal ( $B = M$ ). A lower bound on the estimated elasticity is obtained by scaling excess mass  $B$  by  $1 - a^*$ , where  $a^*$  is the share of individuals in the range of the dominated region  $(W_r^*, W_r^D]$  who are unresponsive to the notch.

Figure 4: Wealth Bunching Estimation at First Two Notches in 2010, and Robustness using Pre-Reform Counterfactual

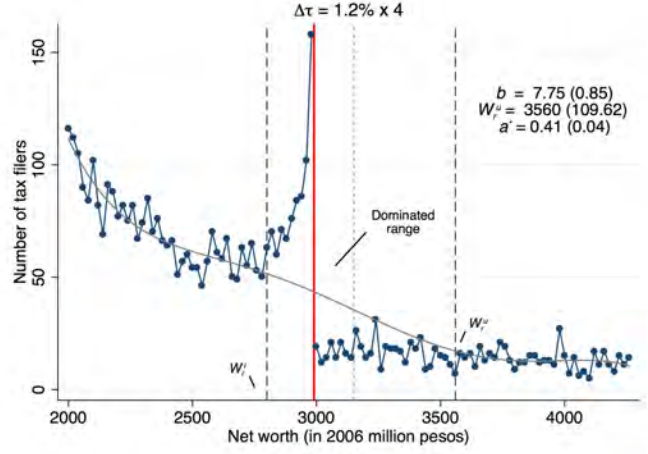
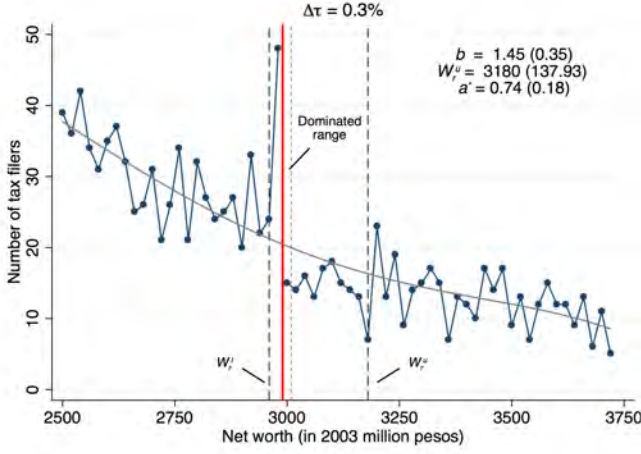


*Notes:* These figures display taxpayer density by 2010 net worth around the first notch in Panels (a) and (c), and the second notch in Panels (b) and (d). The counterfactual densities are obtained from the regression of a polynomial of degree 5 on all data points outside the  $[W_r^l, W_r^u]$  interval in Panels (a) and (b), and using pre-reform data (in gray) in Panels (c) and (d).  $b$  is the excess mass as a share of the counterfactual and  $W_r^u$  is the net worth of the marginal buncher, obtained with the point of convergence method. The lower bound  $W_r^l$  is determined visually. The upper bound  $W_r^u$  is estimated from an iterative process: starting from  $W_r^u = W_r^*$ , we obtain the counterfactual and estimate the excess mass ( $B$ ) below the threshold and missing mass ( $M$ ) above the threshold. For low  $W_r^u$ , the excess mass is larger than the missing mass ( $B \gg M$ ). We iteratively increase  $W_r^u$  until the two masses are equal ( $B = M$ ).  $a^*$  represents the share of individuals in the dominated range that do not bunch due to optimization frictions. The standard errors in parentheses are estimated from 1,000 bootstrap samples with replacement. Revenue losses are obtained by multiplying  $\tau \times W_r$  by the shaded area between the counterfactual and observed densities. Bin width is 10,000,000 pesos (2010 USD 5,208.30 in 12/31/2010). The estimated parameters are summarized in Table 1. *Source:* Authors' calculations using administrative tax microdata from DIAN.

Figure 5: Wealth Bunching Estimation Across Time and Notches: 2003, 2006, 2010, and 2014

(a) 2003, First (and Only) Notch

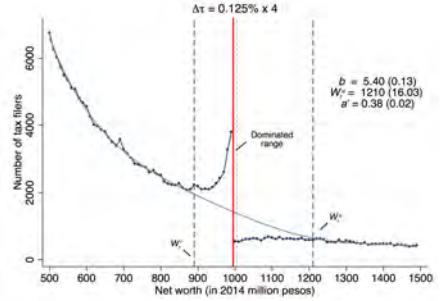
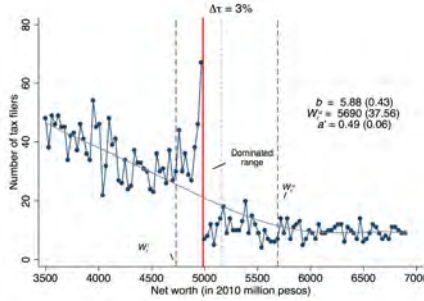
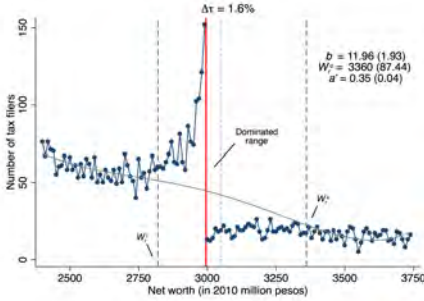
(b) 2006, First (and Only) Notch



(c) 2010, Third Notch

(d) 2010, Fourth Notch

(e) 2014, First Notch

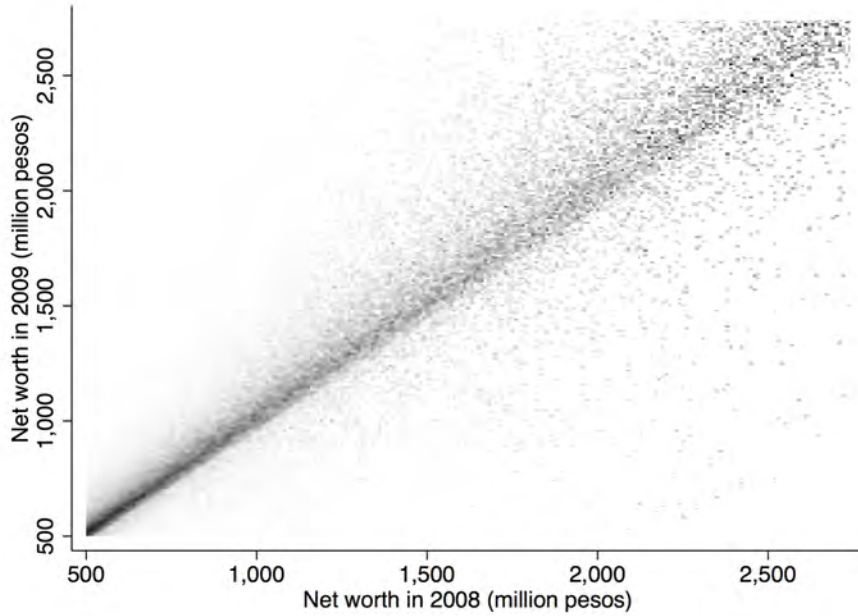


*Notes:* These figures display taxpayer density by net worth in 2003, 2006, 2010, and 2014, and fit the counterfactual distribution.  $b$  is the excess mass as a share of the counterfactual and  $W_r^u$  the net worth of the marginal buncher, obtained with the point of convergence method. The counterfactual is obtained from the regression of a polynomial of degree 5 on all data points outside the  $[W_r^l, W_r^u]$  interval. The lower bound  $W_r^l$  is determined visually. The upper bound  $W_r^u$  is estimated from an iterative process: starting from  $W_r^u = W_r^*$ , we obtain the counterfactual and estimate the excess mass ( $B$ ) below the threshold and missing mass ( $M$ ) above the threshold. For low  $W_r^u$ , the excess mass is larger than the missing mass ( $B \gg M$ ). We iteratively increase  $W_r^u$  until the two masses are equal ( $B = M$ ).  $a^*$  represents the share of individuals in the dominated range that do not bunch due to optimization frictions. The tax notch  $\Delta\tau$  is  $1.2\% \times 4$  in 2006 because individuals with 2006 reported wealth of 3,000 million or more were subject to the wealth tax until 2009 (inclusive). Similarly, the tax notch  $\Delta\tau$  is  $0.125\% \times 4$  in FY 2014 because individuals with reported wealth of 1,000 million or more that year were eligible for the wealth tax until FY 2018. Standard errors in parentheses are estimated from 1,000 bootstrap samples with replacement. Bin width is 20,000,000 pesos in Panels (a) and (b), 10,000,000 pesos in Panels (c) and (e), and 30,000,000 pesos in Panel (d). The estimated parameters are summarized in Table 1. *Source:* Authors' calculations using administrative tax microdata from DIAN.

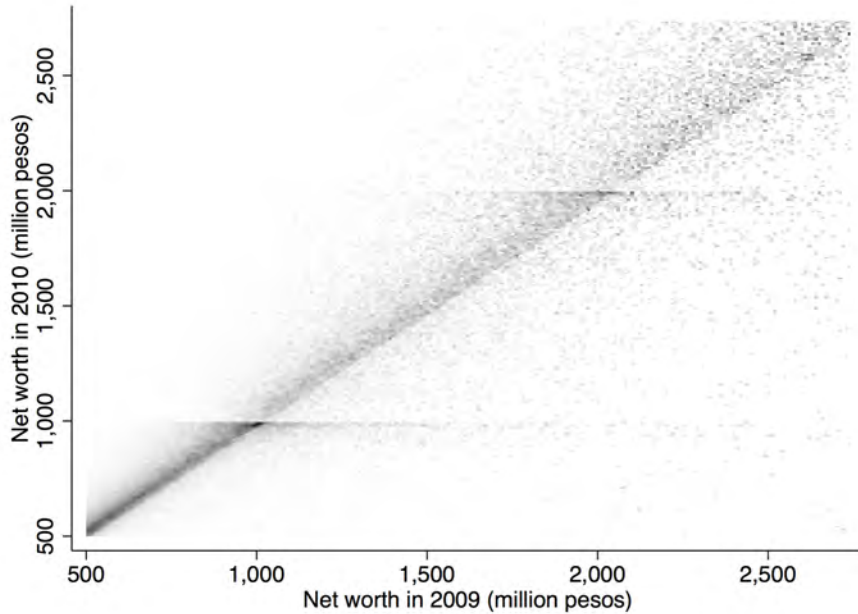


Figure 6: Tax Filer Density Before and After a Wealth Tax Reform

(a) Tax Filers in 2008 and 2009 (Not Subject to the Wealth Tax)



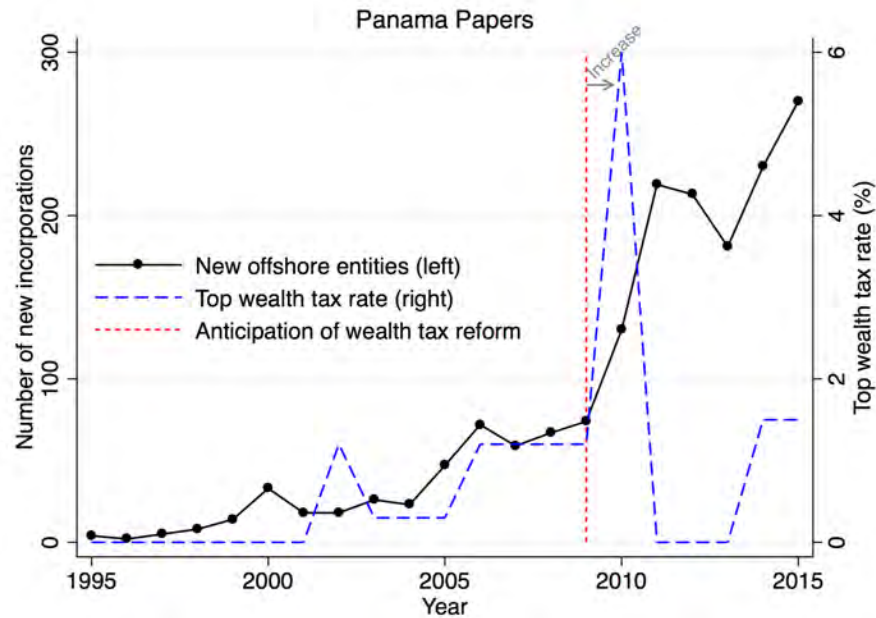
(b) Tax Filers in 2009 and 2010 (Subject to the Wealth Tax)



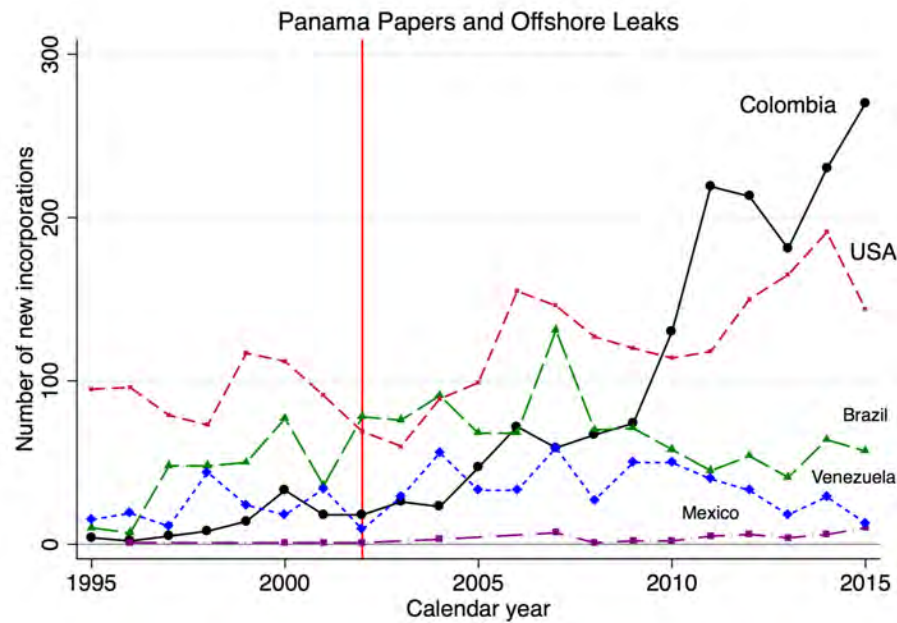
*Note:* These figures present density heatmaps for taxpayers reporting 500 million to 3,000 million pesos in bins of 2010 10 million  $\times$  10 million pesos (USD 5,208.30 in 12/31/2010) in 2008, 2009, and 2009. Darker colors represent higher density of tax filers in that bin. Panel (a) is restricted to individuals who filed in 2008 and 2009 (no notches or kinks), and reweights individuals by 2008 bin density. The figure shows that taxpayers report similar values of net worth from year to year in the absence of wealth tax notches. The presence of diffuse mass in lieu of a precise 45 degree line suggests wealth rises and falls year-to-year, and that such variations are not necessarily related to changes in the wealth tax schedule. Panel (b) is restricted to individuals in 2009 and 2010 (a notched schedule was introduced in 2010), and reweights individuals by 2009 bin density. The figure shows that individuals responded to the introduction of the two tax notches by bunching just below them to reduce their tax burden. This provides additional visual evidence of bunching induced by tax notches. *Source:* Authors' calculations using administrative data from DIAN.

Figure 7: The Use of Offshore Entities

(a) Colombia



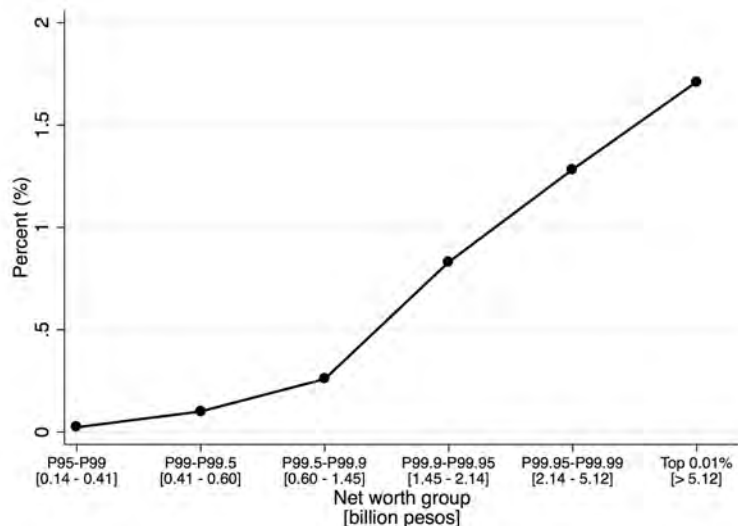
(b) Colombia versus Selected Countries



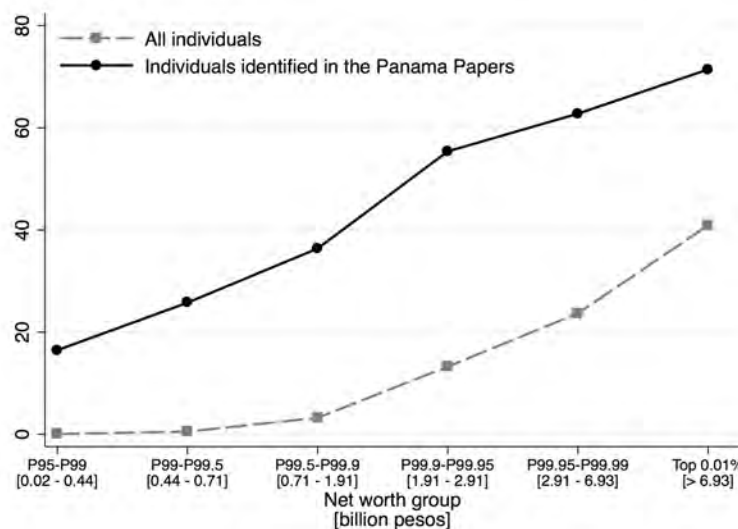
*Note:* These figures, based on the Panama Papers microdata, compare the flow of offshore entities created by individuals from Colombia and other countries through Panamanian law firm Mossack Fonseca. Panel (a) plots the number of new Colombian offshore entities that are incorporated every year (black solid line) and the top statutory annual wealth tax rate (blue dashed line). The figure suggests wealth tax changes are associated with a more frequent incorporation of offshore entities. Panel (b) compares Colombia's offshore entity incorporation flow with that of several other countries (the red vertical line marks the reintroduction of net wealth taxes in Colombia). The figure suggests Colombians stand out in their use of offshore entities, even relative to larger and wealthier countries. Both panels include active and inactive offshore entities. *Source:* ICIJ. Accessed June 12, 2017.

Figure 8: Panama Papers and Disclosures of Hidden Wealth Under Voluntary Disclosure Scheme, by Wealth Group

(a) Probability of Appearing Named in the Panama Papers



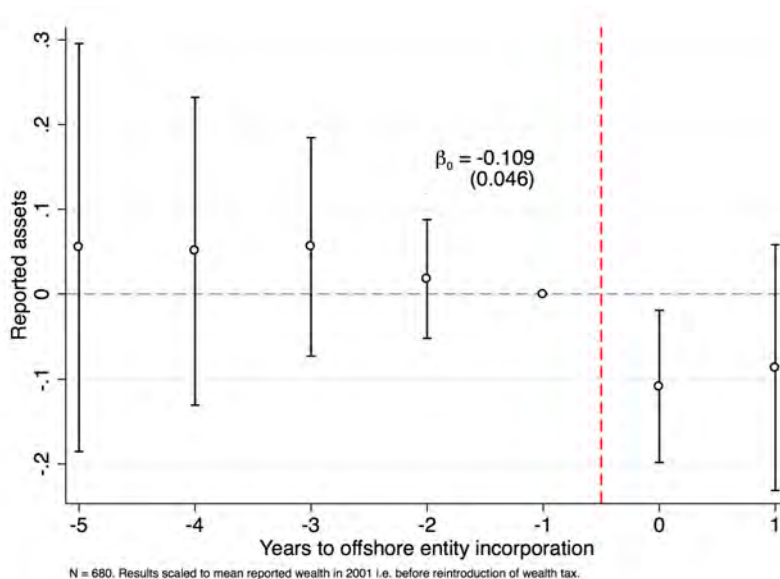
(b) Probability of Disclosing Hidden Wealth Under Scheme



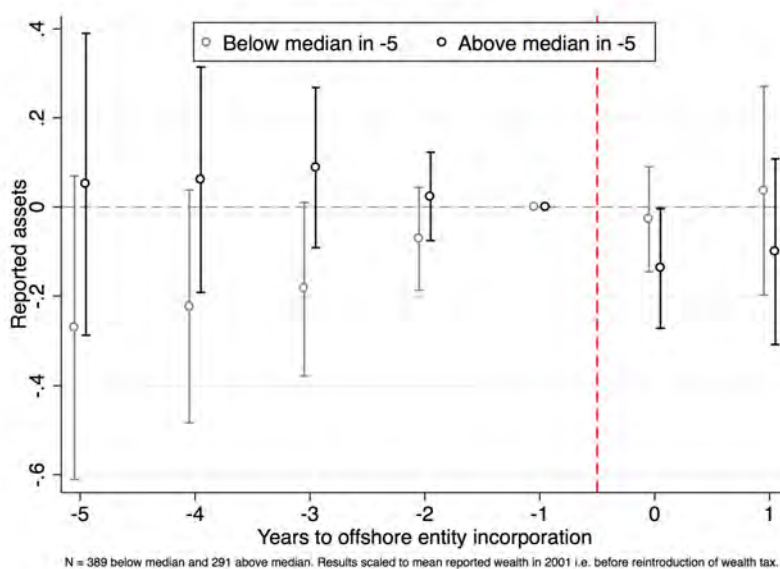
*Notes:* Panel (a) plots the fraction of tax units in Colombia identified in the Panama Papers by bins of net worth. Individuals are ranked by their average net worth reported for any year in which they have filed an income tax return. The sample includes 1,208 shareholders of offshore entities created by Mossack Fonseca who could be exactly matched to their individual income tax return filed at any point between 1993 and 2015. The figure shows that the likelihood of appearing in the Panama Papers is increasing in reported wealth (the differences across wealth groups are always statistically significant). One in sixty individuals in the wealthiest 0.01 percent (1.7 percent) are identified in the Panama Papers. Panel (b) plots the probability of participating in voluntary disclosure program by wealth bins for all tax filers (gray dash line), and tax filers identified in the Panama Papers (solid black line). Individuals are ranked by FY 2013 net worth plus any disclosures made under the scheme. The figure shows that two-fifths percent of individuals in the wealthiest 0.01 percent disclosed hidden wealth under the scheme. This share is 71 percent for individuals identified in the leak. The sample in Panel (b) is restricted to 1,633,383 individuals filing the income tax return in FY 2013, and includes 11,210 disclosers and 1,085 individuals in the Panama Papers (of which 434 disclosed hidden wealth). The exchange rate for 1 billion pesos is USD 335,130 in 12/31/2017. *Sources:* Authors' calculations using administrative tax microdata from DIAN.

Figure 9: The Effect of Opening an Offshore Entity on Assets Reported to the Tax Authority

(a) All Tax Filers



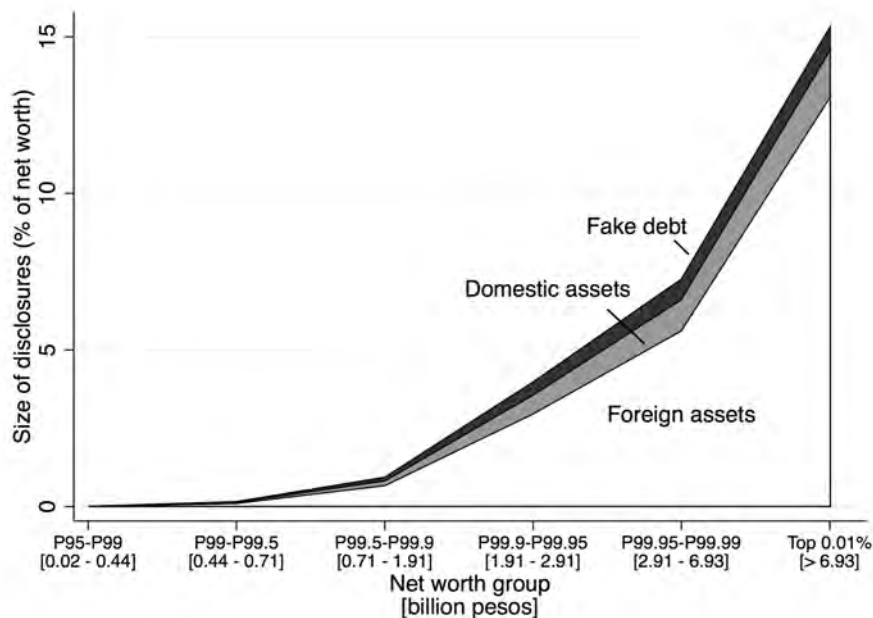
(b) Heterogeneity: Above- vs Below-Median Reported Assets in Event Time -5



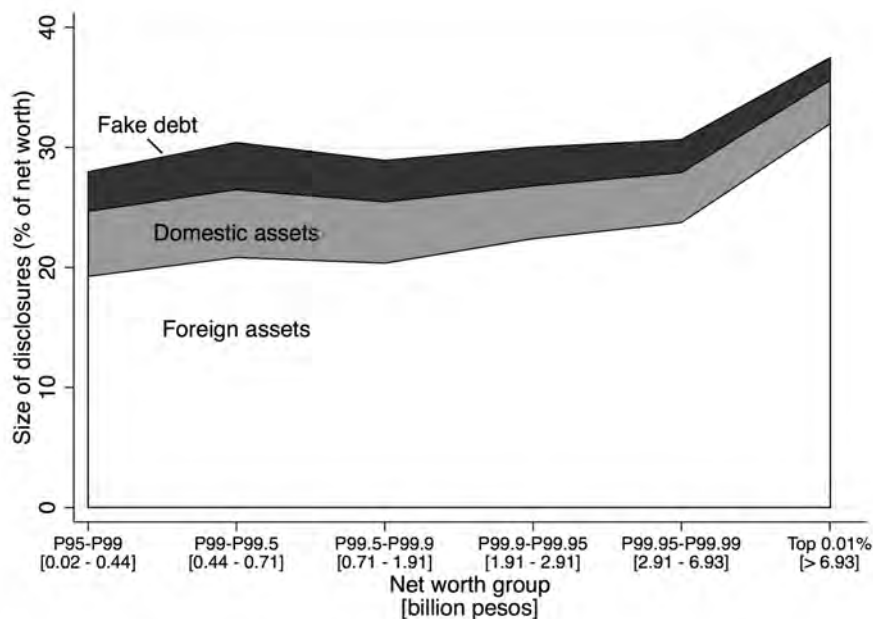
*Notes:* These figures compare total assets reported to the Colombian tax authority before and after incorporating an offshore entity in Panama and other tax havens through Mossack Fonseca. Panel (a) presents the  $\beta_k$  coefficients from event study specification (8). The outcome variable is total reported assets scaled with respect to mean reported wealth in 2001 (i.e., the year preceding the reintroduction of wealth taxation in Colombia). An “event” is defined as the year an individual incorporates an offshore entity for taxpayers with only one offshore entity. The sample is balanced in event time and excludes taxpayers not appearing in the Panama Papers. The figure suggests reported assets drop by 10.9 percent the year a taxpayer incorporates an offshore entity through Mossack Fonseca. This drop is consistent with wealth obfuscation for the purpose of reducing the tax burden. Panel (b) presents results separately for individuals with above- and below-median reported assets in event time -5. The figure suggests that the result is driven by the wealthiest individuals: for this group, reported assets significantly drop by 13.7 percent the year of offshore entity incorporation. As a robustness check, Figure A.11 plots  $\beta_k$  coefficients for different event time windows. *Sources:* Authors’ calculations using administrative tax microdata from DIAN and ICIJ.

Figure 10: Size of Disclosed Hidden Wealth in 2015–2017 Relative to Post-Disclosure Net Worth, by Post-Disclosure Top Wealth Group

(a) All

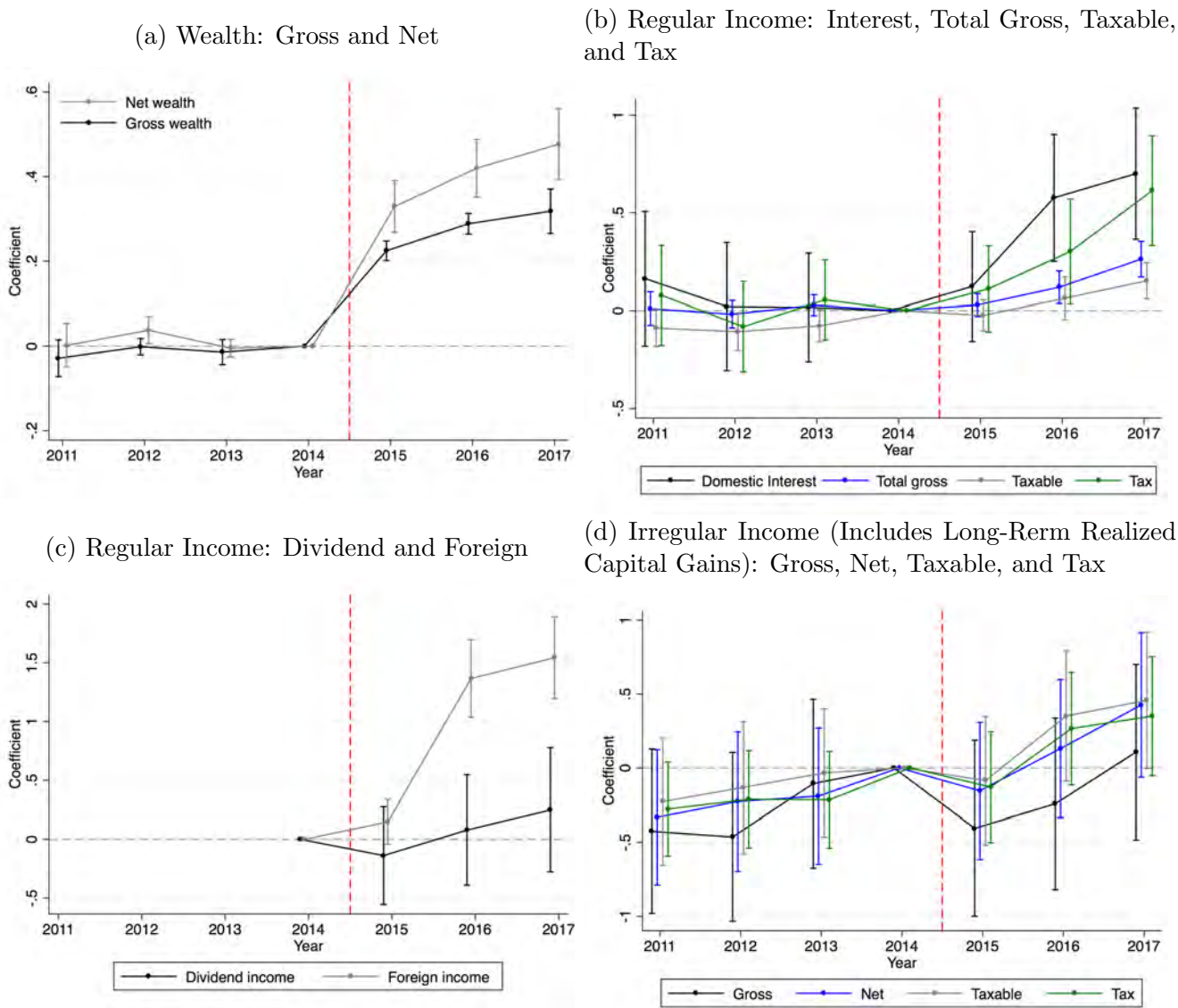


(b) Disclosers Only



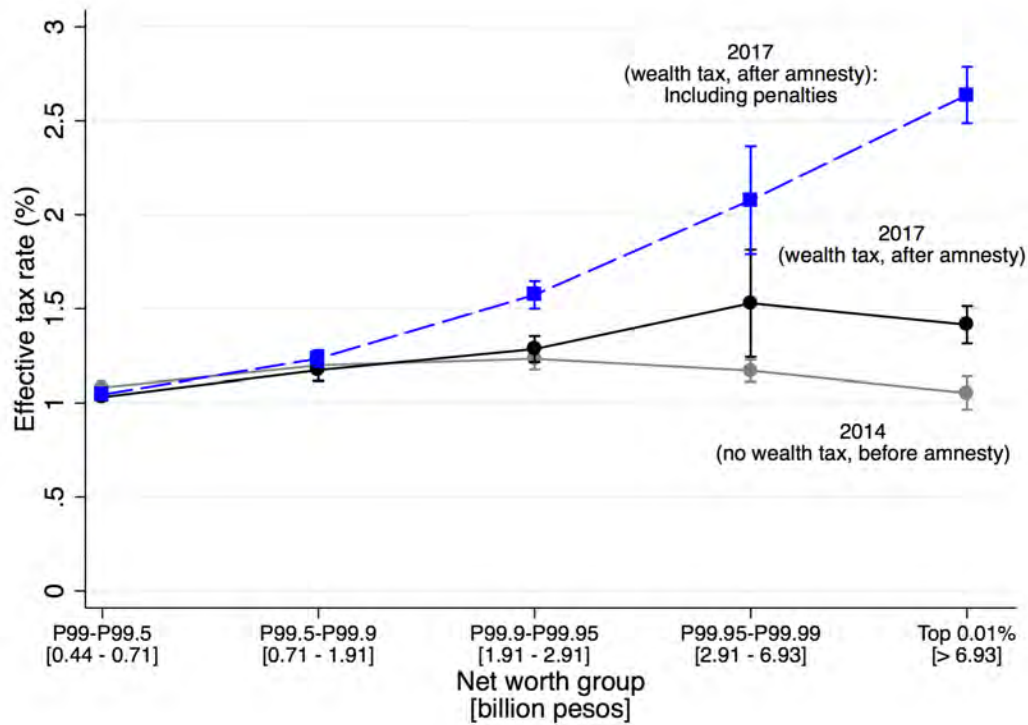
*Notes:* These figures show the magnitude of hidden foreign and domestic assets and fake liabilities disclosed during the 2015–2017 voluntary disclosure program. The sample is restricted to 1,633,383 individuals filing income taxes in FY 2013 (they may or not file a wealth tax return in 2015–2017), of which 11,210 participated in the disclosure program (“disclosers”). Tax filers are ranked by pre-program (FY 2013) net worth *plus* disclosures. Panel (a) shows the size of disclosed hidden assets and fake liabilities between 2015–2017 as a share of FY 2013 net worth *plus* disclosures. The figure suggests 15.3 percent of wealth had been hidden for among the top 0.01 percent. Panel (b) plots these shares for disclosers only. The figure suggests that hidden wealth represented 37.5 percent of disclosers’ wealth for those in the top 0.01 percent. The exchange rate for 1 billion pesos is USD 335,130 in 12/31/2017. *Sources:* Authors’ calculations using administrative tax microdata from DIAN.

Figure 11: The Impact of a Voluntary Disclosure Program on Reported Wealth and Income



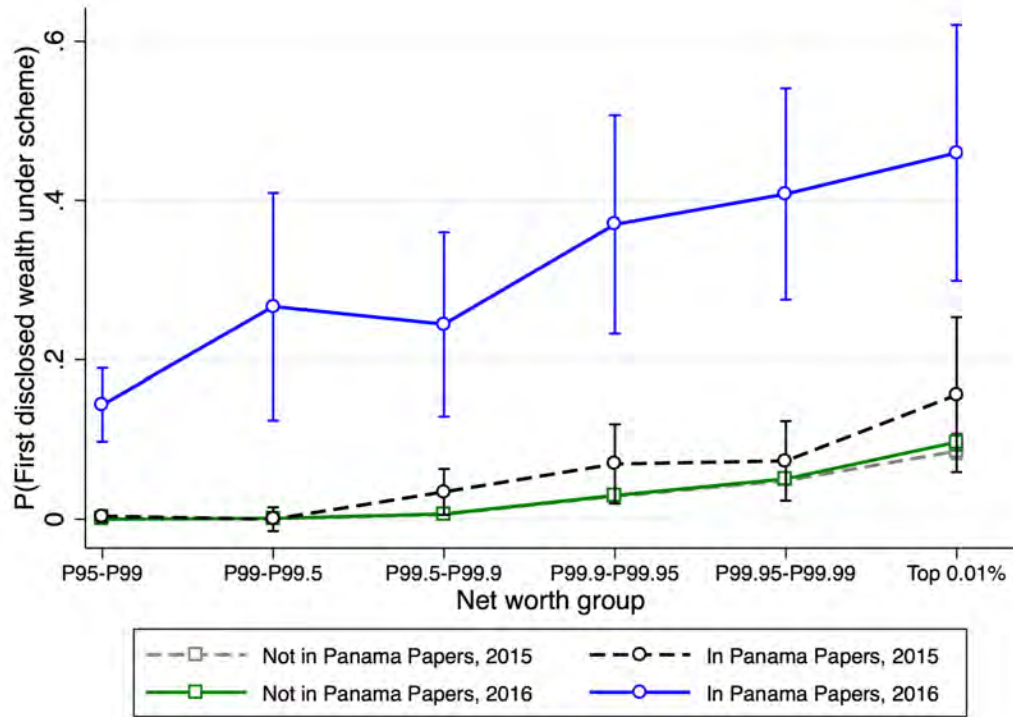
*Notes:* These figures present the effect of the voluntary wealth disclosure scheme on tax compliance. The outcome variable is reported wealth in Panel (a) and reported income categories in Panels (b)–(d). The figures compare outcomes between 1,777 individuals that voluntarily disclosed hidden wealth in 2015 and 43,181 that never disclosed under the scheme between 2015 and 2017. The outcome, an inverse hyperbolic sine transformation of a given income category, is regressed on individual fixed effects and a voluntary discloser dummy interacted with year fixed effects (2014 is the omitted category). Standard errors are clustered at the taxpayer level. The lines plot the coefficients on the interaction terms and 95 percent confidence intervals. The red vertical line marks the period individuals disclosed hidden wealth. The figure shows that the scheme raised wealth reported to the tax authority three years after initial disclosure, as well as reported capital income (interest income, foreign income, realized capital gains) derived from asset ownership. As a result, income tax liability increased. The sample is a balanced panel of 44,958 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015, 2016, or 2017. Tax filers that first disclosed assets and liabilities *after* 2015 (i.e., in 2016 or 2017) are excluded from the estimation sample. *Sources:* Authors’ calculations using administrative tax microdata from DIAN.

Figure 12: Rise in the Effective Tax Rate for Wealthiest Tax Filers



*Notes:* This figure illustrates how wealth taxation and a voluntary disclosure scheme raised tax progressivity at the top of the wealth distribution. The figure plots average taxes paid on income and wealth in 2014 and 2017, expressed as a share of net wealth for subgroups of individuals in the wealthiest 1 percent of the distribution. Individuals are ranked by their net wealth reported before the voluntary disclosure scheme (FY 2013) including any disclosures made under the scheme. The gray curve plots income taxes in calendar year 2014 (FY 2013), before the wealth tax was reintroduced. The black curve plots income *and* wealth taxes in 2017 (FY 2016), while the dashed blue curve adds the penalties associated with the disclosure program that year. The figure shows that wealth taxation increases taxes paid by the wealthiest individuals, and that the voluntary disclosure scheme more than doubled the average effective tax rate for the wealthiest group of individuals. *Sources:* Authors' calculations using administrative tax microdata from DIAN.

Figure 13: The Panama Papers Leak Raised Disclosures of Hidden Wealth

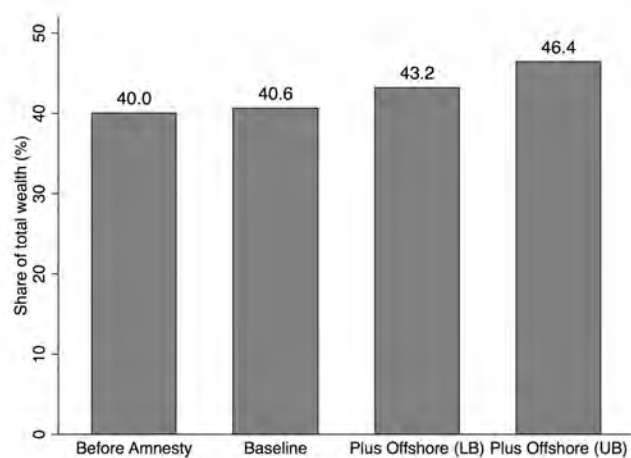


*Notes:* This figure illustrates the impact of the Panama Papers leak on tax compliance. The figure plots the probability of first disclosing hidden assets and/or fake liabilities in 2015 (before the leak) and 2016 (after the leak) for taxpayers in the Panama Papers (round marker) and taxpayers not in the Panama Papers (square marker) by wealth group. The vertical lines represent the 95 percent confidence intervals. The figure suggests that the Panama Papers leak in 2016 raised evaders' willingness to disclose hidden wealth for those named in the leak. The sample is an unbalanced panel of 2,421,936 individuals that either filed the income tax in 2014–2016 or filed a wealth tax return 2015–2017, and includes 11,927 disclosers and 1,167 individuals in the Panama Papers (of which 453 ever disclosed assets). Wealth groups are generated every year including disclosures. *Sources:* Authors' calculations using administrative tax microdata from DIAN.

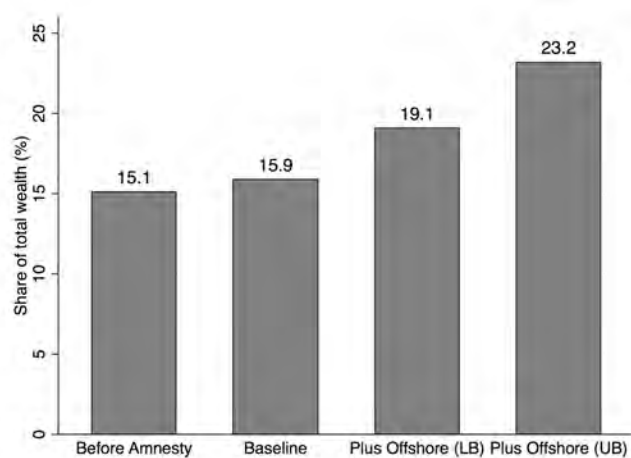


Figure 14: Wealth Inequality in Colombia Including Hidden Offshore Wealth

(a) Top 1 Percent



(b) Top 0.1 Percent



*Notes:* These figures presents estimates of top wealth shares in Colombia for 2017. In the baseline estimates, the top 1 percent owns 40.64 percent of total wealth in Panel (a), and the top 0.1 percent owns 15.85 percent of total wealth in Panel (b). The figures compare wealth inequality excluding offshore assets disclosed during the amnesty (first bar). In addition, the figures present estimates for top shares corrected by including unreported offshore wealth. Using data from [Alstadsater et al. \(2018\)](#) and the Panama Papers leak, the lower bound assumes unreported offshore wealth today represents 6.2 percent of GDP, while the upper bound assumes it represents 15 percent. *Sources:* Table A.6.

Table 1: Summary of Notches, Responses, and Elasticities

Year of Reform (1)	Notch Point (mill. pesos) (2)	Exemption Cutoff (3)	ATR Jump $\Delta\tau$ (%) (4)	Dominated Range $\Delta W_r^D$ (mill. pesos) (5)	Frictions $a^*$ using $\Delta W_r^D$ (6)	Response $\Delta W_r^*$ (mill. pesos)		Reduced-Form Elasticity $e_R$	
						Bunching-Hole Method (7)	Convergence Method (8)	Bunching-Hole Method (9)	Convergence Method (10)
2003	3,000	✓	0.3	9	0.74 (0.18)	120 (80.09)	180 (137.93)	0.27 (0.62)	0.60 (1.76)
2006	3,000	✓	$1.2 \times 4$	151	0.41 (0.04)	340 (52.04)	560 (109.62)	0.13 (0.04)	0.36 (0.16)
2010	1,000	✓	1.0	10	0.43 (0.02)	110 (7.91)	200 (16.86)	0.60 (0.09)	2.00 (0.35)
2010	2,000		0.4	8	0.57 (0.07)	110 (24.10)	180 (64.63)	0.37 (0.19)	1.00 (0.99)
2010	3,000		1.6	49	0.35 (0.04)	220 (40.82)	360 (87.44)	0.17 (0.09)	0.44 (0.20)
2010	5,000		3.0	160	0.43 (0.06)	480 (24.01)	720 (37.56)	0.15 (0.01)	0.34 (0.01)
2014	1,000	✓	$0.0125 \times 4$	5	0.38 (0.02)	110 (6.31)	210 (16.03)	1.21 (0.15)	4.41 (0.71)

*Notes:* This table presents elasticity estimates at different wealth levels exploiting four wealth tax reforms taking place in 2003, 2006, 2010, and 2014. Column (1) presents the year of the wealth tax reform. Column (2) indicates the bracket cutoff, expressed in current million pesos. Column (3) indicates whether this cutoff also marks the eligibility threshold, below which taxpayers are exempt from the wealth tax. Column (4) presents the size of the wealth tax notch. Column (5) presents the dominated range in current million pesos, defined as  $\Delta\tau \cdot W_r^*/(1 - \tau - \Delta\tau)$ . Column (6) presents the estimate of frictions (the fraction of individuals in dominated ranges who are unresponsive). Columns (7)–(8) present the reporting responses in current million pesos using bunching-hole and convergence methods, respectively. Columns (9)–(12) present elasticities based on the reduced-form formula (4) in columns (9)–(10). Table D.1 includes the elasticities based on a parametric equation for a comparison. *Source:* Authors' calculations using administrative tax microdata from DIAN.

Table 2: Compliers (i.e., bunchers) analysis for the first notch in 2010

	$E[Y(0) \text{Compliers}]$ (1)	$E[Y(1) - Y(0) \text{Compliers}]$ (2)	$E[Y \text{Always-takers}]$ (3)	$E[Y \text{Never-takers}]$ (4)
Debt	0.094 (0.005)	0.033 (0.004)	0.079 (0.009)	0.121 (0.002)
Inventories	0.109 (0.016)	-0.024 (0.012)	0.109 (0.024)	0.107 (0.006)
Fixed assets	0.527 (0.027)	-0.002 (0.023)	0.63 (0.042)	0.541 (0.01)
Stock	0.17 (0.02)	0.015 (0.019)	0.091 (0.027)	0.161 (0.007)
Bank deposits	0.086 (0.016)	0.008 (0.017)	0.08 (0.022)	0.094 (0.005)
Accounts receivable	0.066 (0.016)	0.025 (0.013)	0.074 (0.02)	0.08 (0.005)
Other assets	0.038 (0.011)	-0.021 (0.012)	0.019 (0.016)	0.018 (0.002)

*Notes:* This table presents the results of a compliers analysis using the set-up illustrated by Figure A.7. In this setting, a complier refers to a taxpayer bunching below the exemption cutoff in response to the wealth tax. The sample is a balanced panel of 8,016 income tax filers reporting net wealth between  $W_r^l$  and  $W_r^u$  in 2008, 2009, and 2010. The endogenous variable is  $B_{it} = 1$  if the individual has net wealth (in 2010 pesos) between  $W_r^l$  and  $W^*$ , i.e., the bunching region. Complier means in Column (1) are calculated as the coefficient on  $1 - B_{it}$  in a 2SLS regression of  $1 - B_{it}$  multiplied by  $Y_i$  and using 2010 as the instrument ( $Z_{it}$ ). Always-taker and never-taker means are calculated in analogous 2SLS regressions of  $B_{it}(1 - Z_{it})Y_{it}$  on  $B_{it}(1 - Z_{it})$  and  $(1 - B_{it})Z_{it}Y_{it}$  on  $(1 - B_{it})Z_{it}$ , respectively, again using 2010 as  $Z_{it}$ . The first stage coefficient is 0.313 ( $t$ -stat 35.3) for debt, and 0.275 ( $t$ -stat 13.13) for all others, as only business owners keeping records report asset types separately. Standard errors are clustered at the taxpayer level. The table suggests bunchers inflate their debt and underreport inventories, which are not covered by third-party reports, to artificially place themselves below the wealth tax exemption cutoff. *Source:* Authors' calculations using administrative tax microdata from DIAN.

Table 3: Who Are the Shareholders of Offshore Entities Incorporated by Mossack Fonseca?

	Not in Panama Papers (1)	In Panama Papers (2)
Number of individuals	3,300,718	1,208
Number of years filed tax return	6.21 [5.87]	15.83 [6.91]
<b>Demographics</b>		
Male (percent)	56.2	63.4
Born after 1985 (percent)	7.2	5.1
Rentier (percent)	13.21	27.40
Wage-earner (percent)	37.16	59.69
Other (percent)	49.63	12.91
<b>Income and wealth (2017 millions)</b>		
Gross wealth	263.11 [1,034.38]	1,880.42 [3,511.60]
Net worth	209.72 [878.76]	1,533.36 [3,245.76]
Irregular capital income	8.11 [140.32]	65.04 [178.49]
P99 (percent)	9.54	68.96
P99.9 (percent)	0.95	28.75
P99.99 (percent)	0.09	4.47

*Notes:* This table presents descriptive statistics (means and standard deviations in brackets) for the 3.3 million income tax filers we observe between tax years 1993 and 2016 (Column 1) and for tax filers that appear named in the Panama Papers (Column 2). Rentier, Wage-earner and Other refer to economic activity codes, as self-reported by taxpayers to the tax authority. Rentier also includes individuals without an economic activity as well as dependents. Income and wealth values (in 2017 million pesos) and top percentile groups use individual net worth means across tax years. The exchange rate for 1 million pesos is USD 335.13 in 12/31/2017. *Sources:* Authors' calculations using administrative tax microdata from DIAN and ICIJ.

Table 4: Who Disclosed Hidden Assets or Inexistent Liabilities?

	Non-disclosers (1)	Disclosers (2)	Disclosers by year of disclosure		
			2015 (3)	2016 (4)	2017 (5)
Number of individuals	55,098	11,210	2,179	2,708	6,323
Number of years filed tax return	19.69 [5.00]	19.19 [5.62]	19.08 [5.58]	19.38 [5.55]	19.15 [5.67]
<b>Demographics</b>					
Male (percent)	60.58	57.76	61.03	56.99	56.95
Born after 1985 (percent)	0.0	0.0	0.0	0.0	0.0
Rentier (percent)	29.54	34.55	33.59	35.23	34.59
Wage-earner (percent)	24.29	28.72	24.55	31.09	29.13
Other (percent)	46.17	36.74	41.85	33.68	36.28
In the Panama Papers (percent)	0.43	3.87	1.88	10.60	1.68
Buncher (percent)	18.27	13.26	13.68	12.15	13.59
<b>Pre-Disclosure Wealth</b>					
Gross wealth	2,837.43 [7,638.74]	3,288.56 [20,666.54]	4,445.34 [37,727.68]	2,976.44 [5,092.94]	3,023.58 [15,975.48]
Net worth	2,367.62 [5,557.32]	2,719.82 [18,570.51]	3,538.67 [36,321.41]	2,487.30 [4,295.27]	2,537.22 [12,196.98]
Irregular capital income	98.29 [678.19]	95.20 [740.71]	110.60 [526.18]	72.94 [311.14]	99.42 [914.13]
P99 (percent)	100.0	100.0	100.0	100.0	100.0
P99.9 (percent)	46.08	39.71	43.05	42.87	37.21
P99.99 (percent)	4.04	6.75	7.85	7.24	6.17

*Notes:* This table presents descriptive statistics (means and standard deviations in brackets) for 66,308 income tax filers in FY 2013 (i.e., immediately before the disclosure program) that filed a wealth tax declaration in either 2015, 2016, or 2017. Column 1 provides summary statistics for those that did not disclose hidden wealth or inexistent liabilities in 2015, 2016, nor 2017, while Column 2 provides summary statistics for those that ever disclosed between 2015 and 2017. Columns 3–5 provide summary statistics separately by year of first disclosure. Rentier, Wage-earner and Other refer to economic activity codes, as self-reported by taxpayers to the tax authority. Rentier also includes individuals without an economic activity as well as dependents. An individual is coded as a buncher if she is located within the bunching region  $[W_r^l, W_r^*]$  in FY 2003, 2006 or 2010, as defined in Section 4.1. Wealth values (expressed in 2017 million pesos) and top percentile groups (using net worth) are based on values reported in the income tax statement in FY 2013 (calendar year 2014), i.e., immediately before the disclosure program. The exchange rate for 1 million pesos is USD 335.13 in 12/31/2017. *Sources:* Authors' calculations using administrative tax microdata from DIAN and ICIJ.

Table 5: The Impact of a Voluntary Disclosure Program on Wealth and Income Reported to the Tax Authority

	Wealth			Income				Capital gains and other irregular income				
	Gross (1)	Net (2)	Foreign (3)	Dividend (4)	Interest (5)	Total gross (6)	Taxable (7)	Tax (8)	Gross (9)	Net (10)	Taxable (11)	Tax (12)
DID	0.288*** (0.015)	0.400*** (0.030)	1.010*** (0.105)	0.061 (0.170)	0.416*** (0.117)	0.132*** (0.030)	0.132*** (0.034)	0.329*** (0.090)	0.069 (0.157)	0.322** (0.130)	0.339*** (0.125)	0.339*** (0.100)
N	314,706	314,706	138,004	138,004	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.66	0.572	0.614	0.753	0.629	0.686	0.547	0.641	0.264	0.246	0.246	0.242

*Notes:* This table presents the effects of the 2015 voluntary disclosure program on income and wealth reported to the Colombian tax authority. The dependent variables in columns (1) and (2) are taken from the wealth tax form 440, while those in columns (3)–(12) are taken from the individual income tax forms 110 and 210. Outcomes are expressed in log-approximation form using the inverse hyperbolic sine function. The table compares outcomes between 1,777 taxpayers that voluntarily disclosed hidden assets and in-existent liabilities in 2015 and 43,181 that did not disclose between 2015 and 2017. Each outcome is regressed on individual fixed effects, year fixed effects, and an interaction of the voluntary discloser dummy and post-reform years (2014 is the omitted category), as in specification (9). The standard errors in parentheses are clustered at the taxpayer level. The sample is a balanced panel of 44,958 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015. Tax filers that first disclosed assets and liabilities strictly after 2015 (i.e., in 2016 or 2017) are excluded from the estimation sample. The number of observations with foreign income and dividend income is smaller than the rest because taxpayers report these two variables as separate variables starting 2014. Wealth tax liability is not reported as an outcome because there is no wealth tax during most of the pre-program period. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . *Sources:* Authors' calculations using administrative tax microdata from DIAN.

Table 6: The Effect of the Panama Papers Leak on Wealth Disclosures and Taxes Owed

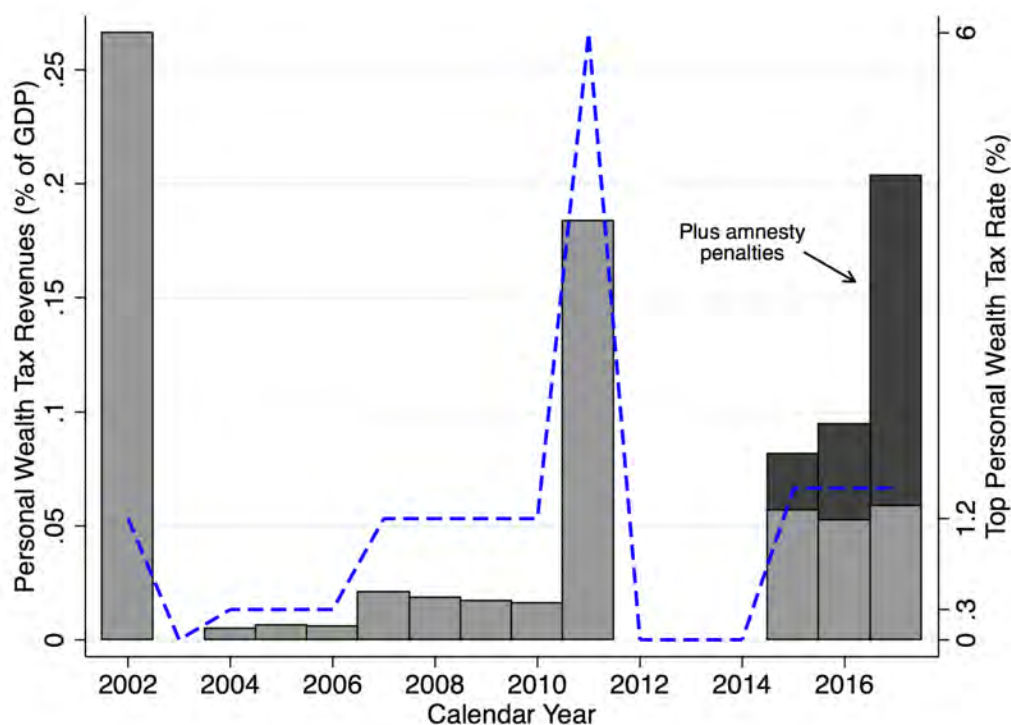
	<i>Dependent variable</i>			
	1(Disclosed any) (1)	1(Disclosed foreign asset) (2)	log(Wealth tax) (3)	log(Wealth tax plus penalties) (4)
$\beta$	0.274*** (0.027)	0.296*** (0.025)	0.261*** (0.043)	0.850*** (0.088)
Control Mean	0.0328	0.0192	15.221	15.315
$N$	118,966	118,966	118,966	118,966
$R^2$	0.015	0.023	0.001	0.004

*Notes:* This table presents the effect of the Panama Papers leak on willingness to disclose hidden wealth and tax liability. Column (1) presents the likelihood of disclosing any hidden asset or fake liability for the first time. Column (2) plots the likelihood of disclosing foreign assets in particular. Columns (3) and (4) display wealth tax liability, including or excluding penalties associated with disclosing hidden wealth. These outcomes are expressed in log-approximation form using the inverse hyperbolic sine function. The table compares outcomes using a balanced panel of 59,483 individuals that filed the wealth tax return in 2015 (before the Panama Papers leak) and 2016 (after the Panama Papers leak), 504 of which appear in the Panama Papers and 58,979 of which do not. The difference-in-differences coefficient represents  $\beta$  from specification (10). The standard errors in parentheses are clustered at the individual level. Column (1) results suggest that taxpayers in the Panama Papers are 27.4 percentage points more likely to first disclose hidden assets and/or fake liabilities after the Panama Papers leak relative to taxpayers that do not appear in the Panama Papers before the leak. On a basis of 0.0328, this implies a more than ninefold increase in the likelihood of disclosing hidden wealth.  $*p < 0.1, **p < 0.05, ***p < 0.01$ . *Sources:* Authors' calculations using administrative tax microdata from DIAN and ICIJ.

# Appendices

## A Figures and Tables

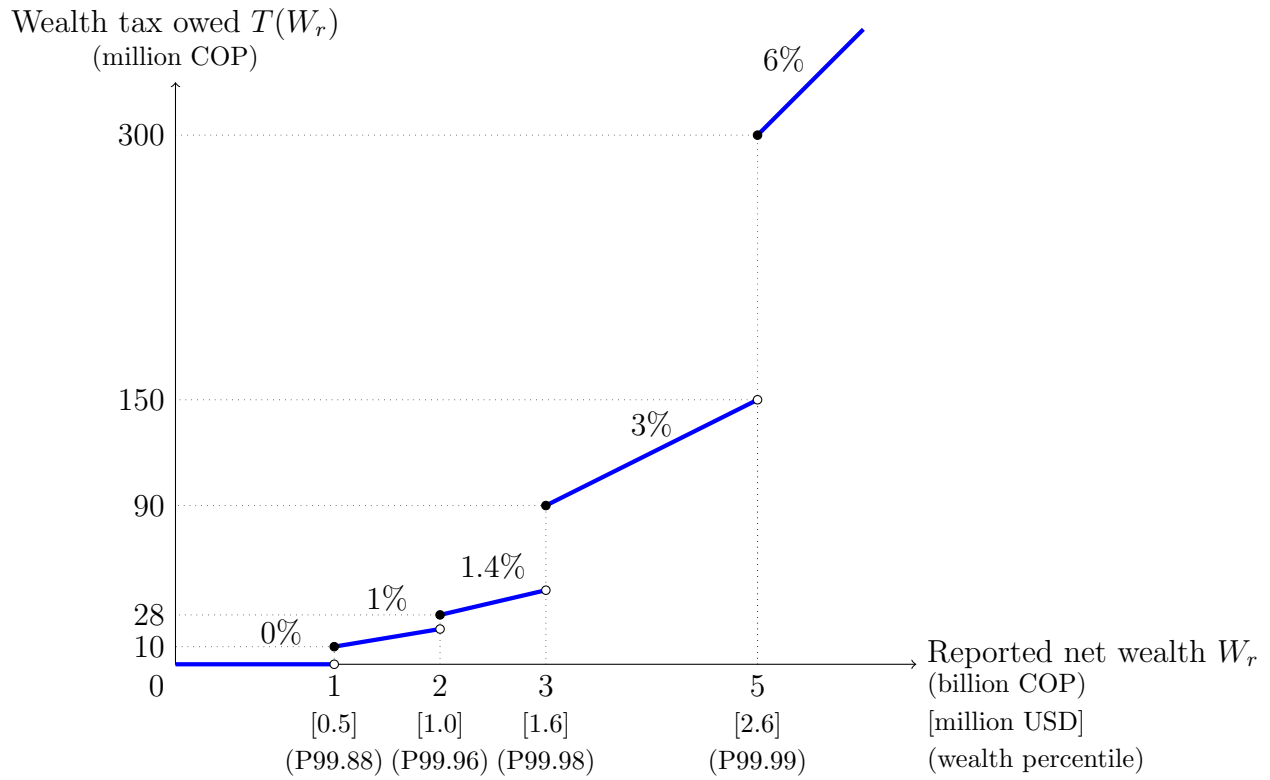
Figure A.1: Personal Wealth Tax and Voluntary Disclosure Program Revenues



*Notes:* This figure plots personal wealth tax revenue (gray bars) plus disclosure penalty revenue (black bars) relative to GDP, and the statutory top personal wealth tax rate (dashed blue line) between calendar years 2002 and 2017. The figure shows that tax revenues on recurrent personal wealth taxes represented between 0 and 0.27% of GDP in Colombia during this period. As a comparison, in 2016 the equivalent share was 0.18% in Spain, 0.22% in France, 0.43% in Norway, and 1.0% in Switzerland (OECD, 2018). Total penalty revenues collected between 2015 and 2017 represent 0.21% of GDP. Wealth tax revenues do not systematically increase in 2016 and 2017 for non-disclosers because (i) eligibility for FY 2015–2018 is determined by net wealth held January 1, 2015 only, and (ii) rules regarding year-to-year changes in tax base. For instance, if net worth is 1,000 million in FY 2015 and 2,000 million in FY 2016 (i.e., an increase), FY 2016 wealth tax base is  $1,000 \text{ million} \times (1 + 0.25i)$  where  $i$  is 2015 inflation rate. If net worth is 2,000 million in FY 2015 and 1,000 million in FY 2016 (i.e., a decrease), FY 2016 wealth tax base is  $2,000 \text{ million} \times (1 - 0.25i)$ . *Sources:* Authors' calculations using administrative tax microdata from DIAN.

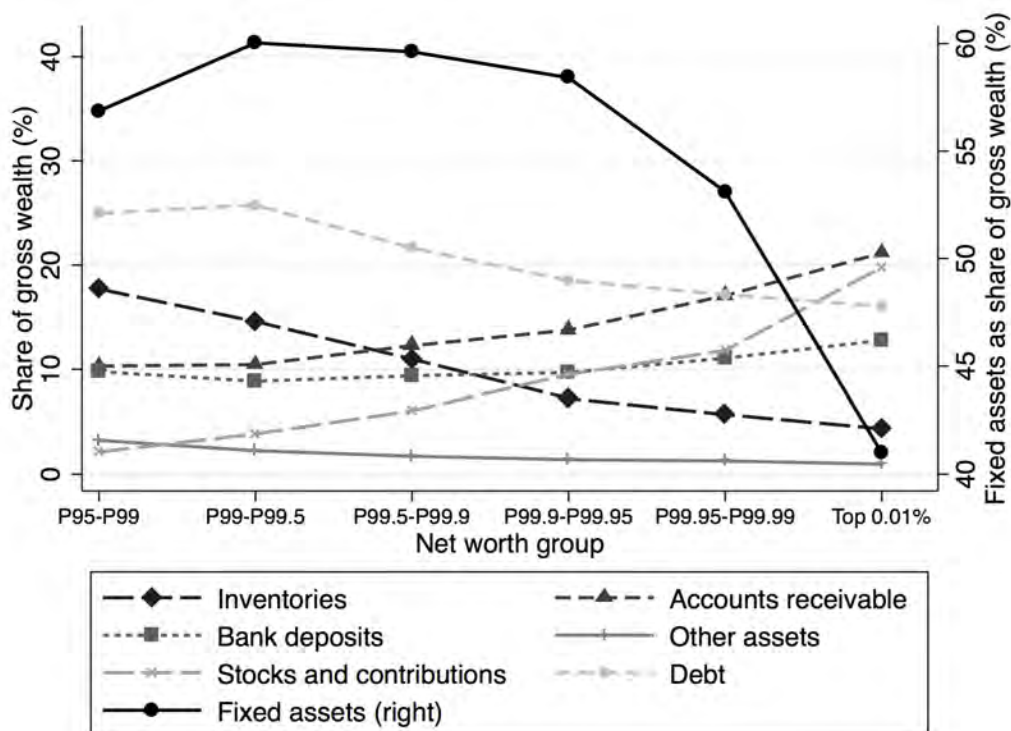


Figure A.2: Wealth Tax Liability as a Function of Reported Net Worth



*Notes:* This figure illustrates the implications of a notched tax schedule for FY 2010. As a result of the discrete jumps in tax rates plotted in Figure 1, Panel (a), tax liability  $T(W_r)$  jumps discretely at the notch points:  $T(W_r) = \tau \cdot W_r + \Delta\tau \cdot W_r \cdot \mathbf{1}(W_r > W_r^*)$ . The exchange rate for 2010 1 billion pesos is approximately USD 520,830 (12/31/2010). The wealth tax brackets affected the top 0.12%, top 0.04%, top 0.02%, and top 0.01%, respectively.

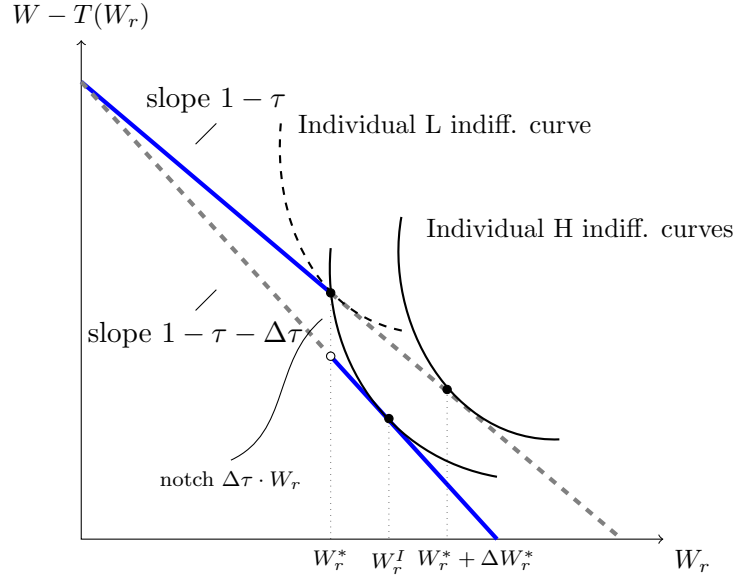
Figure A.3: Wealth Decomposition by Top Wealth Groups, Business Owners Keeping Records



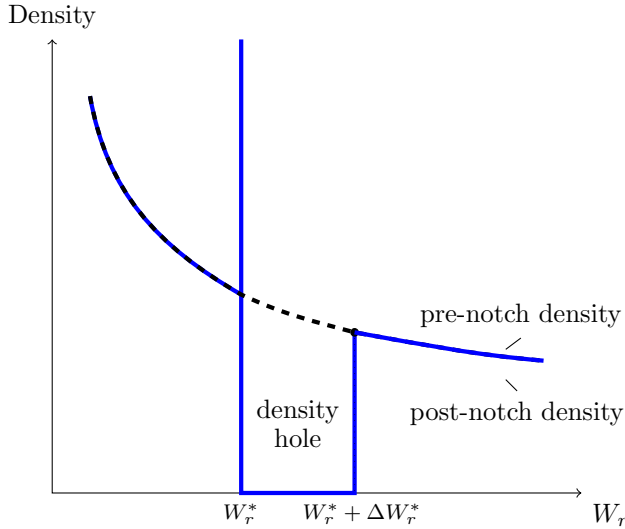
*Notes:* This figure plots mean wealth items as a share of gross wealth by top percentile groups. The figure suggests fixed assets (e.g., real estate, land) represent 56.9 percent of total wealth for individuals in P95–P99, but only 41.0 percent for the top 0.01 percent. In contrast, stocks and contributions, and accounts receivable are increasing in wealth, representing around 40 percent of wealth among the wealthiest 0.01 percent. Top wealth groups are generated ranking all income tax filers in 2016 by their reported net worth. The shares of wealth items are computing using the sample of business owners required to keep records and filing income tax form 110, because wealth decomposition is only available for these taxpayers.

Figure A.4: Behavioral Responses to a Tax Notch

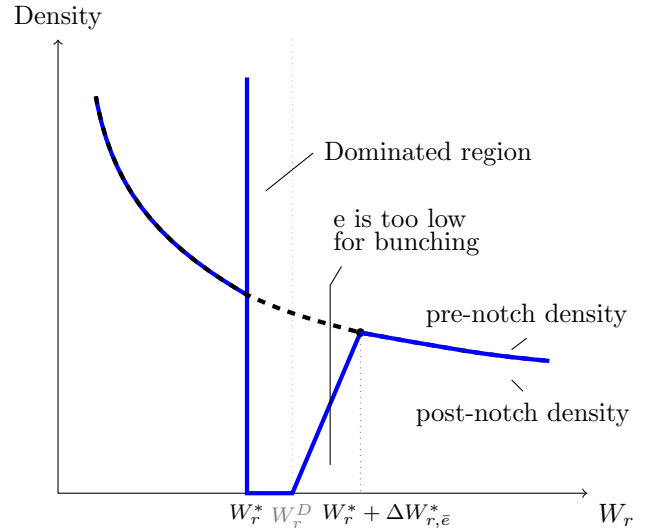
(a) Budget Sets



(b) Density Distributions in the Baseline Model (Homogeneous Elasticities and No Frictions)

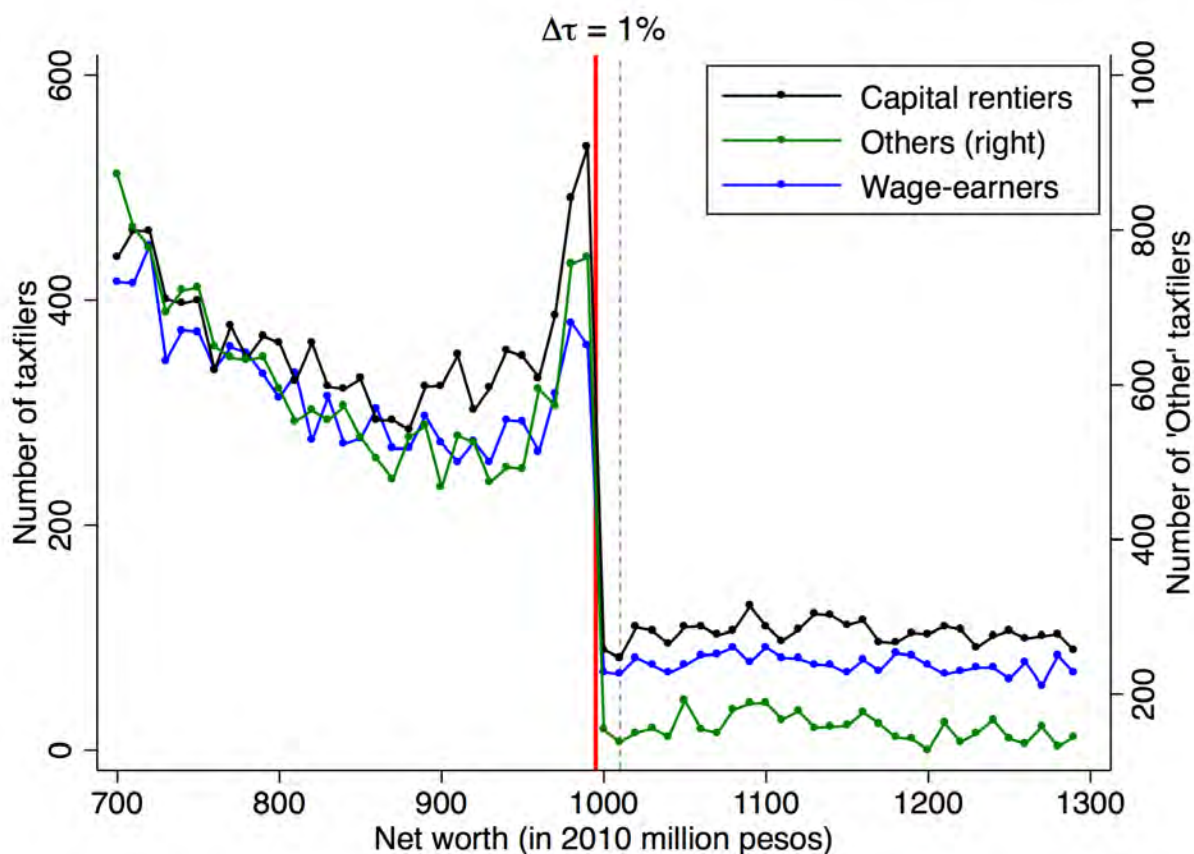


(c) Heterogeneity in Elasticities



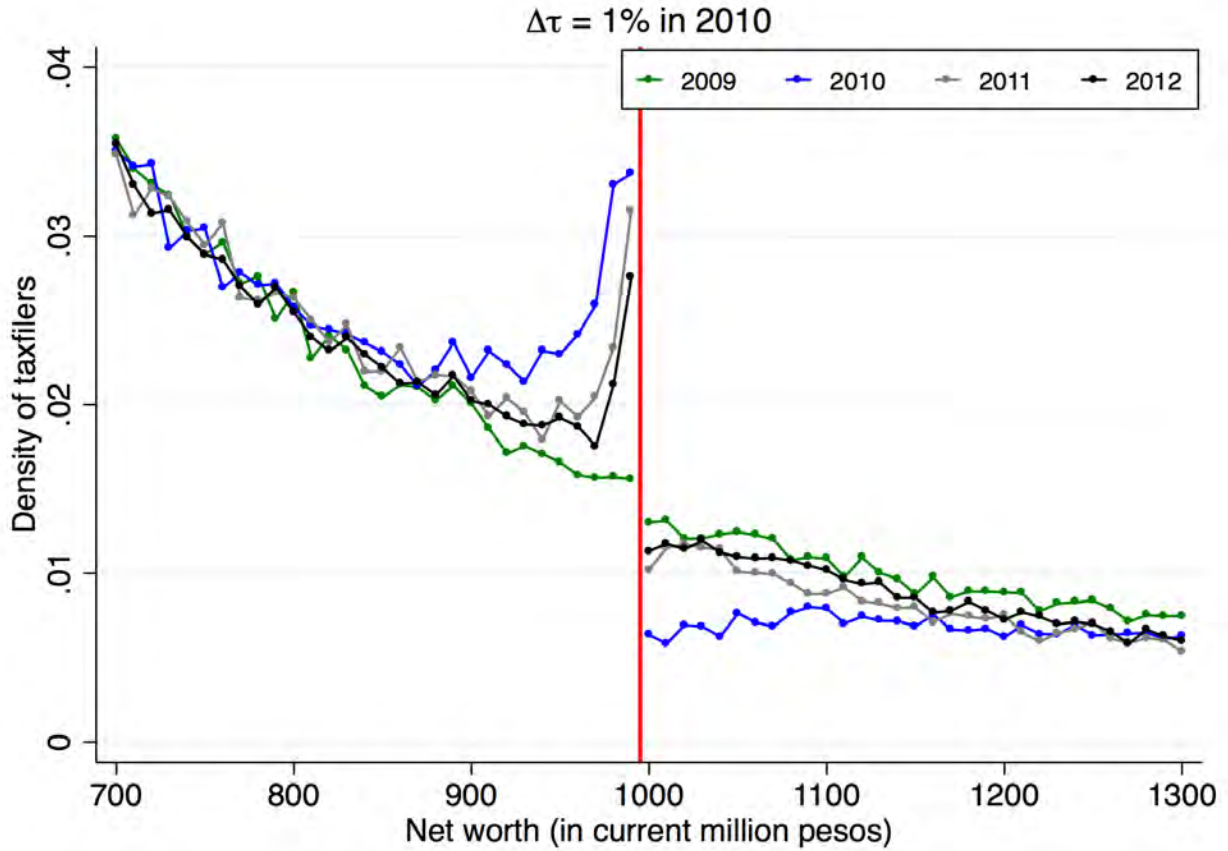
*Notes:* These figures illustrate the implications of a proportional tax notch ( $\Delta\tau > 0$ ) in a budget diagram in Panel (a), and a density distribution diagram in Panels (b) and (c). For simplification, we assume the notch is associated with a small change in the marginal tax rate above the cutoff, so that we can ignore intensive responses by those who stay above the notch. Panel (a) shows the budget constraint of two individuals, L and H, assuming  $W_r \leq W$ . L has the lowest pre-notch reported wealth  $W_r$  (lowest true wealth  $W$ ) among those who locate at the point; she chooses  $W_r^*$  both before and after the tax change. Individual H has the highest pre-notch reported wealth (highest true wealth) among those who locate at the notch point; she chooses reported wealth  $W_r^* + \Delta W_r^*$  before the tax change and is exactly indifferent between the notch point  $W_r^*$  and the interior point  $W_r^I$  after the tax change. Panel (b) shows the corresponding distribution of net worth in the presence of such tax schedule in the baseline model, under homogeneous elasticities and no optimization frictions. There is bunching at the notch point by all individuals between L and H, i.e., who have reported wealth in an interval  $(W_r^*, W_r^* + \Delta W_r^*]$ . Panel (c) extends the baseline model to allow for heterogeneity in elasticities. Individual density is empty in the strictly dominated range  $(W_r^*, W_r^D]$  and then increases gradually until it converges with the pre-notch density at  $W_r^* + \Delta W_{r,e}^*$ . Tax filers with reported wealth in the range  $(W_r^D, W_r^* + \Delta W_{r,e}^*]$  do not bunch because their elasticity is too low. Figure 3 extends Panel (c) to incorporate optimization frictions.

Figure A.5: Wealth Bunching in 2010 by Economic Activity



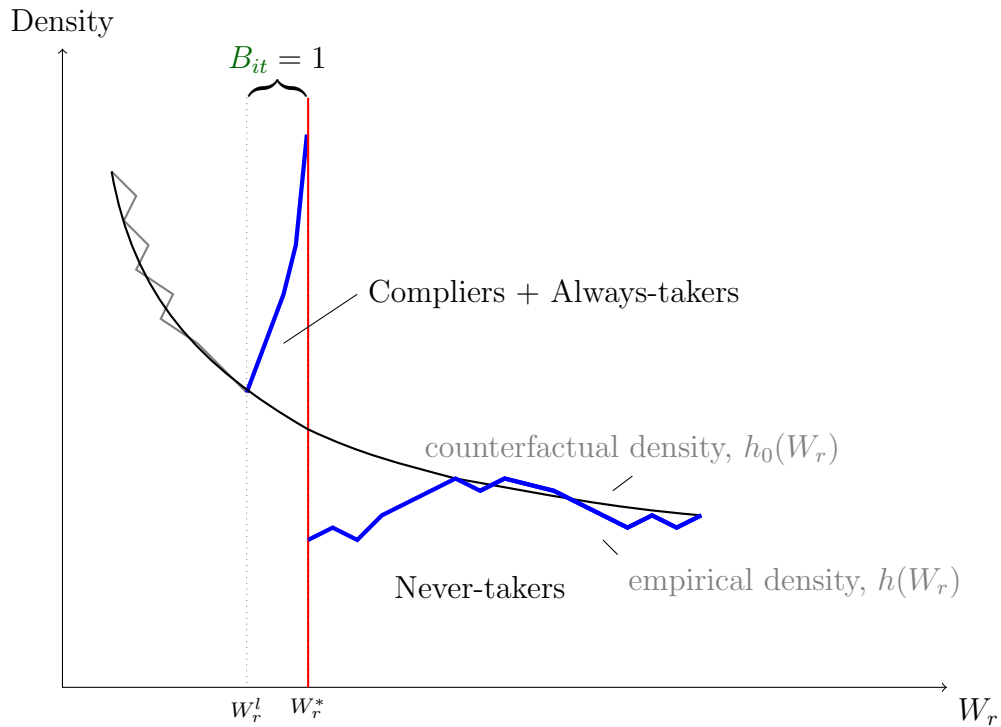
*Notes:* This figure shows heterogeneity in bunching among various samples of taxpayers that have different opportunities to shelter wealth from taxation. The three samples are built based on individuals' self-reported economic activity code: capital renters (in black), wage-earners (in blue), and others (the remainder, in green). The figure shows capital renters display more bunching behavior than other taxpayers, while wage-earners display the least bunching. Bin width is 2010 10,000,000 pesos (2010 USD 5,208.30 in 12/31/2010). *Source:* Authors' calculations using administrative tax microdata from DIAN.

Figure A.6: Bunching in Reported Wealth Persists Even in the Absence of Wealth Taxes



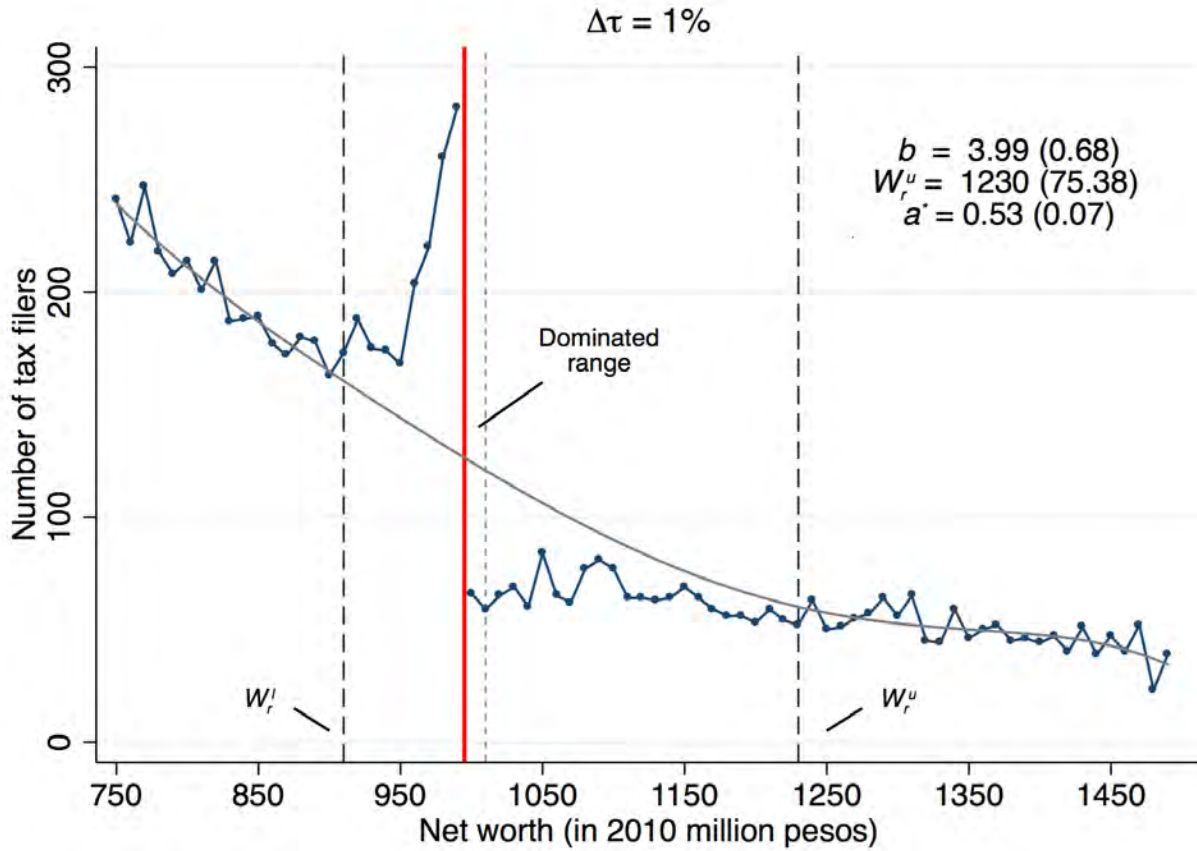
*Notes:* This figure shows the distribution of reported wealth before and after the 2010 reform introduced a wealth tax notch at 1 billion pesos (USD 520,830), above which taxpayers reporting just above it would be levied a one-off tax of 1 percent of their taxable wealth. Tax filer density is plotted in 2009, 2010, 2011, and 2012, and the bin width is current 10,000,000 pesos. The figure shows the immediate emergence of excess mass below the exemption cutoff in response to the 2010 wealth tax. This excess mass remains two years after the reform, even though wealth was not taxed neither in 2011 nor in 2012. Taxpayers are bunching below current 1,000 million pesos, and thus reducing their reported wealth in real terms to avoid surpassing the threshold. *Source:* Authors' calculations using administrative tax microdata from DIAN.

Figure A.7: Compliers (i.e., bunchers) analysis



*Notes:* This figure illustrates the analysis of compliers characteristics in the context of bunching in response to discontinuities in a tax schedule. The blue line represents the (hypothetical) empirical density of taxpayers by reported wealth  $W_r$ . The black solid line represents the counterfactual density.  $B_{it} = 1$  if individual  $i$  is located in bunching range  $[W_r^l, W_r^*)$  in year  $t$ . Tax filers located in this range will be a mix of compliers (i.e., those who react to tax notches by bunching below the cutoff) and always-takers (i.e., those who would be located in that range even in the absence of tax notches). Tax filers located above  $W_r^*$  are never-takers (i.e., those who will not or cannot bunch in response to the tax notch). A 2SLS-IV specification is as follows:  $Y_{it} = \alpha_1 + \gamma_1 t + \beta_1 B_{it} + \epsilon_{it}$ , where  $t$  is a time trend and  $B_{it}$  is instrumented with the post-reform dummy  $Z_{it} = \mathbb{1}(t = 2010)$ . The results of this analysis are presented in Table 2 for individuals around 2010's wealth tax eligibility cutoff.

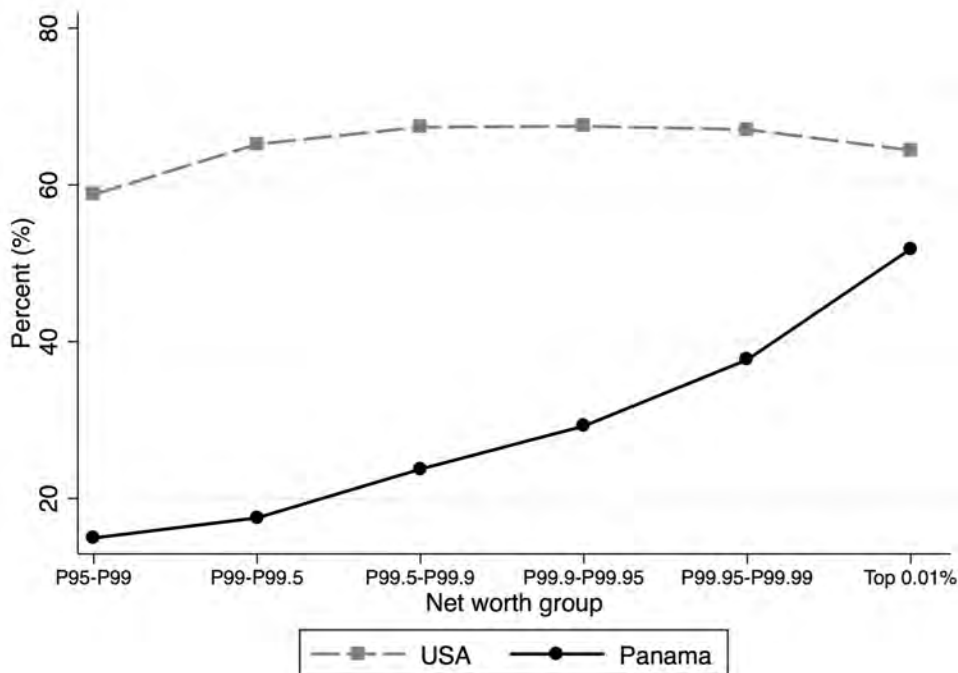
Figure A.8: Bunching Among Business Owners Required to Keep Records



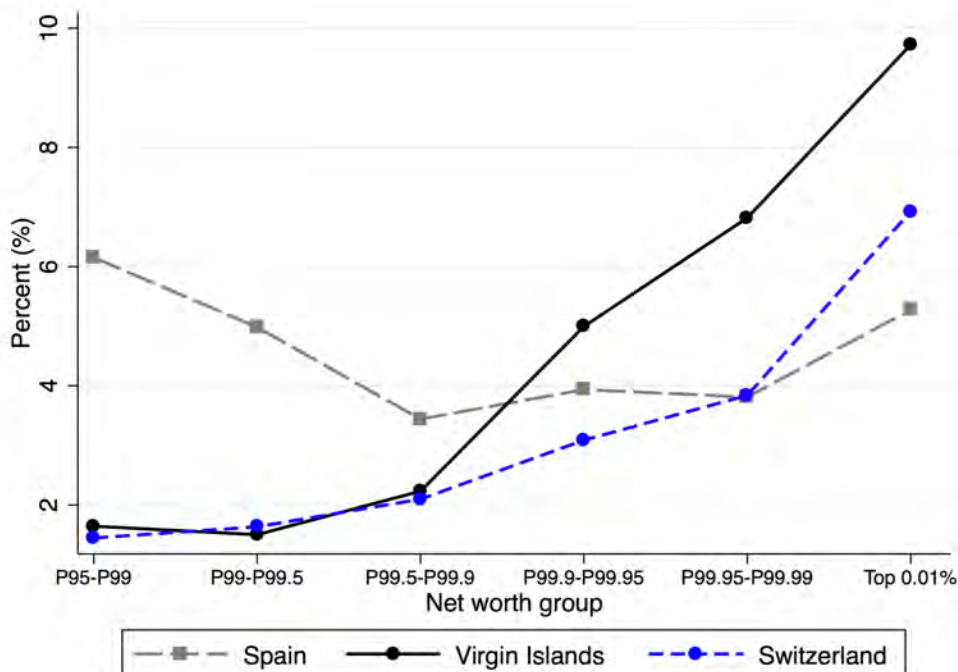
*Notes:* This figure displays the density of taxpayers required to keep records by their net worth in 2010, and fits the counterfactual distribution.  $b$  is the excess mass as a share of the counterfactual and  $W_r^u$  the net worth of the marginal buncher, obtained with the point of convergence method. The counterfactual is obtained from the regression of a polynomial of degree 5 on all data points outside the  $[W_r^l, W_r^u]$  interval. The lower bound  $W_r^l$  is determined visually. The upper bound  $W_r^u$  is estimated from an iterative process: starting from  $W_r^u = W_r^*$ , we obtain the counterfactual and estimate the excess mass ( $B$ ) below the threshold and missing mass ( $M$ ) above the threshold. For low  $W_r^u$ , the excess mass is larger than the missing mass ( $B \gg M$ ). We iteratively increase  $W_r^u$  until the two masses are equal ( $B = M$ ).  $a^*$  represents the share of individuals in the dominated range that do not bunch due to adjustment costs. Bootstrapped standard errors in parentheses are estimated from 1,000 bootstrap samples with replacement. Bin width is 10,000,000 pesos (2010 USD 5,208.30 in 12/31/2010). *Source:* Authors' calculations using administrative tax microdata from DIAN.

Figure A.9: Location of Foreign Assets according to Reports of Foreign Assets in 2017

(a) Two Most Popular Destinations



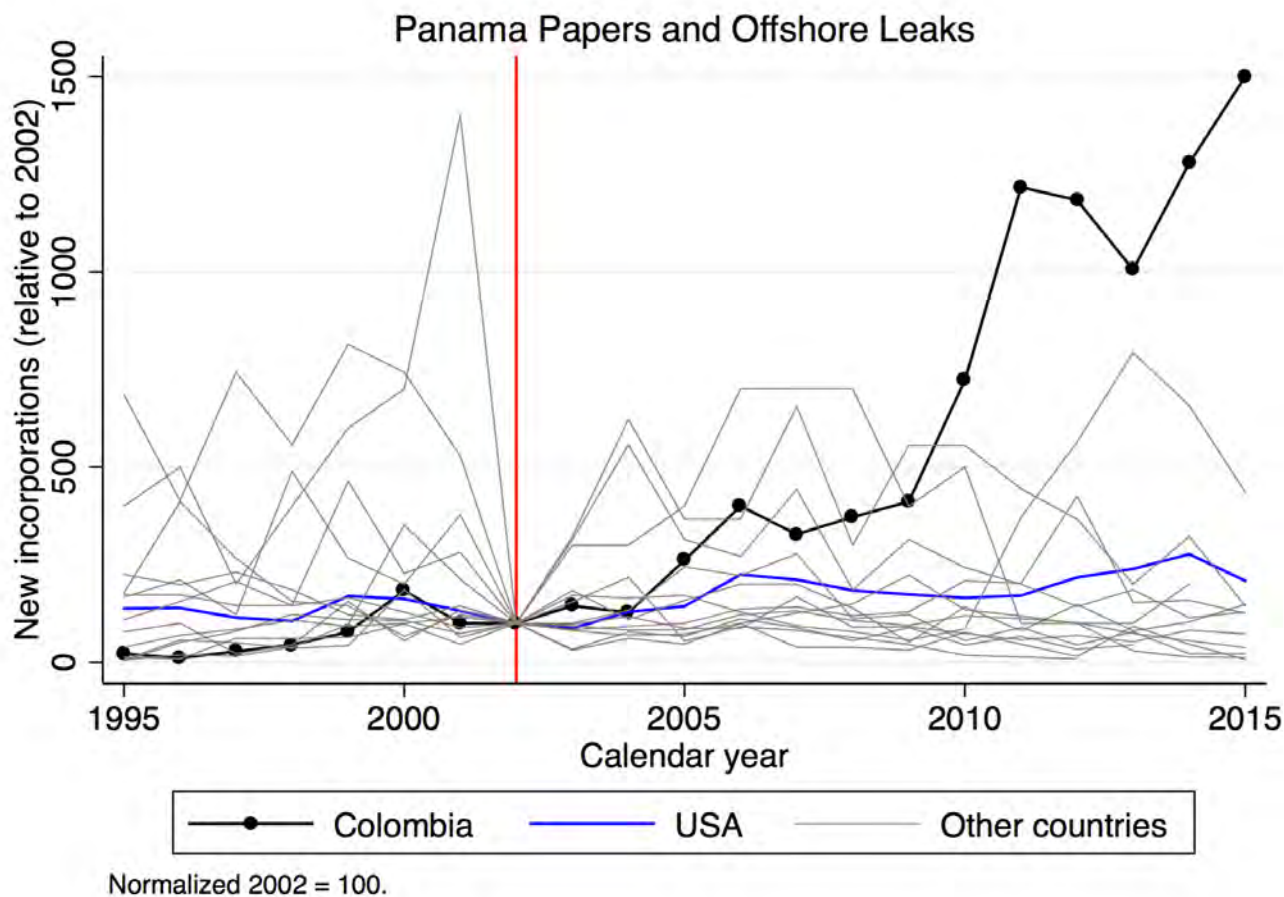
(b) Next Three Most Popular Destinations



*Notes:* These figures show the likelihood of reporting a foreign asset located in a given location for taxpayers filing a foreign asset return (form #160) in FY 2017. The sample is restricted to 2,076,685 individuals filing either the FY 2016 income tax return or FY 2017 a wealth tax return. This sample includes 29,183 taxpayers reporting foreign assets. *Sources:* Authors' calculations using administrative tax microdata from DIAN.



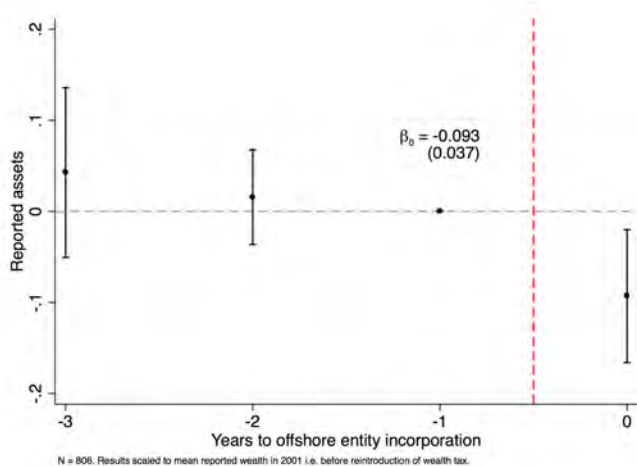
Figure A.10: The Use of Offshore Entities: Colombia versus Other Countries



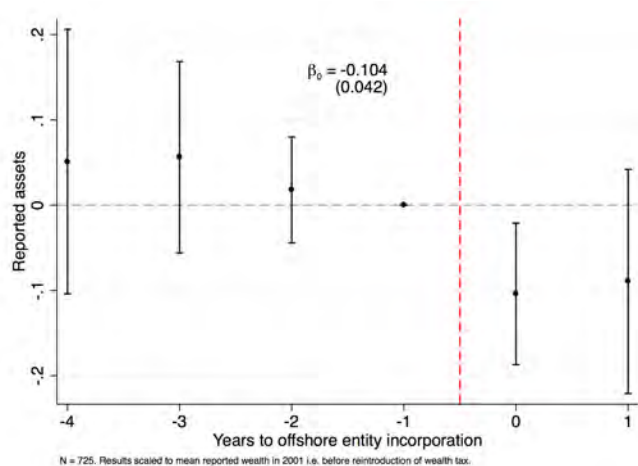
*Note:* This figure compares the dynamics of offshore entity incorporation between Colombia, the United States, and thirteen other countries. To facilitate the comparison, the number of offshore entities is expressed relative to 2002 (the year annual wealth taxation begins in Colombia). The comparison is restricted to countries that have not themselves been considered tax havens (e.g., Panama, British Virgin Islands, United Arab Emirates) and have at least 100 active or inactive offshore entities by December 31, 2002. The countries in gray are Brazil, Canada, Costa Rica, France, Germany, Greece, Ireland, Israel, Russia, Spain, United Kingdom, Uruguay, and Venezuela. Both active and inactive offshore entities are included. The high number of new offshore corporations in 2001 corresponds to Germany. *Source:* ICIJ. Accessed June 12, 2017.

Figure A.11: Robustness Check: The Effect of Opening an Offshore Entity on Assets Reported to the Tax Authority Using Different Event Time Windows

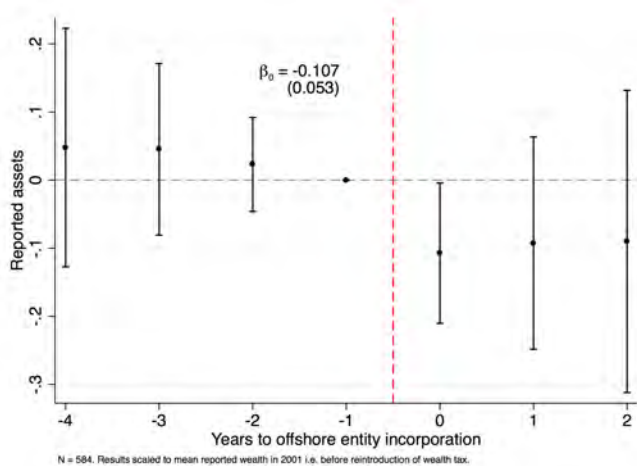
(a) Balanced in  $k \in [-3, 0]$



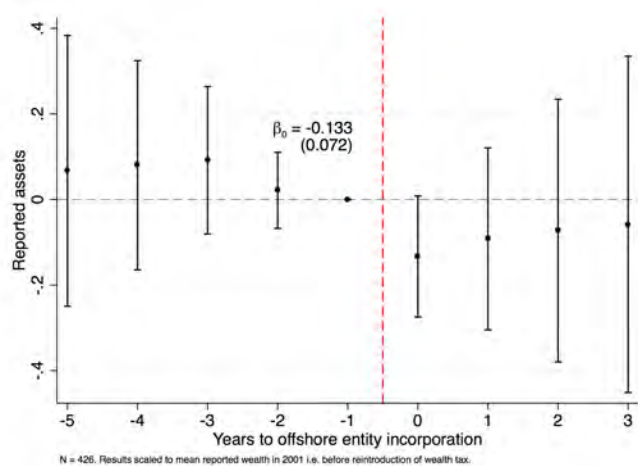
(b) Balanced in  $k \in [-4, 1]$



(c) Balanced in  $k \in [-4, 2]$

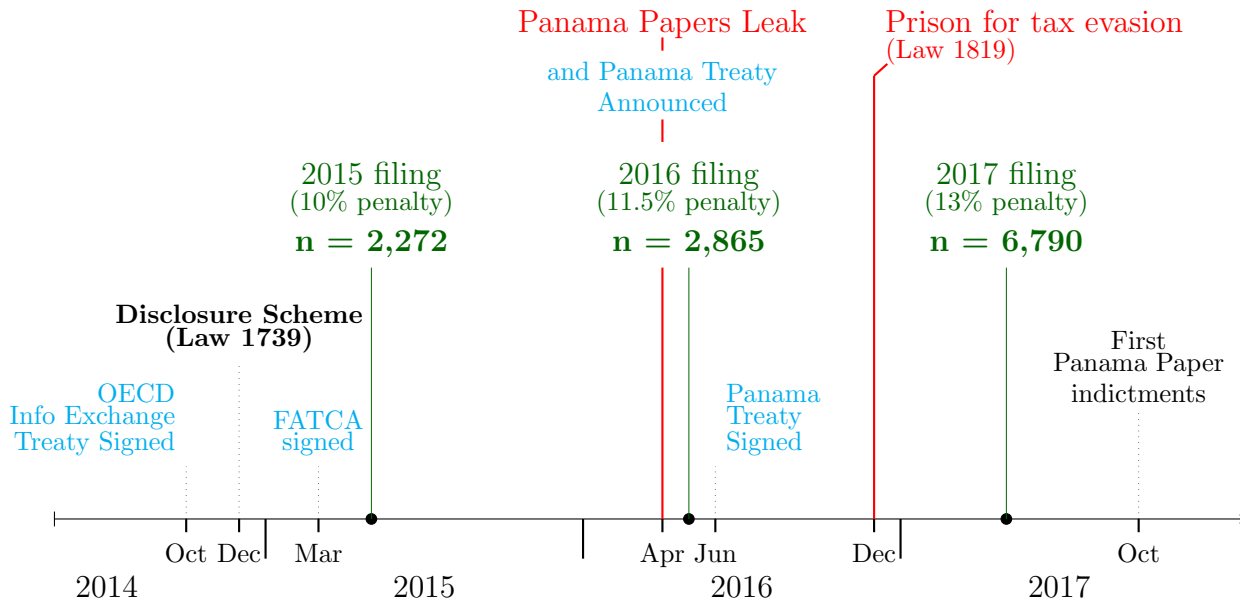


(d) Balanced in  $k \in [-5, 3]$



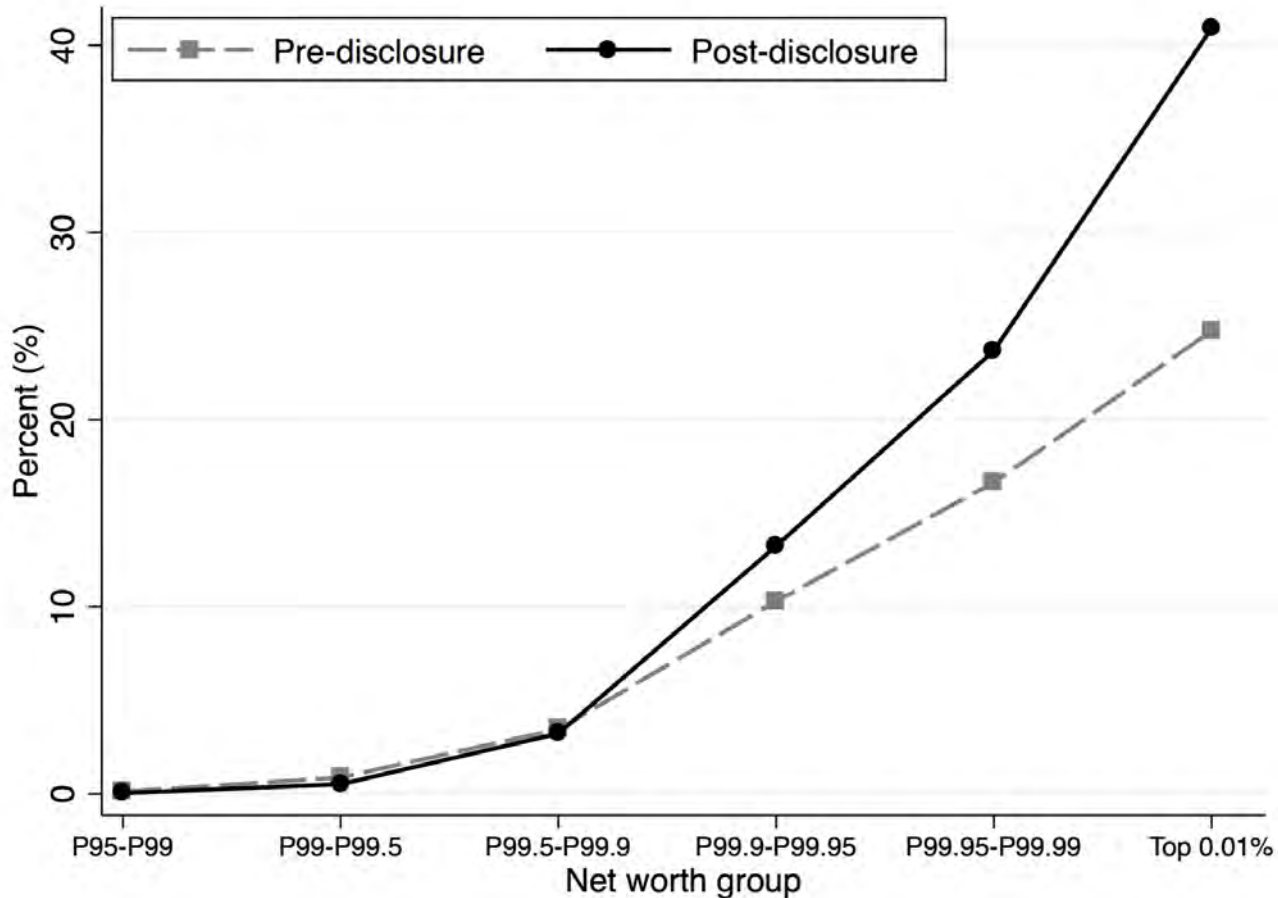
*Notes:* These figures present robustness checks on the  $\beta_k$  coefficients from event study specification (8), varying the event time window across balanced samples of taxpayers in the Panama Papers. The outcome variable is total assets reported to the Colombian tax authority, scaled to the mean wealth in 2001 (i.e., the year before annual taxation of net wealth is re-introduced in Colombia). An event is defined as the year a taxpayer incorporates an offshore entity through Mossack Fonseca, for taxpayers with only one offshore entity. *Sources:* Authors' calculations using administrative tax microdata from DIAN and ICIJ.

Figure A.12: Timeline of Events



Notes: This figure plots a timeline of events taking place around Colombia's voluntary disclosure scheme between 2014 and 2018. *n* (in green) represents the number of individuals first disclosing hidden wealth under the scheme.

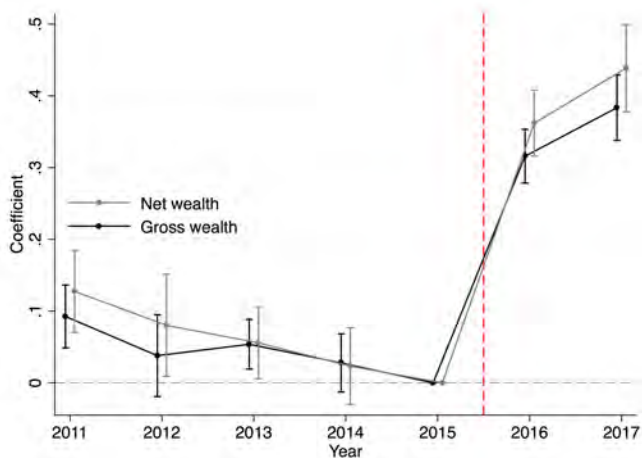
Figure A.13: Probability of Participating in the 2015–17 Voluntary Disclosure Scheme, by Pre- and Post-Disclosure Wealth Group



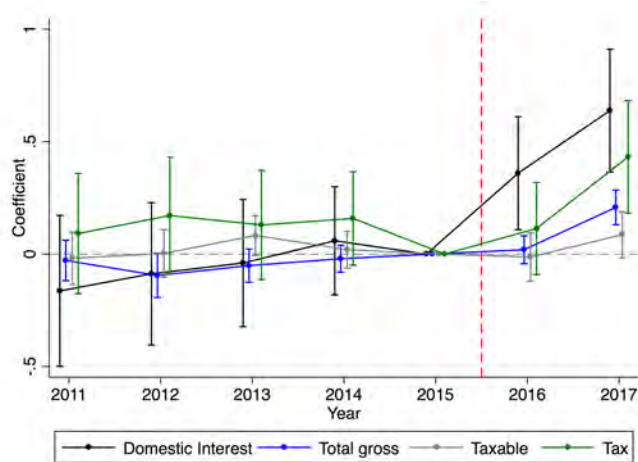
*Notes:* This figure plots the fraction of tax units in Colombia that participate in the 2015–17 voluntary disclosure program by bins of reported net worth. The figure ranks individuals by pre- and post-disclosure net worth, and shows that participation in the program is increasing in both measures of wealth. Ranking by pre-disclosure wealth, 24.7 percent of individuals in the wealthiest 0.01 percent disclosed hidden wealth (dashed gray line). Ranking by wealth including disclosures, 40.9 percent of individuals in the wealthiest 0.01 percent disclosed (solid black line). The sample is restricted to 1,633,383 individuals filing the income tax return in FY 2013 (they may or not file a wealth tax return in 2015–2017), and includes 11,210 disclosers and 1,085 individuals in the Panama Papers (of which 434 disclosed wealth). *Sources:* Authors’ calculations using administrative tax microdata from DIAN.

Figure A.14: The Impact of a Voluntary Disclosure Program on Reported Wealth and Income: 2016 Disclosers

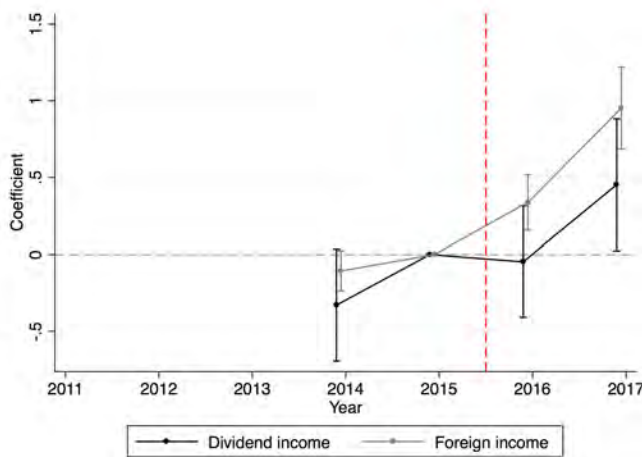
(a) Wealth: Gross and Net



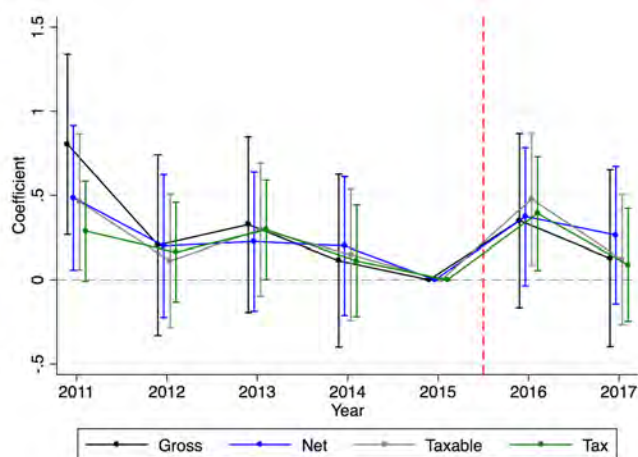
(b) Regular Income: Interest, Total Gross, Taxable, and Tax



(c) Regular Income: Dividend and Foreign



(d) Irregular Income (Includes Long-Term Realized Capital Gains): Gross, Net, Taxable, and Tax

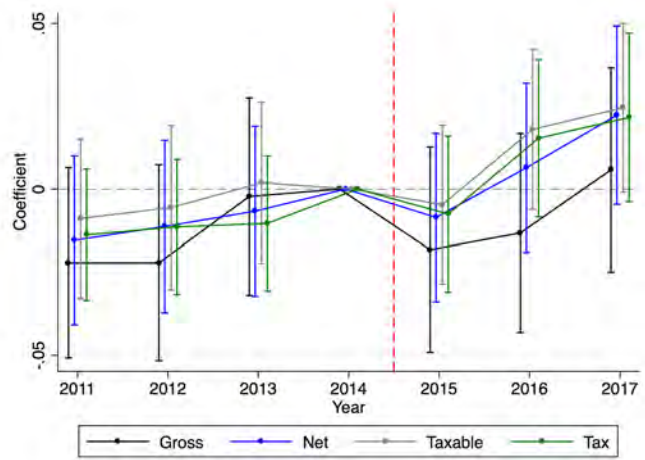
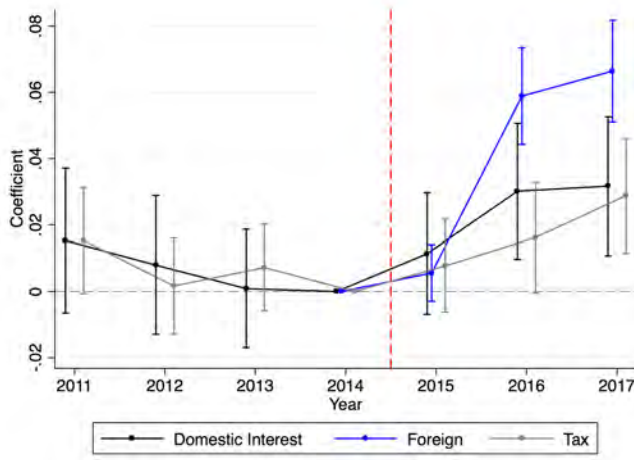


*Notes:* These figures compare outcomes between 2,074 taxpayers that first disclosed hidden assets or in-existent liabilities in 2016 and 43,181 that never disclosed between 2015 and 2017. The inverse hyperbolic sine transformation of a given outcome is regressed on individual fixed effects and a voluntary discloser dummy interacted with year fixed effects (2015 is the omitted category). The standard errors are clustered at the taxpayer level. The figures plot the coefficients on the interaction terms and 95 percent confidence intervals. The red vertical line marks the period taxpayers first disclosed their hidden assets and fake debts. The sample is a balanced panel of 45,255 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015, 2016, or 2017. Tax filers that first disclosed assets and liabilities in either 2015 or 2017 are excluded from the estimation sample. The corresponding difference-in-differences coefficients are presented in Table A.5. *Sources:* Authors' calculations using administrative tax microdata from DIAN.

Figure A.15: The Impact of a Voluntary Disclosure Program on the Probability of Reporting Strictly Positive Values of Capital Income

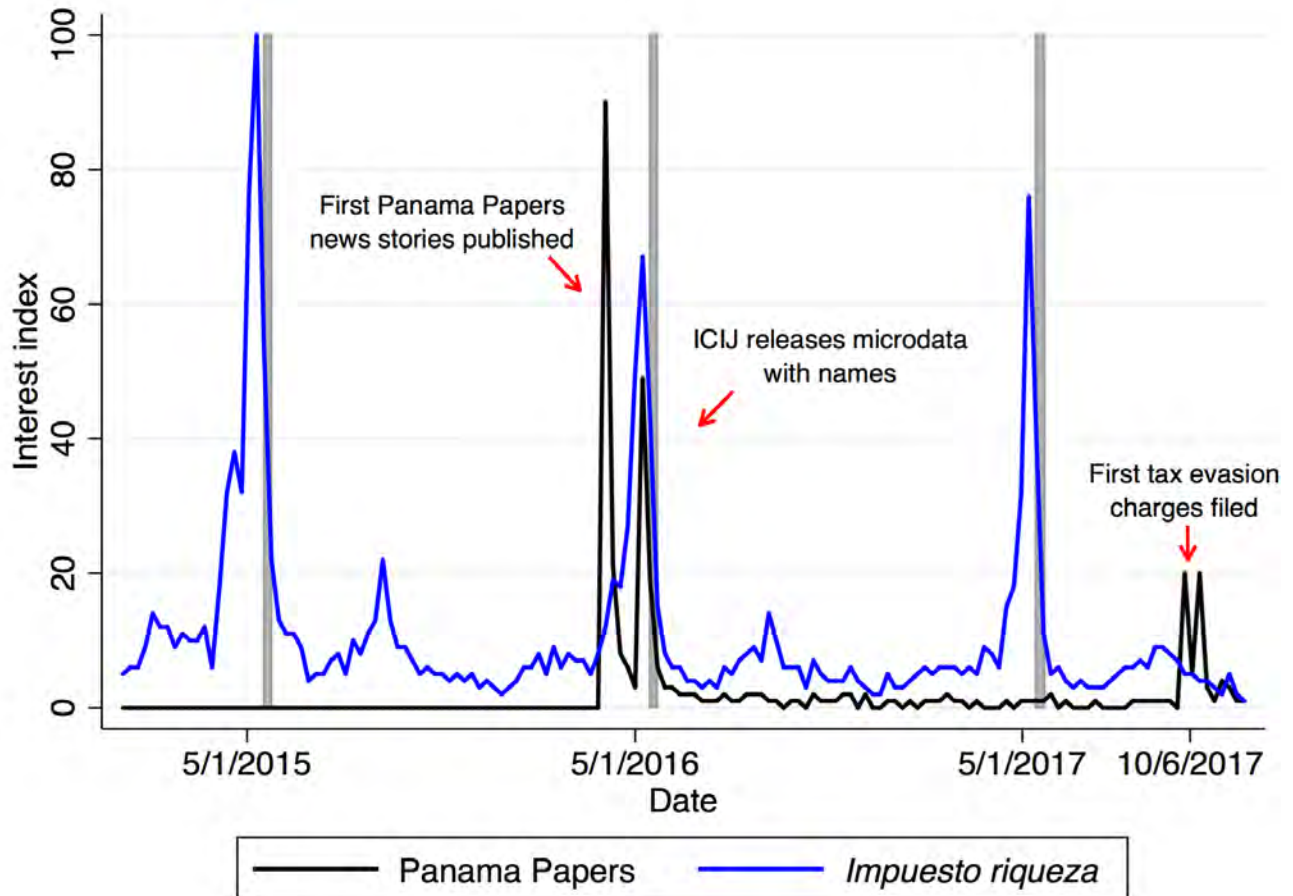
(a) Regular Income: Interest, Foreign, and Tax

(b) Irregular Income (Includes Long-Term Realized Capital Gains): Gross, Net, Taxable, and Tax



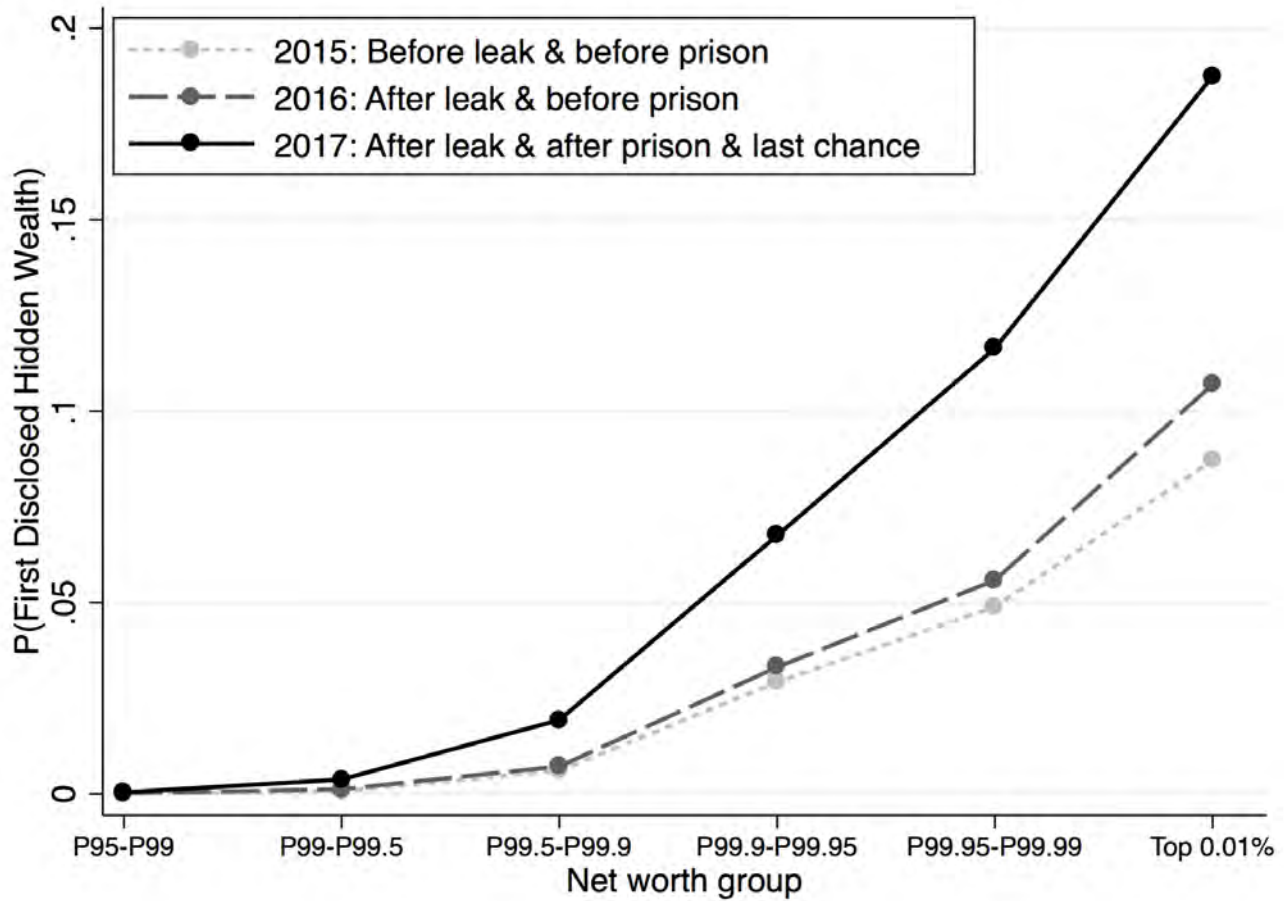
*Notes:* These figures present the effect of the 2015 voluntary disclosure program on the probability of reporting positive values of selected regular income categories in Panel (a) and irregular income categories in Panel (b). The figures compare outcomes between 1,777 taxpayers that voluntarily disclosed hidden assets and nonexistent liabilities in 2015 and 43,181 that never disclose their assets and liabilities between 2015 and 2017. The outcome, which is a dummy for reporting strictly positive values, is regressed on individual fixed effects and a voluntary discloser dummy interacted with year fixed effects (2014 is the omitted category). The standard errors are clustered at the taxpayer level. The figures plot the coefficients on the interaction terms and 95 percent confidence intervals. The red vertical line marks the period taxpayers disclosed their hidden assets and fake debts. The sample is a balanced panel of 44,958 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015, 2016, or 2017. Tax filers that first disclosed hidden assets or fake liabilities *after* 2015 (i.e., in 2016 or 2017) are excluded from the estimation sample. The corresponding difference-in-differences coefficients are presented in Table A.4, Panel B. *Sources:* Authors' calculations using administrative tax microdata from DIAN.

Figure A.16: Comparison on Google Trends of Search Terms “Panama Papers” and “Impuesto Riqueza” (Wealth Tax) in Colombia



*Notes:* This figure plots the relative search interest in Colombia of the terms “Panama Papers” in black and “Impuesto riqueza” (wealth tax, in Spanish) in blue. The number in the  $y$ -axis represents search interest relative to the highest point on the chart for Colombia during the plotted period of time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular, while a score of 0 means the term was less than 1 percent as popular as the peak. The gray bars represent the annual wealth tax filing season. The first Panama Papers news stories were published April 3, 2016. On May 9, 2016, the ICIJ released the database revealing the names and contact addresses of thousands of shareholders of offshore entities. The *fiscalía*—the Colombian equivalent of the district attorney’s office—filed the first charges related to the Panama Papers on October 4, 2017. Nineteen individuals were charged for illicit enrichment, fraud, and money laundering, among others. *Source:* Google Trends, accessed November 30, 2017. Click [here](#).

Figure A.17: Probability of Participating in the Voluntary Disclosure Program, by Post-Disclosure Wealth and Year of First Disclosure



*Notes:* This figure plots the fraction of tax units in Colombia that file taxes and participate in the voluntary disclosure program, by bins of net worth (including disclosures) and the year in which they first disclosed hidden wealth. The figure shows that (1) disclosing hidden wealth is increasing in net worth; and (2) the wealthiest taxpayers disclosed in 2017. *Sources:* Authors' calculations using administrative tax microdata from DIAN.



Table A.1: Wealth Tax Reforms

Reform	Tax year																		
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
D1838				L863		L1111			L1730	L1430				L1739					
Assessment year	2001	2001	2003	2003	2004	2005	2006	2006	2006	2006	2010	2010	2010	2014	2014	2014	2014	2014	2014
Eligibility																			
Rate																			
Wealth tax schedule																			
Eligibility cutoff (bill. pesos)	0.1695	0.1695	3	3	3.183	3.344	3	3*	3*	3*	1	1	1	1	1	1*	1*	1*	1*
Rates (%)	1.2	1.2	0.3	0.3	0.3	1.2	1.2	1.2	1.2	1.2	1/1.4/3/6	1/1.4/3/6	1/1.4/3/6	1/2/3/5	1/2/3/5	1/2/3/5*	1/2/3/5*	1/2/3/5*	1/2/3/5*
Cutoff (bill. pesos)	0.1695	0.1695	3	3	3.183	3.344	3	3*	3*	3*	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5*	1/2/3/5*	1/2/3/5*	1/2/3/5*	1/2/3/5*
Notch or kink	N	N	N	N	N	N	N	N	N	N	N/N/N/N	N/N/N/N	N/N/N/N	N/K/K/K	N/K/K/K	N/K/K/K	N/K/K/K	N/K/K/K	N/K/K/K

Notes: \* subject to eligibility, as defined by another tax year. Wealth tax eligibility is determined using (taxable and non-taxable) net worth in all years but 2001, when it is determined using gross wealth. For 2007–2009, eligibility is established in 2006. For 2010, the tax is paid in eight periods between 2011 and 2014. In 2015–2017, eligibility is established in 2014. Values are expressed in current billion pesos. The tax schedule refers to average tax rates in years 2001–2010, and marginal tax rates in years 2014 and 2015.

Table A.2: Compliers (i.e., bunchers) analysis for the fourth notch in 2010

	$E[Y(0) \text{Compliers}]$ (1)	$E[Y(1) - Y(0) \text{Compliers}]$ (2)	$E[Y \text{Always-takers}]$ (3)	$E[Y \text{Never-takers}]$ (4)
Debt	0.112 (0.047)	0.061 (0.039)	0.1 (0.012)	0.096 (0.015)
Inventories	-0.004 (0.033)	-0.043 (0.049)	0.078 (0.021)	0.043 (0.015)
Bank deposits	0.133 (0.073)	-0.039 (0.076)	0.13 (0.032)	0.068 (0.019)
Stock	0.01 (0.135)	-0.088 (0.092)	0.266 (0.042)	0.271 (0.048)
Fixed assets	0.404 (0.16)	0.092 (0.118)	0.364 (0.05)	0.351 (0.052)
Accounts receivable	0.458 (0.161)	0.085 (0.117)	0.158 (0.041)	0.261 (0.049)
Other assets	-0.001 (0.013)	-0.008 (0.015)	0.004 (0.002)	0.005 (0.005)

*Notes:* This table presents the results of a compliers analysis using the set-up illustrated by Figure A.7. In this setting, a complier refers to a taxpayer bunching below the exemption cutoff in response to the wealth tax. The sample is a balanced panel of 241 income tax filers reporting net wealth between  $W_r^l = 4.5$  billion and  $W_r^u = 5.8$  billion in 2008, 2009, and 2010. The endogenous variable is  $B_{it} = 1$  if the individual has net wealth (in 2010 pesos) between  $W_r^l$  and  $W^*$ , i.e., the bunching region. Complier means in Column (1) are calculated as the coefficient on  $1 - B_{it}$  in a 2SLS regression of  $1 - B_{it}$  multiplied by  $Y_i$  and using 2010 as the instrument ( $Z_{it}$ ). Always-taker and never-taker means are calculated in analogous 2SLS regressions of  $B_{it}(1 - Z_{it})Y_{it}$  on  $B_{it}(1 - Z_{it})$  and  $(1 - B_{it})Z_{it}Y_{it}$  on  $(1 - B_{it})Z_{it}$ , respectively, again using 2010 as  $Z_{it}$ . The first stage coefficient is 0.139 ( $t$ -stat 3.88) for debt, and 0.19 ( $t$ -stat 2.06) for all others, as only business owners keeping records report asset types separately. Standard errors are clustered at the taxpayer level. *Source:* Authors' calculations using administrative tax microdata from DIAN.

Table A.3: Location and Type of Foreign Assets Reported in 2017: Amnesty Disclosers vs Non-disclosers

	<i>Dependent variable</i>					
	Tax Haven	Type of Asset				
		Bank Deposits	Portfolio Securities	Trusts	Real Estate	Cars
(1)	(2)	(3)	(4)	(5)	(6)	
Discloser	0.205*** (0.008)	0.031*** (0.008)	0.171*** (0.008)	0.028*** (0.003)	-0.081*** (0.006)	-0.018*** (0.002)
Constant	0.323*** (0.005)	0.376*** (0.006)	0.401*** (0.006)	0.015*** (0.001)	0.187*** (0.005)	0.024*** (0.002)
<i>N</i>	14,387	14,387	14,387	14,387	14,387	14,387
<i>R</i> <sup>2</sup>	0.043	0.002	0.029	0.007	0.013	0.006

*Notes:* This table compares the location and type of foreign assets held by disclosers and non-disclosers for taxpayers reporting to own any foreign asset in 2017 (information tax return #160). Each column represents a separate regression with a different dependent variable obtained from the foreign asset information return. The dependent variable in Column (1) is an indicator for declaring a foreign asset located in a tax haven (Barbados, Bermuda, Cayman Islands, Curacao, Monaco, Panama, Switzerland, Uruguay, or the Virgin Islands). The outcomes in Columns (2)–(6) are indicator variables for reporting each type of foreign asset. This information is available only for taxpayers with foreign assets above approximately USD 40,000. Portfolio securities refer to portfolios of equities, bonds, and mutual fund shares owned by taxpayers on foreign accounts. The dependent variable is regressed on a dummy for having disclosed a foreign asset during the 2015–17 wealth disclosure program. Robust standard errors in parentheses. The sample is restricted to individuals having (1) filed a wealth tax return in either 2015, 2016, or 2017, and (2) filed a foreign asset information return in 2017.  $*p < 0.1$ ,  $**p < 0.05$ ,  $***p < 0.01$ . *Source:* Authors' calculations using administrative tax microdata from DIAN.

Table A.4: Robustness Checks: The Effect of a Voluntary Wealth Disclosure Program on Reported Income and Wealth

	Wealth		Income					Capital gains and other irregular income				
	Gross (1)	Net (2)	Foreign (3)	Dividend (4)	Interest (5)	Total gross (6)	Taxable (7)	Tax (8)	Gross (9)	Net (10)	Taxable (11)	Tax (12)
<i>Panel A. ArcSinh: no winsorizing</i>												
DID	0.288*** (0.015)	0.400*** (0.030)	1.010*** (0.105)	0.061 (0.170)	0.416*** (0.117)	0.132*** (0.030)	0.132*** (0.034)	0.329*** (0.090)	0.069 (0.157)	0.322** (0.130)	0.339*** (0.125)	0.339*** (0.100)
C Mean	22.018	21.823	0.324	7.622	11.297	20.089	18.741	15.205	4.252	2.695	2.421	1.031
N	314,706	314,706	138,004	138,004	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.66	0.572	0.614	0.753	0.629	0.686	0.547	0.641	0.264	0.246	0.246	0.242
<i>Panel B. Dummy for strictly positive values</i>												
DID	0 (0.000)	0.001 (0.001)	0.044*** (0.005)	-0.002 (0.008)	0.018*** (0.007)	0.001 (0.001)	0.001 (0.002)	0.012** (0.005)	0.003 (0.008)	0.015** (0.007)	0.016** (0.007)	0.019*** (0.006)
C Mean	1.000	0.999	0.0138	0.346	0.721	0.996	0.992	0.906	0.222	0.153	0.139	0.066
N	314,706	314,706	179,832	179,832	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.176	0.256	0.604	0.764	0.567	0.507	0.403	0.558	0.263	0.245	0.241	0.24
<i>Panel C. Levels (in million pesos)</i>												
DID	2021.490*** (681.692)	1586.210*** (180.578)	8.298*** (1.500)	80.673*** (28.006)	5.844* (3.116)	-60.53 (193.269)	24.642** (11.324)	7.748** (3.733)	-28.171* (15.463)	0.986 (7.054)	2.324 (6.613)	-0.299 (1.263)
C Mean	2489.714	2038.660	5.409	72.012	20.842	890.369	123.418	26.409	72.462	18.938	11.385	1.466
N	314,706	314,706	138,004	138,004	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.791	0.815	0.506	0.609	0.248	0.685	0.709	0.706	0.148	0.164	0.163	0.161
<i>Panel D. Levels: winsorizing at top 0.1% each year (in million pesos)</i>												
DID	1326.350*** (81.334)	1413.511*** (75.080)	7.808*** (1.282)	42.251*** (11.549)	7.858*** (1.595)	43.151 (45.563)	15.431*** (3.602)	4.707*** (1.175)	0.777 (8.052)	8.043** (3.839)	8.040** (3.218)	0.727** (0.329)
C Mean	2432.978	1993.944	4.485	64.967	19.037	831.345	121.943	25.921	65.399	15.088	8.525	0.900
N	314,706	314,706	138,004	138,004	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.874	0.863	0.586	0.648	0.581	0.843	0.741	0.738	0.21	0.187	0.185	0.189
<i>Panel E. Levels: winsorizing at top 1% each year (in million pesos)</i>												
DID	1116.518*** (54.471)	1176.559*** (49.964)	2.131*** (0.235)	21.910*** (5.390)	5.226*** (0.940)	41.387* (22.634)	15.269*** (2.613)	4.642*** (0.843)	3.397 (4.675)	4.886*** (1.468)	4.592*** (1.101)	0.449*** (0.109)
C Mean	2347.821	1925.880	0.543	53.249	16.750	732.548	116.873	24.245	53.210	8.978	5.599	0.438
N	314,706	314,706	138,004	138,004	314,706	314,706	314,706	314,706	314,706	314,706	314,706	314,706
R <sup>2</sup>	0.874	0.866	0.592	0.667	0.63	0.845	0.772	0.768	0.217	0.202	0.202	0.208

*Notes:* This table presents the effects of the 2015 voluntary disclosure program on eleven outcomes reported to the Colombian tax authority in the income and wealth tax forms. The table compares outcomes between 1,777 taxpayers that voluntarily disclosed hidden assets and in-existent liabilities in 2015 and 43,181 that never disclose their assets and liabilities between 2015 and 2017. Each outcome is regressed on individual fixed effects, year fixed effects, and an interaction of the voluntary discloser dummy and post-reform years (2014 is the omitted category), as in specification (9). The standard errors in parentheses are clustered at the taxpayer level. The sample is a balanced panel of 44,958 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015, 2016, or 2017. Tax filers that first disclosed assets and liabilities strictly *after* 2015 (i.e., in 2016 or 2017) are excluded from the estimation sample. The number of observations with foreign income is smaller than the rest because taxpayers report foreign income as a separate variable starting 2014. The outcome variables are in log-approximation form in Panel A (inverse hyperbolic sine function), a dummy for strictly positive values in Panel B, and in levels in Panels C–E. Panels D and E winsorize the outcome variables by replacing all values above the 99.9th and 99th percentile of the outcome variable by the 99.9th and 99th percentile value, respectively. “C Mean” represents the mean of the outcome variable for the control group across all pre-event years. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . *Source:* Authors’ calculations using administrative tax microdata from DIAN.

Table A.5: The Impact of a Voluntary Disclosure Program on Reported Wealth and Income: 2016 Disclosers

	Wealth			Income				Capital gains and other irregular income				
	Gross (1)	Net (2)	Foreign (3)	Dividend (4)	Interest (5)	Total gross (6)	Taxable (7)	Tax (8)	Gross (9)	Net (10)	Taxable (11)	Tax (12)
DID	0.307*** (0.014)	0.343*** (0.023)	0.697*** (0.079)	0.366** (0.142)	0.545*** (0.102)	0.153*** (0.029)	0.019 (0.040)	0.163* (0.086)	-0.051 (0.148)	0.097 (0.121)	0.094 (0.115)	0.068 (0.096)
<i>N</i>	316,785	316,785	139,725	139,725	316,785	316,785	316,785	316,785	316,785	316,785	316,785	316,785
<i>R</i> <sup>2</sup>	0.66	0.576	0.605	0.754	0.628	0.685	0.551	0.643	0.264	0.245	0.241	0.24

*Notes:* This table presents the effects of the voluntary disclosure program on the logarithm of income and wealth reported to the Colombian tax authority. The dependent variables in columns (1) and (2) are taken from the wealth tax form 440, while those in columns (3)–(12) are taken from the individual income tax forms 110 and 210. Outcomes are expressed in log-approximation form using the inverse hyperbolic sine function. The table compares outcomes between 2,074 taxpayers that first disclosed hidden assets and in-existent liabilities in 2016 and 43,181 that did not disclose between 2015 and 2017. Each outcome is regressed on individual fixed effects, year fixed effects, and an interaction of the voluntary discloser dummy and post-disclosure years, similar to specification (9). The standard errors in parentheses are clustered at the taxpayer level. The sample is a balanced panel of 45,255 individuals that both filed income taxes annually between 2011 and 2017, and filed the wealth tax in 2015, 2016, or 2017. Tax filers that first disclosed assets and liabilities in 2015 or 2017 are excluded from the estimation sample. The number of observations with foreign income and dividend income is smaller than the rest because taxpayers report these two variables as separate variables starting 2014. Wealth tax liability is not reported as an outcome because there is no wealth tax during most of the pre-program period. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . *Sources:* Authors' calculations using administrative tax microdata from DIAN.


Table A.6: Top Wealth Shares in Colombia Using Tax and Survey Data, Including and Excluding Hidden Offshore Wealth

	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.05%	Top 0.01%	Top 5% to 1%	Top 1% to 0.5%	Top 0.5% to 0.1%	Top 0.1% to 0.05%	Top 0.05% to 0.01%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Survey Data	55.46	25.78	18.11	7.63	5.1	1.52	29.68	7.67	10.48	2.53	3.58
Before Amnesty	68.07	40.04	30.05	15.09	11.1	5.56	28.02	9.99	14.96	3.99	5.54
Baseline	68.39	40.64	30.75	15.85	11.81	6.01	27.74	9.9	14.89	4.05	5.79
Plus Offshore (LB)	69.74	43.17	33.66	19.06	14.8	8.23	26.57	9.51	14.6	4.26	6.57
Plus Offshore (UB)	71.47	46.4	37.39	23.17	18.64	11.08	25.06	9.01	14.22	4.53	7.57
Offshore 37.25%	75.07	53.14	45.17	31.73	26.64	17	21.92	7.98	13.43	5.09	9.64

*Notes:* This table presents top wealth shares in Colombia in 2017. The first row presents estimates using survey data only, while the rest combine tax and survey data. The second row presents estimates before disclosures of offshore hidden wealth during the 2015–2017 voluntary disclosure program. The third row is the baseline, without correcting for unreported hidden wealth. The last rows account for unreported offshore wealth, and make different assumptions about the size of hidden offshore wealth. Using data from [Alstadsater et al. \(2018\)](#) and the Panama Papers leak, the lower bound assumes unreported offshore wealth today represents 6.2 percent of GDP, while the upper bound assumes it represents 15 percent. The last row augments unreported wealth by the observed increase in the stock of entities ever incorporated through Mossack Fonseca between 2007 and 2015. See Section F for a descriptions of how these estimates were constructed. *Sources:* Authors’ calculations using administrative tax microdata from DIAN and IEFIC from DANE.

# B Income and Wealth Tax Returns in Colombia

Figure B.1: Income Tax Form 110 for Tax Filers Required to Keep Records (2010)

 <b>Declaración de Renta y Complementarios o de Ingresos y Patrimonio para Personas Jurídicas y Asimiladas, Personas Naturales y Asimiladas Obligadas a llevar Contabilidad</b>		Privada	<b>110</b>
1. Año: <b>2010</b>		4. Número de formulario: <b>110100000001 0</b>	
<b>Colombia</b> <b>un compromiso que no podemos evadir</b>		 <small>(415)7707212489984(8020)011010000000 0</small>	
Lea cuidadosamente las instrucciones			
5. Número de Identificación Tributaria (NIT)		6. DV	7. Primer apellido
11. Razón social		8. Segundo apellido	
24. Actividad económica		9. Primer nombre	
25. Si es gran contribuyente, marque "X"		10. Otros nombres	
12. Cód. Dirección Seccional			
Si es una corrección indique: 26. Cód. 27. No. Formulario anterior			
28. Fracción año gravable 2011 (Marque "X")		29. Cambio titular inversión extranjera (Marque "X")	
<b>Datos Informativos</b> Total costos y gastos de nómina: 30 Aportes al sistema de seguridad social: 31 Aportes al SENA, ICBF, cajas de compensación: 32		<b>Renta</b> Renta líquida ordinaria del ejercicio (48 - 51 - 56, si el resultado es negativo escriba 0): 57 o Pérdida líquida del ejercicio (51 + 56 - 48, si el resultado es negativo escriba 0): 58 Compensaciones: 59 <b>Renta líquida (57 - 59): 60</b> Renta presuntiva: 61 Renta exenta: 62 Rentas gravables: 63 <b>Renta líquida gravable (Al mayor valor entre 60 y 61, reste 62 y sume 63): 64</b>	
<b>Patrimonio</b> Efectivo, bancos, otras inversiones: 33 Cuentas por cobrar: 34 Acciones y aportes: 35 Inventarios: 36 Activos fijos: 37 Otros activos: 38 <b>Total patrimonio bruto (Suma 33 a 38): 39</b> Pasivos: 40 <b>Total patrimonio líquido (39 - 40, si el resultado es negativo escriba 0): 41</b>		<b>Ganancias ocasionales</b> Ingresos por ganancias ocasionales: 65 Costos por ganancias ocasionales: 66 Ganancias ocasionales no gravadas y exentas: 67 <b>Ganancias ocasionales gravables (65 - 66 - 67): 68</b>	
<b>Ingresos</b> Ingresos brutos operacionales: 42 Ingresos brutos no operacionales: 43 Intereses y rendimientos financieros: 44 <b>Total ingresos brutos (Suma 42 a 44): 45</b> Devoluciones, rebajas y descuentos en ventas: 46 Ingresos no constitutivos de renta ni ganancia ocasional: 47 <b>Total ingresos netos (45 - 46 - 47): 48</b>		<b>Impuesto sobre la renta líquida gravable:</b> 69 Descuentos tributarios: 70 <b>Impuesto neto de renta (69 - 70): 71</b> Impuesto de ganancias ocasionales: 72 Impuesto de remesas: 73 <b>Total impuesto a cargo (Suma 71 a 73): 74</b> Anticipo renta por el año gravable 2010 (Casilla 80 declaración 2009): 75 Saldo a favor año 2009 sin solicitud de devolución o compensación (Casilla 84 declaración 2009): 76 Autorretenciones: 77 Otras retenciones: 78 <b>Total retenciones año gravable 2010 (77 + 78): 79</b> Anticipo renta por el año gravable 2011: 80 <b>Saldo a pagar por impuesto (74 + 80 - 75 - 76 - 79, si el resultado es negativo escriba 0): 81</b> Sanciones: 82 <b>Total saldo a pagar (74 + 80 + 82 - 75 - 76 - 79, si el resultado es negativo escriba 0) o Total saldo a favor (75 + 76 + 79 - 74 - 80 - 82, si el resultado es negativo escriba 0): 83</b> 84	
<b>Costos</b> Costo de ventas: 49 Otros costos: 50 <b>Total costos (49 + 50): 51</b>		<b>Liquidación privada</b> 85 <b>Valor pago sanciones: 85</b> <b>Valor pago intereses de mora: 86</b> <b>Valor pago impuesto: 87</b>	
<b>Deducciones</b> Gastos operacionales de administración: 52 Gastos operacionales de ventas: 53 Deducción inversiones en activos fijos: 54 Otras deducciones: 55 <b>Total deducciones (Suma 52 a 55): 56</b>			
88. Número de Identificación Tributaria (NIT)		89. DV	
94. Número NIT contador o revisor fiscal		95. DV	
981. Cód. Representación		997. Espacio exclusivo para el sello de la entidad recaudadora	
982. Código Contador o Revisor Fiscal		980. Pago total \$ (Suma 85 a 87)	
983. No. Tarjeta profesional		996. Espacio para el adhesivo de la entidad recaudadora (Número del adhesivo)	

Original: Dirección Seccional - UAE DIAN

20114370000001

Figure B.2: Income Tax Form 210 for Tax Filers Not Required to Keep Records (2010)

 <b>Republika de Kolumbia</b> <b>DIAN</b> <small>Departamento de Impuestos y Aduanas Nacionales</small>		<b>Declaración de Renta y Complementarios Personas Naturales y Asimiladas No Obligadas a llevar Contabilidad</b>		<b>Privada</b>		<b>210</b>			
1. Año <b>2010</b>				4. Número de formulario <b>21010000001 0</b>					
<b>Colombia</b> <b>un compromiso que no podemos evadir</b>				 (415)7707212489984(8020)02101 00000000 0					
Lea cuidadosamente las instrucciones									
Datos del declarante	5. Número de Identificación Tributaria (NIT)		6. DV.		7. Primer apellido		8. Segundo apellido		
	9. Primer nombre		10. Otros nombres		11. Cód. Dirección Seccional				
24. Actividad económica									
Si es una corrección indique: 25. Cód. 26. No. Formulario anterior									
27. Fracción año gravable 2011 (Marque "X") <input type="checkbox"/>				28. Cambio titular inversión extranjera (Marque "X") <input type="checkbox"/>					
Datos informativos	Total costos y gastos de nómina		29		Ganancias ocasionales	Ingresos por ganancias ocasionales		53	
	Aportes al sistema de seguridad social		30			Costos por ganancias ocasionales		54	
Aportes al SENA, ICBF, cajas de compensación		31		Ganancias ocasionales no gravadas y exentas		55			
Patrimonio	Total patrimonio bruto		32		<b>Ganancias ocasionales gravables (53 - 54 - 55)</b>		<b>56</b>		
	Deudas		33		<b>Impuesto sobre la renta líquida gravable</b>		<b>57</b>		
<b>Total patrimonio líquido</b> (32 - 33, si el resultado es negativo escriba 0)		<b>34</b>		Descuentos tributarios		58			
Ingresos	Salarios y demás pagos laborales		35		<b>Impuesto neto de renta (57 - 58)</b>		<b>59</b>		
	Honorarios, comisiones y servicios		36		Impuesto de ganancias ocasionales		60		
	Intereses y rendimientos financieros		37		<b>Total impuesto a cargo (Sume 59 a 60)</b>		<b>61</b>		
	Otros ingresos (Arrendamientos, etc.)		38		Anticipo renta por el año gravable 2010 (Casilla 65 declaración 2009)		62		
	<b>Total ingresos recibidos por concepto de renta</b> (Sume 35 a 38)		<b>39</b>		Saldo a favor año 2009 sin solicitud de devolución o compensación (Casilla 69 declaración 2009)		63		
Ingresos no constitutivos de renta		40		Total retenciones año gravable 2010		64			
<b>Total ingresos netos (39 + 40)</b>		<b>41</b>		Anticipo renta por el año gravable 2011		65			
Costos y deducciones	Deducción inversión en activos fijos		42		<b>Saldo a pagar por impuesto (61 + 65 - 62 - 63 - 64,</b> si el resultado es negativo escriba 0)		<b>66</b>		
	Otros costos y deducciones		43		Sanciones		67		
<b>Total costos y deducciones (42 + 43)</b>		<b>44</b>		<b>Total saldo a pagar (61 + 65 + 67 - 64 - 63 - 62,</b> si el resultado es negativo escriba 0)		<b>68</b>			
Renta	<b>Renta líquida ordinaria del ejercicio</b> (41 - 44, si el resultado es negativo escriba 0) <b>o Pérdida líquida del ejercicio</b> (44 - 41, si el resultado es negativo escriba 0)		<b>45</b>		<b>o Total saldo a favor (62 + 63 + 64 - 61 - 65 - 67,</b> si el resultado es negativo escriba 0)		<b>69</b>		
	Compensaciones (Por exceso de renta presuntiva)		46		<b>Valor pago sanciones</b>		<b>70</b>		
	<b>Renta líquida (45 - 47)</b>		<b>47</b>		<b>Valor pago intereses de mora</b>		<b>71</b>		
	Renta presuntiva		48		<b>Valor pago impuesto</b>		<b>72</b>		
	Renta exenta		49						
	Rentas gravables		50						
<b>Renta líquida gravable (Al mayor valor entre 48 y 49,</b> reste 50 y suma 51, si el resultado es negativo escriba 0)		<b>51</b>							
		<b>52</b>							
<b>Servicios Informáticos Electrónicos - Más formas de servirle!</b>  Este formulario también puede diligenciarlo ingresando a <a href="http://www.dian.gov.co">www.dian.gov.co</a> Asistido, sin errores y de manera gratuita									
Signatario	73. Número de Identificación Tributaria (NIT)		74. D.V.		Apellidos y nombres de quien firma como representante del declarante				
	75. Primer apellido		76. Segundo apellido		77. Primer nombre		78. Otros nombres		
981. Cód. Representación <input type="checkbox"/>		Firma del declarante o de quien lo representa		997. Espacio exclusivo para el sello de la entidad recaudadora <small>(El sello debe estar a la izquierda)</small>		980. Pago total \$ (Sume 70 a 72)			
				Coloque el timbre de la máquina registradora al dorso de este formulario		996. Espacio para el adhesivo de la entidad recaudadora (Número del adhesivo)			
Original: Dirección seccional - UAE DIAN									
<b>20114380000001</b>									



Figure B.3: Wealth Tax Form 420 (2004–2011)

		<b>Declaración y Pago del Impuesto al Patrimonio</b>		<b>Privada</b>	<b>420</b>
1. Año <input type="text"/>			4. Número de formulario		
<b>Colombia</b> <b>un compromiso que no podemos evadir</b> Lea cuidadosamente las instrucciones					
Datos del declarante	5. Número de Identificación Tributaria (NIT)		6. DV	7. Primer apellido	8. Segundo apellido
	11. Razón social			9. Primer nombre	10. Otros nombres
		12. Cód. Dirección Seccional			
24. Si es gran contribuyente, marque "X" <input type="checkbox"/>		25. Contribuyente, marque "X": <input type="checkbox"/>		Si es contribuyente del impuesto al patrimonio creado por la Ley 1370 de 2009 y de la sobretasa creada por el Decreto Legislativo 4825 de 2010	
		Si es contribuyente del impuesto al patrimonio creado por el Decreto Legislativo 4825 de 2010			
Si es una corrección indique:		26. Cód.	27. No. Formulario anterior		
Base gravable	Total patrimonio bruto				28
	Menos: Total pasivos				29
<b>Patrimonio líquido (28 - 29)</b>				<b>30</b>	
Liquidación privada	Menos: Valor patrimonial neto de los bienes excluidos				31
	Menos: Valor casa o apartamento de habitación				32
	<b>Base para el impuesto (30 - 31 - 32)</b>				<b>33</b>
	<b>Impuesto al patrimonio (Casilla 33 x tarifa)</b>				<b>34</b>
<b>Sobretasa</b>				<b>35</b>	
Sanciones				36	
<b>Total saldo a pagar (34 + 35 + 36)</b>				<b>37</b>	
Pagos	Valor pago sanciones				38
	Valor pago intereses de mora				39
	Valor pago impuesto				40
<b>Servicios Informáticos Electrónicos - Más formas de servirle!</b> Este formulario también puede diligenciarlo ingresando a <a href="http://www.dian.gov.co">www.dian.gov.co</a> Asistido, sin errores y de manera gratuita					
Signatarios	41. Número de Identificación Tributaria (NIT)		42. DV	Apellidos y nombres de quien firma como representante del declarante	
	47. Número NIT contador o revisor fiscal		48. DV	43. Primer apellido	44. Segundo apellido
		Apellidos y nombres del contador o revisor fiscal		45. Primer nombre	46. Otros nombres
				49. Primer apellido	50. Segundo apellido
				51. Primer nombre	52. Otros nombres
981. Cód. Representación <input type="text"/> Firma del declarante o de quien lo representa		<b>997. Espacio exclusivo para el sello de la entidad recaudadora</b> (Fecha efectiva de la transmisión)		<b>980. Pago total</b> \$ <input type="text"/> (Suma 38 a 40)	
982. Código Contador o Revisor Fiscal <input type="text"/> Firma Contador o Revisor Fiscal				996. Espacio para el adhesivo de la entidad recaudadora (Número del adhesivo)	
983. No. Tarjeta profesional <input type="text"/>		Coloque el timbre de la máquina registradora al dorso de este formulario			

2011423

Figure B.4: Wealth Tax Form 440 (2015–2018)

		<b>Declaración del Impuesto a la Riqueza y Complementario de Normalización Tributaria</b>		<b>Privada</b>	<b>440</b>
1. Año <input type="text"/>			4. Número de formulario		
<b>Colombia</b> <b>un compromiso que no podemos evadir</b>					
Lea cuidadosamente las instrucciones					
Datos Generales	5. Número de Identificación Tributaria (NIT)		6. DV	7. Primer apellido	8. Segundo apellido
	9. Primer nombre			10. Otros nombres	
11. Razón social					12. Cód. Dirección Seccional
Si es una corrección indique: 25. Cód. 26. No. Formulario anterior					
27. Extranjero con menos de cinco años de residencia en el país (Marque "X") <input type="checkbox"/> 28. Es beneficiario de un convenio para evitar la doble imposición (Marque "X") <input type="checkbox"/>					
Impuesto a la Riqueza	Patrimonio bruto (incluidos los activos normalizados)				29
	Pasivos (excluidos los pasivos normalizados)				30
	<b>Patrimonio líquido (29 - 30)</b>				<b>31</b>
	Patrimonio líquido susceptible de ser excluido en virtud de convenios internacionales				32
	Valor patrimonial de la casa o apartamento de habitación (sólo personas naturales, las primeras 12.200 UVT)				33
	Valor patrimonial neto de las acciones o aportes en sociedades nacionales				34
	Valor patrimonial neto de los bienes inmuebles de beneficio y uso público de las empresas públicas de transporte masivo de pasajeros				35
	Valor patrimonial neto de los bancos de tierras que posean las empresas públicas territoriales destinados a vivienda prioritaria				36
	Valor patrimonial neto de los activos fijos inmuebles adquiridos y/o destinados al control y mejoramiento del medio ambiente por las empresas públicas de acueducto y alcantarillado				37
	Valor de la reserva técnica de Fogafin y Fogacoop				38
	Valor de las operaciones activas de crédito y sus rendimientos financieros realizadas por entidades financieras del exterior				39
	Valor de las operaciones de leasing internacional y sus rendimientos financieros, realizados por sociedades o entidades extranjeras sobre activos localizados en el territorio nacional				40
	Patrimonio líquido localizado en el exterior de los extranjeros con menos de 5 años de residencia en el país				41
	Valor patrimonial de los aportes sociales realizados por sus asociados (sólo para entidades de que trata el numeral 4 del artículo 19 del E.T.)				42
	Patrimonio líquido no vinculado a las actividades sobre las cuales tributan como contribuyente del impuesto de renta y complementario (Artículo 19-2 Estatuto Tributario)				43
<b>Total exclusiones (sume 32 a 43)</b>				<b>44</b>	
<b>Base gravable para el impuesto a la riqueza (31 - 44)</b>				<b>45</b>	
Impuesto Complementario de Normalización	Activos omitidos en el exterior				46
	Activos omitidos en el país				47
	Pasivos inexistentes en el exterior				48
	Pasivos inexistentes en el país				49
	<b>Base gravable para el impuesto de normalización (sume 46 a 49)</b>				<b>50</b>
Liquidación privada	Impuesto a la riqueza				51
	Descuentos tributarios por convenios internacionales				52
	<b>Impuesto neto a la riqueza (51 - 52)</b>				<b>53</b>
	<b>Impuesto de normalización tributaria</b>				<b>54</b>
	<b>Total impuesto a la riqueza y de normalización tributaria (53 + 54)</b>				<b>55</b>
	Sanciones				56
	<b>Total saldo a pagar (55 + 56)</b>				<b>57</b>
<b>Servicios Informáticos Electrónicos - Más formas de servirle!</b>					
58. No. Identificación signatario		59. DV			
981. Cód. Representación <input type="text"/> Firma del declarante o de quien lo representa		997. Fecha efectiva de la transacción		980. Pago total \$ <input type="text"/>	
982. Código Contador o Revisor Fiscal <input type="text"/> Firma Contador o Revisor Fiscal. 994. Con salvedades <input type="checkbox"/>		996. Espacio para el número interno de la DIAN / Adhesivo			
983. No. Tarjeta profesional <input type="text"/>					

## C A Brief Recount of Wealth Taxation in Colombia

Colombia began taxing the wealth of its wealthiest citizens in 1935 using a progressive schedule (Law 78/1935). After a series of reforms affecting its marginal tax rates and tax bases over the next five decades (Law 45/1942, Law 135/1944, Law 81/1960, Law 9/1983), the wealth tax was abolished in 1992, only to be re-established a decade later.

Colombia is unique in the extent to which it adopted multiple wealth tax reforms over the last two decades that have significantly changed both tax rates and base. Uribe was inaugurated president of Colombia on August 7, 2002 amid a precarious security situation and dismal economic conditions. Four days after inauguration, Uribe declared a state of emergency, enabling him to take extraordinary legislative measures to boost revenue to finance heightened military spending against illegal armed groups, including FARC (Decree 1837/2002).<sup>93</sup> Decrees 1838, 1885, and 1949 of August 2002 introduced a wealth tax dubbed “special tax for Democratic Security,” in reference to Uribe’s security policy.<sup>94,95</sup> Its rate was established at a flat rate of 1.2 percent of *all* net worth for individuals and firms whose *gross* wealth is at or above \$169.5 million pesos by August 31, 2002.<sup>96</sup> In other words, the *average* tax rate jumps for individuals with *gross* wealth at or above \$169.5 million pesos. This reform affected 48.05% of individual income tax filers: around 158,430 individual filers and 151,101 corporations were subject to this tax.<sup>97</sup> However, individual taxpayers contributed less than one-quarter of this tax revenue, with the bulk being paid for by corporations.

The following year, Uribe extended the “special” tax on wealth to continue funding the exigencies of war against illegal armed groups. Individuals with net worth of \$3 billion (thousand million) Colombian pesos or more (base year 2004) by January 1, 2004, January 1, 2005, and January 1, 2006 would be subject to this tax (Law 863/2003).<sup>98</sup> For these individuals, the tax was levied at a flat rate of 0.3 percent on *all* taxable wealth (i.e., net worth minus two allowances) for FY 2003-05 using tax form 420.<sup>99,100</sup> This reform thus generates a notch around 3 billion pesos, the threshold at which the average rate jumps from 0 to 0.3 percent. This reform annually affected only 1,420 individual taxpayers and some 4,850 firms, with the overwhelming majority (97%) of the tax burden falling on corporations.

After Uribe’s re-election, the wealth tax was extended for tax years 2007-10 (Law 1111/2006), and its *average* rate was raised to 1.2 percent for net worth of \$3 billion (thousand million) pesos or more by January 1, 2007. To be clear, this is *not* a marginal tax rate of 1.2 percent; rather, the 1.2 percent is levied on *all* net worth after subtracting two allowances, thus generating a notch around the 3 billion

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<sup>93</sup> “The adoption of temporary yet effective extraordinary measures is non-postponable to give Colombians their individual and collective security and to respond to the unprecedented challenge posed by criminal groups... every individual must make a significant tax effort to enable the State to ensure public security in vast parts of its territory” (Decree 1837/2002, our translation).

<sup>94</sup> Importantly, this decree was announced a couple of months *after* the deadline to submit income tax returns for FY 2001.

<sup>95</sup> It should be noted that the exigencies of the war against drug cartels and illegal armed groups had previously led to the creation of forced investment bonds, in 1996 and 1998. Tax filers with net worth above 150 million pesos in 1996 were required to invest 0.5 percent of taxable net worth in “Bonds for Security” (Law 345/1996), while taxpayers with net worth above 210 million pesos in 1998 were required to invest 0.6 percent of taxable net worth in “Solidarity Bonds for Peace” in 1999 and 2000 (Law 487/1998).

<sup>96</sup> Deductions are (i) net wealth value of assets in national businesses, and (ii) mandatory contributions to pension funds.

<sup>97</sup> Flores-Macías (2014) studies the factors behind the adoption of the “Democratic Security” tax by Uribe in 2002.

<sup>98</sup> Note that net worth possessed Jan 1, year  $t$  refers to the amount declared in the income tax in FY  $t - 1$ , updated to valuations in year  $t$ .

<sup>99</sup> Allowances are (i) net wealth value of assets in national businesses, and (ii) the first 200 million pesos of the principal residence (increased to 212,200,000 pesos for FY 2005 and 222,959,000 for FY 2006).

<sup>100</sup> Importantly, the reform was announced and adopted several months *before* the deadline to submit returns for FY 2003.

pesos threshold.<sup>101</sup> Importantly, even though the tax was levied on net worth held in tax years 2006, 2007, 2008, and 2009, only taxpayers with net worth of at least 3 billion pesos in 2007 were levied. That is, an individual reporting 2,999,999,999 pesos in FY 2006 and 3 billion pesos or more in 2007, 2008, or 2009 will *not* be subject to the wealth tax. This reform annually affected only some 1,800 individual filers and 5,690 corporations, with 97% of the tax burden falling on firms.

In 2009, Uribe introduced a one-off wealth tax with a increasing average rates of 2.4 percent for taxable wealth held by January 1, 2011 between \$3–5 billion pesos, and 4.8 percent for taxable wealth of \$5 billion pesos or more for 2011 (Law 1370/2009).<sup>102</sup> However, in December the following year, and allegedly to cover expenses to palliate the disastrous effects of the 2010 extreme weather conditions, newly-elected Santos reduced the filing thresholds to \$1 billion pesos, and introduced two additional rates: 1 percent for taxable wealth between \$1–2 billion pesos and 1.4 percent for wealth between \$2–3 billion pesos. In addition, Santos imposed a surcharge of 25 percent on taxpayers covered in Law 1370/2009. This set the previous rates to 3 percent for taxable wealth between \$3–5 billion pesos and 6 percent for wealth of \$5 billion pesos or more to be made in up to eight equal payments between 2011 and 2014 (Law 1430/2010). Note that, once again, these are *not* marginal tax rates but *average* tax rates on *all* taxable net worth. This affected 31,690 individual filers and 21,512 firms, with 94% of the tax revenue being collected from corporations.

On September 10, 2014, the Minister of Finance announced a bill to establish a permanent and progressive wealth tax for individuals with net worth of at least 1 billion pesos. The bill proposed the following tax schedule: an average rate of 0.4 percent for net worth \$1–3 billion, a marginal rate of 1.1 percent for net worth \$3–5 billion, 2 percent for net worth \$5–8 billion, and 2.25 percent for net worth of \$8 billion and above. Importantly, this announcement was made *before* individual taxpayers' deadline to submit their income tax return for FY 2013; in fact, some taxpayers could file their return up to 22 October, 2014 (Decree 2972/2013). Insofar as some taxpayers may have submitted their 2013 tax return expecting wealth taxation, we may see reporting responses starting FY 2013.

The law creating a permanent wealth tax was adopted in December 2014, albeit with a different tax schedule and significantly lower marginal rates than the initial proposed bill (Law 1739/2014). Individuals and corporations with net worth of 1 billion pesos and above on January 1, 2015 would be required to file a wealth tax return. A tax would be levied on net worth held on January 1, 2015, 2016, 2017 and 2018 for individuals using form 440. Importantly, even though the tax was levied on net worth held in tax years 2014–2017, only taxpayers with net worth of 1 billion pesos or more in FY 2014 were levied. That is, an individual reporting 999,999,999 pesos in FY 2014 and 1 billion pesos or more in 2015, 2016, or 2017 will *not* be subject to the wealth tax. For individuals, the tax rate is an *average* rate of 0.125 percent for taxable wealth below 2 billion, and a *marginal* rate of 0.35 percent for taxable wealth between 2 and 3 billion, 0.75 percent for taxable wealth between 3 and 5 billion, and 1.5 percent for taxable wealth of 5 billion and above.<sup>103</sup><sup>104</sup> The reform thus generates a notch around 1 billion pesos in net worth and kinks at 2, 3, and 5 billion pesos in taxable net worth. This reform affected 4.19 percent of filers, with again

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<sup>101</sup>These allowances are (i) net wealth value of assets in national businesses, and (ii) the first 220 million pesos of the principal residence.

<sup>102</sup>Allowances are (i) net wealth value of assets in national businesses, and (ii) the first 319,215,000 pesos of the principal residence, and some other items.

<sup>103</sup>If the wealth tax base in either year  $t$  2016, 2017 or 2018 is bigger (smaller) than that in 2015, the resulting tax base will be the minimum between 2015 tax base plus (minus) 25 percent of the inflation rate in year  $t - 1$  and the tax base in year  $t$ .

<sup>104</sup>For corporations, the wealth tax is phased out between 2015 and 2017 according to the following schedule: in 2015, the tax rates are an average rate of 0.2 percent (0.15 percent in 2016, and 0.05 percent in 2017) for taxable wealth below 2 billion pesos, and a marginal rate of 0.35 percent (0.25 percent in 2016, and 0.10 percent in 2017) for taxable wealth between 2 and 3 billion, 0.75 percent (0.5 percent in 2016, and 0.2 percent in 2017) for taxable wealth between 3 and 5 billion, and 1.15 percent (1 percent in 2016, and 0.4 percent in 2017) for taxable wealth of 5 billion and above.

the bulk of the burden falling on corporations.<sup>105106</sup>

## D Framework for Recovering the Structural Bunching Elasticity

This section presents the conceptual framework used to identify the structural elasticity of reported wealth with respect to the net-of-tax rate. Unlike the reduced-form approach developed in Section 4.1.1, this section builds a parametrized model and assumes a specific utility functional form.

Consider with a utility function of the form

$$u(W, W_r) = W - T(W_r) - W \left[ \frac{1}{1+e} - \frac{W_r}{W} + \frac{1}{1+1/e} \left( \frac{W_r}{W} \right)^{1+1/e} \right] \quad (11)$$

where  $T(W_r)$  represents wealth tax liability and the convex cost function  $C(1 - W_r/W)$  is parametrized by  $\frac{1}{1+e} - \frac{W_r}{W} + \frac{1}{1+1/e} \left( \frac{W_r}{W} \right)^{1+1/e}$ .<sup>107</sup>

If tax liability implies a proportional (average and marginal) tax rate on reported wealth,  $T(W_r) = \tau W_r$ , then the individual maximization problem leads to the first order condition

$$\tilde{W}_r = W (1 - \tau)^e \quad (12)$$

The optimality condition (12) indicates that a positive tax rate depresses  $\tilde{W}_r$  below  $W$ , with the strength of the effect determined by  $e$ , the parameter of interest. If  $e \rightarrow 0$ , then individuals report their true wealth ( $\tilde{W}_r = W$ ), while if  $e \rightarrow \infty$ , individuals report no wealth at all ( $\tilde{W}_r = 0$ ).

The combination of the wealth distribution and the reported wealth function (12) yields a reported wealth distribution associated with the baseline linear tax system. We denote  $H_0(W_r)$  and  $h_0(W_r)$  the distribution and density functions for reported wealth associated with this baseline. Using the optimality condition (12), we obtain  $H_0(W_r) = F\left(\frac{W_r}{(1-\tau)^e}\right)$  and hence  $h_0(W_r) = H'_0(W_r) = f\left(\frac{W_r}{(1-\tau)^e}\right)/(1-\tau)^e$ . Therefore, given a smooth tax system (i.e., no notches and no kinks), the smooth wealth distribution converts into a smooth reported wealth distribution.

Consider the marginal buncher  $H$  located at  $W_r^* + \Delta W_r^*$  before the reform, whose wealth is  $W^* + \Delta W^*$ , and is indifferent between the notch point  $W_r^*$  and the best interior point  $W_r^I$  after the tax change. At notch point  $W_r^*$ , her utility level is given by

$$u^N = W^* + \Delta W^* - \tau W_r^* - (W^* + \Delta W^*) \cdot \left[ \frac{1}{1+e} - \frac{W_r^*}{W^* + \Delta W^*} + \frac{1}{1+1/e} \left( \frac{W_r^*}{W^* + \Delta W^*} \right)^{1+\frac{1}{e}} \right] \quad (13)$$

Using the first order condition  $W_r^I = (W^* + \Delta W^*)(1 - \tau - \Delta\tau)^e$ , the utility level obtained at the best interior location can be written as

$$u^I = (W^* + \Delta W^*) \cdot \left[ \frac{(1 - \tau - \Delta\tau)^{1+e}}{1+e} + \frac{1}{1+1/e} \right] \quad (14)$$

From the condition  $u^I = u^N$  and using the relationship  $W^* + \Delta W^* = (W_r^* + \Delta W_r^*)/(1 - \tau)^e$ , we can

<sup>105</sup> Allowances are (i) net wealth value of assets in national businesses, and (ii) the first 12,200 UVT of the principal residence, and some other items.

<sup>106</sup> Note that, in both cases, the first marginal tax rate applies to *all* taxable wealth below 2 billion, *not* only taxable wealth between 1 and 2 billion.

<sup>107</sup> Note that  $C(0) = 0$ , i.e., there is no cost of underreporting when taxpayers do not underreport. Moreover,  $C(\cdot)$  is convex: if  $u = 1 - W_r/W$ ,  $C'(u) = W[1 - (1 - u)^{1/e}] \geq 0$  and  $C''(u) = W(1 - u)^{1/e-1}/e \geq 0$ .

rearrange the terms so as to obtain

$$\frac{1}{1 + \Delta W_r^*/W_r^*} - \frac{1}{1 + 1/e} \left( \frac{1}{1 + \Delta W_r^*/W_r^*} \right)^{1+1/e} - \frac{1}{1 + e} \left( 1 - \frac{\Delta\tau}{1 - \tau} \right)^{1+e} = 0 \quad (15)$$

This condition characterizes the relationship between the percentage reporting response  $\Delta W_r^*/W_r^*$ , the percentage change in the average net-of-tax rate created by the notch,  $\Delta\tau/(1 - \tau)$ , and the structural elasticity  $e$ .<sup>108</sup> Although it is not possible to obtain an analytical solution for  $e$ , this can be solved numerically given an estimate for  $\Delta W_r^*$  and the observed value of the other arguments.

The disadvantage of this approach is that it relies on a functional form for utility. While the wealth reporting response  $\Delta W_r^*$  can be non-parametrically identified, the underlying structural elasticity  $e$  from equation (15) that could be used for out-of-sample prediction cannot. It is therefore useful to develop a reduced-form approach that does not rely on the specific functional form for individuals' utility, as we do in Section 4.1. As discussed in [Kleven and Waseem \(2013\)](#), under some assumptions equation (4) for this reduced-form elasticity represents an upper bound on the structural elasticity  $e$  from equation (15).

Finally, note that, as the compensated elasticity  $e$  converges to zero (L-shaped Leontief preferences), equation (15) implies

$$\lim_{e \rightarrow 0} \Delta W_r^* = \frac{\Delta\tau \cdot W_r^*}{1 - \tau - \Delta\tau} \equiv \Delta W_r^D \quad (16)$$

This means that, as  $e \rightarrow 0$ , the bunching interval  $\Delta W_r^*$  converges to the strictly dominated range  $\Delta W_r^D$ . The dominated range therefore represents a lower bound on the wealth reporting response to tax notches under any compensated elasticity in a frictionless model ([Kleven and Waseem, 2013](#)).

Table D.1 presents the estimated parameters. For each reform year, the table shows the notch point (column 2), whether this notch also defined eligibility for the wealth tax (column 3), the average tax rate jump (column 4), the size of the dominated range (column 5), the share of taxpayers in dominated ranges that are unresponsive to the tax notch (column 6), the lower and upper bounds on the reporting responses (columns 7 and 8, respectively), and the bounds on the elasticities based on either the parametric equation (15) (columns 9 and 10) or the reduced-form formula (4) (column 11 and 12).

The table shows that the structural elasticities driving the large wealth reporting responses for the first notch in 2010 range between 0.47 to 1.42. The reduced-form elasticities, which represent an upper bound if the uncompensated reported wealth elasticity is not too strongly negative, are between 0.6 and 2.0. These elasticities obtained for the first notch are all statistically significantly different from zero at the 1 percent level. In contrast, elasticities obtained from the second notch are smaller and often less precisely estimated: the structural elasticities between 0.32 to 0.84, and the reduced-form elasticities are between 0.37 and 1.0, but the upper bounds using the convergence method are not statistically significantly different from zero.

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<sup>108</sup>See proofs and derivations in Section E.

Table D.1: Summary of Notches, Responses, and Elasticities

Year of Reform (1)	Notch Point (mill. pesos) (2)	Exemption Cutoff (3)	ATR Jump $\Delta\tau$ (%) (4)	Dominated Range $\Delta W_r^D$ (mill. pesos) (5)	Frictions $a^*$ using $\Delta W_r^D$ (6)	Response $\Delta W_r^*$ (mill. pesos) (7)		Structural Elasticity $e$ (9)		Reduced-Form Elasticity $e_R$ (11)	
						Bunching-Hole Method (7)	Convergence Method (8)	Bunching-Hole Method (9)	Convergence Method (10)	Bunching-Hole Method (11)	Convergence Method (12)
2003	3,000	✓	0.3	9	0.74 (0.18)	120 (80.09)	180 (137.93)	0.24 (0.52)	0.53 (1.27)	0.27 (0.62)	0.60 (1.76)
2006	3,000	✓	$1.2 \times 4$	151	0.41 (0.04)	340 (52.04)	560 (109.62)	0.07 (0.03)	0.21 (0.10)	0.13 (0.04)	0.36 (0.16)
2010	1,000	✓	1.0	10	0.43 (0.02)	110 (7.91)	200 (16.86)	0.47 (0.07)	1.42 (0.22)	0.60 (0.09)	2.00 (0.35)
2010	2,000		0.4	8	0.57 (0.07)	110 (24.10)	180 (64.63)	0.32 (0.14)	0.84 (0.73)	0.37 (0.19)	1.00 (0.99)
2010	3,000		1.6	49	0.35 (0.04)	220 (40.82)	360 (87.44)	0.18 (0.05)	0.33 (0.14)	0.17 (0.09)	0.44 (0.20)
2010	5,000		3.0	160	0.43 (0.06)	480 (24.01)	720 (37.56)	0.10 (0.02)	0.23 (0.01)	0.15 (0.01)	0.34 (0.01)
2014	1,000	✓	$0.0125 \times 4$	5	0.38 (0.02)	110 (6.31)	210 (16.03)	0.98 (0.12)	3.17 (0.42)	1.21 (0.15)	4.41 (0.71)

*Notes:* This table presents elasticity estimates at different wealth levels exploiting four wealth tax reforms taking place in 2003, 2006, 2010, and 2014. Column (1) presents the year of the wealth tax reform. Column (2) indicates the bracket cutoff, expressed in current million pesos. Column (3) indicates whether this cutoff also marks the eligibility threshold, below which taxpayers are exempt from the wealth tax. Column (4) presents the size of the wealth tax notch. Column (5) presents the dominated range in current million pesos, defined as  $\Delta\tau \cdot W_r^*/(1 - \tau - \Delta\tau)$ . Column (6) presents the estimate of frictions (the fraction of individuals in dominated ranges who are unresponsive). Columns (7)–(8) present the reporting responses in current million pesos using bunching-hole and convergence methods, respectively. Columns (9)–(12) present elasticities based on either the parametric equation (15) in columns (9)–(10) or the reduced-form formula (4) in columns (11)–(12). *Source:* Authors' calculations using administrative tax microdata from DIAN.

## E Proofs and Derivations

**Structural elasticity formula, equation (15):** Recall from Figure A.4, Panel (a), that the marginal buncher  $H$  is located at  $W_r^* + \Delta W_r^*$  before the reform and has (latent) wealth  $W^* + \Delta W^*$ . This individual is indifferent between the notch point  $W_r^*$  and the best interior point  $W_r^I$  after the tax change. Her utility level at notch point  $W_r^*$  is given by

$$u^N = W^* + \Delta W^* - \tau W_r^* - (W^* + \Delta W^*) \cdot \left[ \frac{1}{1+e} - \frac{W_r^*}{W^* + \Delta W^*} + \frac{1}{1+1/e} \left( \frac{W_r^*}{W^* + \Delta W^*} \right)^{1+\frac{1}{e}} \right]$$

Using the first order condition  $W_r^I = (W^* + \Delta W^*) (1 - \tau - \Delta\tau)^e$ , the utility level obtained at the best interior location is

$$\begin{aligned} u^I &= W^* + \Delta W^* - (\tau + \Delta\tau) W_r^I - (W^* + \Delta W^*) \cdot \left[ \frac{1}{1+e} - \frac{W_r^I}{W^* + \Delta W^*} + \frac{1}{1+1/e} \left( \frac{W_r^I}{W^* + \Delta W^*} \right)^{1+\frac{1}{e}} \right] \\ &= W^* + \Delta W^* - (W^* + \Delta W^*) (\tau + \Delta\tau) (1 - \tau - \Delta\tau)^e \\ &\quad - (W^* + \Delta W^*) \cdot \left[ \frac{1}{1+e} - \frac{W^* + \Delta W^*}{W^* + \Delta W^*} \cdot (1 - \tau - \Delta\tau)^e + \frac{1}{1+1/e} \left( \frac{W^* + \Delta W^*}{W^* + \Delta W^*} \cdot (1 - \tau - \Delta\tau)^e \right)^{1+\frac{1}{e}} \right] \\ &= (W^* + \Delta W^*) \left[ 1 - (\tau + \Delta\tau) (1 - \tau - \Delta\tau)^e - \frac{1}{1+e} + (1 - \tau - \Delta\tau)^e - \frac{1}{1+1/e} (1 - \tau - \Delta\tau)^{1+e} \right] \\ &= (W^* + \Delta W^*) \left[ 1 + (1 - \tau - \Delta\tau)^{1+e} - \frac{1}{1+1/e} (1 - \tau - \Delta\tau)^{1+e} - \frac{1}{1+e} \right] \\ &= (W^* + \Delta W^*) \cdot \left[ \frac{(1 - \tau - \Delta\tau)^{1+e}}{1+e} + \frac{1}{1+1/e} \right] \end{aligned}$$

From the condition  $u^I = u^N$  and using the relationship  $W^* + \Delta W^* = (W_r^* + \Delta W_r^*) / (1 - \tau)^e$ , we can obtain

$$\begin{aligned} &W^* + \Delta W^* - \tau W_r^* - (W^* + \Delta W^*) \cdot \left[ \frac{1}{1+e} - \frac{W_r^*}{W^* + \Delta W^*} + \frac{1}{1+1/e} \left( \frac{W_r^*}{W^* + \Delta W^*} \right)^{1+\frac{1}{e}} \right] \\ &\quad - (W^* + \Delta W^*) \cdot \left[ \frac{(1 - \tau - \Delta\tau)^{1+e}}{1+e} + \frac{1}{1+1/e} \right] = 0 \\ \Leftrightarrow &\frac{W_r^* + \Delta W_r^*}{(1 - \tau)^e} - \tau W_r^* - \frac{W_r^* + \Delta W_r^*}{(1 - \tau)^e} \cdot \left[ \frac{1}{1+e} - \frac{W_r^* (1 - \tau)^e}{W_r^* + \Delta W_r^*} + \frac{1}{1+1/e} \left( \frac{W_r^* (1 - \tau)^e}{W_r^* + \Delta W_r^*} \right)^{1+\frac{1}{e}} \right] \\ &\quad - \frac{W_r^* + \Delta W_r^*}{(1 - \tau)^e} \cdot \left[ \frac{(1 - \tau - \Delta\tau)^{1+e}}{1+e} + \frac{1}{1+1/e} \right] = 0 \end{aligned}$$



Dividing by  $\frac{W_r^* + \Delta W_r^*}{(1-\tau)^e}$ :

$$\begin{aligned}
1 - \frac{\tau W_r^* (1-\tau)^e}{W_r^* + \Delta W_r^*} - \frac{1}{1+e} + \frac{W_r^* (1-\tau)^e}{W_r^* + \Delta W_r^*} - \frac{1}{1+1/e} \left( \frac{W_r^* (1-\tau)^e}{W_r^* + \Delta W_r^*} \right)^{1+\frac{1}{e}} - \frac{(1-\tau-\Delta\tau)^{1+e}}{1+e} - \frac{1}{1+1/e} &= 0 \\
\frac{W_r^* (1-\tau)^{1+e}}{W_r^* + \Delta W_r^*} - \frac{1}{1+1/e} \left( \frac{W_r^* (1-\tau)^e}{W_r^* + \Delta W_r^*} \right)^{1+\frac{1}{e}} - \frac{(1-\tau-\Delta\tau)^{1+e}}{1+e} &= 0 \\
\frac{(1-\tau)^{1+e}}{1 + \Delta W_r^*/W_r^*} - \frac{1}{1+1/e} \left( \frac{(1-\tau)^e}{1 + \Delta W_r^*/W_r^*} \right)^{1+\frac{1}{e}} - \frac{(1-\tau-\Delta\tau)^{1+e}}{1+e} &= 0
\end{aligned}$$

Dividing by  $(1-\tau)^{1+e}$ :

$$\frac{1}{1 + \Delta W_r^*/W_r^*} - \frac{1}{1+1/e} \left( \frac{1}{1 + \Delta W_r^*/W_r^*} \right)^{1+1/e} - \frac{1}{1+e} \left( 1 - \frac{\Delta\tau}{1-\tau} \right)^{1+e} = 0$$

□

**Equivalence between wealth and capital income elasticities:** Let  $\tau_W$  be the wealth tax rate and  $\tau_K$  the equivalent tax rate on capital income so that  $\tau_W = r \cdot \tau_K$  where  $r$  is the rate of return on wealth. For instance, if  $\tau_W$  is 1 percent, and  $r$  is 5 percent, then  $\tau_K$  is 20 percent.

$$\begin{aligned}
d(1-\tau_W) &= d(1-\tau_K) \cdot r \\
\frac{d(1-\tau_W)}{(1-\tau_W)} &= \frac{d(1-\tau_K)}{(1-\tau_K)} \cdot r \left( \frac{1-\tau_K}{1-\tau_W} \right) \\
\left[ \frac{d(1-\tau_W)}{(1-\tau_W)} \cdot \frac{W}{dW} \right]^{-1} &= \left[ \frac{d(1-\tau_K)}{(1-\tau_K)} \cdot r \left( \frac{1-\tau_K}{1-\tau_W} \right) \cdot \frac{W}{dW} \right]^{-1} \\
\epsilon_W &= \epsilon_K \cdot \left[ \frac{1-\tau_W}{r(1-\tau_K)} \right]
\end{aligned}$$

In our example,  $\frac{1-\tau_W}{r(1-\tau_K)} = 24.75$ . Therefore, to translate our estimated elasticities of reported wealth into the equivalent elasticities of capital income, we divide  $\epsilon_W$  by a factor of 24.75.

# F Measuring Wealth Inequality in Colombia

Measuring top wealth shares (e.g., the fraction of total wealth held by the top 1 percent) faces challenges due to severe data limitations in Colombia. These data limitations affect both our measure of the amount of wealth held by wealthy individuals (the numerator) and the total amount of wealth held by individuals (the denominator). This section discusses these limitations and describes how we deal with each one of them to estimate top wealth shares in Colombia.

## F.1 Total Wealth of Non-Filers

Unlike in many developed countries, there is no aggregate wealth measure to construct the denominator in Colombia. National accounts do not report personal wealth estimates and personal financial wealth, as reported by the Central Bank, appears significantly underestimated. Moreover, we cannot compute total wealth as wealth reported in the tax records because only a fraction of tax units file taxes in Colombia. For instance, in FY 2016, taxpayers with gross wealth below 133,889,000 pesos (USD 46,780) did not have to file income taxes. This excluded the bottom 94% of tax units (adults aged 20+) from filing income taxes, which means we do not observe wealth holdings for most tax units. As a second-best alternative, we refer to survey data to capture wealth for non-filers.

For this purpose, we use *Encuesta de Carga Financiera y Educación Financiera de los Hogares* (IEFIC). IEFIC surveys a representative sample of households with formal financial services from three largest urban areas (Bogota, Medellin, and Cali). In 2017, 28,114 households were surveyed from Colombia's main household survey, *Gran Encuesta Integrada de Hogares* (GEIH). Among these surveyed households, 19,419 households reported to have access to financial services and are thus included in IEFIC. Therefore, our initial survey sample comes from 47,347 individuals aged 18 and above. Before any corrections, monthly individual income ranges from 0 to 100 million pesos (USD 0 to 33,500), and household net wealth ranges from 0 to 10 billion pesos (USD 0 to 3,605,362). 45.13% of households are self-reported home-owners.

Using household survey data from IEFIC to estimate the wealth of non-filers has three main issues. The first issue is that the unit of observation is the tax unit in our study (individuals aged 20 and above) while individuals aged 18 and above are included in the survey. We thus drop survey respondents aged below 20 from the sample. Further, some assets and debts are reported at the family-level by the head of household in the survey (real estate, business assets, vehicles, and livestock; and the outstanding debt of each asset), while others are reported at the individual-level (financial assets, consumption debt). This implies that we must make assumptions about the intra-family distribution of assets and debts reported at the family level in the survey. We proceed as follows:

- For family size  $n = 1$ , we attribute 100% of assets and debts to head of household ( $w_h = 1$ )
- For family size  $n = 2$  with head of household and spouse/partner, we split assets and debts equally ( $w_h = w_s = .5$ )
- For family size  $n \geq 2$  with head of household but no spouse/partner, we attribute 80% to head of household and the remaining 20% split equally across other members ( $w_h = .8, w_{j \neq h} = .2/(n - 1)$ )
- For family size  $n > 2$  with head of household and spouse/partner, we attribute 40% to each spouse/partner and the remaining 20% split equally across other members ( $w_h = w_s = .4, w_{j \neq h, s} = .2/(n - 2)$ )

The second issue is valuation. At face value, wealth items reported in the survey are similar to those in the tax records: primary and secondary housing, business assets, real estate properties (e.g., industrial buildings, land, offices, warehouses, parking lots, hotels and lodgings), livestock, vehicles (e.g., motorcycles, private vehicles, boats, planes), inventories, financial assets (e.g., savings accounts, mutual

investment funds, shares, swaps), shares and contributions, and voluntary pension contributions are all included in the survey. None of these items are top-coded. However, the survey asks respondents to self-assess their wealth at “market” values. The questionnaire reads as follows: “*If you wanted to sell this asset, what would be the minimum price at which you would sell it?*” Survey respondents are encouraged to use bank account statements to answer questions regarding debts. Nevertheless, it is clear that values reported by survey respondents are not systematically the same as values reported in tax records.

The direction of the bias of wealth items in the survey relative to tax records could go in either direction. On the one hand, survey respondents are more likely to self-report their assets at market values, which are larger than cadastral values. Moreover, given incentives for underreporting wealth in tax records, survey respondents are also likely to overstate their wealth in surveys compared to what they would report to the tax authority. On the other hand, wealthy individuals with financial assets poorly covered in the survey questionnaire will underreport their wealth. Because we focus on potential non-filers in the survey to capture wealth at the bottom of the distribution, it is more likely that our estimates of wealth for this population suffers from upward bias, thus artificially deflating top wealth shares.

The third and last issue is the representativeness of the survey. IEFIC is representative of households in Bogota, Medellin, and Cali that have access to financial services. It is therefore *not* representative of all Colombian adults.<sup>109</sup> Because urban household with access to financial services are likely to be wealthier than other households, this again implies that our estimates of wealth for non-filers will likely suffer from upward bias. Given are wealth denominator will be biased upward, our top wealth shares will be biased downwards. We thus interpret our top wealth shares as conservative estimates of wealth inequality in Colombia.

In the survey data, we find that the wealthiest 10 percent of individuals own 71 percent of all wealth reported in the survey. This is very close to the equivalent top share of 75.3 percent in the United States, based on data from the Survey of Consumer Finances from 2013 (Saez and Zucman, 2016). Moreover, the wealthiest 1 percent in Colombia own 25.8 percent of total wealth according to IEFIC survey, which is significantly less than the United States’ 35.8 percent estimate for households using the Survey of Consumer Finances. Figure F.1 plots wealth decomposition by net wealth groups. The figure shows that 50 percent of individuals have 0 net wealth. This is not surprising, given recent evidence that one-quarter of households in OECD countries have negative net wealth (Balestra and Tonkin, 2018). Individuals in the third quartile (P50–P75) have less than 22.8 million pesos, that is, less than USD 7,641. For these individuals, most of their wealth comes from vehicle and livestock ownership. For middle and upper-middle class individuals (e.g., P75–P95), real estate represents more than 90 percent of wealth. Finally, for individuals in the top 1 percent, the share of wealth belonging to real estate falls to 80.7 percent while the shares of financial and business assets increase. However, it is clear from Figure F.1 that financial assets are underreported in the survey data, making this less than ideal to study wealth inequality at the top. Because our use of survey data is to focus on wealth at the bottom for non-filers, this issue is less of a concern for our purposes.

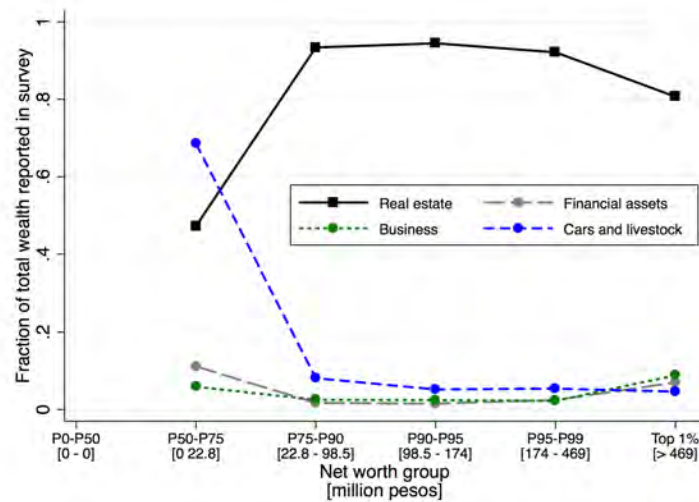
We impute average net worth for non-filers using net worth of surveyed units with gross wealth below the filing threshold of 133,889,000 pesos. For this group, average net worth is 12,763,333 pesos (USD 4,277). At baseline, non-filers have one-third of total wealth.

**Forbes:** According to the 2018 Forbes rich list, the fortune of Colombia’s richest man alive, Luis Carlos Sarmiento, was worth US \$12.1 billion. Sarmiento ranked 123 on the list of the world’s wealthiest individuals, and was followed by the Santo Domingo dynasty (Alejandro and Andrés ranked 449 with US \$4.3 billion; Julio Mario III ranked 1103 with US \$2.2 billion.), Jaime Gilinski Bacal (ranked 606 with US \$3.7 billion), and Carlos Ardila Lulle (ranked 859 with US \$2.8 billion).

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<sup>109</sup>In fact, the sum of survey weights add up to 6,719,291, i.e., 21 percent of all tax units.

Figure F.1: Wealth Decomposition in Survey Data



*Notes:* This figure plots wealth decomposition by asset types across wealth groups using household survey data from 2017. Individuals aged 20 and above are included. For assets reported at the family level (real estate, business assets, vehicles, and livestock—and the outstanding debt of each asset), we make the following assumptions about the intra-family distribution. For family size  $n = 1$ , we attribute 100% of assets and debts to head of household. For family size  $n = 2$  with head of household and spouse/partner, we split assets and debts equally. For family size  $n \geq 2$  with head of household but no spouse/partner, we attribute 80% to head of household and the remaining 20% split equally across other members. Finally, for family size  $n > 2$  with head of household and spouse/partner, we attribute 40% to each spouse/partner and the remaining 20% split equally across other members. Individuals are ranked by their net worth. *Sources:* Authors’ calculations using 2017 IEFIC from DANE.

Table F.1: Net wealth groups in survey data

Fractile	Min (million pesos)	Mean (million pesos)	Mean $P_0$ – $P_1$ (million pesos)	Share of total wealth (%)	Sum of survey weights
(1)	(2)	(3)	(4)	(5)	(6)
P50	0.0	71.39	6.35	100	6,719,291
P75	22.8	136.43	52.00	95.6	6,719,291
P90	98.5	263.10	130.21	73.7	6,719,291
P95	174.0	396.01	264.70	55.5	6,719,291
P99	469.0	923.38	923.38	25.8	6,719,291

*Notes:* This table plots mean net worth across wealth groups, as well as the minimum wealth needed to belong to each group, using household survey data from Colombia. Individuals aged 20 and above are included. For assets reported at the family level (real estate, business assets, vehicles, and livestock—and the outstanding debt of each asset), we make the following assumptions about the intra-family distribution. For family size  $n = 1$ , we attribute 100% of assets and debts to head of household. For family size  $n = 2$  with head of household and spouse/partner, we split assets and debts equally. For family size  $n \geq 2$  with head of household but no spouse/partner, we attribute 80% to head of household and the remaining 20% split equally across other members. Finally, for family size  $n > 2$  with head of household and spouse/partner, we attribute 40% to each spouse/partner and the remaining 20% split equally across other members. Individuals are ranked by their net worth. *Sources:* Authors’ calculations using 2017 IEFIC from DANE.

## F.2 Cadastral-to-Market Values

For most middle-class individuals, real estate represents the largest share of gross assets (Balestra and Tonkin, 2018). Yet in Colombia, real estate is reported in tax records at cadastral (not market) values and, as in other developing countries, cadasters are outdated. This implies that cadastral values represent a fraction of market values today. As a result, our measure of real estate in the tax records must be adjusted to obtain wealth at market values  $W^*$ :

$$W^* = [K \cdot (1 - \alpha) + \alpha \cdot K \cdot \delta] - L \quad (17)$$

where  $K$  represents gross wealth as reported in tax records,  $\alpha \in [0, 1]$  represents real estate as a fraction of  $K$ ,  $\delta \in [0, 1]$  is the cadastral-to-market value conversion factor, and  $L$  represents liabilities. Equation (17) thus shows measuring  $W^*$  depends critically on accurate measures of  $\alpha$  and  $\delta$ . We discuss how we estimate each parameter next.

Unfortunately, since 2004, wealth is not decomposed by type of assets for most taxpayers, so it is impossible to know what share of assets  $\alpha$  should be inflated to reflect market values. To deal with this issue, we obtain  $\alpha$  using data from taxpayers required to keep accounting books, which are mostly business owners. In FY 2016, these taxpayers represented 8% of all taxpayers. The tax return used by these taxpayers (income tax form #110) has a “fixed assets” category that includes real estate, land ownership, vehicles, and boats. We assume that the share of fixed assets is similar between individuals required and not required to keep accounting books, and impute estimated shares for all taxpayers. We estimate these shares separately by top wealth groups for FY 2016:  $\alpha_{P0-P99} = 0.6$ ,  $\alpha_{P99-P99.9} = 0.55$ ,  $\alpha_{P99.9-P99.99} = 0.4$ , and  $\alpha_{P99.99} = 0.25$ .

To inflate cadastral values to reflect market values, we account for the fact that Bogota has done a better job updating its cadasters than other cities in Colombia. We assume cadastral values represent 70 percent of market values in Bogota, and 60 percent in all other cities (hence  $\delta = 1/.7 = 1.43$  in Bogota and  $\delta = 1/.6 = 1.67$  elsewhere). Unfortunately, there is time and spatial variation in how outdated cadastral values are in Colombia. Legislation has been introduced to force regular updating of cadastres, such that cadastral values be at least 40 (Law 223/1995) or 60 (Law 1450/2011) percent of market values. However, compliance with this norm varies substantially across neighborhoods and time. We ignore these issues and assume  $\delta$  is the same across individuals within a given city.

## F.3 Unreported Offshore Wealth

As discussed in Sections 5.1 and 5, offshore wealth may be underreported in tax records for the purposes of reducing the tax burden. To the extent that wealthier individuals are disproportionately likely to hold foreign assets, our measures of top wealth shares will underestimate inequality if we do not account for unobserved offshore wealth. Indeed, while the 2015–2017 voluntary disclosure program incentivized some taxpayers to disclose (at least part of) their assets hidden in tax havens, it is likely that other taxpayers choose to continue evading and remain keeping their fortunes concealed from the tax authority. In this section, we place bounds on the total amount of offshore wealth that could potentially remain hidden abroad, and illustrate their implications for estimates of wealth inequality in Colombia.

We begin from the macro estimate for total offshore wealth by Colombians from Alstadsater et al. (2018). Using fiduciary deposits data from the Central Bank of Switzerland in 2003–2004 as well as cross-border bank deposits data from offshore financial centers in 2007, Alstadsater et al. (2018) estimate that total offshore wealth by Colombians is 9.0% of GDP. This places Colombia just below the world average of 9.8 percent of GDP kept offshore. How much of this is reported to the tax agency?

In FY 2017, total offshore wealth reported by individuals in tax return #160 for foreign assets amounts to 2.8% of GDP. That is, less than one-third of the baseline measure of offshore wealth is reported to the tax authorities. Half of this amount (1.4% of GDP) was disclosed thanks to the voluntary

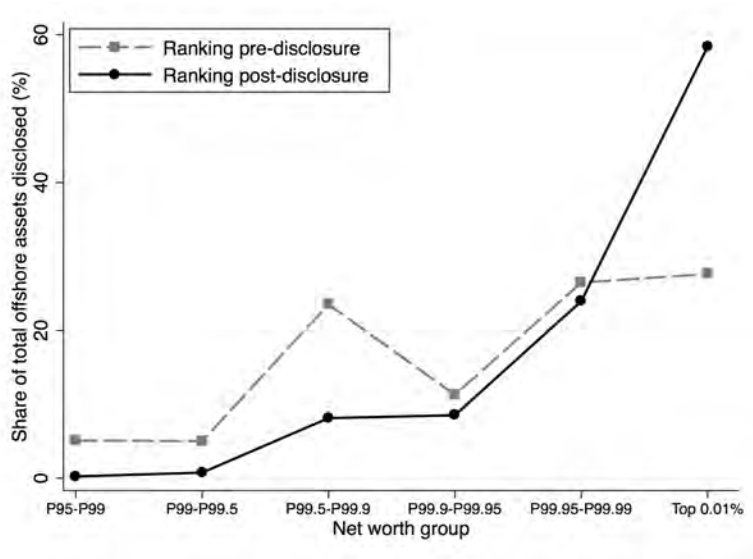
disclosure program.<sup>110</sup> This means 6.2% of GDP remains concealed offshore. Who holds this offshore wealth?

We assume that the distribution of unreported offshore wealth is similar to the distribution of offshore wealth disclosures made during the 2015–2017 voluntary disclosure program by each net wealth group. Figure F.2 shows the total amount of offshore assets disclosed by wealth group, ranking individuals by their pre- and post-disclosure wealth. We use the black solid line as our estimate of unreported wealth for each wealth group: 58% if P99.99; 24% if P99.95–P99.99, 9% if P99.9–P99.95, 8% if P99.5–P99.9, 0.8% if P99–P99.5, 0.2% if P95–P99, and 0% if P0–P95. We then re-rank individuals according to this augmented measure of wealth and re-compute total wealth accordingly.

Note, however, that the estimates from (Alstadsater et al., 2018) are based mostly from 2007, a year that predates high wealth taxation in Colombia. If individuals respond to higher wealth taxes by obscuring their wealth offshore, as suggested in Section 5.1, this implies that our baseline measure of unreported offshore wealth today may be underestimated. How much could overall offshore wealth have increased due to higher wealth taxes in Colombia?

We use the Panama Papers microdata to estimate increases in offshore wealth between 2007 and 2015 due to high wealth taxation in Colombia. The cumulative number of entities ever incorporated through Mossack Fonseca was 400 in 2007 and 1778 in 2015. This represents a 345 percent increase. If the increase in the use of offshore structures also reflects rises in assets held offshore, then offshore wealth today could reach 40 percent of GDP ( $40\% = (1 + 3.45) \times 9\%$ ) and 37.25 percent of GDP would be unreported to the tax agency. We use this estimate as an upper bound on the total amount of offshore wealth that is unreported to the tax authority today.

Figure F.2: Distribution of Hidden Offshore Assets in 2015–2017, by Pre/Post-Disclosure Top Wealth Group



Notes: This figure shows the fraction of total disclosures of hidden offshore assets during the 2015–2017 voluntary disclosure program for each wealth group, ranking by pre- and post-disclosure net worth. The figure shows that the volume of offshore assets disclosed in 2015–2017 is increasing in net worth. Tax filers in the wealthiest 0.01 percent post-disclosure disclosed 58 percent of all disclosures. The sample is restricted to 1,633,383 individuals filing the income tax return in FY 2013 (they may or not file a wealth tax return in 2015–2017). This sample includes 11,210 disclosers and 1,085 taxpayers in the Panama Papers (of which 434 disclosed wealth). Sources: Authors’ calculations using administrative tax microdata from DIAN.

<sup>110</sup>Total disclosures of hidden foreign and domestic assets and fake liabilities during the 2015–2017 voluntary disclosure program represent 1.73% GDP.