Corporate Taxation and Evasion Responses: Evidence from a Minimum Tax in Honduras

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Abstract

The international landscape of corporate taxation has been changing rapidly: tax rates have fallen across the world and opportunities to shift profits to low-rate locations have grown. The challenge to tax corporations is particularly stark in developing countries which often lack the institutional capacity to enforce compliance. One tool already deployed in several low-income countries and being discussed in international tax cooperation agreements are minimum taxes, provisions that tax firms on a broader base if reported profits are too low. In this paper we use administrative data on the universe of corporate taxpayers between 2011-2018 to study the impact of a minimum tax implemented in Honduras. We first document substantial tax evasion when costs are deductible: large corporations significantly increase their reported profit margins when incentives to over report costs disappear, implying evasion rates of up to 17% of profits. We then show that firms strategically reduce reported revenue in order to locate below the exemption threshold for the minimum tax policy and estimate revenue elasticity around one. Bunching is less pronounced when third-party information on revenues is available, suggesting the response is partly explained by misreporting. Using these parameters, we calibrate a model of firm optimization and study the impacts of alternative tax schedules. As designed, we estimate the minimum tax policy increased tax revenues by up to 30%, but at the cost of substantially decreasing firms' aggregate profits. We then show that the tax authority can increase revenues by up to 10% without losses on aggregate profit by introducing a small degree of production distortion through limited cost deductibility.

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1 Introduction

The landscape of corporate taxation has changed significantly in the last decades. Average statutory corporate tax rates have fallen from over 40% in the 1990s to 30% in low-income countries, and by even more in middle- and high-income countries (International Monetary Fund, 2019b). At the same time, technological changes such as the rise of digital companies and the emergence of tax heavens mean that governments face increasing challenges to assure compliance in corporate tax payments (Zucman, 2014). These trends pose particularly stark threats to the tax base in lower-income countries, which often do not have the institutional capacity to fight tax evasion.

One tool already deployed by several governments to assure tax payments by corporations are minimum taxes (Best, Brockmeyer, Kleven, Spinnewijn, & Waseem, 2015; Mosberger, 2016), provisions that tax firms on a broader tax base when reported profits are very low. The International Monetary Fund (IMF) recommends the use of minimum taxes as part of "simple measures protecting against base erosion" (International Monetary Fund, 2019a). Some form of minimum taxation on corporations is also at the core of recent international tax cooperation initiatives, such as the G20/OECD Inclusive Framework on Base Erosion and Profit Shifting (BEPS). It also features on the 2017 US Tax Cuts and Job Act (TCJA), which includes a provision for multinational firms to pay the maximum between corporate profit taxes and taxes on a broader base which does not allow for certain costs usually linked to profit shifting to be deducted[1]. Despite the prominence of minimum taxes on economic debates, evidence on their impact on firms' behavior and implications for policy design are still scant.

In this paper we study corporate response to the introduction of a minimum tax in Honduras between 2014-2017. Corporations in Honduras typically face a flat 25% tax on reported profits, and special income tax regimes for corporations account for a large part of tax expenditures estimated to be equivalent to 7% of GDP (International Monetary Fund, 2018). Starting in FY2014, the country introduced a minimum tax provision mandating that taxpayers above a certain gross revenue threshold pay the maximum between their profit tax liability and 1.5% of their gross revenue. This policy was highly salient, being disputed in courts and eventually upheld by the Supreme Court, and potentially affected the largest 20% corporations operating in the country.

Using the universe of corporate tax declarations between 2011 and 2018, we start by documenting that taxpayers responded strongly to the incentives created by the minimum tax. Since the policy only applied to firms reporting gross revenue above L10 million (approximately USD400,000), its introduction created a potential *notch* at that level: taxpayers with low profits had a strong incentive to reduce reported revenues below the threshold in order to avoid facing a discontinuously higher liability. Benefiting from data before the introduction of the tax, we show that the density of firms was smooth around the threshold between 2011 and 2013, but presents

[1] This so called BEAT (base erosion anti-abuse) provision effectively replaced the alternative minimum tax (AMT) for corporations, which was repealed. A form of minimum tax also exists for personal income in the United States since the US Tax Reform Act of 1969 established a predecessor to the AMT. In the context of the ongoing debate about large corporations not paying federal taxes, US Democratic presidential candidate Joe Biden has proposed a minimum tax on corporations with book profits above USD100 million (Li, Watson, & LaJoie, 2020)

a clear and increasing excess mass after the minimum tax went into effect in 2014. When the exemption threshold was increased to L300 million in 2018, the excess mass around the previous notch immediately disappears.

We use tools from the bunching literature (Kleven, 2016; Kleven & Waseem, 2013), adapted to our context, to recover bounds on the elasticity of revenue with respect to one-minus the tax rate. Our estimates suggest that the marginal buncher reduces their reported revenue by 15-30% to avoid being subject to the minimum tax and facing higher tax liability. We estimate revenue elasticities in the range of 0.35-1, considerably higher than for corporations in Costa Rica (Bachas & Soto, 2018), for example.

While the bunching behavior in theory could be completely explained by real production decisions, we offer evidence that misreporting revenue is part of the explanation. While the exemption threshold depends on self-declared revenues, the tax authority observes part of taxpayers' revenue through third-party reporting. We estimate that the excess mass below the notch is 65% larger for firms with below median share of third-party informed revenue. We also explore different levels of third-party reporting across economic sectors and show a strong, negative correlation between degree of bunching and availability of third-party information. Taken together, we interpret these as evidence that at least part of the observed response of declaring revenue below the exemption threshold is explained by misreporting.

We also document that taxpayers with revenues significantly above the threshold (and therefore inframarginal to bunching behavior) reduce their reported costs and increase their reported profit margins, consistent with the fact that under revenue taxation firms face no incentives to over report costs. We interpret this as *prima facie* evidence of evasion under the profit taxation regime. In order to make progress in quantifying these evasion responses, we explore the fact that a minimum tax creates a *kink* in taxpayers budget set (Best et al., 2015): both the tax rate and the tax base change discontinuously at the profit margin level that separates the two regimes, while the tax liability changes continuously.

We show that corporations in Honduras, when faced with the minimum tax, respond as predicted and bunch at the 6% profit margin kink: the marginal buncher increases their reported profit margin by 0.9-1.1 percentage point. Following the decomposition developed by Best et al. (2015) and using the upper-bound revenue elasticity obtained using the notch[2], we estimate that corporations change their reported costs by 13-17% of their profits. We also explore the rich administrative data to show that not all deduction categories respond in the same manner. We provide both non-parametric evidence and estimate "donut-hole" discontinuity regressions that suggest costs linked to the purchase of goods and materials are the most responsive to the change in evasion incentives. This is similar to findings from Mosberger (2016) in Hungary and strongly suggest a focus for tax authorities efforts in assessing the veracity of claimed deductions under

[2] Best et al. (2015) do not have any variation that allows them to estimate the revenue elasticity, but show that cost adjustment estimates are robust to a wide range of elasticity values since real production incentives are very small around the kink. We can explore the fact that the minimum tax in Honduras introduces both a notch and a kink in the tax schedule to separately estimate the revenue elasticity and use that to pin down a precise evasion response.

profit taxation.

Our estimates are robust to a variety of approaches. Our main sample consists of an unbalanced panel of corporations between 2011 and 2018. We show that corporate responses to the minimum tax are qualitatively similar if we restrict our analysis to a balanced panel of firms that filed taxes in every year throughout the period. We also show that responses are broadly similar across firms operating in different economic sectors. A small number of sectors also face a different minimum tax rate (0.75% instead of 1.5%), which should induce bunching at 3% in the profit margin distribution. We document that firms in those sector behave accordingly, generating a profit margin distribution with excess mass a 3%, instead of 6% for the overall population of affected firms.

Results in the first part of the paper document strong behavioral responses to the minimum tax and illustrate the main trade-off induced by deviating from profit taxation: a broader tax base reduces tax evasion (Best et al., 2015), at the cost of efficiency loss (Diamond & Mirrlees, 1971). It also exemplifies the distortions introduced by tax notches: by taxing marginal revenue well above 100% when crossing an arbitrary threshold, notches induce large responses even if underlying elasticities are modest (Kleven & Waseem, 2013; Slemrod, 2013; Sallee & Slemrod, 2012)[3].

In order to make progress in assessing how alternative corporate tax systems would fare in comparison to simple profit taxation, we impose more structure on firms' profit maximization problem and calibrate a model using behavioral parameters estimated above. We present two main exercises. First, under our parametric assumptions, we fully characterize the impact of the specific minimum tax policy introduced in Honduras, considering that previously firms were taxed on profits. We estimate that the reform increased tax revenues by up to 30%, but at the cost of reducing aggregate corporate profit by 10%. We also show the very stark incentives created by the tax notch: firms bunching below the L10 million threshold are able to reduce their tax liabilities by 80%, even though in aggregate the revenue loss from their behavior is less than 1%. We also present different scenarios in which the minimum tax rate and/or the revenue eligibility threshold change and assess their impacts on tax revenue and profits.

Given the stark losses faced by owners of capital in the previous scenarios, our second exercise consists in simulating tax systems in which the government varies the share of costs that can be deducted and the tax rate applied to the resulting taxable income base (Bachas & Soto, 2018; Best et al., 2015). Our results highlight the intuition that, starting from a non-distortionary system where only pure profits are taxed, allowing some degree of production distortion might generate large welfare gains by decreasing evasion costs incurred by firms[4]. The revenue-maximizing pair, holding aggregate profits constant, only allow firms to deduct 50% of

[3] Slemrod (2013) discusses in detail the use of notches and their implications on welfare. Kanbur & Keen (2014); Keen & Mintz (2004); Bigio & Zilberman (2011) discuss optimal thresholds for informality, which are akin to enforcement notches, when oversight requires fixed costs.

[4] As Bachas & Soto (2018) and Best et al. (2015), we refer to welfare gains considering scenarios in which aggregate profits do not fall but government revenues increase. Crucial to our results is the assumption that evasion costs are true social costs (Chetty, 2009).

costs and tax net revenues at 3.1%, generating 9.4% higher revenues. This level of revenue gains, furthermore, can be approximated using any deduction share below 85% by adjusting tax rates, including by the blunt revenue taxation instrument. Interestingly, we find that the revenue maximizing tax rate when revenue taxation is used is 1.65% - slightly higher but close to the actual rate implemented with the minimum tax.

Two caveats about our results should be taken into account. First, we do not attempt to estimate who bears the incidence of corporate taxes (Auerbach, 2005; Bastani & Waldenström, 2020). While the classic result of Harberger (1962) is that capital owners economy-wide bear the full incidence of corporate taxation in a closed economy, recent empirical evidence suggests that a substantial share of the tax burden is also borne by workers (Suárez Serrato & Zidar, 2016). For those reasons we also do not discuss any possible redistribution motives from the minimum tax reform, since such exercises would require attributing incidence. Second, our model of firm optimization and simulations do not consider general equilibrium effects of a broader tax base. Limiting cost deduction not only distorts firm size directly, but also cascades down production networks and distorts input prices and the size of downstream firms. Best et al. (2015) develop a general equilibrium model and show that introducing some degree of production inefficiency is still optimal when enforcement is imperfect.

This paper provides several contributions to the public finance literature. First, it provides new evidence on corporate responses to a minimum tax, a policy widely debated but for which evidence is still limited (Best et al., 2015; Mosberger, 2016). In particular, the minimum tax design allow us to credibly document and quantify tax evasion under the profit taxation regime, driven by cost over reporting. Estimates of tax evasion for registered taxpayers are particularly absent for lower-income countries where broad, randomized tax audits are rare[5]. Second, it contributes to the growing literature on bunching methodologies that use discontinuities in the tax design to identify structural parameters (see Kleven (2016) for a recent review). While there exists extensive research on how individuals react to discontinuities in the tax schedule (Saez, 2010; Bastani & Selin, 2014; Kleven & Waseem, 2013), we contribute to the more limited literature on how corporations respond to such incentives, similarly to the work of Bachas & Soto (2018) in Costa Rica and Devereux, Liu, & Loretz (2014) in the United Kingdom. Finally, our work provide new evidence on tax evasion in developing countries using administrative data. Londoño-Vélez & Ávila Mahecha (2019) document substantial evasion of a wealth tax in Colombia, highlighting the use of offshore accounts as a relevant mechanism and the role of tax authorities' enforcement to curb evasion. By document that availability of third-party information reduces bunching below the exemption threshold, this paper also reinforces the idea that evasion responses are not fundamental primitives that govern firms' behavior, but are to some degree sensitive to the enforcement context. This is consistent with other recent evidence that investment in tax authorities' capac-

[5]Trigueros, Longinotti, & Vecorena (2012) document that only nine out of eighteen surveyed countries in Latin America have any estimate of evasion available, for any kind of tax. Our estimates for Honduras refer to tax evasion by large corporations filing income tax and do not consider other margins such as non-registration or non-declaration.

ities might generate large gains in revenue by curbing evasion (Congressional Budget Office, 2020; Sarin & Summers, 2020; Johannesen et al., 2020; International Monetary Fund, 2015).

The rest of the paper is organized as follows. In Section 2 we present the context of corporate taxation in Honduras, discuss in details the minimum tax provisions and describe our sample. In section 3 we present a model of firm profit maximization that illustrates how we can expect corporations to react when faced with the introduction of a minimum tax. In Section 4 we first present non-parametric evidence of corporations' behavior under the minimum tax and then show how those can be used to recover structural parameters of interest. We provide robustness exercises that strengthen our argument that we identify responses to the minimum tax in section 5. In section 6 we present a calibrated model of firms' decisions and simulate the impact of alternative tax systems. We conclude in section 7.

2 Institutional Context and Data

We study a reform that introduced a minimum tax on corporations in Honduras, a lower middle income country in Central America with a population of 9 million and per capita GDP of $5,800 PPP in 2018. The level and composition of government tax revenues in Honduras is comparable to other countries with similar per capita income. First, total tax revenues represent around 18% of GDP, significantly below the average of 25% observed in high income OECD countries[6]. Second, the country is much more reliant on goods and services taxes, representing over 50% of total tax revenue, than on income taxes, which amount to one-third of total tax revenue. Finally, corporate income taxes are equivalent to 4% of GDP, almost twice as much as personal income taxes (International Monetary Fund, 2018). These last two facts are broadly consistent with the perception that lower income countries face significant informational constraints in assessing more complex tax liabilities and therefore rely more on broader sales taxes and/or taxing large corporations (Gordon & Li, 2009)[7]. Recent years have witnessed significant efforts to improve tax collection capacity in the country, including a broad overhaul of the Tax Authority agency in 2015[8]. Since then the number of income tax filers has doubled (from 74,000 to almost 150,000) and the share of electronic declarations has increased by 16 percentage points to 81%.

[6]These numbers refer exclusively to taxes and exclude important revenue components such as social security contributions. Considering total revenue, the OECD average revenue-to-GDP ratio is 35% while in Honduras it stays close to 20%, making the gap even starker.

[7]Figure A1 illustrate how Honduras compares to other countries in terms of overall and corporate income tax collection. While total tax collection as share of GDP is very much in line with the average value for countries with similar per capita income, Honduras is more reliant on corporate income taxes.

[8]Starting in 2013, the government of Honduras restructured several public institutions under the oversight of the "Centralized and Decentralized Public Administration Reform Commission". The reform of the tax authority (formerly known as DEI, *Dirección Ejecutiva de Impuestos*) was led by the Interamerican Development Bank (IDB). The diagnostic before the reform was that "most administrative and technical staff do not have the basic profiles or training levels required for managing tax administration properly." (Interamerican Development Bank, 2015). Other shortcomings described were similar to what International Monetary Fund (2015) identifies as key challenges to tax administration in many countries: high turnover of senior staff, lack of IT personnel and infrastructure, and lack of professional development. Over 1,500 workers were dismissed and new hires were performed by an international, independent human resources firm.

Non-incorporated taxpayers (*Personas Naturales*) are approximately 80% of the total number of income tax filers and face a progressive tax schedule on labor income[9]. Corporations (*Personas Jurídicas*), on the other hand, face a 25% flat tax rate on taxable income, defined as gross revenues minus standard deductions such as wages, raw materials, depreciation of capital, interests paid and carryover losses[10]. Fiscal years in Honduras run according to the calendar year and taxpayers must file the income tax declaration by April 30th.

The minimum tax studied in this paper was introduced in 2014 as part of the broader "Public Finance Management, Exemptions' Control and Anti-Evasion Measures" tax law[11]. The two main features of the minimum tax are as follows. First, it exempts taxpayers reporting gross revenue below L10 million[12], which are still liable for a 25% rate on declared taxable income. Second, taxpayers reporting gross revenue above L10 million are liable for a minimum of 1.5% of their reported revenue. When filing the yearly income tax declaration, corporations must compute their tax liability under the usual profit regime and the 1.5% regime, and are liable for the largest of the two. Since profits are taxed at 25%, a taxpayer declaring 6% profit margin (tax liability divided by gross revenue) will face a tax liability equivalent to 25%*(6%) = 1.5% of gross revenues and will be located exactly at the edge between the two regimes.

Three special provisions of the Minimum Tax law are worth discussing in more detail. First, taxpayers in certain sectors (cement, state enterprises, pharmaceuticals and bakery) face a 0.75% rate instead of 1.5%. Firms in those sectors are less than 2% of taxpayers, so we exclude them from our main analysis and present separate results showing their behavior is also consistent with predictions from theory. Second, we also exclude from our main analyses firms operating in petroleum-related sectors and those in their first two years of operations, which are exempt from the minimum tax[13]. As discussed below, the number of corporations filing taxes is rapidly increasing in the period of study and "young" firms represent up to 25% of taxpayers in some years. Nonetheless, they are predominantly very small firms, with declared gross revenue well below the exemption threshold. Finally, firms declaring losses are also exempt from the minimum tax. This feature is potentially very relevant to our empirical exercises, since in theory that might create very strong incentives for low profit firms to report negative results. In practice, nonetheless, this behavior is very limited due to the existence of a net asset tax that applies to firms reporting losses. In Appendix F, we discuss the net asset tax in more detail and show

[9] The progressive tax schedule is updated yearly to account for inflation and includes four brackets with increasing marginal tax rates. In FY2019, income below L158,995 (approximately USD 6,400) was exempt and amounts above that face increasing marginal rates of 15%, 20% and 25%. Income from capital such as dividends and capital gains are taxed at a 10% flat rate.

[10] Throughout the paper we use the terms "taxable income" and "profits" interchangeably, always referring to the base taxed at 25%.

[11] The 2014 tax law also increased VAT rates from 12% to 15%, made permanent a surcharge of 5% on taxable income above L 1 million and introduced a 10% tax on dividends received by residents.

[12] Approximately USD 400,000 using the average market exchange rate in 2018 (USD 1 = L24.5). This is the exchange rate used throughout the paper when mentioning US dollar amounts.

[13] Both exemptions in the first years of operation and lower rate for sectors such as pharmaceuticals are common features of minimum tax regimes across the world. We provide a summary of minimum tax provisions in several countries in Appendix G.

that the introduction of the minimum tax seems to overwhelmingly affect firms that otherwise would be paying taxes on profit, not on their net assets. The fact that loss incurring firms are not liable for minimum taxes is still relevant to characterize which taxpayers are "marginal" in their response to the policy, and we go back to this point when discussing our results.

Despite being part of a larger tax reform, the Minimum Tax provision was highly salient and widely debated at the public sphere. A previous attempt to institute a 1% minimum tax had been established in 2011 but was eventually ruled unconstitutional by the Supreme Court and never went into effect. The 2014 reform was again challenged in the courts but eventually upheld as constitutional in 2015, and stayed in place until FY2017. In the aftermath of highly contested elections in that year, the government approved a package of reforms that included the gradual phasing out of the minimum tax provision. For FY2018, the exemption threshold was raised from L10 million to L300 million. The law also established further increases in the threshold to L600 million in FY2019 and L1 billion in FY2020, meaning that very few corporations will be affected by the minimum tax at the end of this period (International Monetary Fund, 2018).

2.1 Data and descriptive statistics

The main analyses in this paper are based on administrative data comprising the universe of income tax declarations from corporations in the 2011-2018 period. We supplement this data, in additional exercises, with monthly VAT declarations and third-party information on taxpayers' transactions. Electronic filing has steadily increased in the period, from less than 60% of total declarations in 2011 to almost 85% in 2018[14]. Throughout the paper, we exclude taxpayers in special regimes that exonerate them from paying any income taxes[15]. The resulting dataset is an unbalanced panel of over 180,000 firm-year observations and approximately 41,000 unique firms.

We present basic descriptive statistics for our sample in Table 1 for years 2013-2018, highlighting the following facts. First, the number of corporations filing income tax has steadily increased throughout the period, from less than 20,000 in 2013 to approximately 30,000 in 2018. While in our main estimates we use an unbalanced panel of taxpayers, we show that firm's responses to the minimum tax are qualitatively similar in a balanced panel of corporations that file every year. Second, average reported gross revenue was around L30 million (USD 1.2 million) but with wide dispersion: the median corporation in the sample had yearly gross revenues of L1.2 million (USD 48,000) and over 80% reported revenues below L10 million. Third, pre-tax profit margins steadily increase throughout the period, from less than 2% in 2013 to almost 5% in 2018. As discussed below, part of this increase is likely explained by the introduction of the minimum tax, which induced a decrease in reported deductions and consequent increase in profits. Despite that, average profit margins are always well below 6%, meaning that the average tax liability under profit taxation is less than 1.5% of gross revenues. Fourth, even though the minimum tax is not directly

[14]Our dataset encompasses declarations using three type of forms: DEI-350 was an electronic form discontinued in 2015, when the more detailed SAR-357 was introduced. Throughout the period, taxpayers could also use a pre-impressed form (SAR-352) which provides less detailed information on both revenues and deductions.

[15]Approximately 3-5% of corporations in each period, mostly export-oriented manufacturing firms.

aimed at multinational corporations (MNC) operating in the country, these are disproportionately large and thus potentially affected by the policy: even though MNCs represent only 2-4% of corporate filings, they answer for approximately 60% of taxes[16]. Finally, even though only a small fraction of firms end up liable for minimum taxes (between 6-8% in 2014-2017), they contribute 20-30% of total corporate tax revenues. Indeed, despite the number of firms liable for minimum taxes falling by an order of magnitude in 2018, their contribution to total corporate tax revenues was still close to 15%.

In order to illustrate the relevance of the largest corporations to tax collection, we present in Table 2 the share of total revenue and taxes declared by the largest taxpayers. In 2013, before the introduction of the minimum tax provision, the largest twenty corporations in terms of gross declared revenue (top 0.1%) declared almost 30% of total revenues and accounted for 32% of total corporate taxes. Almost 70% of taxes were generated by the top 1% corporations and the top 10% (approximately 2,000 firms) paid more than 90% of taxes[17]. This skewness in the distribution of corporations' size highlights the significant potential of the minimum tax to increase revenue collection despite exempting approximately 80% of firms.

3 Model

In this section we present a stylized model of firms' profit maximization to illustrate the incentives introduced by a minimum tax and motivate the empirical exercises that follow. Firms choose a production level y and the level of costs $\hat{c}$ reported to the tax authority. True costs of production are given by $c(y)$ and firms face an increasing and convex loss in the amount of cost misreported given by $g(\hat{c} - c(y))$, with $g(0) = 0$[18]. Following Best et al. (2015), we allow for different tax bases to accommodate the fact that the minimum tax imposes a broader tax base. Let μ be the share of costs that can be deducted to obtain the tax base, then firms choose the vector $(y, \hat{c})$ to maximize profits:

$$\Pi(y,\hat{c}) = y - \tau\big(y - \mu\hat{c}\big) - c(y) - g\big(\hat{c} - c(y)\big) \tag{1}$$

[16]Multinational corporations are defined as firms filing transfer price declarations at some point in the period 2014-2017. The potential for the minimum tax to increase tax collection from MNCs depend not only on their gross revenues but also on their profit margin in the absence of minimum taxation. In Figure A2 we show that large MNCs declare higher profit margins than domestic firms in 2013, but still only 30% declare margins above 6%, implying an effective tax rate above 1.5%.

[17]This is similar to what Devereux et al. (2014) report for corporations in the United Kingdom (top 1% account for 80% of corporate income taxes) and Almunia & Lopez-Rodriguez (2018) report for Spain (top 2% report 80% taxable profits). In the United States, Auerbach (2005) mentions that the largest 0.04% corporations in terms of assets account for 62% of all corporate income tax in 2001. In a more similar context, Bachas & Soto (2018) document that the largest 20% corporations account for 87% of corporate taxes, which is a substantially smaller share than in Honduras

[18]In our stylized model we consider that firms can only misreport cost and not revenue. This is a simplifying assumption we make to illustrate the idea that it is easier to misreport costs than revenue.

Under a flat system of profit/revenue taxation, optimality conditions require:

$$\tau\mu = g'(\hat{c} - c(y)) \tag{2}$$

$$c'(y) = \frac{(1-\tau\mu)}{1-\tau} = 1 - \tau\frac{(1-\mu)}{1-\tau\mu} = 1 - \tau_E \tag{3}$$

That is, firms equate the marginal cost of misreporting costs to the marginal benefit $\tau\mu$, and equate the marginal benefit of producing one extra unit of output $1-\tau$ to the marginal cost $c'(y)(1-\tau\mu)$, which crucially depends on how much of costs can be deducted from the tax bill. We re-write equation (3) so that firms equate the marginal cost of production to $1-\tau_E$, the net-of-tax benefit of marginally increasing production.

Under a pure profit taxation regime, when all production costs can be deducted ($\mu = 1$), we have that $\tau_E = 0$ and $c'(y^*) = 1$: taxes on pure profits are non-distortionary and firms choose the efficient level of production. In the other extreme, when $\mu = 1$ firms pay taxes on their gross revenue and $\tau_E = \tau$ and $c'(y_r) = 1 - \tau \implies y_r \leqslant y^*$. That is, firms are sub-optimally small since the marginal benefit of an extra unit of revenue is $1-t$. For any interior value of $\mu \in (0,1)$, production levels will be below optimal.

While taxing a broader base than profits induce distortions in productions levels, the opposite is true for evasion levels: under revenue taxation equation (2) becomes $g'\big(\hat{c} - c(y)\big) = 0$ and then $\hat{c} = c(y)$. When costs are not deductible, firms have no incentive to misreport and so report truthfully. Increases in costs deductibility μ induce firms to increase their reported costs in order to reduce tax liability, but also produce misreporting losses[19].

3.1 Incentives under a minimum tax

As previously discussed, corporations reporting yearly gross revenue below L10 million are exempt from the minimum tax provision. To illustrate the incentives that generate behavioral responses, consider first firms with gross revenue significantly above L10 million and therefore not exempt from the minimum tax. Corporations which in the absence of the minimum tax would have reported profit margins above 6%[20] have no incentive to change their behavior: they will still pay taxes on profits since their effective tax rate will be above 1.5%. Firms which declare positive profit margins below 6%, on the other hand, now face a tax of 1.5% on their gross revenues instead of 25% on declared taxable income. According to the model discussed, this induces changes in two dimensions. First, production decisions are now distorted, and firms will decrease in scale. Second, under revenue taxation firms will not over-report costs, since misreporting entails losses but no longer provide the benefit of minimizing tax liability. As discussed in Best et al. (2015), under the assumption of decreasing returns to scale both behavioral changes

[19] Importantly for welfare evaluation, we interpret these evasion losses as social losses, such as the costs of keeping parallel accounting systems or avoiding entering certain economic transactions that might reveal true costs. As discussed by Chetty (2009), implications for welfare analysis differ if evasion costs are actually seen as transfer between agents (fines paid to the government, for example) or if perceived costs are different from actual costs.

[20] Or negative profits, since these are also not subject to the minimum and therefore pay no taxes.

imply an increase in reported profits, causing the pre-tax profit margin distribution to shift right. Since taxpayers reporting profit margins above 6% are not affected, only the distribution below 6% is shifted and we should observe an excess mass around that threshold.

While firms with revenues significantly above L10 million are infra-marginal to any revenue-bunching behavior, those locating close to the threshold might change their production decisions to avoid being subject to the minimum tax. Consider first a corporation that in the absence of the minimum tax would generate revenue slightly above L10 million and very low profits, such that their tax liability is close to zero. With the introduction of the minimum tax, they would now be liable for 1.5% of their reported gross revenue. Under those circumstances, it might be optimal for them to reduce their scale below L10 million in order to be exempt. On the other hand, a high-profit firm that would have reported a profit margin above 6% even in the absence of the MT has no incentive to change their behavior. Their tax liability will be larger than 1.5% of gross revenues and they are not affected by the change in policy.

Unlike notches generated by wealth (Londoño-Vélez & Ávila Mahecha, 2019) or gross income taxes (Kleven & Waseem, 2013), where all taxpayers above the notch see their liability discontinuously increase, in our setting only a subset of taxpayers are affected by the notch (Bachas & Soto, 2018). The benefit of declaring revenue below the threshold, i.e., of bunching, is inversely proportional to the profit margin that would be declared in the absence of the minimum tax. In Figure 1, we illustrate how bunching incentives vary according to the combination of profit and revenue decisions.

Consider the profits of a hypothetical taxpayer that must decide between choosing a production level below the exemption threshold (bunching) or producing slightly above the threshold and paying the minimum tax:

$$
\begin{aligned}
\Pi(y^T,\hat{c}|\text{Bunch}) &= y^T - \tau_\pi(y^T-\hat{c}) - c(y^T) - g(\hat{c}-c(y^T)) \\
\Pi(y_0,\hat{c}_0|\text{NotBunch}) &= y_0 - \tau_y y_0 - c(y_0) - \underbrace{g(\hat{c}_0 - c(y_0))}_{=0}
\end{aligned}
$$

in which the term of cost misreporting will be zero since staying above the threshold means being taxed on revenue, so there is no incentive to overreport costs.

The gains from deciding to bunch can therefore be written as

$$
\text{Gains} \approx \underbrace{(y^T - y_0)}_{\leqslant 0} - \underbrace{(c(y^T)-c(y_0))}_{\leqslant 0} - \underbrace{(\tau_\pi y^T - \tau_y y_0)}_{\geqslant 0} + \tau_\pi \hat{c} - g(\hat{c}-c(y))
$$

The expression above breaks down the change in profits when deciding to bunch. The first two terms capture the fact that, when bunching, firms will reduce real output, therefore losing revenue but also reducing costs. The third term captures the fact that bunching means paying a much larger tax rate on gross reported revenues (25% vs. 1.5%), while the fourth term captures the main benefit of bunching: the opportunity to deduct 25% of all costs when being taxed on profits instead of revenue. This highlights the fact that the incentive to bunch is directly (inversely) proportional to costs (profits): for any given level of revenues, firms with higher costs have a stronger incentive to bunch since they will be able to deduct those costs from their tax base when bunching[21]. The fifth term captures the negative effects for the firm in misreporting costs, which is increasing in the distance between true and reported costs.

4 Empirical results

We start this section providing non-parametric evidence that the introduction of the minimum tax substantially increased the effective tax rate faced by large corporations and that taxpayers responded in a manner consistent with the model described above. We then proceed to explore these behavioral responses in order to recover structural parameters of interest.

4.1 Effective tax rates

The immediate objective of the minimum tax was to create a floor to the effective tax rate faced by large taxpayers: regardless of declared profits, corporations with revenue above L10 million should not pay less than 1.5% of their declared gross revenues in taxes. In Figure 2, panel A, we present evidence that the policy substantially raised the effective rate faced by large corporations. In the period 2011-2013, before the minimum tax was in place, the median effective rate faced by firms with gross revenue around L10 million was approximately 0.5% of their revenues. Between 2014 and 2017, when the minimum tax is in place for firms above L10 million, the median effective rate dramatically changes around the threshold. Firms declaring gross revenues below that level still face an effective rate close to 0.5%. Corporations with revenue above L10 million, however, are now subject to the minimum tax and the median firm faces an effective rate of exactly 1.5%[22]. While in panel A we focus on corporations around the exemption threshold, in panel B we document that the policy was effective in increasing the median effective rate for all firms declaring gross revenue well above the threshold.

4.2 Evidence of behavioral responses

We start presenting evidence that, consistent with the simple model outlined previously, taxpayers responded to the existence of the exemption threshold by reporting gross revenue immediately below L10 million. In Figure 3, we present the empirical densities of reported gross revenues separately for three periods: 2011-2013, before the introduction of the minimum tax; 2014-2017, when the policy was in place with a L10 million exemption threshold; and 2018, when the exemption threshold was increased to L300 million. It is clear that, in the absence of the notch created by the minimum tax, the distribution of reported revenue is smooth throughout the interval. In

[21]As discussed in section 2, firms reporting negative profits are not liable for the minimum tax. Incentives to bunch are therefore largest for firms with high costs but positive profits, and turn to zero when firms incur losses.

[22]Figure A3 shows a similar pattern when plotting the average instead of median effective rate.

the period when the minimum schedule creates a notch at L10 million, however, corporations respond by adjusting their reported revenue to slightly below the threshold: there is a clear excess mass of firms in that region, and a more diffuse absence of mass slightly above. Consistent with the theory presented previously, there is no "hole" in the distribution immediately above the L10 million notch, since the minimum 1.5% effective rate is not binding for firms with high enough profit margin[23]. Furthermore, we highlight that the bunching in reported gross revenue might be driven by real production responses, by under reporting real revenue or by a mix of the two. We return to this issue below and provide evidence that at least part of this behavior is driven by misreporting.

While firms immediately to the right of the notch have a strong incentive to bunch at the L10 million threshold, firms that would have reported much larger revenue are infra-marginal to the bunching behavior. Under the minimum tax, firms are taxed on gross revenues whenever declared profit margin is below 6%, so incentives to over report costs to minimize tax liability disappear. According to our model, this should induce a right-shift in the distribution of profit margin below the 6% threshold, and an excess mass exactly at the kink. Similarly to other contexts where taxpayers face kinks, in practice we often observe a diffuse mass in the vicinity of the kink (Saez, 2010). In Figure 4, Panel A, we present the empirical density of reported profit margin for firms declaring revenue above L13 million, and therefore infra-marginal to the bunching behavior at the notch, separately for 2011-2013 and 2014-2017. In the period before the introduction of the minimum tax, we observe a steep negative slope in the density of profits, smoothly distributed around the 6% kink. With the introduction of the minimum taxation in 2014, the distribution becomes starkly different. First, there is much less mass around positive but close to zero profit margins: declaring small profits does not decrease tax liability, since firms are liable for the minimum tax, so they report their profit truthfully, which leads to an increase in declared profit margins. Additionally, firms face a kink in their tax liability at the 6% rate and respond by bunching: there is a clear excess mass of firms around the kink.

While in Panel A of Figure 4 we illustrate the change in profit margin density before and after the introduction of the minimum tax, panel B presents empirical densities for the period 2014-2017, while the minimum tax was in place, separately for firms with reported revenue significantly below and above the L10 million threshold. The pattern is remarkably similar to Panel A: firms unaffected by the minimum tax are much more likely to declare low profit margins, while those eligible declare higher profit margins and bunch at the 6% kink.

The previous set of figures are strong evidence that the minimum tax was a highly salient policy change that induced taxpayer behavioral responses. In the remaining of this section we explore how these responses can be used to identify parameters of interest.

[23]As discussed by Kleven & Waseem (2013), Bachas & Soto (2018) and Gelber, Jones, & Sacks (2020), among others, some firms might not respond to the incentives to bunch due to inattention, high adjustment costs or some combination of other frictions. We discuss below how we interpret the existence of such taxpayers in our elasticity estimates.

4.3 Revenue elasticity at the L10 million notch

As discussed above, the introduction of the minimum tax creates a potential notch for taxpayers declaring gross revenue in the vicinity of L10 million: tax liability might change discontinuously when reporting revenue just above the notch, particularly for low profit corporations. According to our model, firms deciding to locate exactly at the notch (bunchers) come from a continuous region $[y^T, y^T + \Delta Y]$, where $y_T = L10$ million.

In order to recover ΔY, we start by discussing how to estimate the counterfactual density that would have prevailed under a 25% flat tax rate on profits. Following Saez (2010) and Chetty, Friedman, Olsen, & Pistaferri (2011), we fit a polynomial regression to the empirical density of revenue, including dummies for the "excluded region" - the area around the notch affected by the policy. We then predict the counterfactual density for the entire distribution ignoring the dummies, such that we extrapolate the polynomial prediction to the bunching area, assuring a smooth counterfactual distribution around the notch.

We first collapse the data in bins of L100,000 (USD 4,080) of revenue and estimate:

$$n_j = \sum_{k=0}^{5} \beta_k y_j^k + \sum_{b=y_L}^{y_H} \gamma_b \mathbb{1}\{y_j = b\} + \epsilon_j \tag{4}$$

where n_j is the number of observations in bin *j*, y_j are the revenue midpoint of bin *j*, $[y_L, y_H]$ is the excluded region affected by the notch and $\mathbb{1}\{y_j = b\}$ are dummies indicating that bin *j* belongs to the excluded region.

The predicted counterfactual density is defined as $\hat{n}_j = \sum_{k=0}^{5} \hat{\beta}_k y_j^k$. We then define the excess mass of taxpayers in the bunching area as the difference between the empirical and the predicted densities $\hat{E} = \sum_{b=y_L}^{y_N} (n_j - \hat{n}_j)$, where y_N is the bin with upper bound equal to the notch threshold.

The credible estimation of the counterfactual density requires the excluded region to be correctly determined - all those bins affected by the existence of the notch/kink in the budget set should not be used to estimate the counterfactual density. We follow the method pioneered by Kleven & Waseem (2013): while the lower bound of bunching is visually determined, we use the convergence method to obtain an upper bound for the affected region. We exploit the fact that, according to our model, the excess mass observed immediately below the notch ($\hat{E}$) must be equal to the missing mass above $\left(\hat{M} = \sum_{b=y_N}^{y_u} (n_j - \hat{n}_j)\right)$, so we recursively estimate the above regression increasing the upper bound until $\hat{E} \approx \hat{M}$ [24], at which point we determine that to be the upper bound.

Under the assumption of homogeneous elasticity across all taxpayers, this **convergence method** allow us to recover the structural revenue elasticity: the upper bound y_u determines the point at which taxpayers are indifferent between bunching and staying at their internal optimal solution. If elasticities are heterogeneous, however, the convergence method recovers the

[24] Since we estimate the regression using discrete bins, we determine $\hat{E} \approx \hat{M}$ to mean that $|(\hat{E} - \hat{M})/\hat{E}| \leqslant 0.03$.

response of the taxpayer with higher elasticity (the marginal buncher) (Kleven & Waseem, 2013; Londoño-Vélez & Ávila Mahecha, 2019). For that reason, we consider our estimate using that method as an upper bound on the true structural elasticity.

A second approach we take is similar to the "bunching-hole" method proposed by Kleven & Waseem (2013), but adapted to take into account the fact that bunching incentives depend on firms' profit margins (Bachas & Soto, 2018). We provide details on Appendix D, but we interpret it as providing a lower bound on the average revenue elasticity around the notch.

Once we have estimates of ΔY, we can recover the revenue elasticity with respect to the net of tax rate. As shown in Kleven & Waseem (2013), however, we need to adjust the elasticity formula to take into account that in notches we observe a change in *average* tax rate faced by taxpayers, and not *marginal* taxes. Since in this context taxpayers are liable for profit taxes on one side of the threshold but revenue taxes on the other, we need to adjust the formula slightly (details are presented in Appendix B). We use the following expression to calculate the revenue elasticity:

$$\epsilon_{y,(1-\tau)} \approx \left(\frac{\Delta Y}{Y^T}\right)^2 \left(\frac{(1-\tau)}{\Delta\tau}\right)\left(\frac{1}{2+\frac{\Delta Y}{Y^T}}\right)$$

Empirical revenue densities for each year and estimated counterfactual densities are presented in Figures 5 and 6. In each figure we provide estimates of the total excess number of firms (B), the excess mass of firms as a share of average density (b), the upper bound of revenues estimated using the convergence method (y_u) and the number of underlying observations used in each graph (N). Estimates for each year and from all firm-year observations pooled are presented in Table 3[25]. At each year between 2014 - 2017, we estimate an excess between 80 and 150 taxpayers around the cutoff - between four and six times as many firms as the average density in the bunching region. In order to estimate the revenue-elasticity, the key parameter we need to obtain the change in reported revenue ΔY.

First using the convergence method, which provides an upper bound on the elasticity, we estimate that $\Delta Y \in [1.4, 3]$: the marginal buncher would have reported gross revenue between L11.4 and L13 million, therefore reducing their reported revenue between 15 - 30%, depending on the year, when faced with the incentives provided by the minimum tax schedule. Using the approximation for the elasticity discussed above, we arrive at revenue-elasticities in the interval of 0.6-2.6. To give some context to those magnitudes, Londoño-Vélez & Ávila Mahecha (2019) report wealth-elasticities in the range of 0.3 - 4 depending on the year, and Kleven & Waseem (2013) on the range of 0.05 - 1.3 (but only one estimate is above 1), both using the convergence method. Bachas & Soto (2018), exploring different notches in the tax schedule faced by firms in Costa Rica, obtain much smaller elasticities of 0.1 and 0.25. While the estimates for 2014 and 2015 are well above unit, for most subsequent analysis we consider the upper bound elasticity to

[25] Standard errors are obtained by bootstrapping the entire estimating procedure resampling errors from equation (4) 500 times.

be $\epsilon_y = 0.99$, the estimate for the pooled sample.

We also present our lower bound estimates for ϵ_y using the second method discussed above. Here estimated elasticities are both much lower and more stable across years, in the range of $[0.2, 0.4]$. Again, these estimates and the gap between the two methods are not inconsistent with other results found in the literature: Londoño-Vélez & Ávila Mahecha (2019) report elasticities in the range of 0.08 - 1.2, and Kleven & Waseem (2013) on the range of 0.05 - 0.3, using this method (with some adjustment for non-response as mentioned above)[26].

4.4 Real or misreporting response at L10 million notch?

As previously mentioned, the observed bunching in declared gross revenues under the minimum tax could be due to real production decisions, to under reporting of realized revenues or to a mix of both. In this section we explore the evidence related to these possibilities.

First, we explore whether the amount of bunching is related to the availability of third-party information (TPI) about taxpayers' sales. Previous studies have documented much less bunching in response to change in marginal tax rates among wage-earners than among the self-employed (Saez, 2010) and also less evasion (measured by audits) for income with third-party information (Kleven, Knudsen, Kreiner, Pedersen, & Saez, 2011). All else equal, we consider that observing less bunching among taxpayers with higher share of revenues reported by third-parties is evidence in favor of misreporting as opposed to real production decisions.

Several transactions in which firms engage, such as selling to the government or exporting, generate third-party information: these sales are directly informed to the tax authority, allowing them to independently assess part of the revenue declared by taxpayers[27]. The availability of this information, nonetheless, is limited: overall less than 60% of corporations have any third-party information available, and even among larger firms declaring revenue above L5 million more than 15% are not covered at all. Conditional on having any third-party information available, the median ratio between self-declared and third-party informed revenue is only 25%[28].

In Figure 8, panel A, we plot the empirical density of revenue for the period 2015-2017 around the L10 million threshold separately for two groups: corporations for which some third-party information is available and those for which it is not. We observe bunching in both distributions, although there is slightly more mass below the threshold among those firms with no third-party information available. Since for a significant number of taxpayers the amount reported by third-

[26]In Figure 7 we present a graphical comparison of the main estimates discussed above.

[27]The tax authority uses five sources to construct a measure of third-party informed revenue for taxpayers. The most important one are sales to some large companies, which are mandated to report individual purchases as part of the credit system used for VAT. Credit and debit card operators also provide information on sales as they are VAT withholding agents. All sales to the government and exports are also directly accessible to the tax authority. Finally, some other withholding activities by very large companies also generate information on sales of their suppliers.

[28]One clear limitation for the availability of third-party information is the rule that determines which firms must provide detailed purchase information on suppliers as part of the VAT credit system. Currently, only firms that are legally defined as "medium" and "large" are mandated to report individualized purchase information, while "small" firms can provide only total purchases used for credit. The legal definition of firm size was last updated in 2011 and only includes around 1,200 corporations as medium and large.

parties is very small, we also repeat the exercise in panel B, now separating the sample in those above and below the (unconditional) median share of reported revenue (15%). Now we observe a much sharper bunching behavior for firms with lower degree of third-party reporting, although excess mass is still clearly present for firms with higher degree of third-party coverage. We quantify these differences in panel A of Table 4. Whereas we estimate the excess mass at the notch for firms with below median share of TPI as four times the counterfactual density, for firms with above median coverage we estimate seven times as much mass, and this difference is precisely estimated. We interpret this finding as evidence that at least part of the observed bunching is due to corporations misreporting their revenue in order to be exempt from the minimum tax, as opposed to purely real production responses.

We provide additional evidence that bunching below the exemption threshold is driven by revenue misreporting by evaluating heterogeneity across economic sectors. The availability of TPI varies systematically across sectors given the nature of their economic activities and position in the supply chain. On one extreme, the median corporation operating in construction or retail sees less than 15% of their total self-declared revenue being reported directly to the tax authority by third-parties[29]. On the other, for the median firm in manufacturing or transportation sectors the revenue reported by third-parties amount to approximately 40% of their self-reported revenue. We then evaluate whether bunching at the sectoral level is systematically correlated with the amount of TPI availability in the sector (Almunia & Lopez-Rodriguez, 2018).

In panel B of Table 4 we present estimates of excess bunching at the notch, normalized by the predicted density at the threshold (column 2). First, we estimate large and precisely estimated excess bunching for firms in all economic sectors. The amount of bunching, however, vary significantly across sectors: the excess mass ranges from 3.5 times the counterfactual density in manufacturing to approximately 8 times in agriculture and construction. To assess whether the amount of bunching is correlated with the availability of TPI, in Figure 9 we plot the estimated excess mass in each sector and the median share of revenue informed by third-parties. There exists a strong negative correlation between the two measures: in sectors where third-party reporting covers a larger share of firm's revenue much less bunching is observed immediately below the L10 million notch. Take retail, where the majority of sales are to final customers and a low penetration of debit and credit cards means that only a small fraction of corporations' revenues are reported to the tax authority. The excess mass observed below the notch is seven times the predicted density, indicating a large amount of response to the incentives provided by the minimum tax. Manufacturing firms, on the other hand, mostly supply to other firms and see a much larger share of their total sales directly informed to the tax authority. Here the excess mass at the notch is only half that observed among retail firms. While other factors might be contributing to the observed negative correlation, we interpret this as further evidence that misreporting revenues

[29]We compute, for each corporation and year, the total amount of revenue informed by third party and divide it by the gross revenue self-reported in the annual income tax declaration. The availability of firm-level information on TPI allows for a direct measure of the information set available for the tax authority on taxpayers revenues. Almunia & Lopez-Rodriguez (2018), for example, rely on the input-output tables to compute the share of sales from each sector to final consumers to perform a similar exercise.

plays a role in explaining the observed bunching below the exemption threshold.

4.5 Cost misreporting at 6% profit threshold

We now turn to firms with gross revenue significantly above L10 million and therefore infra-marginal to the bunching behavior discussed above. With the introduction of the minimum tax, firms reporting more than 6% in profits are not affected and pay a 25% rate on their reported taxable income, whereas those reporting less than 6% will pay a fixed amount of 1.5% over their gross revenues.

While all those reporting profits below the threshold are expected to increase reported profits, an amount B of taxpayers will bunch at the threshold - allowing for some optimization friction, they will locate in the vicinity of the threshold. These bunchers are coming from a continuous segment $[\Pi_T - \Delta\Pi, \Pi_T]$ below the kink. All taxpayers who would otherwise be in this area instead bunch at the threshold. The area where they would otherwise be is not empty, however, since taxpayers who would have declared a lower profit now declare higher profits and are observed in this area, such that we see no "absence of mass" in the distribution.

Following a very similar approach as the one used above, we estimate a counterfactual distribution of profits using a polynomial regression and obtain estimates of the excess mass of taxpayers located around the kink. We can then recover the change in reported profits induced by the kink as

$$\Delta\hat{\Pi} \approx \frac{\hat{B}}{f_0\left(\frac{\tau_y}{\tau_\Pi}\right)}$$

Figures 10 and 11 present the empirical densities in each year and the estimated counterfactual profit densities. In the first three columns of Table 5 we present initial estimates of excess bunching and $\Delta\hat{\Pi}$ separately for each year in the 2014-2017 period and also for the entire period pooled. Between 60 and 210 firms are estimated to bunch around the 6% profit threshold each year in the period 2014-2017, with the mass between equivalent to 2-6 times the average density in the interval. Our estimates of change in reported profits fall between 0.9-1.1 percentage point, a narrow range of estimates for all periods with the exception of 2014 where we estimate much lower change in profits (0.4 p.p.).

In order to interpret the magnitude of these changes in reported profit in relation to parameters of interest, we follow Best et al. (2015) in decomposing the observed $\Delta\Pi$ as follows:

$$\Delta\hat{\Pi} == \frac{\tau_y^2}{\tau_\pi}\epsilon_{y,(1-\tau)} - \frac{d(\hat{c} - c(y))}{\hat{y}}$$

We present the results of these decompositions in the last columns of Table 5. In column (5) we present what would be the necessary revenue elasticity, according to the model to match our bunching estimates if there is no cost overreporting. With the exception of 2014 where the $\epsilon_y = 4$

is not that distant from some of our upper bound estimates of revenue elasticity using the notch, the remaining elasticities of 10-12 are five times larger than our largest estimate, suggesting that cost and/or revenue evasion must be playing a significant role in explaining the observed bunching.

We present our estimates of cost misreporting in column (6), using the revenue elasticity of $\epsilon_y = 0.99$ previously obtained in the pool sample. With the exception of 2014, where bunching is smaller, in the period 2015-2017 and using the pooled data we estimate that cost misreporting is in the range of 13-17% of reported profits. This is very much in line with the main estimates in Best et al. (2015).

4.6 The composition of cost adjustments

In the previous sections we document that corporations evade a substantial amount of taxes by over reporting costs under a profit regime, and immediately change their reporting behavior when evasion incentives disappear under the minimum tax. Evidently, we measure evasion decisions taken in a specific institutional context: we should not expect these behaviors to be invariant to changes in audit intensity by the Tax Authority, for example. One relevant policy question arising from these evasion responses is whether firms adjust all cost categories similarly between these regimes, or if some cost items seem particularly prone to evasion.

We first present non-parametric evidence, in Figure 12, that deduction levels change discontinuously at the L10 million revenue threshold, consistent with the fact that, under the minimum tax, larger firms increase their reported profits[30]. Reassuringly, we observe no discontinuity in claimed costs in the period 2011-2013, before the minimum tax was in place. In order to assess whether specific cost categories are more responsive to the change in incentives, we use detailed cost items claimed in corporate income tax filings to construct five broad cost categories: Labor, Goods and Materials, Operations, Financial and Losses & others[31]. In Figure 13, Panel A, we present costs as share of gross revenue for each bin of declared revenue. The figure suggests that "goods and materials" is the only deduction category that significantly changes at the L10 million threshold[32]. While for firms declaring revenue below L10 million the participation of goods in material steadily increases, the average share of those costs falls discontinuously by over 5 p.p. at the threshold and remains at a lower level for firms declaring up to L15 million in revenue. In Panel B of the same figure we focus on the "goods and materials" category, showing that the discontinuous change observed at the notch is not observed any longer in 2018, when the exemption threshold is moved to L300 million.

[30]In Figure A4 we show that the discontinuous change in deductions claims around the notch implies an increase in profit margins.

[31]The detailed breakdown of cost categories only exists for firms declaring using the electronic SAR-357 form introduced in 2015. In all exercises using detailed cost data, we restrict our sample to the period 2015-2018 and to taxpayers filing electronically (70 - 80% of all corporations).

[32]While firms do not provide information on the number of employees in their income tax filings, we use data on withholding of taxes on wages to approximate the number of wage workers across the revenue distribution. In Figure A5 we show that the average number of wage workers is smooth across the L10 million notch, suggesting no change in labor across the notch.

We present a more formal test of whether these discontinuities can be attributed to the minimum tax in Table 6. Since we previously presented strong evidence that taxpayers strategically locate below the revenue threshold in order to avoid the minimum tax, we cannot simply estimate a regression discontinuity at the notch. Instead we follow Bachas & Soto (2018) and estimate a linear "donut-hole" discontinuity regression, evaluating whether the level of costs change at the threshold but extrapolating from revenue levels not affected by bunching behavior[33].

In Column (1) we present results from a specification using median deductions by bin as dependent variable. We estimate that the amount of claimed deductions fall by approximately L260,000 at the threshold, consistent with the non-parametric evidence presented. Since the median deduction at the threshold is L9.8 million, the estimated effect implies that the median firm above the threshold decrease deduction claims by 2.7% and doubles the reported profit margin. In Columns (2) through (5) we repeat the same exercise but use the ratio of deductions to revenue as dependent variable. The only estimate statistically different from zero and meaningful in magnitude is goods and material costs: they fall by almost 5 p.p. from an average of 37% below the notch. Mosberger (2016), using a different empirical strategy, also documents a significant change in goods and materials costs by firms facing a minimum tax in Hungary, suggesting this seems to be a deduction category particularly over reported by firms trying to minimize profit tax liabilities and therefore a potential focus for tax authorities.

5 Robustness and additional exercises

In this section we provide a series of additional evidence that the empirical patterns presented above are indeed the result of corporations' behavioral responses to the minimum tax.

Our main sample consists of an unbalanced panel of corporations. Since the number of firms filing income tax increases significantly during the period, one might worry that results are purely driven by sample composition. We show that this is not the case by restricting the sample to a subset of firms observed in every year between 2013 and 2018[34]. In panel A of Figure A6 we present empirical revenue densities and in panel B we present profit margin densities for each year. The same pattern observed in the full sample is present in the balanced panel: an excess of firms reporting revenue slightly below L10 million and larger firms bunching around 6% profit margin in 2014-2017, but not before or after the exemption threshold was substantially increased.

We also investigate whether the bunching behavior in both revenue and profit margin reporting is distinct for firms operating in different economic sectors. We present empirical densities of revenue and profit margins in panels A and B of Figure A7, respectively. Bunching below the L10 million notch in revenue is particularly pronounced on wholesale, retail and other services,

[33]Unlike Bachas & Soto (2018), we cannot use these regressions to recover an estimate of cost elasticity. The reason is that, unlike in their setting where all firms in the bracket above the notch face an incentive to change costs due to a higher average tax rate, in our setting only low-profit firms will have an incentive to change costs, while firms with profit margins above 6% do not change their behavior. The observed change in average costs at the threshold will conflate both behaviors.

[34]There are 12,172 corporations that filed income tax declarations in every year between 2013 and 2018.

but can also be observed in almost all sectors with the exception of automotive and finance. The right shift of the profit margin distribution and the bunching around the 6% kink seems more widespread across sectors. In Table A1 we present estimates of excess bunching at the 6% profit margin kink and cost evasion for corporations in different economic sectors. With the exception of the small number of firms with undeclared economic sector, we estimate large and significant cost evasion for all sectors, ranging from 10% of taxable income in retail to over 25% in manufacturing, automotive and transportation. These results suggest that the behavior observed in the aggregate data is not driven by firms in few sectors.

As mentioned in Section 2, a small number of economic sectors were subject to a reduced minimum tax rate of 0.75% instead of 1.5%. According to our model, this means we should observe excess mass around $\frac{0.0075}{0.25} = 3\%$ for this group and not at the 6% kink faced by the majority of firms. Figure A8 shows that this is precisely the case: between 2014-2017, the distribution of profit margins for firms in these selected sectors is shifted to the left when compared to corporations facing the 1.5% minimum tax, and the peak of the distribution is exactly around 3%. This is further evidence that the behavior documented previously is not driven by other policies but a response to the minimum tax specific features.

We also explore the panel dimension of our data in two ways. First, we restrict the sample to a balanced panel of firms observed in the eight years covered by our data. We then pick firms that reported revenue within L2 million bins in the entire period while the Minimum Tax was in place (2014-2017) and evaluate how their reported revenues varied before and after that period. We present results in Figure A10. Firms which consistently reported revenue in the ranges of L6-8million, L10-12 million and L12-14 million also reported lower revenue, on average, in the period 2011-2013, before the introduction of the MT. Those in the bunching region, between L8-10 million, on the other hand, seem to have "converged from above": firms in these group reported, on average, revenue above L10 million in both 2011 and 2012, and only slightly below that in 2013. This is suggestive evidence of bunching through misreporting.

We also investigate whether bunching firms time their revenues differently by exploring monthly VAT data (Bachas & Soto, 2018). In Figures A9 and **??** we plot the mean and 95% confidence intervals of the mean monthly reported revenue for bunching and non-bunching firms. We deem "bunching firms" those reporting revenue between L9-10 million, and in the first figure we present non-bunching firms immediately below (L5-9 million) and above (L11-15 million), while in the second figure we compare only firms reporting yearly revenue between L9-10 million, but for different periods. There is no striking evidence that bunching firms report differentially across months. We also test this more formally in Table A2, assessing whether firms located at the bunching region decrease their revenues in the "bunching year" and increase their revenues in the following one. Our estimates are noisy and do not consistently suggest that to be the case.

Finally, we also investigate whether the bunching at the 6% profit margin kink is induced by "lazy cost reporting" (Best et al. (2015)). If there are fixed-costs in filing different cost line items, taxpayers might respond to the minimum tax by reducing the number of items filed and therefore generating an increase in profit margins, even if they were reporting truthfully under a profit taxation regime. We investigate whether there are significant changes in the share of cost line items reported in Figure A11. Panel A presents the share across the 6% profit margin kink, for firms reporting revenue above L13 million, while panel B reports shares across the L10 million notch. If the observed changes in deductions/profit were being driven by filing costs, we should expect an increase in the share of items reported when firms report profit margins above 6% (Panel A) and a decrease for firms reporting above the exemption threshold (Panel B). Instead, shares seems mostly smooth across the thresholds, and no different from the behavior of firms in 2018, when the exemption threshold was much higher and fewer firms are subject to the minimum tax. These results suggest it is unlikely that costly filing drive our results, and point to the importance of evasion under profit taxation.

6 Reforming the Tax System

Having estimated the structural parameters that govern firms' responses to taxes on both the revenue and cost/profit side, we now make stronger parametric assumptions to investigate the implications of alternative tax systems. We consider firms with isoelastic production costs and cost misreporting loss functions with the form:

$$\hat{\Pi}(y, c(y), \hat{c}) = (1-\tau)y + \tau\mu\hat{c} - \alpha_i - \frac{\theta_i}{1+1/e}\left(\frac{y}{\theta_i}\right)^{(1+1/e)} - \frac{B_i}{1+1/\gamma}\left(\hat{c} - c(y)\right)^{(1+1/\gamma)}$$

Taxpayer are heterogeneous in three dimensions, characterized by the vector $(\theta_i, \alpha_i, B_i)$ that define productivity, production fixed cost and evasion ability, respectively. Heterogeneity in productivity allows firms to have different optimal production levels, while varying fixed costs generates a distribution of profit margins.

We consider firms' profit maximization problem under a simple profit taxation regime and calibrate the model using the parameters previously estimated and data from 2013, before the introduction of the minimum tax (Best et al., 2015).[35]. Details are presented in Appendix C.

We perform two exercises. First, we simulate the actual Minimum Tax system implemented in Honduras in 2014, with an exemption threshold of L10 million in gross revenues and minimum effective tax of 1.5% for larger firms. We also consider how changes to the two main features of this system - the exemption threshold and the minimum tax rate - affect tax collection and firms' profits. Second, we simulate an alternative tax system in which all firms are taxed not on pure profits but on a broader base that only allow partial cost deduction.

We present results for our first exercise in Table 7. First, consider the actual minimum tax implemented, in which firms reporting gross revenue below L10 million are exempt and those above face a minimum tax liability of 1.5% of gross revenue. We estimate that over 60% of corporations declaring revenue above the exemption threshold are liable for the minimum tax and that

[35] We present simulated densities of gross revenue and profit margins under a minimum tax in Figures A13 and A12.

total government revenues increase by over 30% when compared to a flat profit tax rate of 25%[36]. This is attained by a 120% increase in the aggregate tax liability of firms paying the minimum tax and a decrease of 10% in aggregate profit for all firms in the economy. The fall in aggregate profits shows that, under the parameters of the actual policy implemented, the potential gains for firms when moving from profit to revenue taxation (decrease in losses from misreporting cost) is dwarfed by the losses from higher tax liability and production distortions.

Our calibrated model also allows us to quantify the strong incentives introduced by the exemption notch: the total tax liability of bunching firms is less than 25% what they would have payed had they stayed above the threshold and paid the minimum tax. Despite that strong reaction at the margin, the increase in taxes paid by infra marginal firms dwarfs this loss: reduction in taxes from bunching firms is only 1% of total revenue from the minimum tax. While in our model bunching below the exemption threshold is exclusively driven by real production decisions, we provided evidence that at least part of this behavior seems to be explained by revenue misreporting. That finding highlights that, despite generating relatively small aggregate losses, notches can generate large horizontal inequities: firms otherwise similar might be liable for vastly different tax burdens simply due to willingness to misreport revenue.

We now turn to assessing the impact of alternative minimum tax specifications, in which we vary both the exemption threshold and the minimum tax rate. We highlight two features of our simulations. First, holding constant the minimum tax rate on gross revenues, increasing the exemption threshold only slowly decreases total revenue gains due to the long right tail of firm size. Doubling the exemption threshold from L10 to L20 million, for example, still leads to 28% revenue gain, and a L50 million exemption threshold still increases tax revenue by 23%. For the same reasons, aggregate profits still fall substantially when considering exemption thresholds at L20 million (-9%) and L50 million (-7.6%). Second, small changes in the minimum tax rate generate large impacts in aggregate tax revenue and firms' profit, given the very broad base (gross revenue). Using the same L10 million exemption threshold and considering a minimum tax rate of 0.5% (implying a minimum profit margin of 2% under profit taxation), for example, generates a tax revenue increase of less than 4% and aggregate profit loss of 0.5%. When comparing these magnitudes with the actual policy implemented, the decrease in tax revenue gain is driven by two forces. First, the minimum "allowable" profit margin is now lower: corporations with a 5% profit margin, for example, are allowed to pay an effective tax rate of 25%*5% = 1.25% when the minimum tax is 0.5%, while they would be liable for the 1.5% minimum tax under the previous regime. Second, firms with very low profit margins now only pay 0.5% in effective tax rate instead of 1.5%. This logic extends to increases in the minimum tax rate: increasing it from 1.5% to 2% leads to a 50% increase in tax revenue but at the cost of a 17% fall in aggregate firms' profits.

These simulations suggest that corporations' owners had strong reasons to oppose the introduction of a minimum tax scheme, at least in the format it was implemented. Following Best et al. (2015) and Bachas & Soto (2018), we consider alternative scenarios that could be more at-

[36]In these simulations we exclude taxpayers that were liable for Net Asset tax in 2013, since we do not model firms' asset accumulation and reporting decisions.

tractive to corporate shareholders. Instead of pure profit taxation and an additional minimum tax on gross revenue, we consider systems that allow only partial deduction for all firms, under the constraint that aggregate firm profit is not reduced when compared to the baseline of pure profit taxation under a 25% rate. Here we explicitly explore the production vs. revenue efficiency trade-off at the heart of the minimum tax discussion of Best et al. (2015): it is only possible to increase both aggregate profits and government revenue because corporations incur in non-deductible misreporting costs under profit taxation. By introducing some production distortion in the form of partial cost deductibility, we can reduce losses from cost misreporting.

Figure 14 presents the main results of our simulation. For each level of deduction rate μ, we compute the revenue maximizing tax rate (under the constraint of constant profit) and how aggregate revenues change. For a wide range of deduction levels, we show that aggregate revenues could be increased by 8-10%. Among all possible pairs of (τ, μ), we estimate that allowing 45% of costs to be deducted and taxing the remaining net revenues under a 2.3% rate would increase government corporate tax collection by 9.4%, without reducing aggregate profits. But it is noteworthy that there is little gain to be obtained once we consider deduction rates below 85%: we obtain large revenue increases by introducing small distortions in production starting from firms' optimal production level, but after these initial distortions the government can do little more to raise revenue without decreasing aggregate profits. In particular, it's noteworthy that under a pure revenue tax system ($\mu = 0$), we estimate the optimal tax rate to be 1.3% - not far from the current 1.5% applied under the minimum tax.

7 Conclusion

Minimum taxes are a widely used tool of tax authorities to curb tax evasion in developing countries and are at the heart of recent debates on global tax cooperation. In this paper we provide new evidence on corporations' reaction to minimum taxes in the context of Honduras. The specific policy design, including an exemption threshold of gross revenues and the kink generated by minimum taxes, allows us to credibly estimate relevant elasticities.

We document widespread evasion under profit taxation through the over reporting of costs. Corporations in sectors such as manufacturing and automotive reduce their tax liabilities by up to 25% by inflating costs. While curbing evasion through excessive reporting of deductions is costly (Carrillo, Pomeranz, & Singhal, 2017), since it requires labor-intensive verification of receipts, our results suggest a focus for tax authorities: misreporting seems particularly rampant on costs related to purchase of goods and materials, which fall by about 5 p.p. as a share of revenue across the exemption notch.

Our estimates indicate revenue elasticity in the range of 0.35-1, implying that firms affected by the minimum tax reduce their gross revenue, through real responses and/or misreporting, by about 0.5-1.5%. We use our estimates to calibrate a model of firm optimization and estimate that, despite the behavioral responses of corporations, a 1.5% minimum tax applied to firms with gross revenue above L10 million increases tax revenues by one-third. Although firms bunching below the exemption threshold are able to substantially reduce their tax liability, the implications for aggregate revenue are insignificant: the associated revenue loss is less than 1%, since the the vast majority of taxes are being paid by very large firms that are infra marginal to the bunching behavior. We also simulate alternative tax schedules, in particular considering flat systems that limit tax deductions. We estimate tax revenue gains in the range of 10%, without aggregate profit losses.

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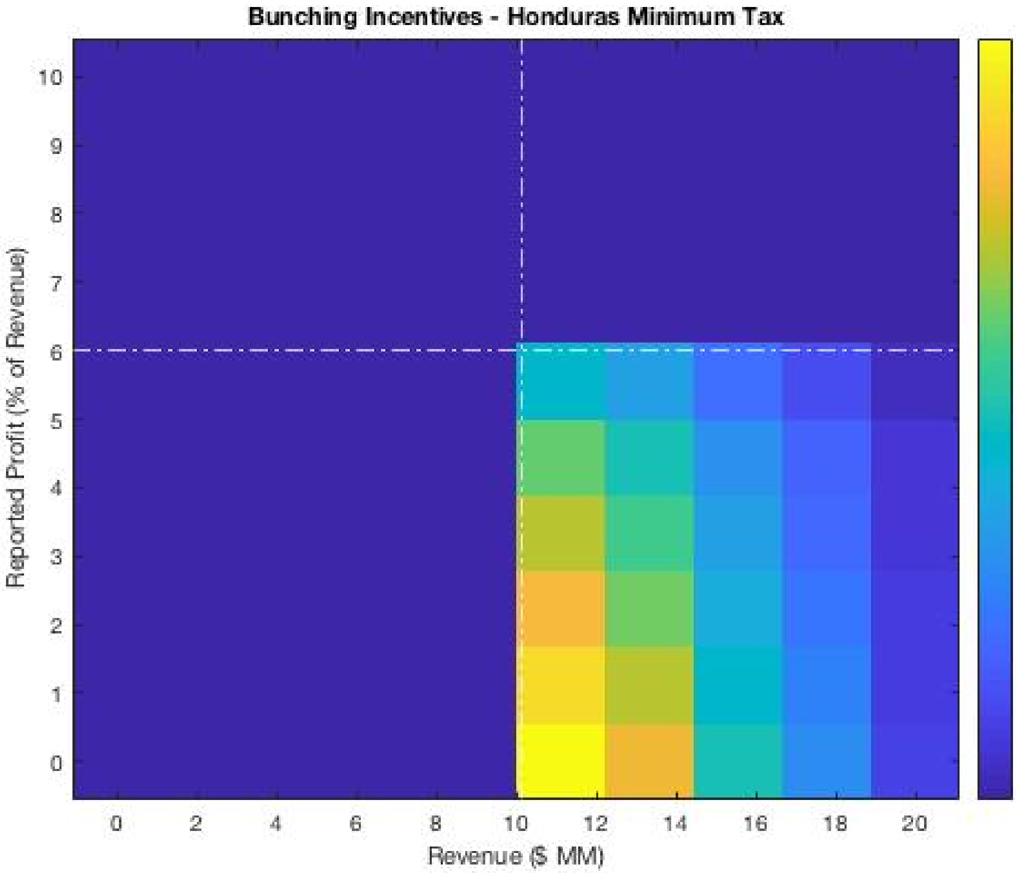
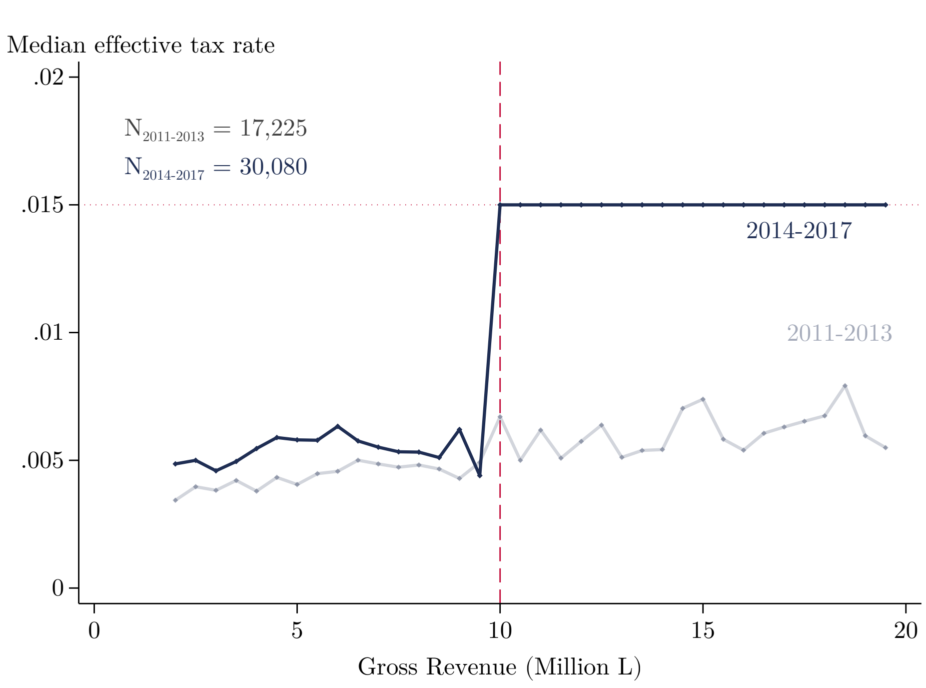
8 Figures and Tables

Figure 1: Heat Map of Incentives

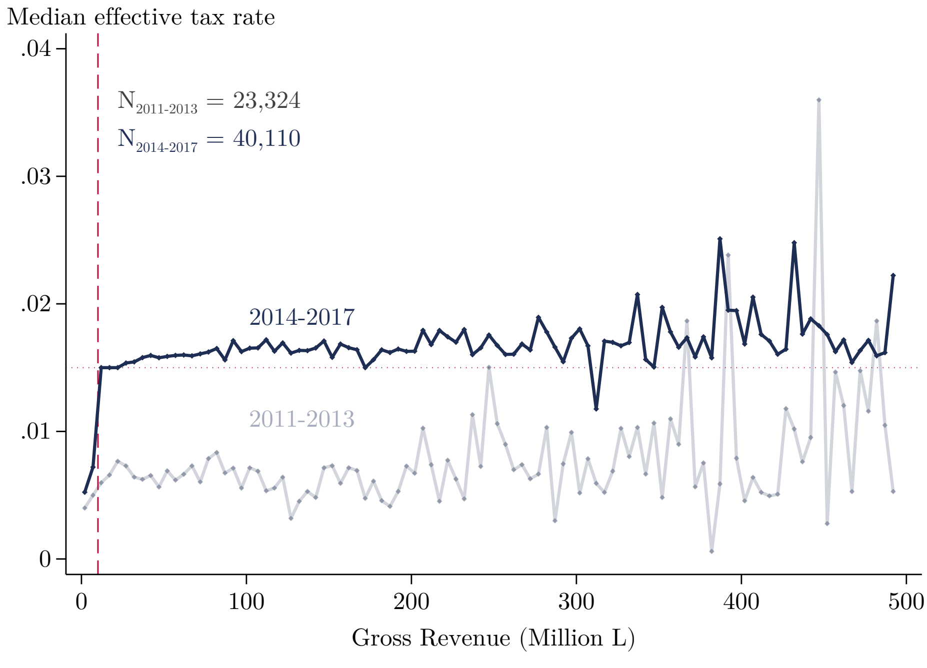


Note: This figure illustrates incentives for bunching in the revenue margin. These incentives are driven by the interaction of two dimensions: profit and revenue. Colors displayed at the top of the side bar refer to areas with greater incentives for bunching.

Figure 2: Median effective tax rate across declared revenue distribution



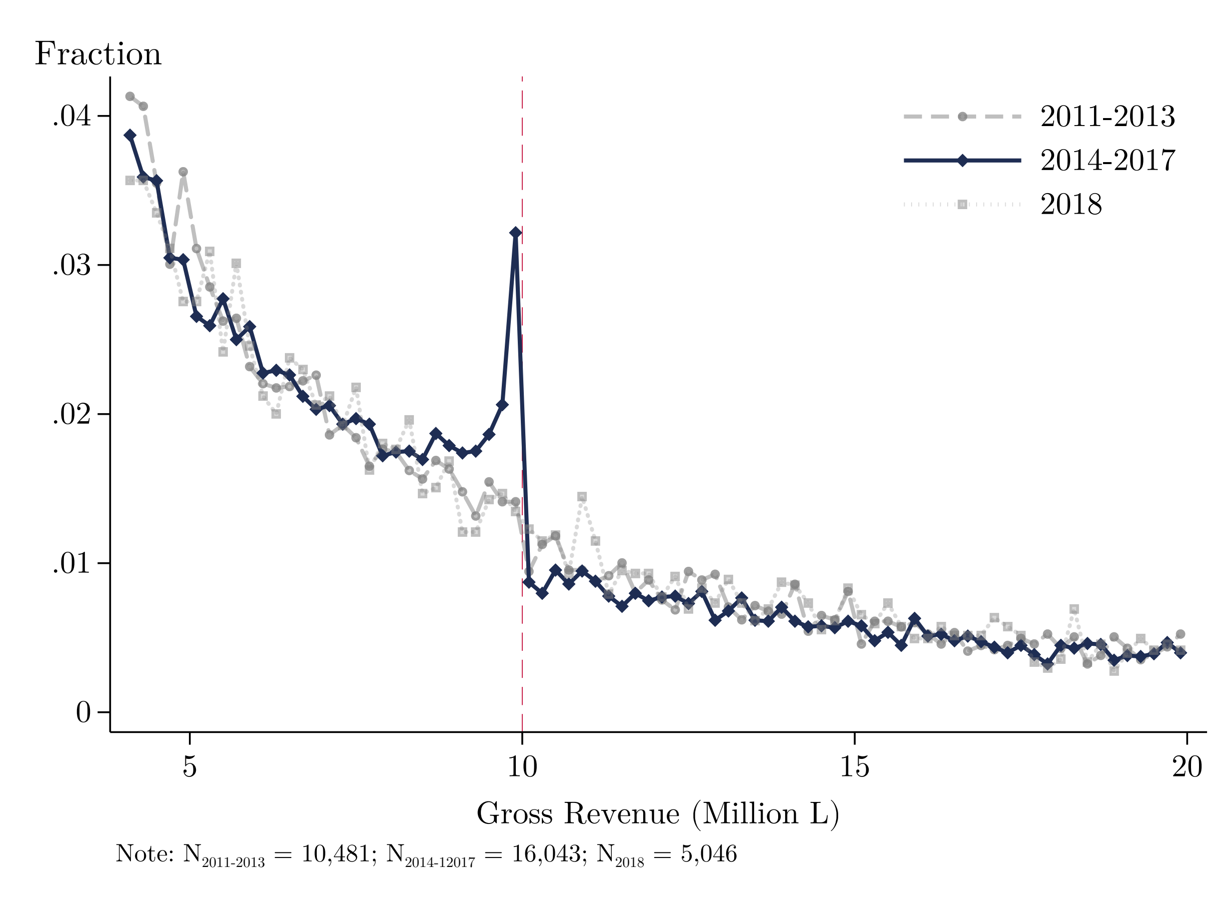
(a) Around L10 million exemption threshold



(b) Across gross revenue distribution

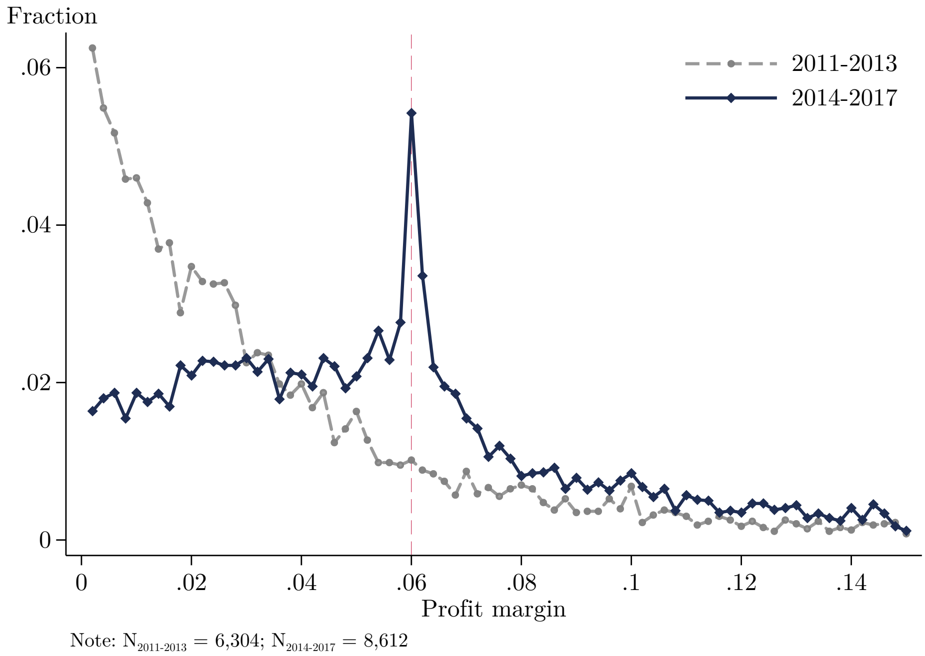
Note: This figure presents the median effective tax rates, defined as the ratio between tax liability and gross revenue, for each bin of declared gross revenue. Panel A restricts the sample to taxpayers declaring gross revenue between L2-20 million, while panel B includes taxpayers with gross revenue between L2 - 500 million. It documents that the minimum tax was effective in increasing effective tax rates for corporations declaring more the L10 million: the median effective rate increases by approximately 1p.p. around the threshold in 2014-2017, with no equivalent variation in 2011-2013, before the policy was introduced. Bins are L500,000 wide in Panel A and L5 million in Panel B.

Figure 3: Empirical Density of Gross Revenue around L10 MM threshold

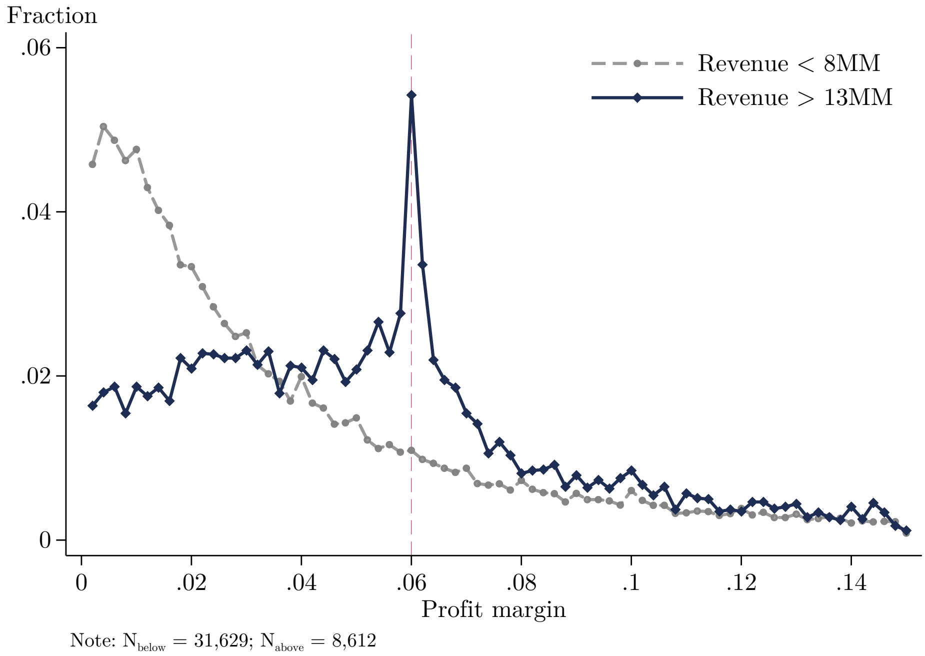


Note: This figure presents the empirical density of gross revenues from firms pooled for three periods: 2011-2013 (before the minimum tax introduction); 2014-2017 (when the exemption threshold was L10 million); and 2018 (after the threshold for eligibility increased to L300 million). It documents that, consistent with theoretical predictions, taxpayers respond to the notch created by the L10 million exemption threshold by bunching below the threshold. Bins are L200,000 wide. The sample is restricted to taxpayers declaring gross revenue between L4-20 million and excludes taxpayers exempt from the minimum tax.

Figure 4: Empirical Density of Profits



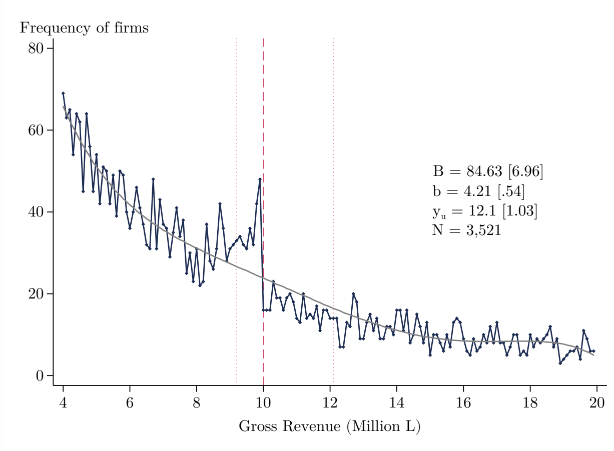
(a) Empirical Density of Profits above L13 MM - Pre and Post Minimum Tax



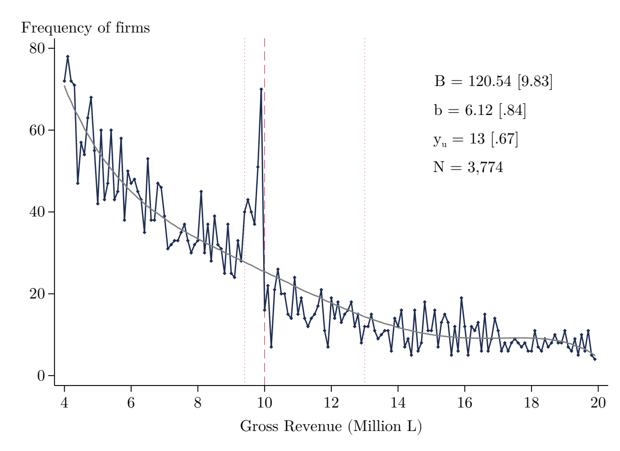
(b) Empirical Density of Profits in 2014-2017 - Below and above L 10MM threshold

Note: These figures present the empirical density of positive reported profit margins. Panel A presents densities for firms with gross revenue above L13 million, before (2011-2013) and during (2014-2017) the existence of the minimum tax. Panel B present densities for the period of 2014-2017 of two groups of firms: those reporting gross revenue below L8 million (exempt from minimum tax) and those above L13 million (potentially liable for the minimum tax and infra-marginal to the bunching behavior at L10 million in revenue). It documents that firms affected by the minimum tax increase their reported profit margin and bunch around the 6% kink. Bins are 0.2 percentage points wide and the first bin starts at 0.1%, such that the 6% kink is the midpoint of a bin.

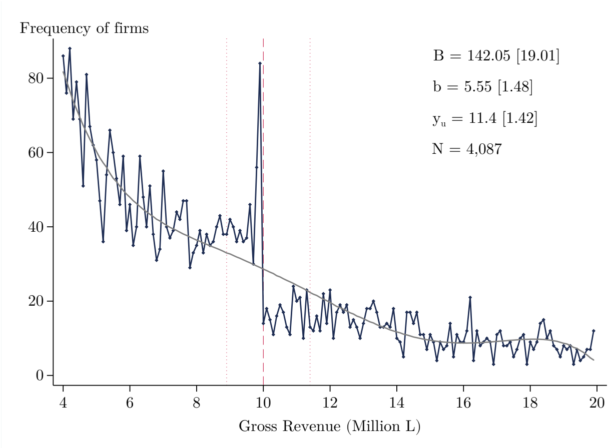
Figure 5: Empirical Density of Gross Revenue around L10 MM threshold



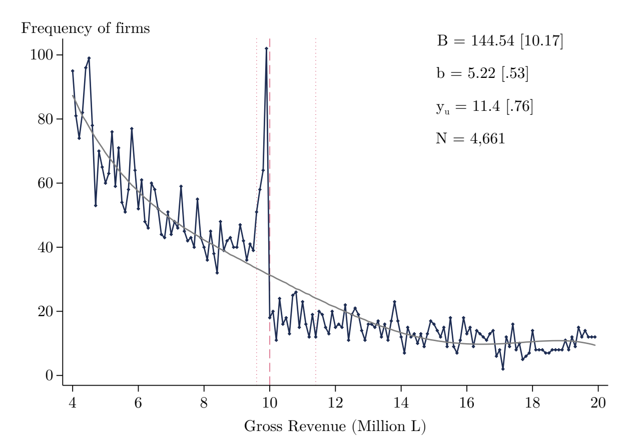
(a) 2014



(b) 2015



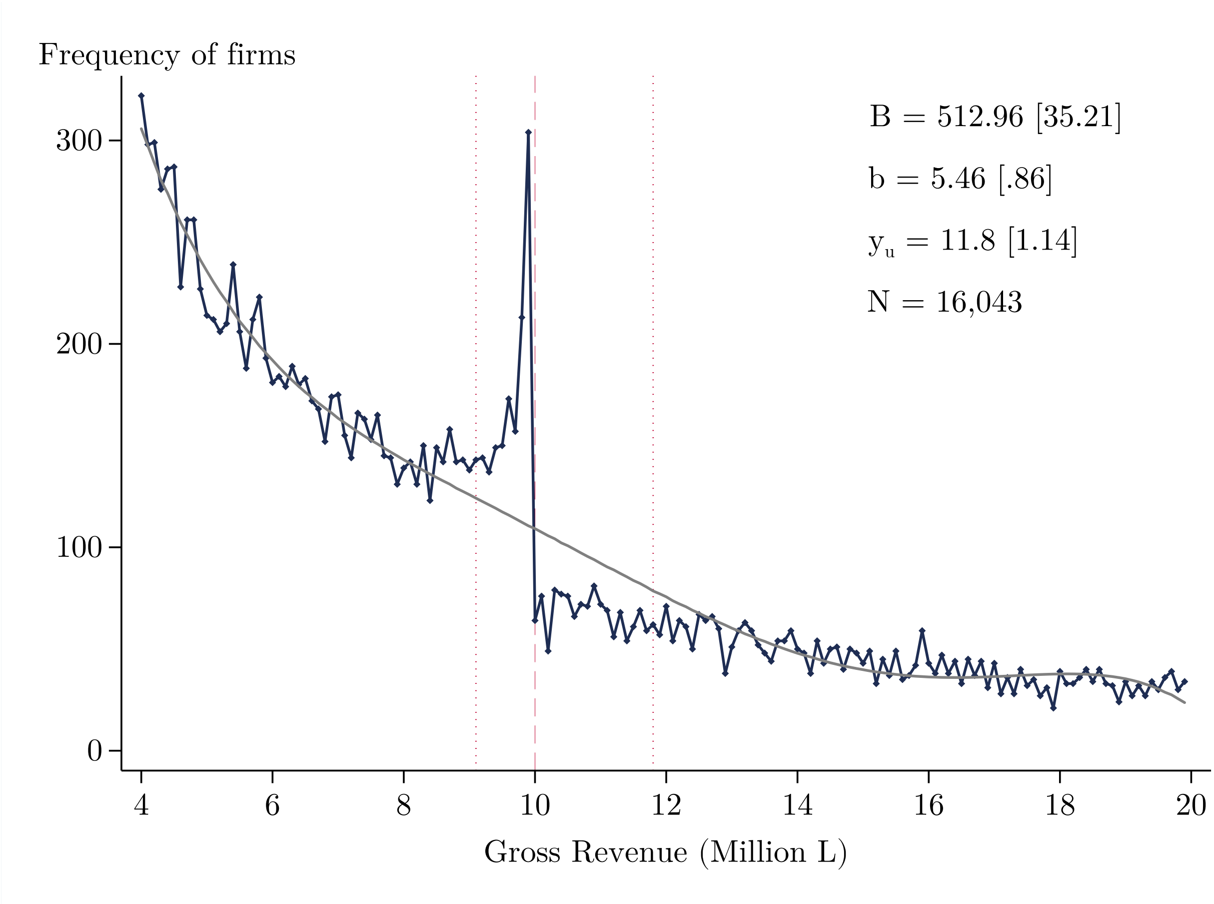
(c) 2016



(d) 2017

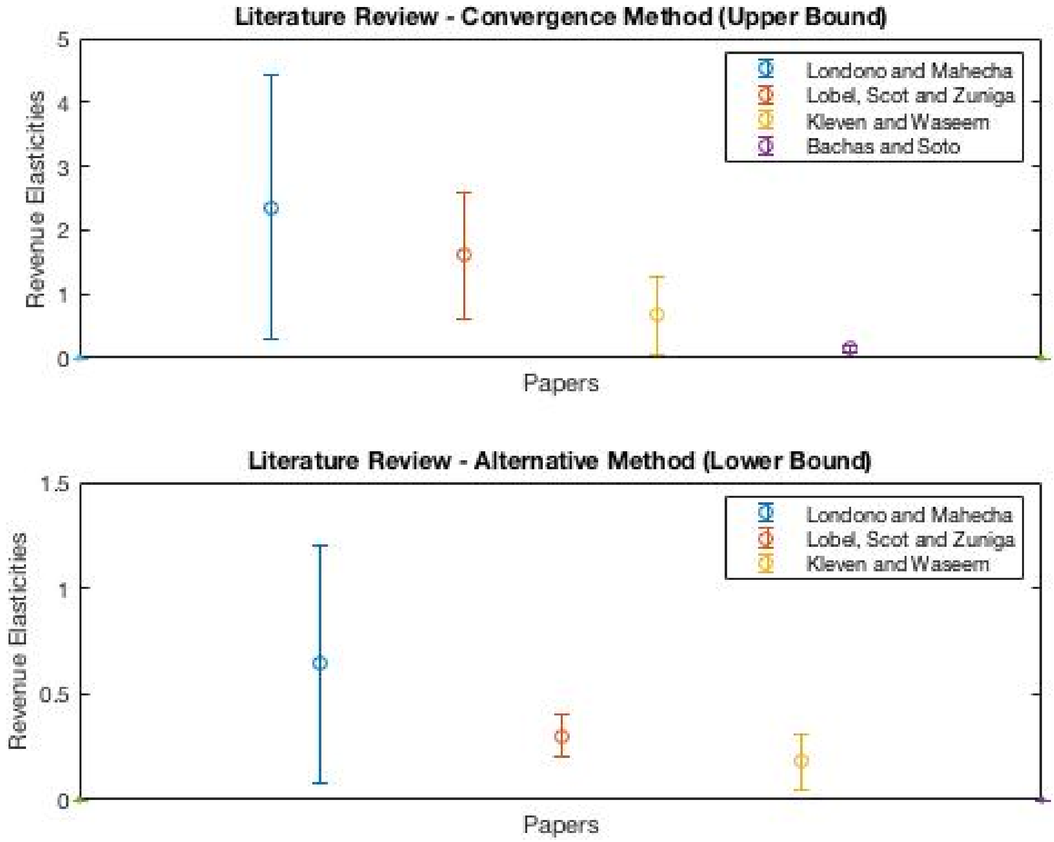
Note: These figures present empirical and counterfactual estimated gross revenue densities for each year in the period 2014-2017. The lower bound of the bunching region is chosen visually while the upper bound is obtained using the convergence method discussed in Section 4.3. The dashed line marks the L10 million notch while the dotted lines mark the lower and upper bounds of the bunching region. For each year we present the excess mass below the notch (B), the excess mass as a share of the predicted mass in the bunching region (b), the upper bound obtained from the convergence method (y_u) and the underlying number of taxpayers in each figure (N). Standard errors in brackets are obtained through bootstrapping. Bins are L100,000 wide.

Figure 6: Empirical Density of Gross Revenue around L10 MM threshold - Pooled Years (2014-2017)



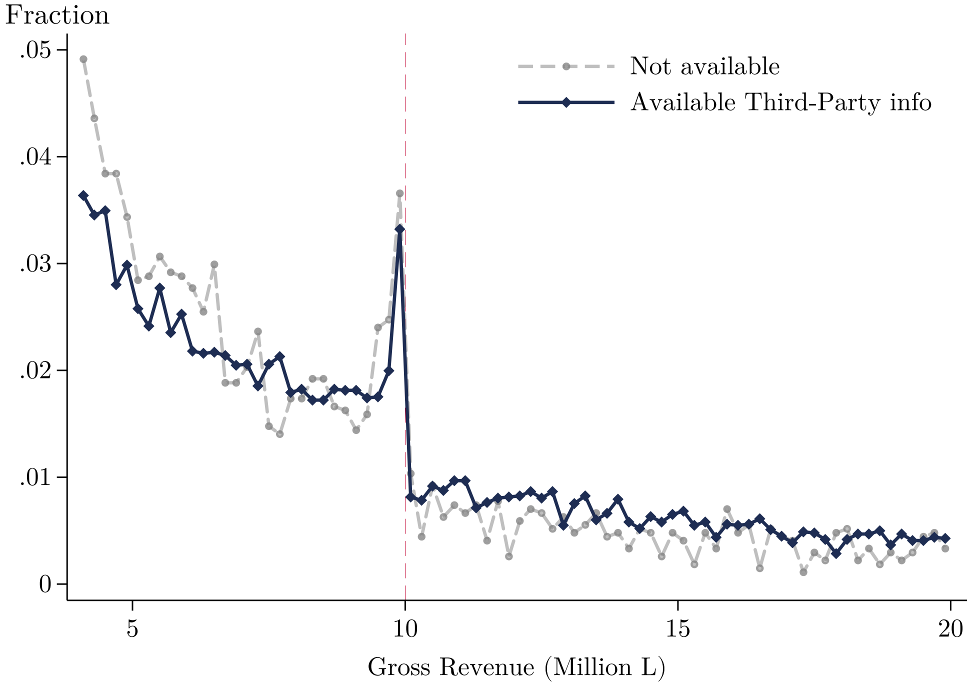
Note: This figure present empirical and counterfactual estimated gross revenue densities for a pooled sample of firms in the period 2014-2017. The lower bound of the bunching region is chosen visually while the upper bound is obtained using the convergence method discussed in Section 4.3. The dashed line marks the L10 million notch while the dotted lines mark the lower and upper bounds of the bunching region. We present the excess mass below the notch (B), the excess mass as a share of the predicted mass in the bunching region (b), the upper bound obtained from the convergence method (y_u) and the underlying number of taxpayers in each figure (N). Standard errors in brackets are obtained through bootstrapping. Bins are L100,000 wide.

Figure 7: Literature Review

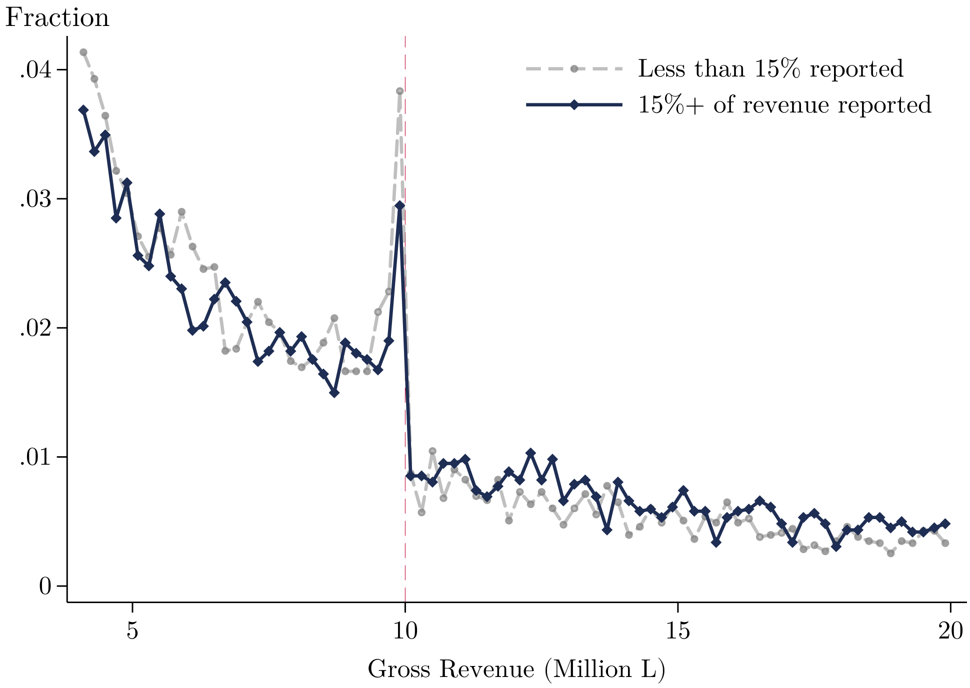


Note: These figures present elasticities estimate using two different methods discussed in the literature. Important to note that (Londoño-Vélez & Ávila Mahecha, 2019) report wealth elasticity. All other papers report revenue elasticity. For each of those papers, estimates are presented in a range. The figure illustrate those ranges, with a dot mark at the range median.

Figure 8: Empirical gross revenue density by third-party status - pooled 2015-2017



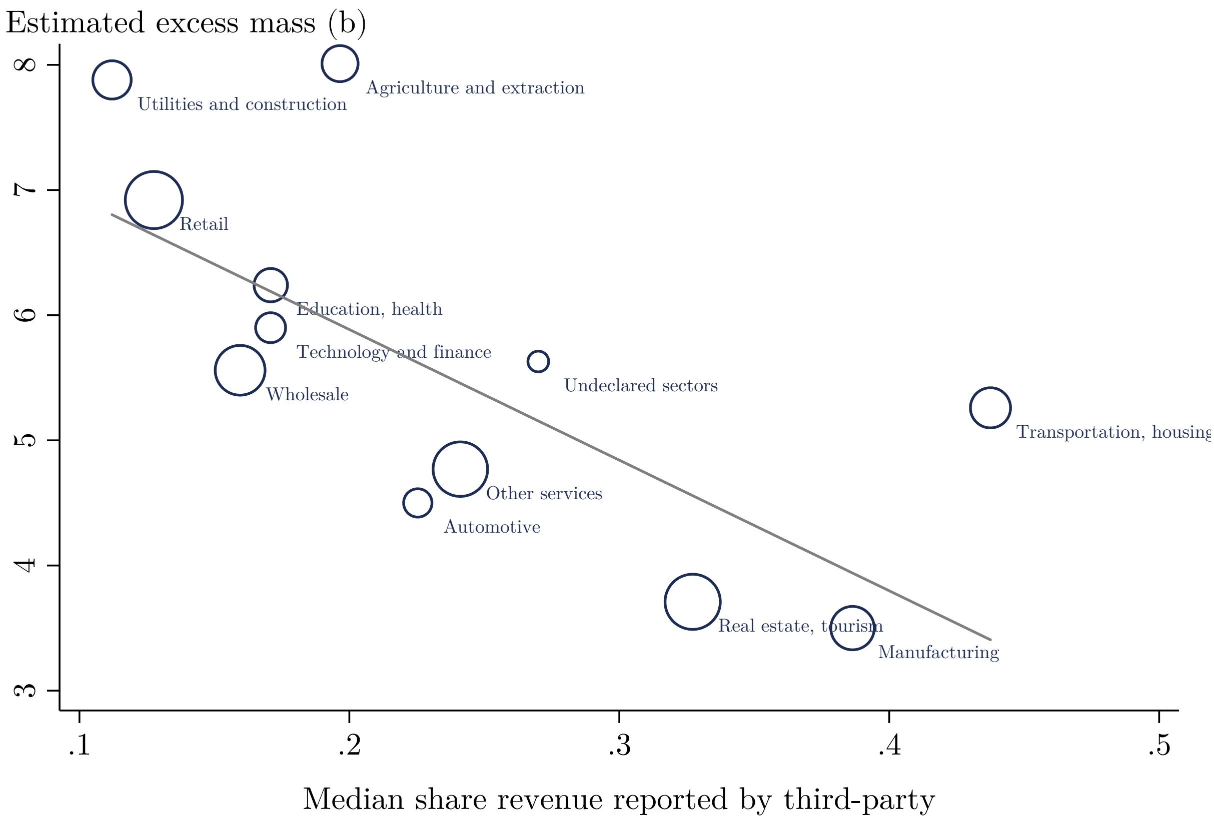
(a) Extensive margin



(b) Intensive margin

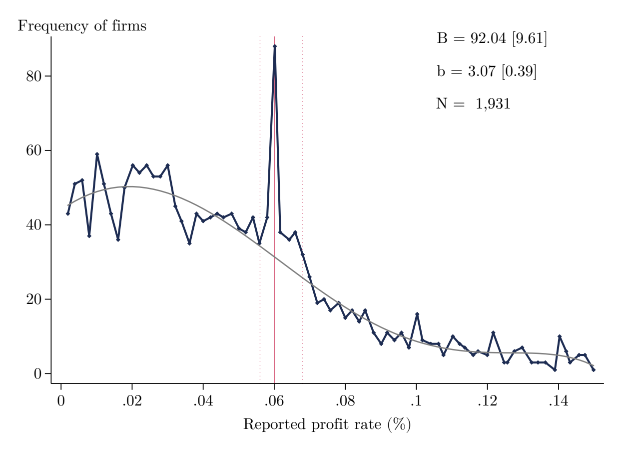
Note: These figure presents the empirical densities of declared gross revenue, pooled for the 2015-2017 period, exploring heterogeneity according to availability of third-party information on revenue. Panel A compares corporations for which no third-party information is available (gray line) with those for which some information is available (blue line). Panel B explores differences in the intensive margin of third-party information: it compares firms with below median (15%) share of declared revenue reported by third parties (gray line) with thos above median (blue line). Bins are L200,000 wide.

Figure 9: Scatter plot amount of bunching vs. share of revenues reported by third-party

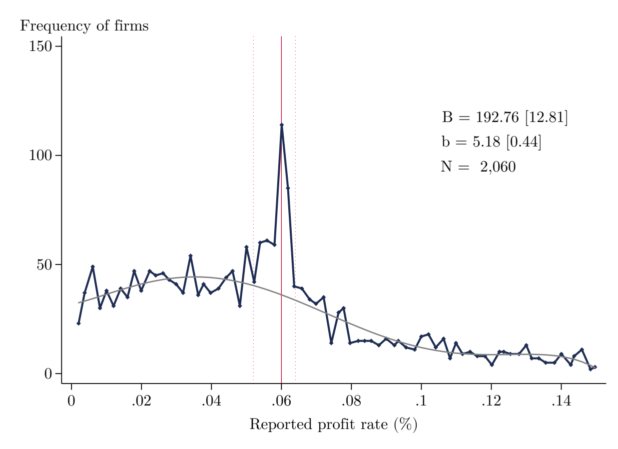


Note: This figure presents a scatter plot of estimated excess mass at the L10 million threshold in each economic sector and the median share of self-reported revenue also informed by third parties in the sector. Results show that in sectors with higher third-party reporting we observe less bunching. Excess mass is defined as the excess number of firms bunching at the L10 million notch as a ratio of the predicted mass at the notch. The share of reported revenues is calculated in 2018, for firms declaring gross revenues in the interval L5-15 million. The size of markers is proportional to the reported sales in 2018 by sector.

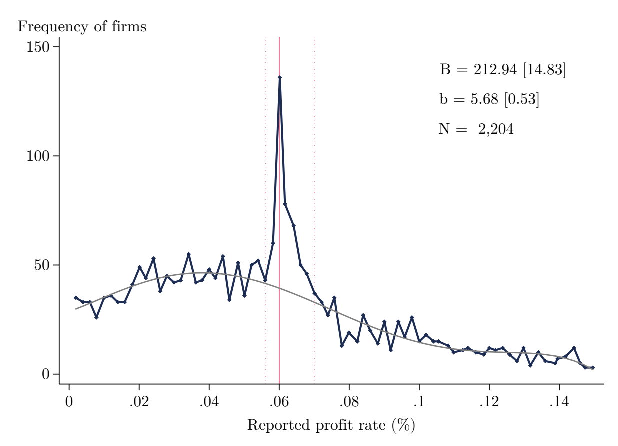
Figure 10: Empirical Density of profits around 6% threshold



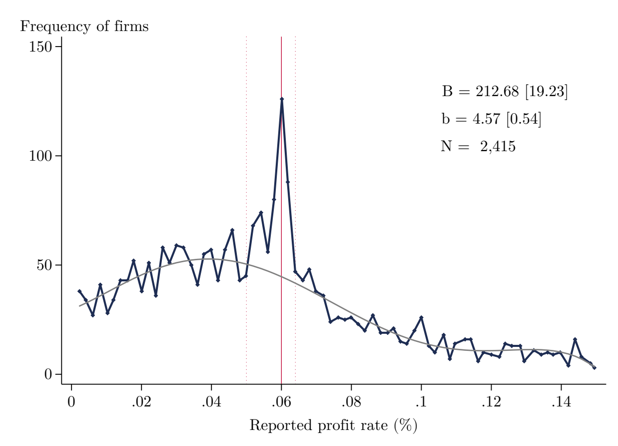
(a) 2014



(b) 2015



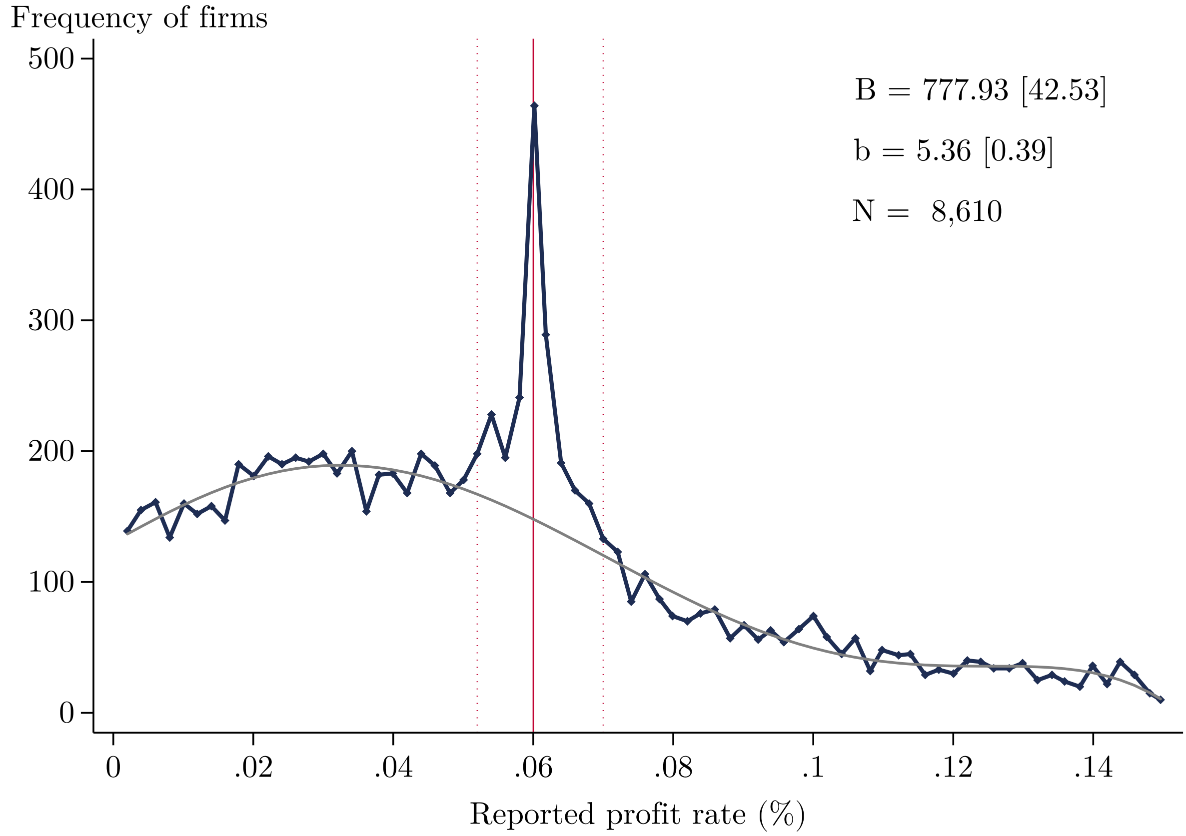
(c) 2016



(d) 2017

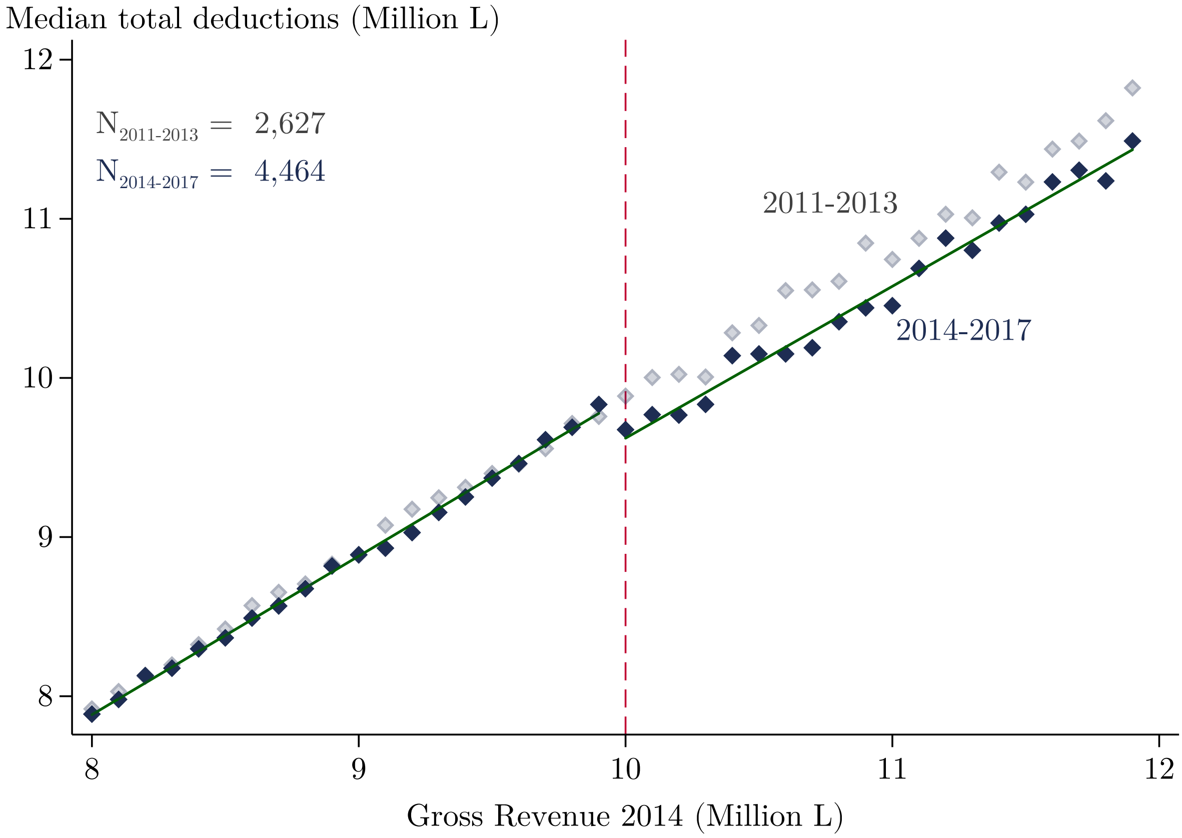
Note: These figures present the empirical and estimated counterfactual distributions of profit margins for each year in the period 2014-2017. The lower and upper bounds of the bunching region are determined visually. The solid red line marks the 6% kink while the dotted lines present the lower and upper bounds of the bunching region. For each year we present the excess mass around the kink (B), the excess mass as a share of predicted density around the kink (b) and the underlying number of taxpayers in each figure (N). Standard errors in brackets are obtained through bootstrapping. Bins are 0.2 percentage points wide and the first bin starts at 0.1%, such that the 6% kink is the midpoint of a bin.

Figure 11: Empirical Density around 6% profit margin threshold - Pooled Years (2014-2017)



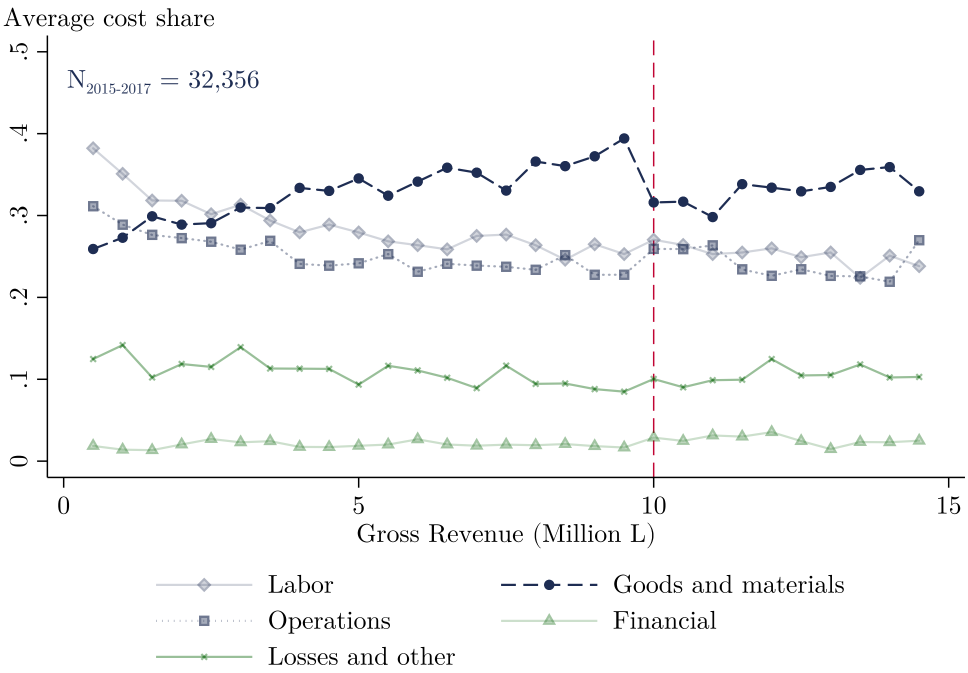
Note: These figures present the empirical and estimated counterfactual distributions of profit margins for a pooled sample of firms in the period period 2014-2017. The lower and upper bounds of the bunching region are determined visually. The solid red line marks the 6% kink while the dotted lines present the lower and upper bounds of the bunching region. We present the excess mass around the kink (B), the excess mass as a share of predicted density around the kink (b) and the underlying number of taxpayers in each figure (N). Standard errors in brackets are obtained through bootstrapping. Bins are 0.2 percentage points wide and the first bin starts at 0.1%, such that the 6% kink is the midpoint of a bin.

Figure 12: Median total deductions by gross revenue

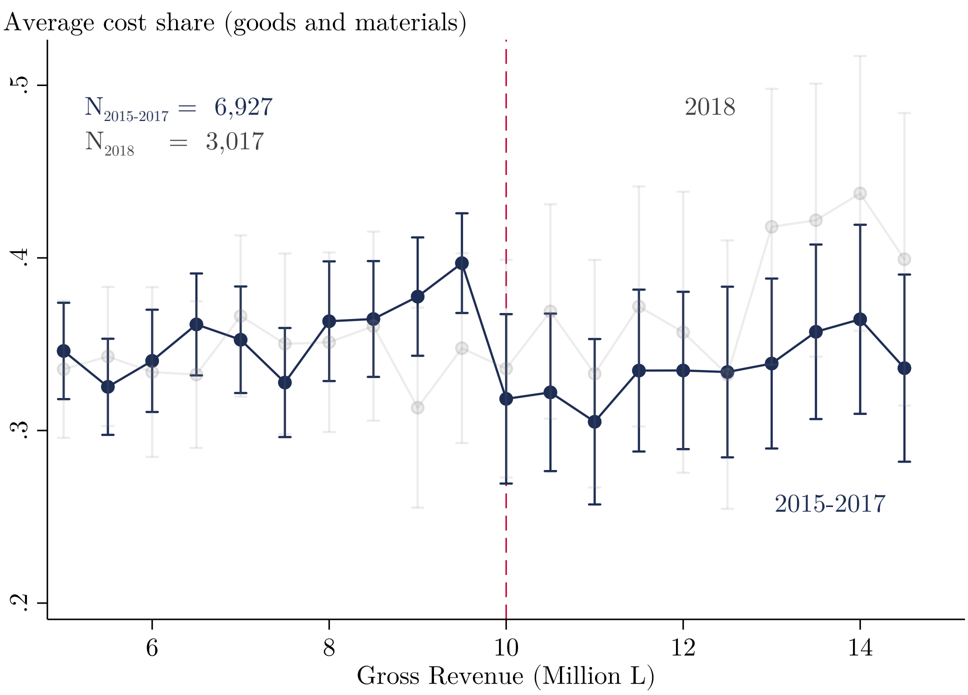


Note: This figure presents median reported total deductions by revenue bin for two groups: taxpayers in 2011-2013, before the introduction of the minimum tax, and 2014-2017, while the minimum tax was in place with a L10 million exemption threshold. The figure documents that claimed deductions fall discontinuously at the exemption threshold during the 2014-2017 period, consistent with the right-shift of the profit distribution observed for taxpayers subject to the minimum tax. No similar discontinuous change is observed in the period before the introduction of the minimum tax. Bins are L100,000 wide.

Figure 13: Cost line items as share of revenue



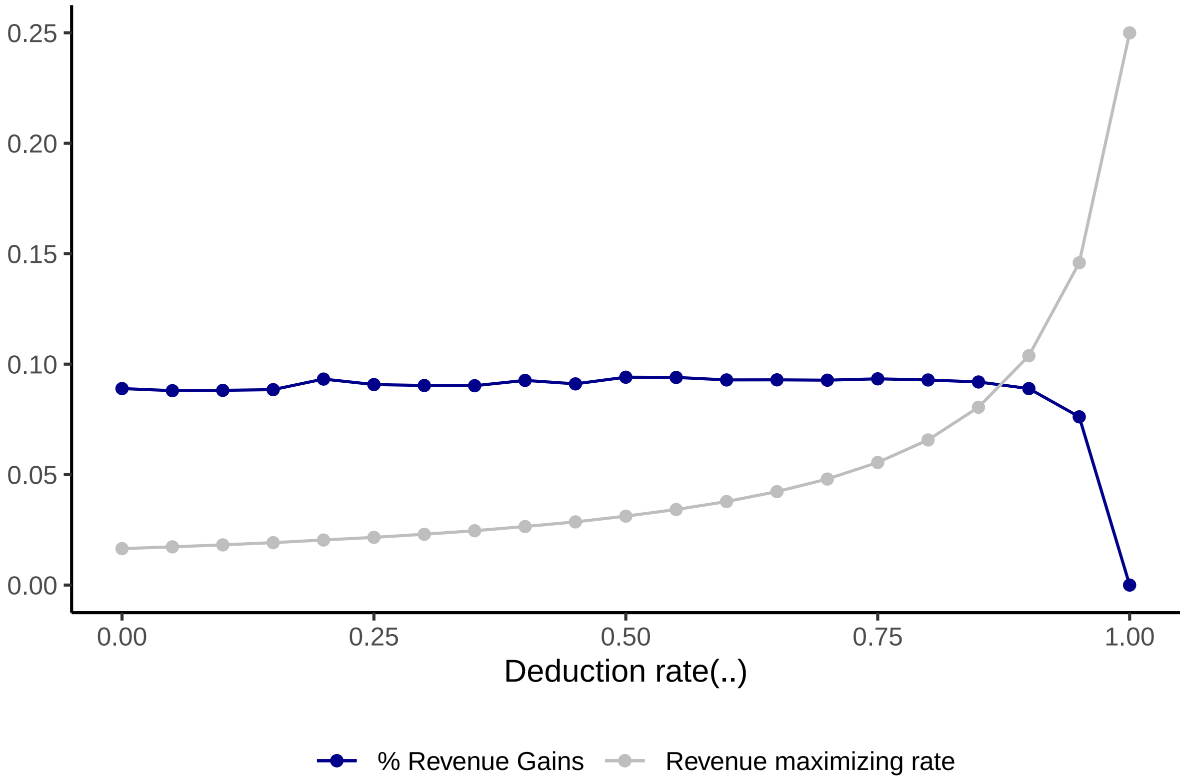
(a) All categories (2015-2017)



(b) Goods and materials (2015-2017 & 2018)

Note: These figures present cost line items as share of revenues in each bin. Panel A presents average shares in 2015-2017 for five cost categories: Labor, Goods and Materials, Operations, Financial, and Losses and other. Panel B focuses on Goods and Materials cost shares, separately for 2015-2017 and 2018. Bins are L500,000 wide in both panels. This sample only includes taxpayers using electronic declaration, for which we have detailed breakdown of cost items (approximately 80% of taxpayers per year) and excludes taxpayers with profit margins above the 99th and below 1st percentile of profit margin distribution.

Figure 14: Optimal Tax and Revenue Gains



Note: This figure presents the results of simulations of taxes systems using different sets of tax and deduction rates. The x-axis present different values of μ, the share of costs that can be deducted. The grey line presents, for every level of deduction, the tax rate that maximizes revenue conditional on aggregate profits being no smaller than in baseline, while the blue line presents the revenue gains for each deduction and tax rate pair.

Table 1: Descriptive statistics

	2013	2014	2015	2016	2017	2018
Overall firms' characteristics						
Revenue (Million L)	31.35	30.81	27.99	26.49	28.31	27.47
	(336.33)	(329.80)	(293.49)	(257.53)	(317.50)	(314.64)
Deduction (Million L)	30.54	30.00	26.59	24.85	26.92	26.33
	(347.37)	(342.83)	(281.04)	(235.07)	(311.61)	(299.31)
Pre-tax profits (Million L)	0.83	0.87	1.44	1.68	1.48	1.22
	(63.59)	(65.57)	(40.91)	(33.25)	(54.17)	(57.37)
Pre-tax profit margin (%)	1.94	2.36	3.13	4.19	4.14	4.89
	(20.18)	(21.38)	(22.43)	(22.33)	(22.44)	(24.87)
Tax liability (Million L)	0.54	0.67	0.69	0.68	0.72	0.68
	(10.90)	(10.80)	(11.09)	(9.86)	(11.89)	(12.24)
Exempt from Minimum Tax (%)	.	17.8	24.6	26.3	22.2	21.1
Revenue above L10 Million (%)	18.0	17.4	16.7	17.1	17.1	17.9
Not exempt and above L10 million (%)	.	16.2	14.7	14.1	14.2	16.1
Paid Minimum Tax (%)	.	8.1	6.6	6.1	6.4	0.5
Share taxes from Minimum Tax (%)	.	29.5	21.6	19.5	19.8	14.6
Share of MNC (%)	3.5	3.6	3.2	3.0	2.8	2.6
Share taxes from MNC (%)	66.4	65.4	62.0	60.0	58.7	60.7
N	19,223	20,464	23,658	25,729	27,825	29,944

Note: This table reports descriptive statistics for the sample of corporations filing income taxes in Honduras in the period 2013-2018. Profit margins are defined as the ratio between tax liability and gross revenue and are trimmed below -100% when calculating yearly averages in this table. Exemption from the minimum taxes is defined for taxpayers in first two years of operation and/or by economic sector, and does not include taxpayers declaring revenue below the exemption threshold. Multinational corporations (MNC) are identified as firms presenting a transfer price declaration in the period 2014-2018.

Table 2: Share of revenue and taxes across gross revenue distribution

	2013		**2017**	
	Revenue	Taxes	Revenue	Taxes
	(1)	(2)	(3)	(4)
Top 0.1%	28.1	32.2	28.5	34.3
Top 1%	63.0	68.6	63.4	67.2
Top 10%	91.0	91.9	90.8	93.2
Top 20%	95.8	96.2	95.6	97.1
Bottom 50%	0.6	0.9	0.5	0.7

Note: This table presents the share of total revenue and total taxes for corporations at the top 0.1%, top 1%, top 10%, top 20% and the bottom 50% of declared yearly gross revenues. Colums (1) and (2) refer to statistics in 2013, while columns (3) and (4) refer to 2017. Corporations exempt from all income taxes are excluded from the sample. The results illustrate the skewness of the size distribution and the importance of the very largest firms for aggregate tax collection: in 2013, 20 firms (top 0.1%) declared 28% of total revenue and were liable for 32% of total taxes.

Table 3: Estimates by year for L10 MM notch

Year	Excess # Firms (B)	Firms % counterfactual (b)	y_u (upper bound)	Δ Revenue (upper bound)	ϵ_y (upper)	ϵ_y (lower)
2014	84.63	4.21	12.10	2.10	1.33	0.20
	(6.96)	*(0.54)*	*(1.03)*	*(1.03)*	*(1.62)*	*(0.03)*
2015	120.54	6.12	13.00	3.00	2.61	0.40
	(9.83)	*(0.84)*	*(0.67)*	*(0.67)*	*(1.13)*	*(0.08)*
2016	142.05	5.55	11.40	1.40	0.61	0.40
	(19.01)	*(1.48)*	*(1.42)*	*(1.42)*	*(2.21)*	*(0.12)*
2017	144.54	5.22	11.40	1.40	0.61	0.35
	(10.17)	*(0.53)*	*(0.76)*	*(0.76)*	*(1.01)*	*(0.06)*
Pooled	512.96	5.46	11.80	1.80	0.99	0.35
	(35.21)	*(0.86)*	*(1.14)*	*(1.14)*	*(1.86)*	*(0.06)*

Note: This table presents estimates of change in reported revenue and elasticities for each year in the period 2014-2017 and also for all years pooled. The first column reports the estimated excess number of firms, defined above as $\sum_{b=y_L}^{y_N}(n_j - \hat{n}_j)$, while column 2 reports the ratio between excess mass and average counterfactual density in the bunching region. Column (3) presents the upper bound estimated using the convergence method and column (4) the change in revenue. Column (5) presents the estimated elasticity in each year, and for the pooled sample.

Table 4: Bunching at L10 million notch - by TPI and economic sectors

	Excess # Firms (B)	Firms % counterfactual (b)	Number Observations
Third-party information			
Below median TPI	256.27	7.11	6,312
	(20.15)	*(0.91)*	
Above median TPI	163.82	4.33	6,210
	(16.43)	*(0.91)*	
Economics sectors			
Agriculture and extraction	45.75	8.01	865
	(3.62)	*(0.97)*	
Manufacturing	38.09	3.50	1,516
	(7.48)	*(1.29)*	
Utilities and construction	52.20	7.88	1,038
	(6.46)	*(1.90)*	
Automotive	16.70	4.50	650
	(6.08)	*(2.07)*	
Wholesale	65.11	5.56	1,880
	(8.93)	*(0.91)*	
Retail	71.64	6.92	1,884
	(13.01)	*(1.69)*	
Transportation, housing	31.65	5.26	1,174
	(10.09)	*(2.31)*	
Technology and finance	23.70	5.90	757
	(5.39)	*(1.49)*	
Real estate, tourism,other	48.30	3.71	2,530
	(9.40)	*(0.67)*	
Education, health, entertainment	37.00	6.24	1,050
	(10.72)	*(2.15)*	
Other services	62.23	4.77	2,298
	(10.74)	*(1.51)*	
Undeclared sectors	16.33	5.63	401
	(5.20)	*(2.06)*	

Note: This table presents changes in taxable income and elasticities for each year in the period 2011-2018, and also for the period 2015-2018 pooled. The first column reports the estimated excess number of firms while column 2 reports the ratio between excess mass and average counterfactual density in the bunching region. Column (3) presents the change in revenue for the marginal buncher. Column (5) presents the estimated elasticity in each year, and for the pooled sample.

Table 5: Estimated responses at the kink

Year	Excess Mass (B)	Bunching(b)	Delta Profit	Implied ϵ_y (no evasion)	Estimated evasion (ϵ_y = 0.99)
2014	92.04	3.07	0.60	6.67	-8.52
	(9.61)	*(0.39)*	*(0.10)*	*(0.94)*	*(1.41)*
2015	192.76	5.18	1.00	11.11	-15.18
	(12.81)	*(0.44)*	*(0.10)*	*(1.04)*	*(1.56)*
2016	212.94	5.68	1.10	12.22	-16.85
	(14.83)	*(0.53)*	*(0.10)*	*(1.22)*	*(1.82)*
2017	212.68	4.57	0.90	10.00	-13.52
	(19.23)	*(0.54)*	*(0.10)*	*(1.23)*	*(1.85)*
Pooled	777.93	5.36	1.10	12.22	-16.85
	(42.53)	*(0.39)*	*(0.10)*	*(0.96)*	*(1.43)*

Note: This table presents estimates of change in reported profit margins and evasion estimates for each year in the period 2014-2017 and also for all years pooled. The first column reports the estimated excess number of firms while column 2 reports the ratio between excess mass and average counterfactual density in the bunching region. Column (3) presents estimated change in profits, while columns (4) and (5) present results of decomposition changes in profit margin in real changes in output and changes in cost misreporting.

Table 6: Deductions discontinuity at the notch

		Deductions components (% of revenue)				
	(1)	(2)	(3)	(4)	(5)	(6)
	Total deductions	Labor	Materials	Operation	Financial	Other
Jump in cost	-0.265***	0.0108	-0.0483**	-0.00268	0.00419	0.0120
	(0.06)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Slope below threshold	0.983***	-0.00573**	0.00793**	-0.00133	0.000893	-0.00281
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Slope change above threshold	-0.0283**	0.00207	-0.00200	0.00162	-0.00137	0.00339
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Intercept	9.764***	0.250***	0.373***	0.233***	0.0205***	0.0931***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
Observations	160	160	160	160	160	160
R-Squared	0.999	0.214	0.225	0.149	0.266	0.165

Note: This table reports results of regressions using binned data for firms declaring between L4 and L20 million in revenue. Robust standard errors are presented in parenthesis.

Table 7: Simulated impact of counterfactual policies

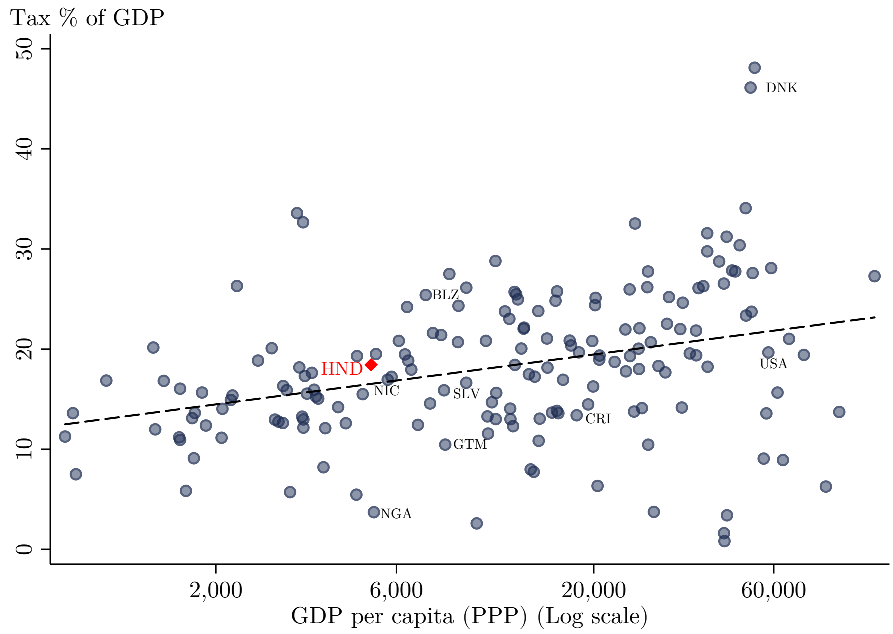
Exemption Threshold (L million)	Minimum tax rate (%)	Tax revenue increase (%)	Tax loss from bunchers (%)	Tax liability change for MT firms (%)	Change aggregate profits (%)	Share taxpayers owing MT (%)
10	1.5	30.3	1.0	122.5	-10.0	62.4
10	0.5	3.6	0.5	94.5	-0.5	28.0
10	2.0	49.2	1.3	146.8	-17.4	70.6
20	0.5	3.3	0.3	92.9	-0.5	16.5
20	1.5	27.7	1.2	120.7	-9.1	36.4
20	2.0	45.1	1.5	144.8	-16.0	40.6
50	0.5	2.6	1.5	88.7	-0.4	7.4
50	1.5	22.8	2.4	117.3	-7.6	17.1
50	2.0	36.9	3.3	141.2	-13.2	18.5

Note: This table presents results of counterfactual Minimum Tax policies using the calibrated model. Columns (1) and (2) present the counterfactual notch above which the firms are subject to the MT and the tax rate applied on gross revenue, respectively. Column (3) presents the increase in collected tax revenue; column (4) presents the share of total potential revenue collected under MT that is lost from bunching taxpayers; column (5) presents the aggregate increase in tax faced by firms paying MT and column (6) presents aggregate profit losses.

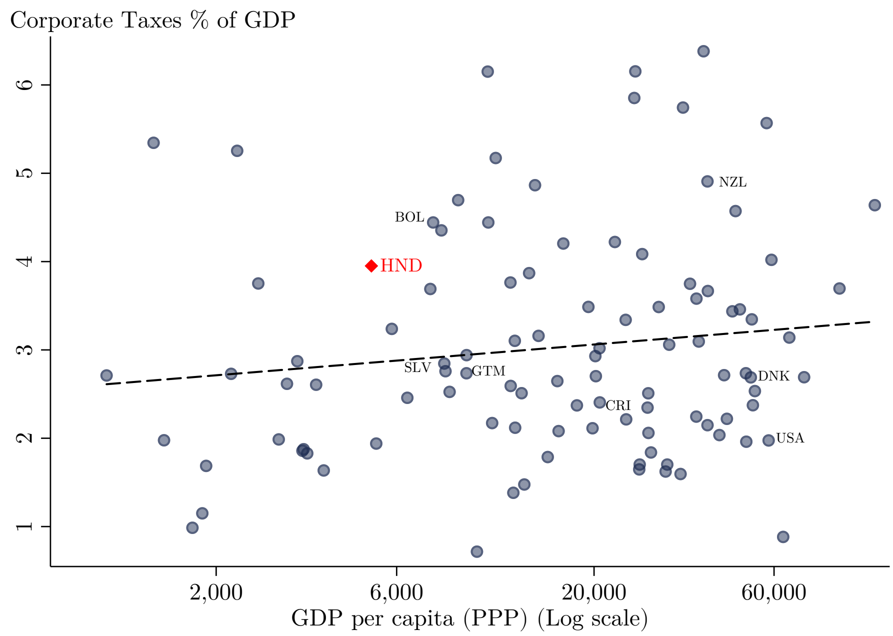
9 Appendix

A Appendix Graphs and Table

Figure A1: Taxes as percentage of GDP across countries



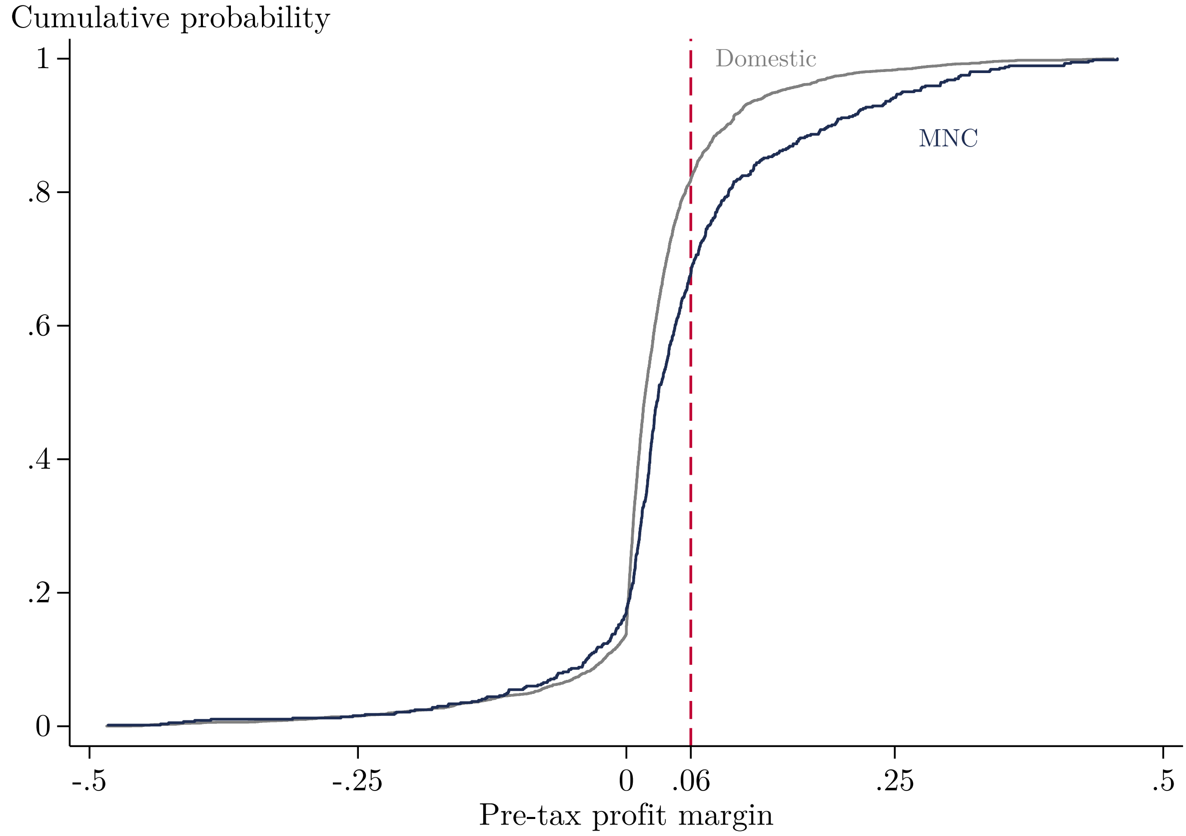
(a) Tax revenue



(b) Corporate income tax revenue

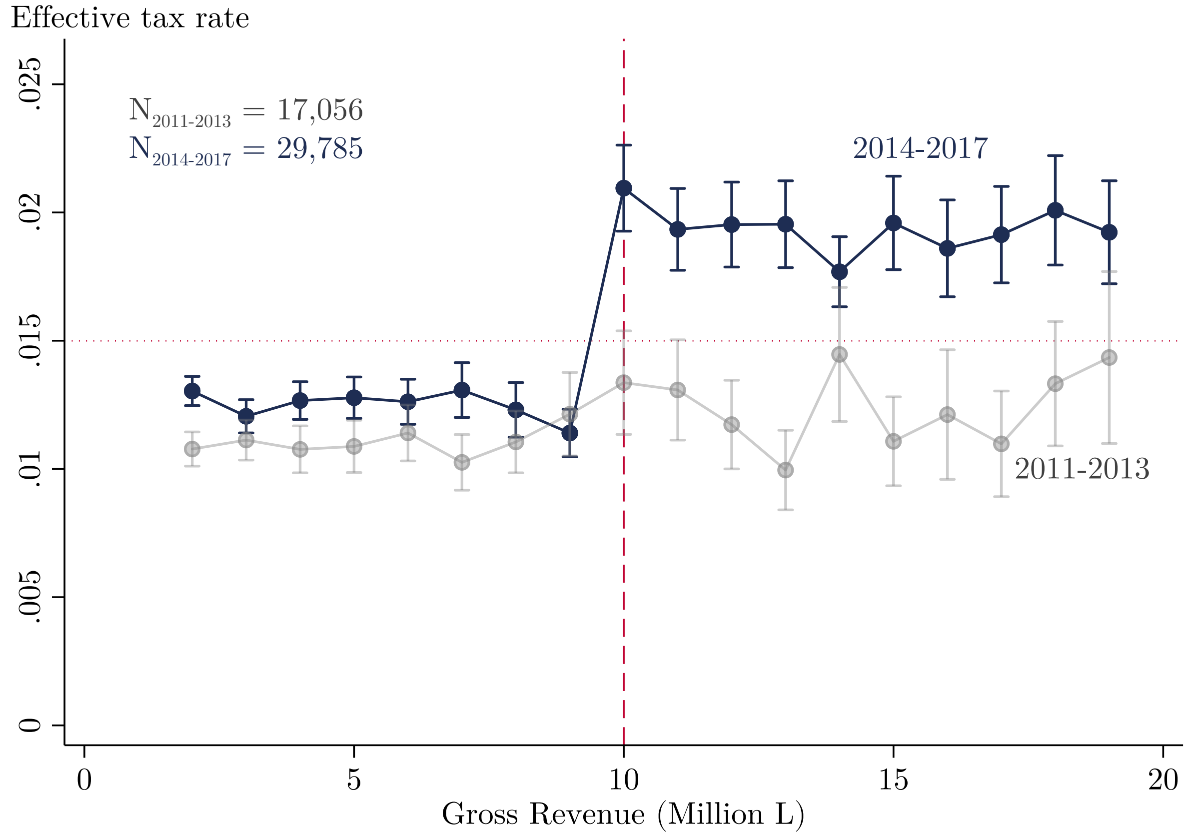
Note: These figures plot countries' tax revenue (Panel A) and corporate income tax revenue (Panel B) as percentage of GDP vs. (log) per capita GDP in 2016. Per capita GDP is expressed in PPP current dollars. Source: World Bank and International Monetary Fund (IMF) World Revenue Longitudinal Data.

Figure A2: Pre-tax profit margin CDF - Domestic vs. Multinational corporations



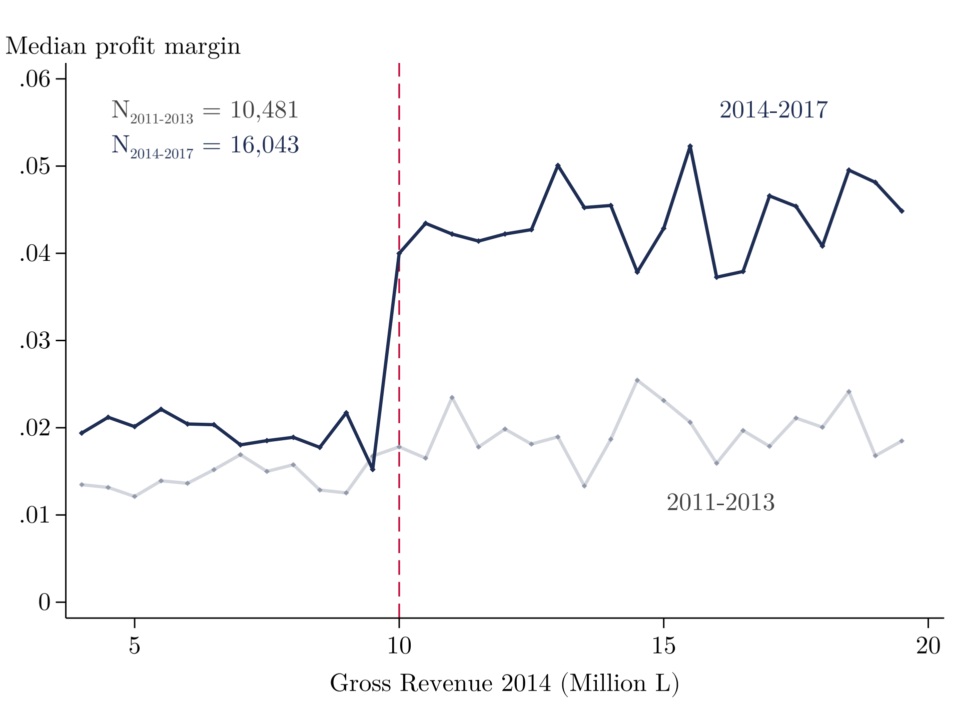
Note: This figure presents the cumulative distribution functions (CDF) of pre-tax profit margins by domestic and multinational firms in 2013, before the introduction of the minimum tax. The CDF of MNCs is shifted to the right (for positive values), indicating higher declared profit margin across the distribution. In particular, approximately 30% of MNC declared profit margins above the 6% threshold that separates the minimum tax and profit regimes in 2014-2017, while this number is less than 20% for domestic corporations. MNCs are defined as taxpayers that present transfer pricing declarations at some point in 2014-2018. The sample is restricted to taxpayers declaring at least L8 million in gross revenue and the distribution is trimmed at the 1st and 99th percentiles.

Figure A3: Average effective tax rate across declared revenue distribution

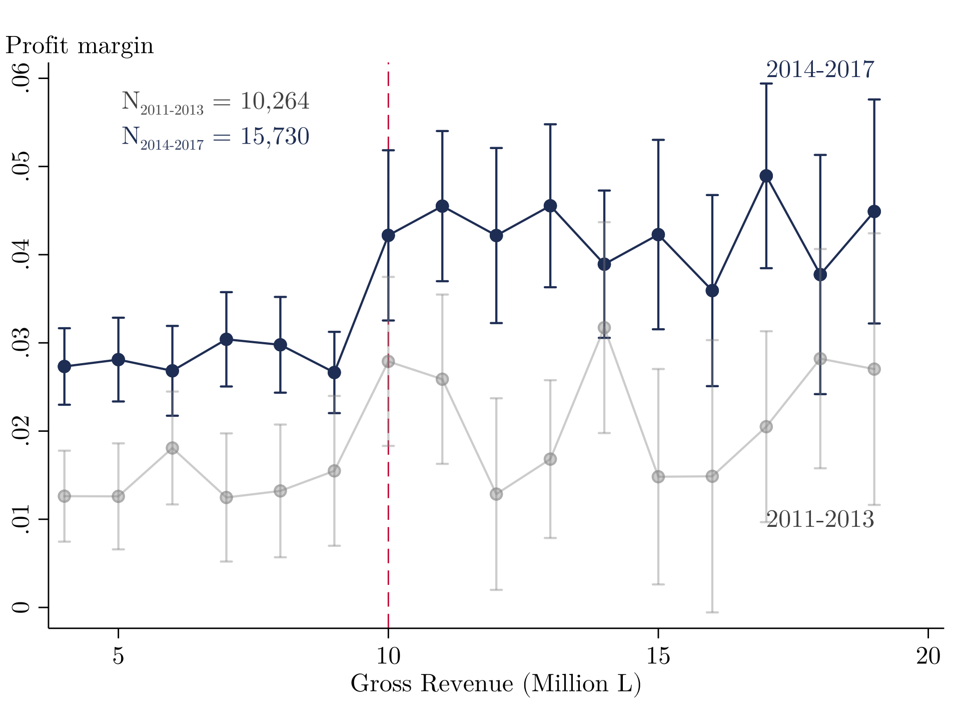


Note: This figure presents mean and 95% confidence intervals of the effective tax rate, defined as the ratio between taxes due and gross revenue, for each bin of declared gross revenue. It documents that the minimum tax was effective in increasing effective tax rates for corporations declaring more the L10 million: the average effective rate increases by approximately 1 p.p. around the threshold in 2014-2017, with no equivalent variation in 2011-2013, before the policy was introduced. Bins are L1 million wide. Sample is restricted to taxpayers declaring between L2-20 million and effective rate is trimmed at 99th percentile. The blue line refers to the pooled sample of taxpayers in 2014-2017, when the minimum tax was in place, while the gray line refers to the pooled sample of 2011-2013, before the introduction of the policy.

Figure A4: Reported profit margin by gross revenue



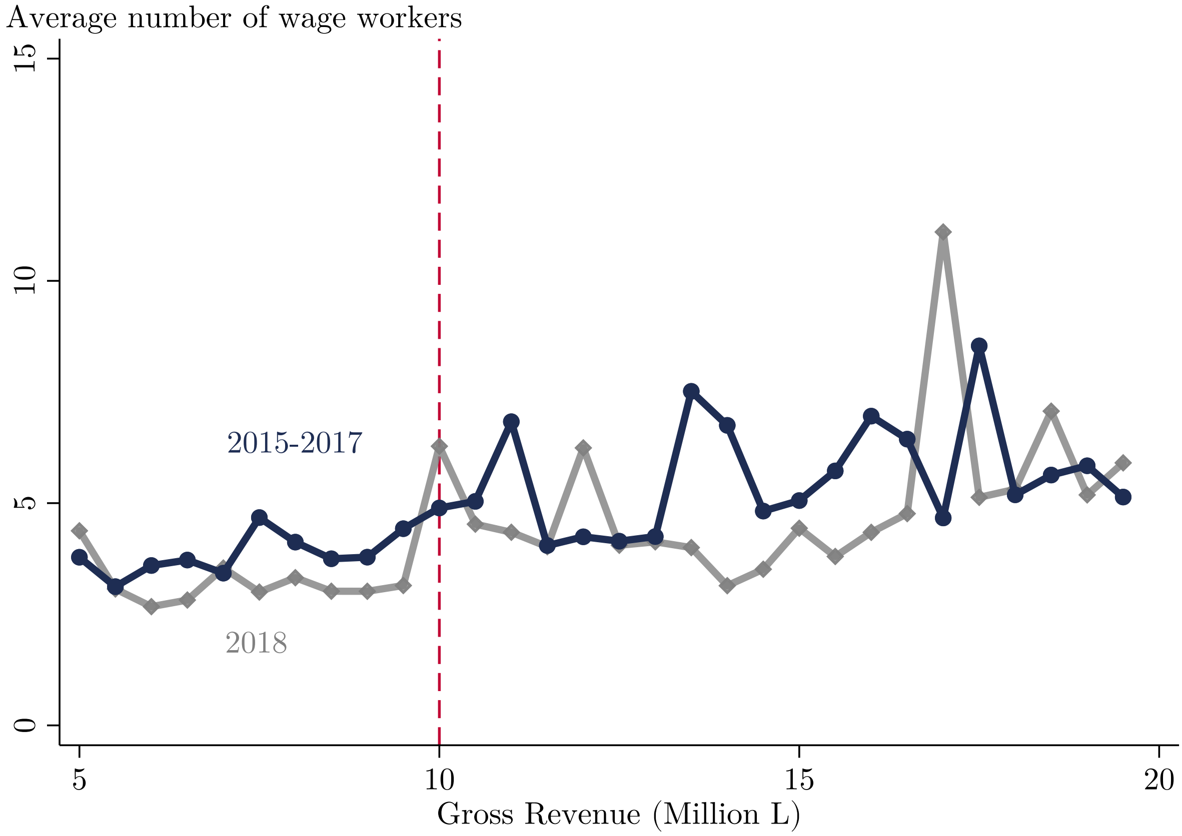
(a) Median profit margin



(b) Average profit margin

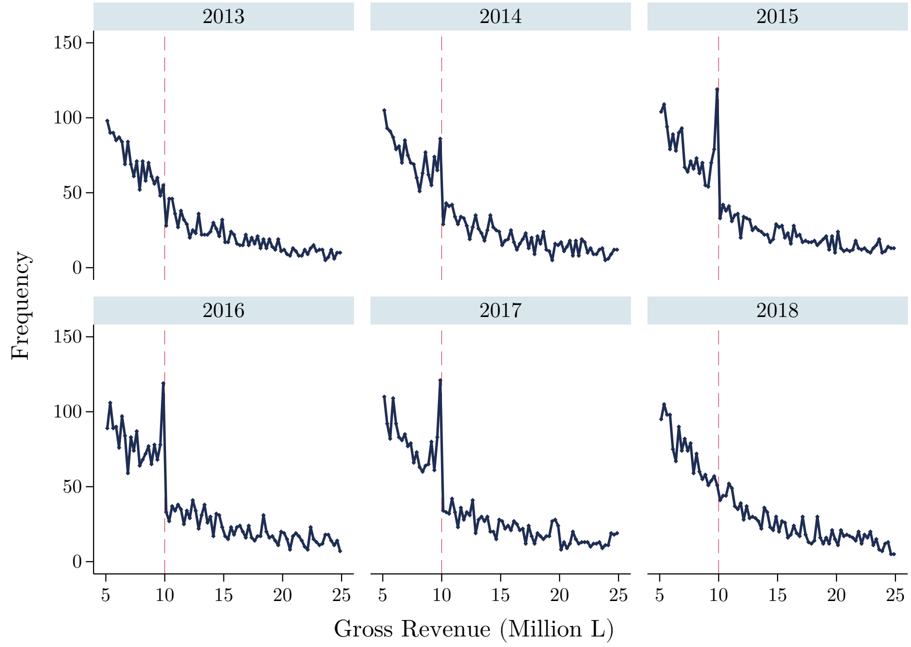
Note: This figure presents median (Panel A) and average with 95% CI (Panel B) reported profit margins by firms in two groups: 2011-2013, before the introduction of the minimum tax, and 2014-2017, then the minimum tax was in place for corporations with gross revenue above L10 million. The figure illustrates that corporations liable for the minimum tax increase their reported profit margins, consistent with the disappearance of the incentive to over report deductions in order to minimize tax liability. Bins are L500,000 wide in Panel A and L1 million in Panel B. Profit margins are trimmed at the 1st and 99th percentiles in Panel B.

Figure A5: Average number of wage workers by gross revenue (2015-2017 vs. 2018)

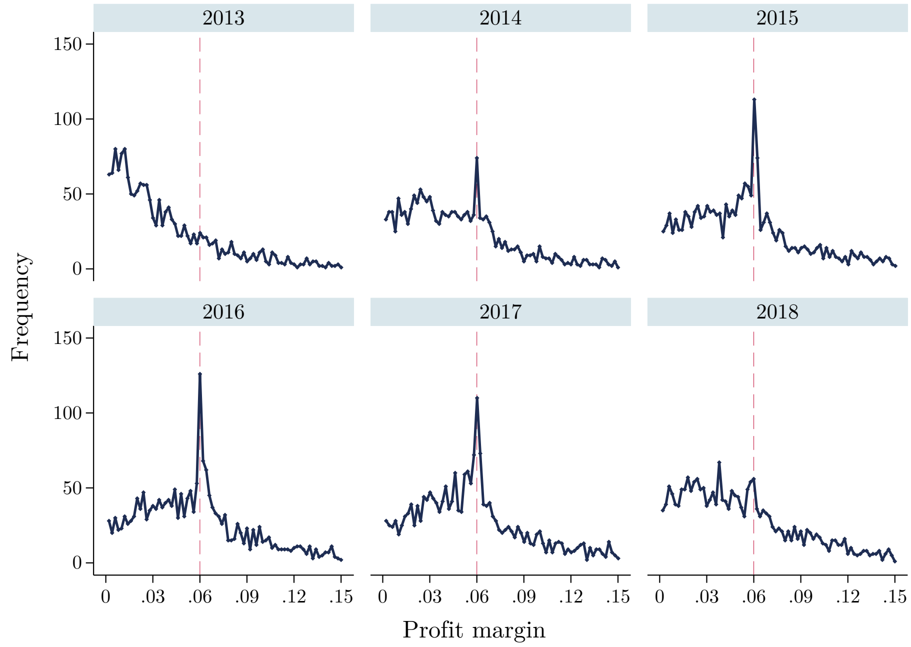


Note: This figure presents the average number of wage workers for firms in each gross revenue bin in 2015-2017 (when the exemption threshold was L10 million) and 2018 (when the threshold increased to L300 million). The number of wage workers is computed as the number of unique individuals for which the firm withheld taxes on wages. Firms are not required to withhold taxes if the total amount paid is below the exemption threshold for non-incorporated individuals, so these estimates of number of workers should be interpreted as lower bounds. The sample is limited to firms declaring at least one employee withholding (between 50-60% of firms declaring gross revenue above L5 million).

Figure A6: Robustness: Balanced panel of corporations (2013-2018)



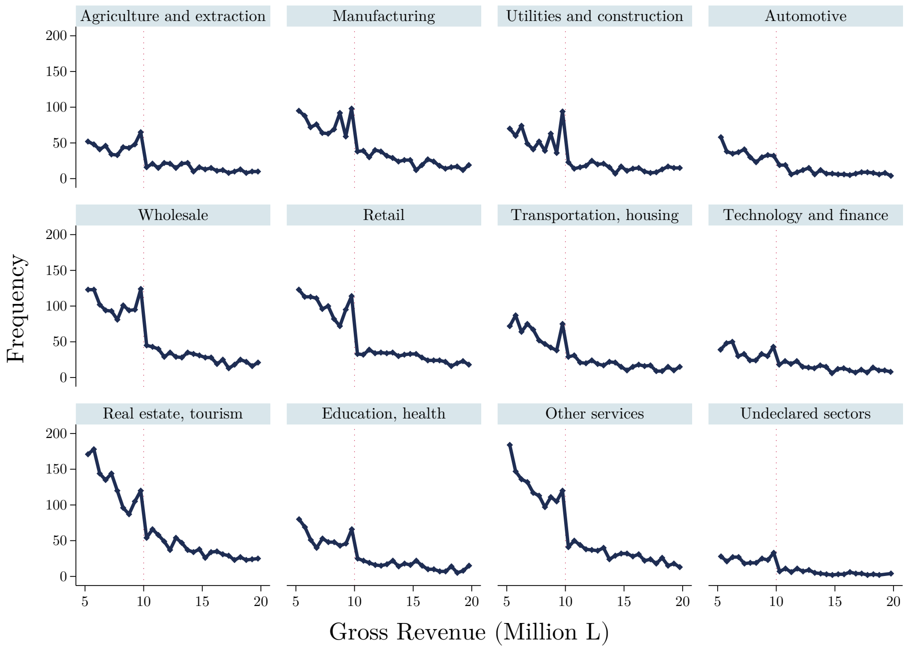
(a) Gross revenue empirical density



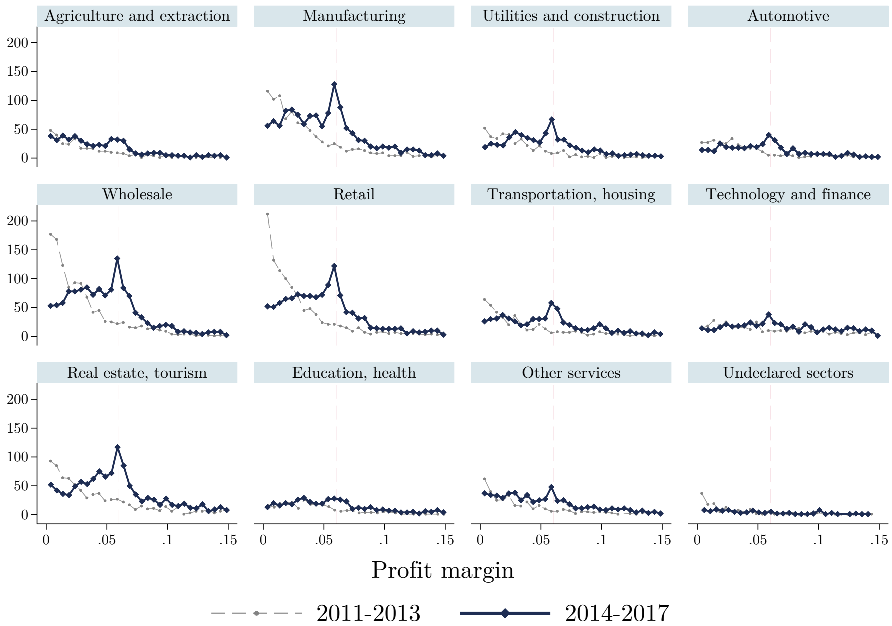
(b) Profit margin empirical density

Note: This figure presents the empirical density of gross revenues (Panel A) and profit margins (Panel B)for a balanced panel of 12,172 firms, for each year in the period 2013-2018. It documents the same pattern observed for the full sample. Panel A shows a smooth distribution of gross revenue around the L10 million notch in 2013 and 2018, but significant excess mass between 2014-2017. This is evidence that taxpayers respond to the minimum tax by strategically bunching below the exemption threshold. Panel B shows that taxpayers liable for the minimum tax increase their reported profit margin and bunch around a 6% margin, which separates the minimum tax and profit taxation regimes. Bins are L250,000 wide in Panel A and 0.2 p.p. wide in Panel B. The sample in Panel B is restricted to firms reporting gross revenue above L13 million in each year.

Figure A7: Robustness: Behavioral responses by economic sector



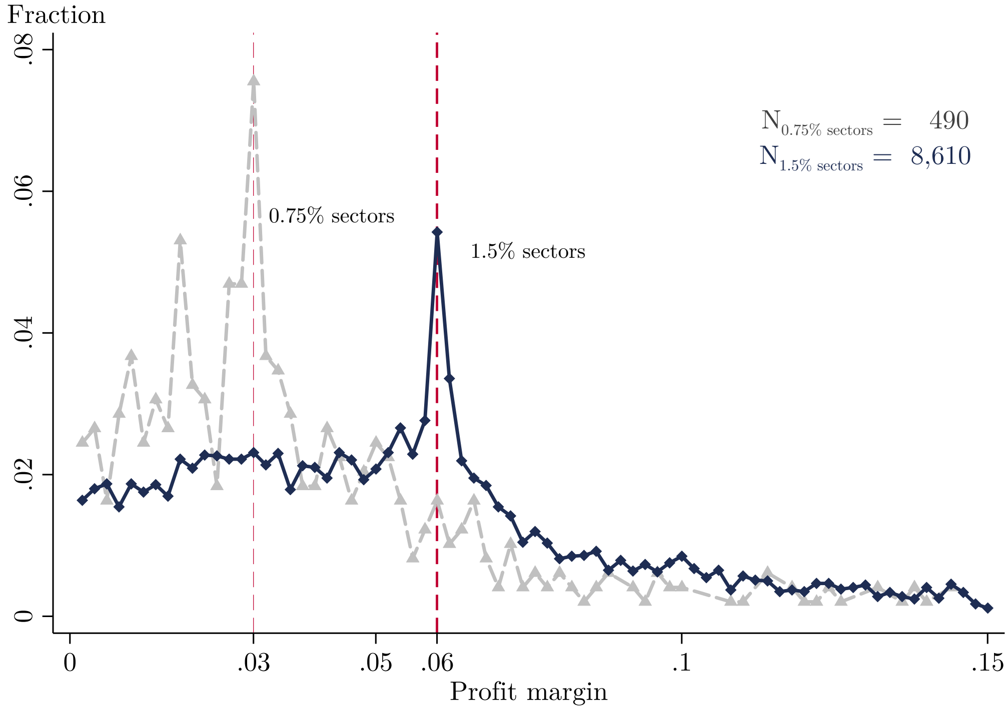
(a) Gross revenue empirical density



(b) Profit margin empirical density

Note: This figure presents the empirical density of gross revenues (panel A) and profit margins (Panel B) for firms in different economic sector for the period 2014-2017 pooled. Panel A documents that bunching below the notch is observed, in different degrees, for firms in the majority of sectors. Panel B shows that before the introduction of the minimum tax (2011-2013) the profit margin distribution is smooth around the 6% kink and presents a steep negative slope. With the introduction of the minimum taxation, the distribution shifts to the right and present excess mass around the kink. Bins are L500,000 wide in Panel A and 0.5 p.p. wide in Panel B. The sample in Panel B is restricted to firms reporting revenue above L13 million (infra marginal to the revenue bunching).

Figure A8: Empirical Density around 6% profit margin threshold - 0.75% vs. 1.5% sectors (2014-2017)



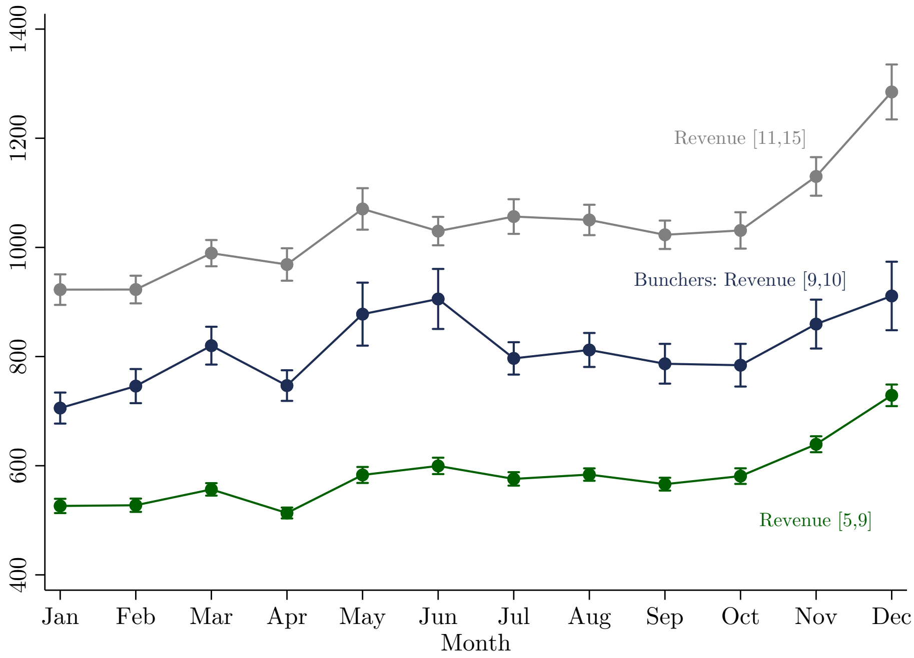
Note: This figure presents the empirical density of reported profit margins for firms subject to the 1.5% minimum tax (in solid blue) and those in sectors subject to the 0.75% rate (in dashed gray) for the period 2014-2017. The sample is restricted to firms reporting revenue above L13 million (infra marginal to revenue bunching). Bins are 0.2 p.p. wide and the first bins starts at 0.1% such that the 6% kink is the midpoint of a bin.

Table A1: Cost evasion responses across economic sectors

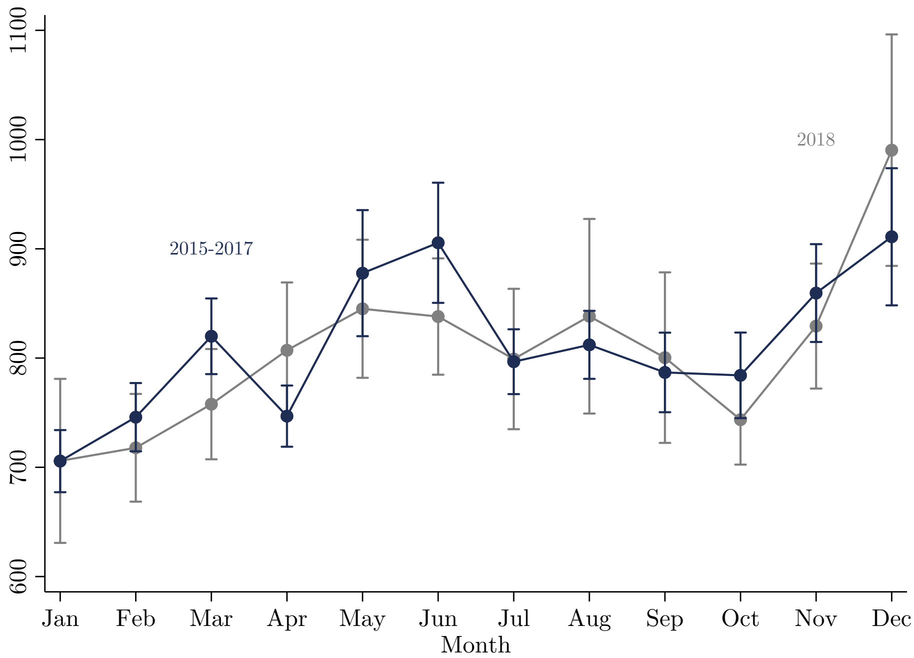
Year	Excess Mass (B)	Bunching(b)	Delta Profit	Estimated evasion (ϵ_y = 0.99)
Agriculture and extraction	38.35	6.06	1.20	-18.52
	(9.67)	*(2.26)*	*(0.50)*	*(7.53)*
Manufacturing	153.10	7.86	1.60	-25.18
	(16.32)	*(1.23)*	*(0.20)*	*(4.12)*
Utilities and construction	61.86	5.55	1.10	-16.85
	(8.00)	*(1.02)*	*(0.20)*	*(3.35)*
Automotive	49.72	7.91	1.60	-25.18
	(6.42)	*(1.60)*	*(0.30)*	*(5.26)*
Wholesale	132.19	5.66	1.10	-16.85
	(16.63)	*(0.98)*	*(0.20)*	*(3.32)*
Retail	85.16	3.71	0.70	-10.18
	(12.00)	*(0.63)*	*(0.10)*	*(2.17)*
Transportation, housing	69.39	8.09	1.60	-25.18
	(9.52)	*(1.76)*	*(0.40)*	*(5.88)*
Technology and finance	28.68	3.80	0.80	-11.85
	(7.33)	*(1.17)*	*(0.20)*	*(3.91)*
Real estate, tourism,other	93.89	4.15	0.80	-11.85
	(11.69)	*(0.64)*	*(0.10)*	*(2.10)*
Education, health, entertainment	31.71	4.59	0.90	-13.52
	(6.57)	*(1.22)*	*(0.20)*	*(4.13)*
Other services	34.21	4.04	0.80	-11.85
	(6.85)	*(1.01)*	*(0.20)*	*(3.32)*
Undeclared sectors	-1.93	-1.11	-0.20	4.82
	(4.23)	*(2.35)*	*(0.50)*	*(7.86)*

Note: This table presents estimates of change in reported profit margins and cost evasion for firms by economic sector, pooled for the 2014-2017 period. The first column reports the estimated excess number of firms (B) while column 2 reports the ratio between excess mass and average counterfactual density in the bunching region (b). Column (3) presents estimated change in profits, while column (4) present changes in cost misreporting using the decomposition presented in Section 4.4.

Figure A9: Monthly sales for firms with different yearly gross revenue



(a) 2015-2017 - Around L10 million notch



(b) 2015-2017 vs. 2018 - Below notch

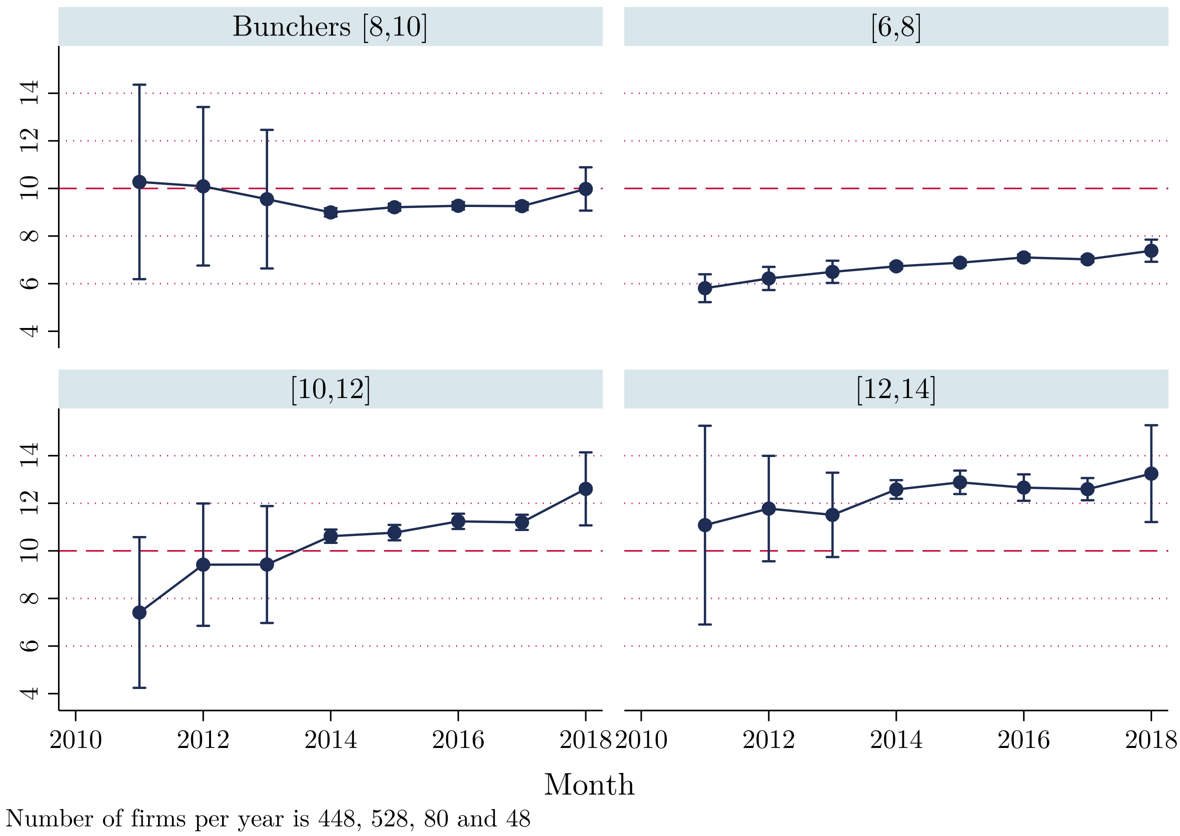
Note: This figure presents average and 95% CI monthly sales separately for firms declaring gross revenue in L5-9 million, L9-10 million and L11-15 million bins on period 2015-2017 (Panel A), and for firms declaring gross revenue between L9-10 million in 2015-2017 and 2018. The sample is restricted to firms filing both monthly sales taxes and yearly income taxes and only include firm-year observations for which the total amount of monthly revenue falls within 5% of the total revenue declared in the yearly Income Tax Declaration,

Table A2: Timing of revenue realization throughout the year

	Bunchers vs. Non-Bunchers				During vs. post Minimum Tax			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Buncher_{y-1}*January	20.95	10.66						
	(20.05)	(19.95)						
Buncher_{y}*December			-87.02**	-107.0***				
			(36.03)	(31.97)				
BuncherPre2018*January					95.11**	71.76		
					(47.26)	(45.89)		
BuncherPre2018*December							-93.66	-118.4*
							(67.64)	(65.19)
Observations	88,108	88,098	76,077	76,071	10,690	10,688	12,613	12,612
R-Squared	0.014	0.182	0.015	0.197	0.007	0.314	0.011	0.079
Firm Fixed Effect	No	Yes	No	Yes	No	Yes	No	Yes

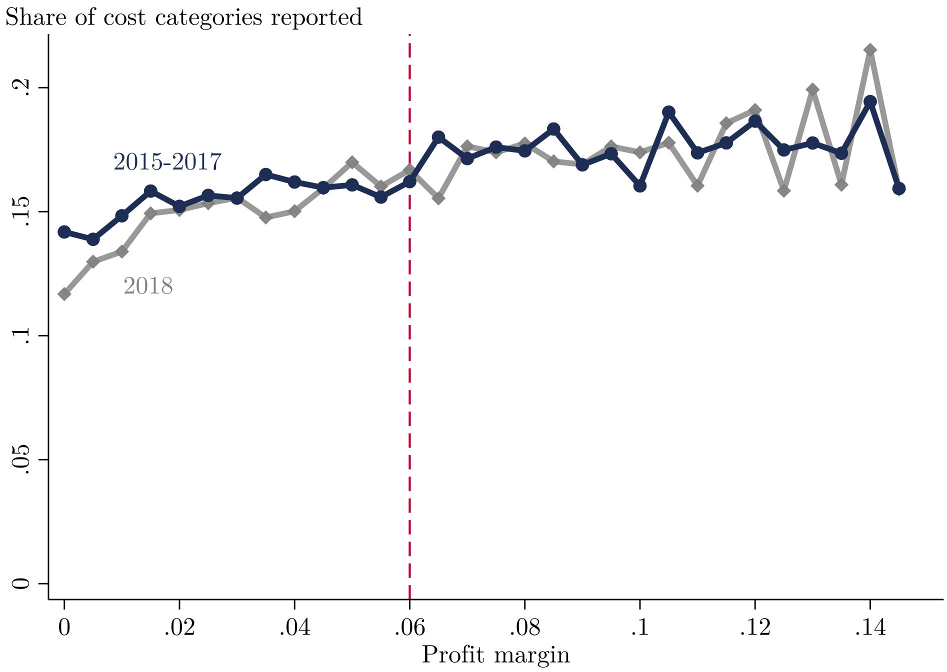
Note: This table presents regressions investigating the differential timing of revenue reporting by bunching firms. The dependent variable is the monthly amount of revenue declared (L 1,000s). In all specifications we only include firm-year observations for which the total amount of monthly revenue falls within 5% of the total revenue declared in the yearly Income Tax Declaration, and that declare between L5 - 15 million in yearly revenue. In columns (1) through (4) the non-bunchers are firms declarion above L10 million or below L9 million during 2014-2017, while in columns (5) through (10) non-bunchers are firms reporting between L9-10 million in 2018, after the notch disappeared from the tax schedule.

Figure A10: Gross revenue across years

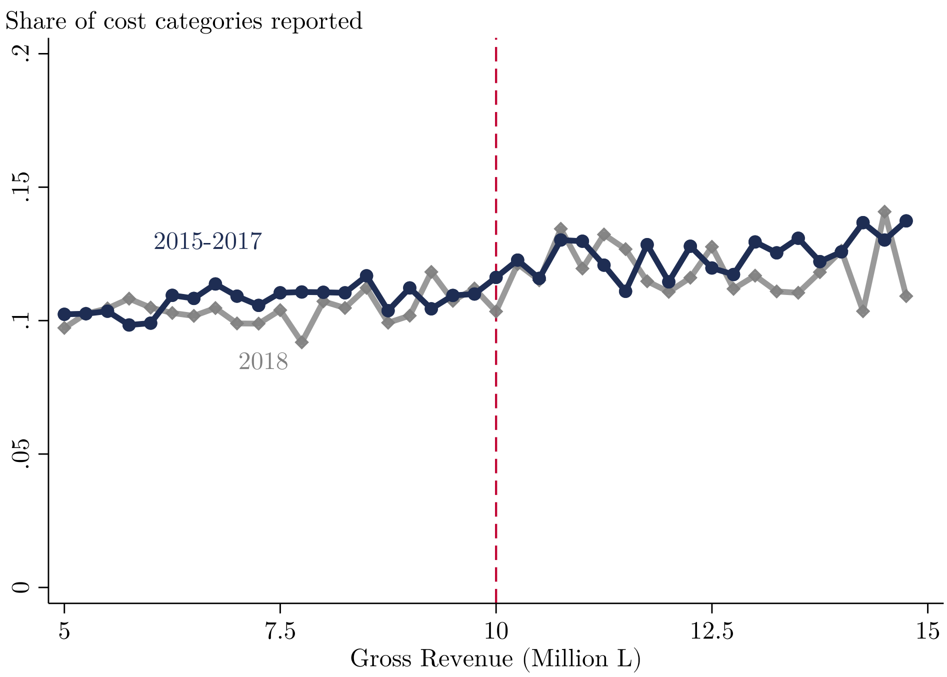


Note: Each panel is presents a balanced sample of corporations that reported revenue within L2 million bins in all years in the period 2014-2017, in the ranges of L8-10 million, L6-8 million, L10-12 million and L12-14 million, starting from the top left and moving clockwise.

Figure A11: Average number of cost categories with positive deduction



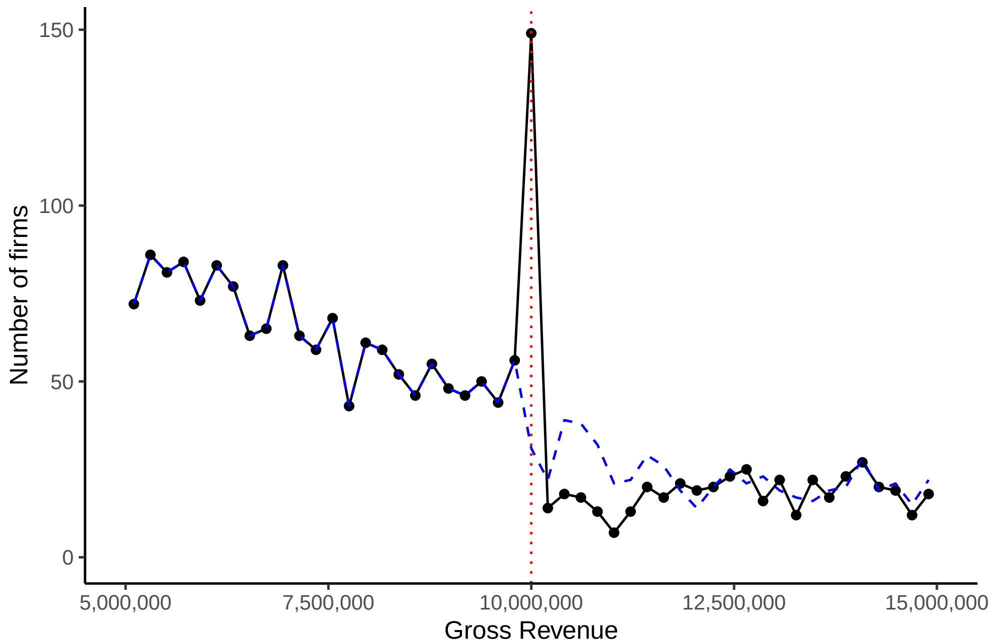
(a) Around 6% profit margin kink



(b) Around L10 million notch

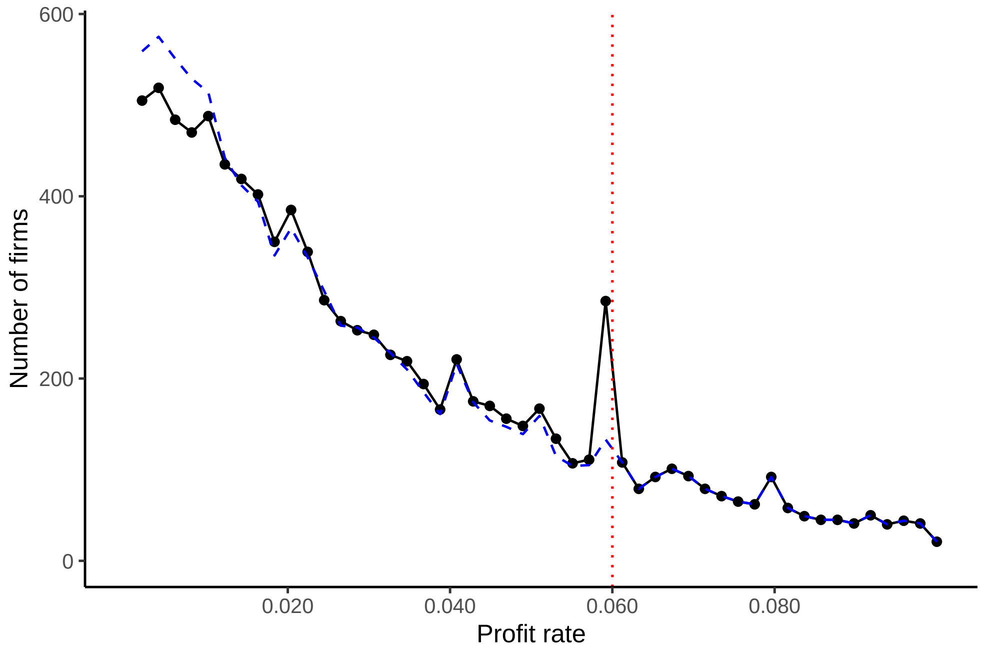
Note: This figure presents the average share of all cost categories reported by taxpayers in each bin. Panel (a) restricts the sample to taxpayers reporting revenue above L12 million and therefore infra-marginal to the revenue bunching behavior. Profit margin bins are 0.5% wide. The blue line represents declarations in the period 2015-2017, when the minimum tax affected a large number of taxpayers, while the gray line refers to declarations in 2018, when only a small subset of corporations were affected by the minimum tax. Panel (b) compares the usage of cost categories across the reported gross revenue distribution, for the period 2015-2017 (blue) and 2018 (gray). Both panels restrict the sample to taxpayers filing electronically, for which detailed cost categories are available.

Figure A12: Calibrated model - bunching on L10 million revenue notch



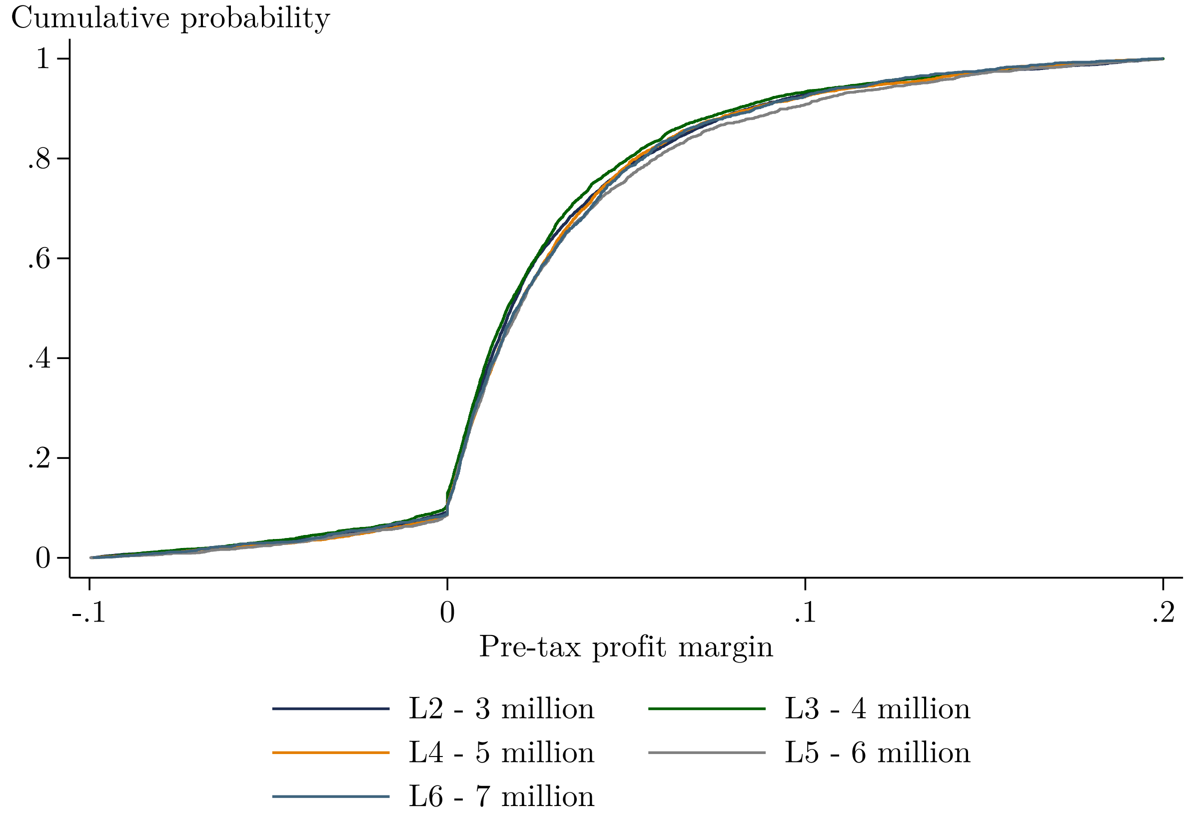
Note: This figure presents the density of simulated gross revenue using our calibrated model. The blue dashed line is the simulated density under profit taxation, while the solid black line presents the density under a Minimum Tax regime in which firms declaring above L10 million are subject to a minimum tax liability equivalent to 1,5% of their declared gross revenue.

Figure A13: Calibrated model - bunching on 6% profit margin kink



Note: This figure presents the density of simulated profit margin using our calibrated model. The blue dashed line is the simulated density under profit taxation, while the solid black line presents the density under a Minimum Tax regime in which firms declaring above L10 million are subject to a minimum tax liability equivalent to 1,5% of their declared gross revenue. We restrict the simulated sample to firms that choose to declared gross revenue above L12 million and are therefore infra-marginal to the bunching behavior at the notch.

Figure A14: CDF of profit margin for different revenue ranges



Note: This figure presents cumulative distribution functions (CDFs) of profit margins in 2014-2017, for corporations reporting gross revenues in bins of L1 million between L2-7 million. The distributions are trimmed at -10% and 20%. The profit margin distributions are similar across different revenue levels, suggesting the assumption used to estimate the lower bound revenue elasticity (using profit margin distribution below the L10 million notch as the counterfactual distribution above the notch) is reasonable.

Table A3: Alternative order of polynomial - gross revenue distribution

	Excess # Firms (B)	Firms % counterfactual (b)	y_u (upper bound)	Δ Revenue (upper bound)	ϵ_y (upper)	ϵ_y (lower)
Order p = 3	604.30	8.82	14.70	4.70	5.96	0.65
	(23.83)	*(0.41)*	*(0.64)*	*(0.64)*	*(1.31)*	*(0.06)*
Order p = 4	569.91	6.78	12.90	2.90	2.45	0.50
	(23.31)	*(0.43)*	*(0.34)*	*(0.34)*	*(0.54)*	*(0.06)*
Order p = 6	494.55	5.69	12.30	2.30	1.58	0.35
	(32.01)	*(0.81)*	*(0.91)*	*(0.91)*	*(1.55)*	*(0.06)*

Note: This table presents results from replicating the exercises performed in Table 3 using different order of polynomials to estimate the counterfactual distribution of gross revenue for the sample of pooled taxpayers in 2014-2017. The baseline specification uses polynomial regression of order five, while in this table we present results using polynomials of order three, four and six.

Table A4: Alternative order of polynomial - Profit margin distribution

Year	Excess Mass (B)	Bunching(b)	Delta Profit	Estimated evasion (ϵ_y = 0.99)
Order p = 3	779.64	5.38	1.10	-16.85
	(51.79)	*(0.44)*	*(0.10)*	*(1.59)*
Order p = 4	834.22	6.05	1.20	-18.52
	(39.97)	*(0.38)*	*(0.10)*	*(1.43)*
Order p = 6	788.99	5.49	1.10	-16.85
	(37.07)	*(0.36)*	*(0.10)*	*(1.37)*

Note: This table presents results from replicating the exercises performed in Table 5 using different order of polynomials to estimate the counterfactual distribution of profit margin for the sample of pooled taxpayers in 2014-2017. The baseline specification uses polynomial regression of order five, while in this table we present results using polynomials of order three, four and six.

B Approximating the elasticity with notch

In this section we adapt the exercise of Kleven & Waseem (2013) and Kleven (2018) to obtain the elasticity formula when taxpayers face a notch instead of a kink. The intuition behind the derivation is that we try to recover what would have been the kink that would "replicate" the same behavior observed with the notch. We start by considering the average slope of the indifference curve of the marginal buncher: this IC is tangent to the threshold using the hypothetical kink with slope $(1-\tau^*)$ and has slope of $(1-t_0-\Delta t)$ at the point $y^t+\Delta Y$. In our case, $t_0=0$ since the effective marginal rate on revenue is zero below the threshold, and $\Delta t=\tau_y=0.015$ (such that the slope above the L10 MM threshold is 0.985). We can write

$$\frac{\int_{y^T}^{y^t+\Delta Y} I'(y)dy}{\Delta Y} \approx \frac{I'(y^T)+I'(y^t+\Delta Y)}{2} = \frac{(1-\tau^*)+(1-t-\Delta t)}{2} = \frac{(1-\tau^*)+(1-\tau_y)}{2}$$

The implicit tax rate faced by corporations is the change in tax liability when we change the reported revenue from above the threshold to exactly at the notch:

$$\begin{aligned} t^* = \frac{T(y^t+\Delta Y)-T(y^T)}{\Delta Y} &= \frac{\tau_y(y^t+\Delta Y)-\tau_\pi(y^T-\hat{c})}{\Delta Y} \\ &= \tau_y + \frac{\tau_y y^T+\tau_\pi(y^T-\hat{c})}{\Delta Y} \end{aligned}$$

Combining the fact that we have these two approximations to the slope of the IC in that region, and that $\Delta t = 0.015 = \tau_y$, we can write:

$$1 - t^* = \frac{(1-\tau^*) + (1-\tau_y)}{2}$$
$$\tau^* = \tau_y + 2\left(\frac{\tau_y Y^T + \tau_\pi (y^T - \hat{c})}{\Delta Y}\right)$$

Plugging in the expression for τ^* in the usual expression for obtaining revenue elasticity when facing changes in marginal taxes we obtain:

$$\begin{aligned}
\epsilon_{y,(1-t)} = \frac{\frac{\Delta Y}{Y^T}}{\frac{\Delta \tau^*}{(1-\tau^*)}} &= \frac{\Delta Y}{Y^T}\left(\frac{1-\tau^*}{\tau^* - t_0}\right) \\
&= \frac{\Delta Y}{Y^T}\left(\frac{1-\tau^*}{\tau_y + 2\left(\frac{\tau_y Y^T - \tau_\pi (Y_T - \hat{c})}{\Delta Y}\right)}\right) \\
&= \left(\frac{1}{\tau_y(2 + \frac{\Delta Y}{Y^T}) - 2\tau_\pi \frac{(Y_T - c)}{Y_T}}\right)\left(\frac{\Delta Y}{Y^T}\right)^2 (1-t)
\end{aligned}$$

Some things are worth noting from this expression. First, if profits are zero, than the expression above simplifies to

$$\epsilon_{y,(1-\tau)} \approx \left(\frac{\Delta Y}{Y^T}\right)^2 \left(\frac{(1-\tau)}{\Delta \tau}\right)\left(\frac{1}{2 + \frac{\Delta Y}{Y^T}}\right)$$

which is exactly the same expression in Kleven & Waseem (2013). This is the expression we use to calculate the upper bound of elasticities presented in the text.

Second, note that if profit margin is exactly 6%, then it's true that

$$\tau_y(2 + \frac{\Delta Y}{Y^T}) - 2\tau_\pi 0.06 = 0.015(2 + \frac{\Delta Y}{Y^T}) - 2(0.25)0.06 = 0.015 * \frac{\Delta Y}{Y^T}$$

and the elasticity becomes

$$\begin{aligned}
\epsilon_{y,(1-t)} &= \left(\frac{1}{\tau_y(2 + \frac{\Delta Y}{Y^T}) - 2\tau_\pi \frac{(Y_T - c)}{Y_T}}\right)\left(\frac{\Delta Y}{Y^T}\right)^2 (1-\tau^*) \\
&= \left(\frac{Y^T}{0.015\Delta Y}\right)\left(\frac{\Delta Y}{Y^T}\right)^2 (1-\tau^*) \\
&= \left(\frac{\Delta Y}{Y^T}\right)\frac{(1-\tau)}{\tau_y} = \epsilon_{kink}
\end{aligned}$$

If the marginal buncher had profit margin = 6%, then he's not facing a notch at the L10 million threshold, but a kink, and the elasticity reflects that.

C Model calibration details

We modify firms' profit function by making explicit assumption about the cost and misreporting loss functions such that firms maximize:

$$\hat{\Pi}(y,c(y),\hat{c}) = (1-\tau)y + \tau\mu\hat{c} - \alpha_i - \frac{\theta_i}{1+1/e}\left(\frac{y}{\theta_i}\right)^{(1+1/e)} - \frac{B_i}{1+1/\gamma}\left(\hat{c}-c(y)\right)^{(1+1/\gamma)}$$

Each taxpayer is characterized by the vector $(\theta_i, \alpha_i, B_i)$ that define productivity, fixed cost and evasion ability, respectively. To simulate optimal taxation we also need to pin down the output elasticity e and the "evasion" elasticity γ. Given our functional forms, optimal vector of output and reported costs $(y^*, \hat{c}^*(y^*))$ are:

$$\begin{aligned} y^* =& \theta(1-\tau_E)^e \\ \hat{c}^*(y^*) =& c(y^*) + B_i\left(\tau\mu\right)^\gamma \end{aligned}$$

where $\tau_E = \tau\left(\frac{1-\mu}{1-\tau\mu}\right)$. Note that if we have profit tax then $\mu = 1$ and $\tau_E = 0$, so decisions are undistorted.

In order to calibrate the model, we follow Best et al. (2015) and use data for the 2013, when no notches or kinks were in place. Under profit taxes, we have that

$$\begin{aligned} y^* =& \theta \\ c(y^*) =& \alpha + \frac{\theta}{1+1/e} \\ \hat{c}^*(y^*) =& \alpha + \frac{\theta}{1+1/e} + \left(\frac{\tau}{B_i}\right)^\gamma \end{aligned}$$

From these equations we can immediately pin down θ, which is simply the vector of reported output, which in this model coincides with real output. We also know the elasticity of output e, which we fix to be $e = 0.99$, the upper bound estimated for the pooled years.

However, we do not observe $c(y^*)$, the real costs, but only the reported costs $\hat{c}^*(y^*)$. But we have estimated evasion as a share of profits using the 6% profit margin kink. Let that quantity be $\epsilon_{\hat{c}}$ Using the fact that at the profit kink $(y-\hat{c})/y = \tau_y/\tau_\pi$ we can write

$$\frac{(\hat{c}-c)}{y} = \frac{(\hat{c}-c)}{(y-\hat{c})} * \frac{(y-\hat{c})}{y} = \epsilon_{\hat{c}}(\tau_y/\tau_\pi) = \epsilon_{\hat{c}} * 0.06$$

Using the equations above, we have that

$$\frac{(\hat{c}-c)}{y} = \frac{\left(\frac{\tau}{B_i}\right)^\gamma}{\theta} = 0.06\epsilon_{\hat{c}}$$

We already know θ, so we need two different values for $\epsilon_{\hat{c}}$ to pin down both (B_i, γ). Best et al. (2015) use different profit tax structures for low and high rate firms to identify $\epsilon_{\hat{c}}$. Bachas &

Soto (2018) use their estimates of cost elasticity in two different thresholds (Costa Rica's profit tax schedule has two notches) to obtain two different levels of cost evasion. We have many different variations to explore in the Honduras' context. We are still working on the most appropriate way to estimate cost elasticity. By now, we are using estimates from Best et al. (2015), which is approximately 1.5.

Finally, once we have all of these pinned down, we can just obtain the fixed cost vector α by computing

$$\hat{c}^* = \alpha + \frac{\theta}{1 + 1/e} + \left(\frac{\tau}{B_i}\right)^{\gamma}$$

Once we've estimated those parameters, we can ask the counterfactual question: what are the welfare impacts of varying the pair (μ, τ)? Following Best et al. (2015) and Bachas & Soto (2018), we perform this exercise by assessing the impact of pairs (μ, τ) that doesn't reduce aggregate firms' profits.

D Estimation of revenue elasticity: model-based

Following Bachas & Soto (2018), we compute the average revenue elasticity considering that firms with different profit levels (generated by heterogeneity in fixed-costs) will face different incentives to bunch. First, recall that firms with counterfactual profits above 6% or below 0% will not decide to bunch, since they are not affected by the minimum tax. Second, for firms within that profit range, the incentive to bunch is directly (inversely) proportional to their costs (profit margins): firms with high costs (low profit margins) will have a strong incentive to bunch since their tax liability at the threshold will be small, while not bunching means a much larger tax liability based on their revenues.

We can then express the amount of bunching taxpayers as

$$\begin{aligned}
B &= \int_c \int_{Y^T}^{Y^T + \Delta Y} \Psi(y_0, c_0)\, dy\, dc \\
&= \int_c \int_{Y^T}^{Y^T + \Delta Y} \phi_y(y_0)\phi(c_0)\, dy\, dc \\
&= \int_{Y^T}^{Y^T + \Delta Y} \phi_y(y_0) \int_{c_0} \phi(c_0)\, dc\, dy \\
&= \int_{Y^T}^{Y^T + \Delta Y} \phi_y(y_0) \int_0^{m(y_0)} \phi(m_0)\, dm\, dy
\end{aligned}$$

where in the second line we assume that the cost and revenue distributions are independent; in the third line we make it explicit that, for any given level of revenue, there is a cost region that will induce bunching; and in the last line we re-write the expression as a function of profit levels instead of cost, and make it explicit that, for any given revenue level, only low-profit taxpayers will bunch, the upper threshold of which depends on the revenue level. Intuitively, for taxpayers very close to the notch, all those potentially affected by the minimum tax will decide to bunch, whereas those farther from it will only bunch if the differential tax liability is large due to their low profits.

In order to connect the cost/profit levels that induce bunching at each revenue level, recall that we previously computed that, for the marginal buncher at revenue level $Y^T + \Delta Y$, we can compute the revenue elasticity as

$$\epsilon_{y,(1-t)} = \left(\frac{1}{\tau_y (2 + \frac{\Delta Y}{Y^T}) - 2\tau_\pi \frac{(Y_T - c)}{Y_T}} \right) \left(\frac{\Delta Y}{Y^T} \right)^2$$

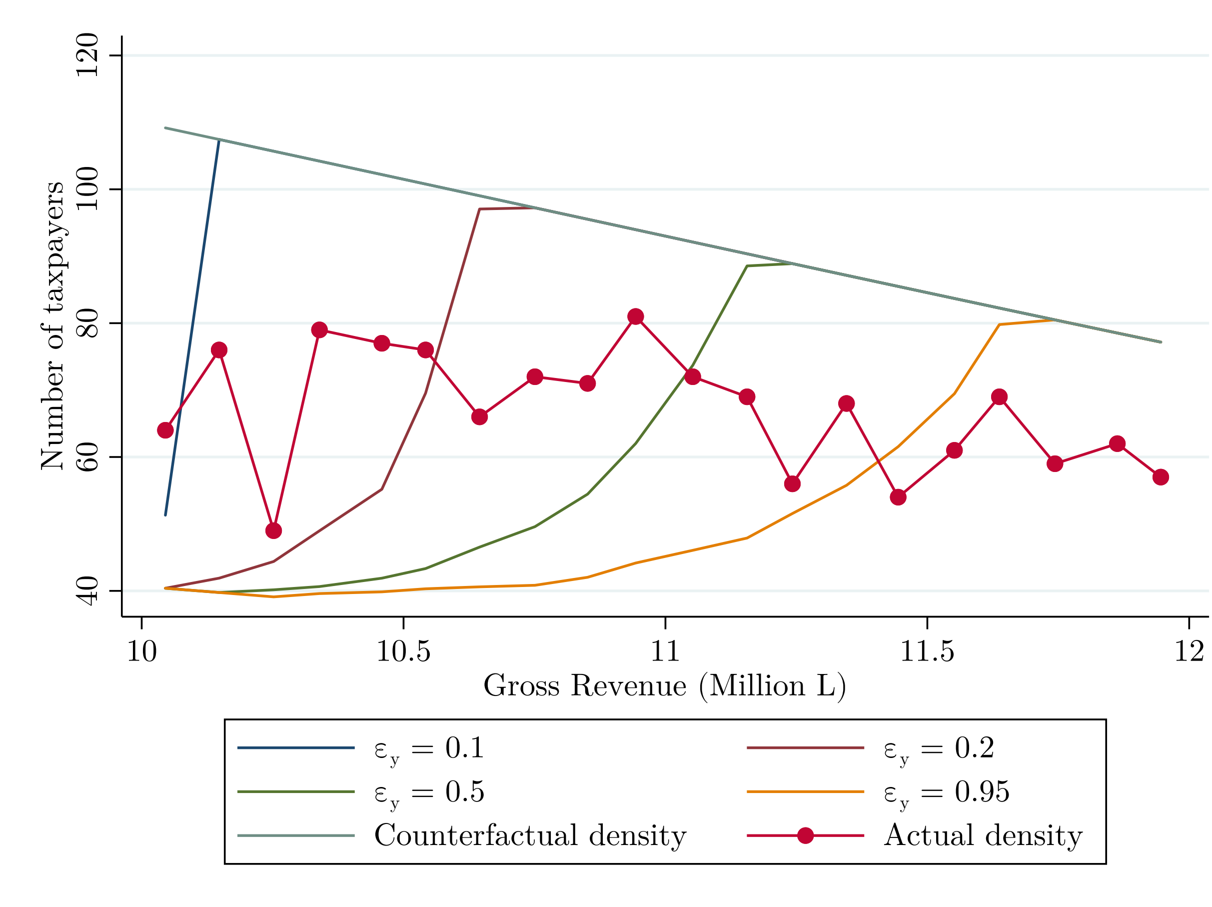
We can rewrite this equality putting the cost *c* in evidence:

$$c^* = y^T \left(1 - \frac{\tau_y}{\tau_\pi}\right) - \frac{\tau_y}{\tau_\pi} \frac{\Delta y}{2} + \frac{(\Delta y)^2}{2 * \epsilon_y * \tau_\pi * Y^T}$$

For a given revenue level and elasticity, c^* is the cost at the threshold that would make a taxpayer indifferent between bunching and staying above the notch. Any taxpayer with costs above that level, i.e. a lower profit margin, would decide to bunch.

We implement the estimation of the revenue elasticity ϵ_y in the following steps: 1) we consider that the counterfactual profit distribution in each revenue bin is the same as that for the bins between L5-8 million in the same period; 2) with that distribution in hand, we compute, for each ϵ_y, what is the share of taxpayers with profit margin between 0 and the implied upper bound; 3) using the counterfactual density estimated previously, we compute the number of taxpayers that bunch in each revenue bin; 4) we sum the total number of bunchers obtained for each elasticity revenue and compare it with the excess mass estimated previously. The final elasticity, therefore, is the value that generates the same number of bunchers as the excess mass below the threshold.

Figure A15: Simulation to obtain average elasticity



Note: This figure presents the empirical density of gross revenues above the L10 million threshold (in red); and several simulations of what the density would have been given different revenue elasticities according to the model described above.

E Assessing dominated region with parametric model

As in Kleven & Waseem (2013), let's consider a parametric model to assess what is the dominated region in our notch setting, that is, the interval of revenue that is (potentially) strictly dominated for taxpayers to locate at. Consider a simple version of our iso-elastic cost model, where firms are defined by a productivity parameter θ and a fixed-cost parameter α and profits are given by

$$\hat{\Pi}(y,\alpha) = y - \alpha - \frac{\theta}{1+1/e}\left(\frac{y}{\theta}\right)^{(1+1/e)} - T(y,\alpha)$$

First, note that under a pure profit tax ($T(y,\alpha) = \tau_\pi * (y - c(y))$), we have that $y^* = \theta$, so the revenue choice reveals the productivity parameter. Under revenue taxation, the optimal revenue choice is $y^* = \theta(1-\tau_y)^e$. Let the productivity of the marginal buncher be $\theta^T + \Delta\theta$. The marginal buncher is indifferent between reporting revenue exactly at the threshold or staying at their best interior solution. Their profit under each decision are given by

$$\Pi_{\text{Bunch}} = (1-\tau_\pi)\left(y^T - \alpha - \frac{\theta^T + \Delta\theta}{1+1/e}\left(\frac{y^T}{\theta^T+\Delta\theta}\right)^{1+1/e}\right)$$

$$\begin{aligned}\Pi_{\text{NotBunch}} &= (1-\tau_y)y^* - \alpha - \frac{\theta^T+\Delta\theta}{1+1/e}\left(\frac{y^*}{\theta^T+\Delta\theta}\right)^{1+1/e} \\ &= (\theta^T+\Delta\theta)(1-\tau_y)^{1+e} - \alpha - \frac{\theta^T+\Delta\theta}{1+1/e}(1-\tau_y)^{1+e} \\ &= \frac{(\theta^T+\Delta\theta)(1-\tau_y)^{1+e}}{e+1} - \alpha\end{aligned}$$

Finally, since the internal solution for the marginal buncher, had she not bunched, could be written as $y^T + \Delta Y = (\theta^T + \Delta\theta)(1-\tau_y)^e$, we can replace the terms involving the (unobserved) taxpayer type with the (observed) thereshold and the (estimable) change in revenue. We then have

$$\begin{aligned}\Pi_{\text{Bunch}} &= \Pi_{\text{NotBunch}} \\ (1-\tau_\pi)\left(y^T - \alpha - \frac{y^T+\Delta y}{(1-\tau_y)^e(1+1/e)}\left(\frac{y^T(1-\tau_y)^e}{y^T+\Delta y}\right)^{1+1/e}\right) &= \frac{y^T+\Delta y}{(1-\tau_y)^e}\frac{(1-\tau_y)^{1+e}}{e+1} - \alpha \\ (1-\tau_\pi)(y^T-\alpha) - (1-\tau_\pi)(1-\tau_y)\frac{y^T+\Delta y}{1+1/e}\left(\frac{y^T}{y^T+\Delta y}\right)^{1+1/e} &= \frac{1-\tau_y}{e+1}(y^T+\Delta y) - \alpha\end{aligned}$$

Let's consider what happens when taxpayers have $e = 0$. Taking the limit of the above equality as elasticity goes to zero we get:

$$\begin{aligned}(1-\tau_\pi)(y^T-\alpha) - \frac{1-\tau_y}{1}(y^T+\Delta y) &= 0 \\ \text{Lim}_{e\to 0}\Delta y &= \frac{\tau_y y^T - \tau_\pi(y^T-\alpha)}{1-\tau_y}\end{aligned}$$

Some things to note. First, if $1-\alpha/y^T = 0.06$, then $\text{Lim}_{e\to 0}\Delta y = 0$: for taxpayers with "profit margin" equal to 6% and zero elasticity, there exists no dominated region - the notch becomes a kink. For those with $y^T = \alpha$, so they report non-positive profits, $\text{Lim}_{e\to 0}\Delta y = \frac{\tau_y * y^T}{1-\tau_y} = L152,000$. These are the taxpayers with strongest incentive to bunch, and the region between L10 million and L10,152,000 is dominated. For those with taxable income rates between 0-6%, the dominated region lies between 0 and L152,000.

In our empirical estimation of elasticity we use bins of L100,000. According to the calculation above, no taxpayers with taxable income rate between 0 - 2% should locate in that region. Using the counterfactual taxable income rate distribution, this group represents approximately 30% of taxpayers, meaning that no more than 70% of taxpayers could be observed reporting revenue above the threshold. As can be seen in Figure A15, for the first bin we observe less than 70 taxpayers while the counterfactual distribution predicts 110 taxpayers. So we cannot reject that, under 0 elasticity, all taxpayers that should bunch have actually bunched. Note that this is an extreme assumption, and we just cannot precisely explore the notch to recover "innatention" as in Kleven & Waseem (2013) or (Londoño-Vélez & Ávila Mahecha, 2019).

F Social Contribution Tax and Net Asset Tax

Corporations face a 25% flat tax on yearly profits in Honduras. Three more special provisions affect their potential tax liability, nonetheless. The first is the Minimum Tax studied in this paper, which was introduced in 2014 and started to phase out in 2018. Since 1994, corporations also faced a Net Asset tax similar in nature to a minimum tax: if the tax liability under the asset tax is smaller than the profit tax liability, it can be used as a credit, meaning that in practice firms would only pay the profit tax. If the asset tax is larger, firms formally must pay the income tax and the additional difference between the two liabilities. In practice, the asset tax is also a tool to avoid that large corporations minimize their tax liability by inflating costs and driving down taxable income. In the period under study, the Net Asset tax was 1% of the net assets above L3 million.

The last provision is the Social Contribution (AS for the spanish *Aportación Solidaria*) tax, a surcharge on income tax applying to large firms. Established for the first time as a temporary measure in 2003, the AS tax rate varied between 5-10% in the period of this study and applied to declared taxable income above L1 million (USD 40,000)[37].

In Table A5 we present the distribution of firms by their tax status in each year of the sample. Both the AS and the asset tax existed throughout the analysis period, while the Minimum Tax was established in 2014. In each year, approximately one-quarter of tax filing corporations pay no income tax - this is often the result of generating no revenue in the period or, more frequently, registering losses. Before the introduction of the Minimum Tax, around 63% of corporations were liable for income tax and 9% for the Net Asset tax. With the introduction of the Minimum Tax in 2014, the share of firms liable for asset tax does not change, but the share paying income tax falls by 8 percentage points as firms start being liable for the minimum tax. Between 1,400 and 1,700 firms were paying the minimum tax before 2018, when the number falls drastically to only 135 once the exemption threshold increases from L10 million to L300 million. The Social Contribution tax was payed by 8-10% of corporations every year, and it is a surcharge on those paying either income or minimum tax, but not the asset tax[38].

We now present evidence of taxpayers' response to the incentives posed by the Net Asset tax and the AS. First, corporations with net assets slightly above the L3 million threshold might have an incentive to bunch below that value, since any assets declared above that value are potentially

[37] A tax reform in 2010 established the AS tax rate at 10% for the first two years and then progressively declined to zero by 2015. With the 2014 tax reform, nonetheless, the tax was made permanent and the tax rate fixed at 5%.

[38] In order to arrive at the final tax liability, the Tax Authority first calculates the maximum between the income tax and the minimum tax liabilities, and add the social contribution liability to that. This value is then compared to the asset tax liability, and the maximum of these two is the final tax liability.

taxed at 1%. The asset tax liability starts at zero for firms declaring exactly L3 million in assets and increases with a slope of 1% for each additional Lempira in net asset declared. This constitutes a *kink* in the taxpayers' budget set, and one that is only relevant for corporations with very low income or minimum tax liability.

In Figures A17 and A18 we present evidence of bunching in declared net assets, for each year between 2014 and 2018 and for the same period pooled together[39]. Throughout the period we observe an excess mass of taxpayers reporting net assets around L3 million, particularly in 2017 and 2018. When pooling all years together and estimating a counterfactual distribution in the same vein as Equation (4), we estimate an excess mass equivalent to 2 times the density at the threshold and find that the marginal buncher decreases reported net assets by 3% to avoid taxation[40].

We then turn to the Social Contribution tax. Described as a "surcharge" on taxable income above L1 million, in practice the AS introduces a kink on the tax schedule faced by firms: taxable income below L1 million is taxed at 25%, while any amount above that faces a marginal tax rate of 25+5 = 30%. It's worth noting that taxpayers' response to this kink is less straightforward than on personal income taxation: if we consider that taxable income is equivalent to pure profits, then we should expect no behavioral response since pure rents are being taxed. Realistically, production costs such as managers' efforts are not deductible and previous research has documented positive elasticities of corporate taxable income (Devereux et al., 2014).

In figures A19 and A20 we present evidence that corporations respond to those incentives by bunching at the kink. We present estimates of the corporate taxable income elasticity in Table A6[41]. Estimates for the first years are noisier, but for the period 2014-2018 estimates are precisely estimated and fall in the range of 0.3-0.6. These local estimates, around a kink equivalent to USD 40,000, are similar to the ones obtained by (Devereux et al., 2014) for corporations with taxable income around £10,000 in the UK.

[39]We do not present results for the period 2011-2013 due to data limitations. Before 2014 a much larger share of tax filings were not electronic and a different paper form was used. For those years, there seems to be inconsistencies between the total declared net assets and the sum of its components.

[40]We do not attempt to obtain a net asset elasticity from those estimates, since incentives to bunch will depend both on corporations' gross revenues and taxable income.

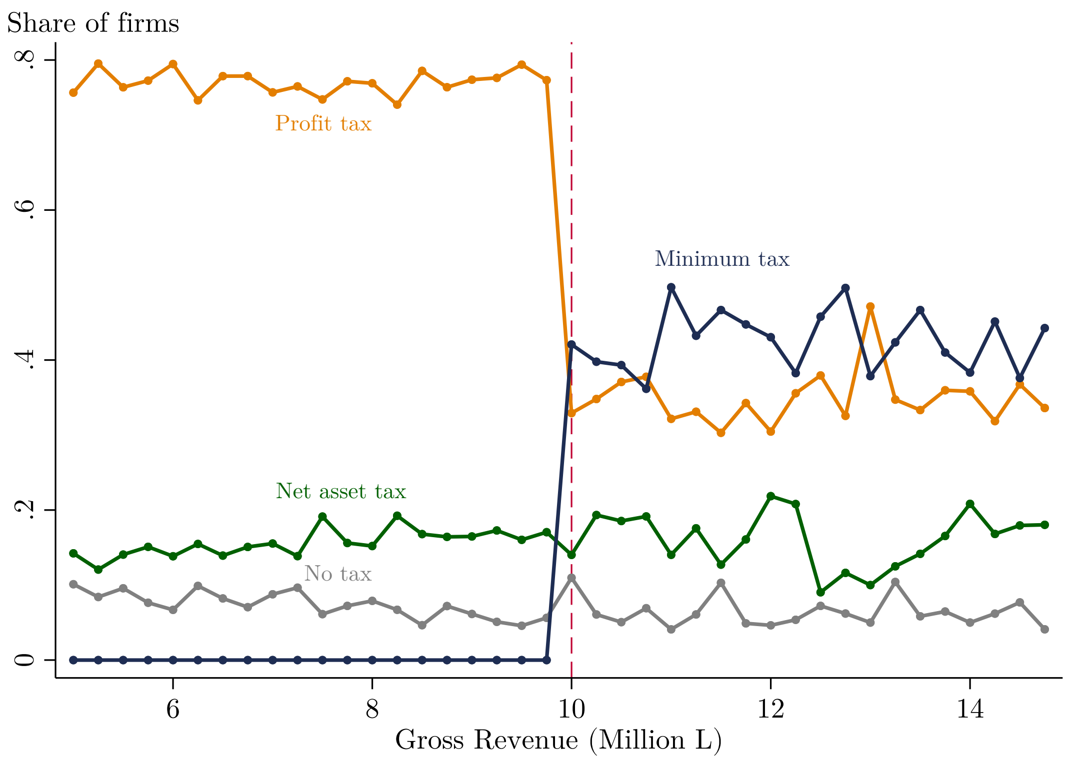
[41]The marginal taxpayer deciding to bunch is locating at an interior optimum so we can express the elasticity simply as $\epsilon_y = \frac{\Delta y/y}{\Delta\tau/(1-\tau)}$.

Table A5: Taxpayer status by year

Year	Not taxed	Income Tax	Asset Tax	Minimum Tax	Total
2011	4,791	10,940	1,563	0	17,294
2012	4,763	11,548	1,798	0	18,109
2013	4,945	12,372	1,906	0	19,223
2014	5,397	11,566	1,891	1,610	20,464
2015	6,237	13,997	1,944	1,480	23,658
2016	6,641	15,553	2,057	1,478	25,729
2017	7,328	16,544	2,281	1,672	27,825
2018	7,946	19,080	2,783	135	29,944

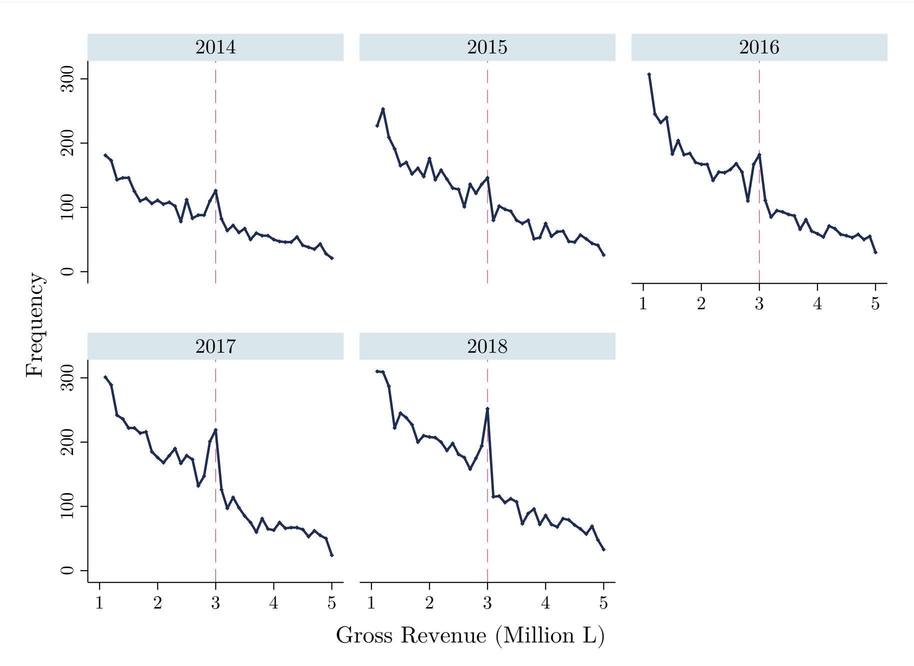
Note: This table presents the distribution of corporate taxpayers each year, according to their tax liability status.

Figure A16: Share of firms liable for each type of tax (2014-2017)



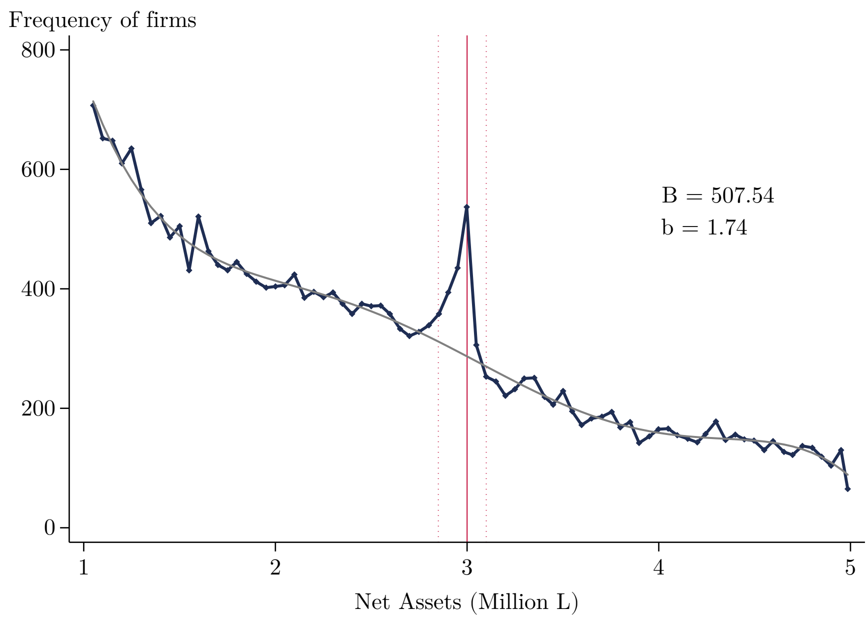
Note: This figure presents the share of firms liable for each type of tax (profit, minimum, net asset or no tax), in each bin of gross revenue for the period 2014-2017 pooled. It shows that when crossing the L10 million exemption threshold the increase in the share of firms paying the minimum tax is mirrored by a decrease in the share of firms liable for profit tax, with little change observed in the share of firms paying the net asset tax or not paying any taxes. The sample excludes corporations exempt from the minimum tax due to sectoral exceptions and/or recent start of operations.

Figure A17: Bunching on L3 million assets - by year 2014-2018



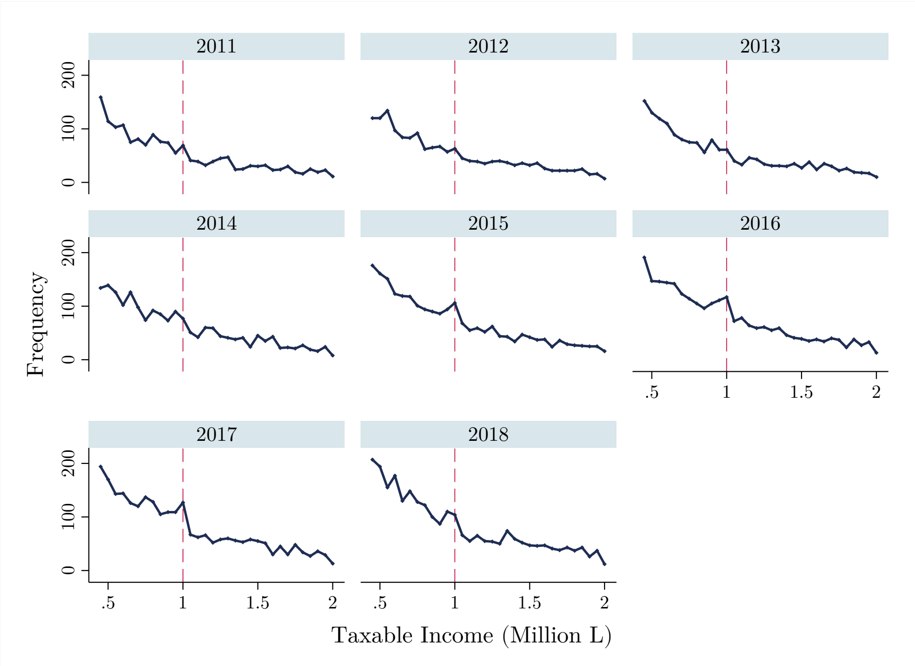
Note: This figure presents, for each year in the period 2014-2018, the empirical density of declared net assets. The data shows an excess mass of taxpayers declaring net assets in the vicinity of L3 million, the exemption threshold for the net asset tax (marked by a red dashed line). Bins are L100,000 wide and the first bin starts at L1.05 million, such that L3 million is the midpoint of a bin.

Figure A18: Bunching on L3 million assets - pooled 2014-2018



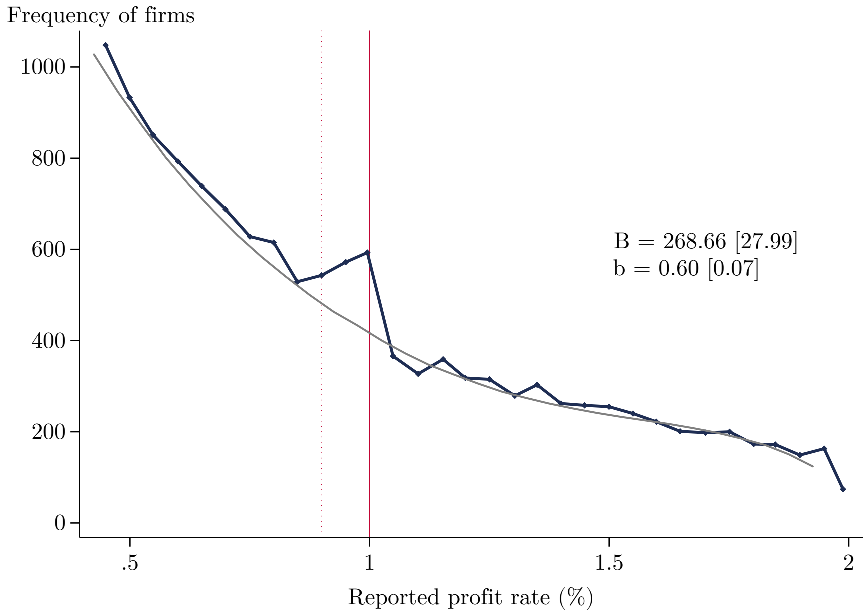
Note: This figure presents, for a pooled sample in the period 2014-2018, the empirical density of declared net assets (blue line) and the estimated counterfactual distribution (gray line), obtained from a similar polynomial specification as equation (4). Bins are L50,000 wide and the first bin starts at L1.025 million so that L3 million is the midpoint of a bin. The red solid line marks L3 million, the threshold above which firms can be liable for Net Asset taxes, and the dotted lines mark the "excluded region" where we observe excess mass (bunching).

Figure A19: Bunching on L1 million taxable income - 2011-2018



Note: This figure presents, for each year in the period 2011-2018, the empirical density of declared taxable income. There's a clear excess mass of taxpayers declaring taxable income around L1 million, the exemption threshold for the Social Contribution tax, particularly for the latest years in the sample. Bins are L50,000 wide and first bin starts at L425,000 such that L1 million is the midpoint of a bin.

Figure A20: Bunching on L1 million taxable income - pooled 2013-2018



Note: This figure presents, for a pooled sample in the period 2013-2018, the empirical density of declared taxable income (blue) and the counterfactual estimated density (gray), obtained using a polynomial specification similar to equation (4). Bins are L50,000 wide and first bin starts at L425,000 such that L1 million is the midpoint of a bin. The pooled sample is restricted to 2013-2018 since Social Contribution tax rate was fixed at 5% in that period.

Table A6: Elasticity of taxable income

Year	Excess # Firms (B)	Firms % counterfactual (b)	Δ Taxable income	ϵ_{π}
2011	8.68	0.15	0.008	0.12
	(12.63)	*(0.23)*	*(0.011)*	*(0.17)*
2012	17.21	0.33	0.017	0.21
	(9.70)	*(0.20)*	*(0.010)*	*(0.15)*
2013	20.42	0.39	0.020	0.30
	(8.79)	*(0.18)*	*(0.009)*	*(0.14)*
2014	38.81	0.61	0.031	0.47
	(16.35)	*(0.27)*	*(0.014)*	*(0.20)*
2015	50.84	0.68	0.034	0.51
	(6.99)	*(0.10)*	*(0.005)*	*(0.08)*
2016	50.43	0.57	0.028	0.42
	(10.65)	*(0.13)*	*(0.006)*	*(0.10)*
2017	55.54	0.63	0.032	0.48
	(13.66)	*(0.17)*	*(0.008)*	*(0.12)*
2018	52.84	0.66	0.033	0.49
	(14.74)	*(0.20)*	*(0.010)*	*(0.15)*
Pooled (2013-2018)	268.66	0.60	0.030	0.45
	(27.99)	*(0.07)*	*(0.003)*	*(0.05)*

Note: This table presents changes in taxable income and elasticities for each year in the period 2011-2018, and also for the period 2013-2018 pooled. The first column reports the estimated excess number of firms while column 2 reports the ratio between excess mass and average counterfactual density in the bunching region. Column (3) presents the change in revenue for the marginal buncher. Column (5) presents the estimated elasticity in each year, and for the pooled sample.

G Minimum taxes around the world

This section presents a summary of corporate minimum tax schemes across low and medium income countries. Table A7 lists several countries that adopted some type of minimum tax for corporations as of 2019, the minimum tax rate (applied to gross revenues, in the majority of cases), the profit tax rate and specific relevant provisions.

We highlight features that are common in several contexts. First, several countries exempt firms in the first 24-36 months of operations, a period where initial investment and set-up costs might legitimately generate low or negative profits (Holland & Vann, 1998). Second, the tax rate applied to gross revenues often falls in the range of 0.5 - 2%, with reduced rates (or exemptions) applied to sectors such as pharmaceuticals, utilities and oil related industries. While this determines a floor for the effective tax rate (tax liability as share of gross revenues) corporations must pay, the implied minimum allowable profit margin (that is, the minimum profit margin reported such that firms are not paying the minimum tax rate) also depends on the corporate profit tax rate. In most countries the minimum allowable profit margin falls in the range of 1.5 - 5%, below the 6% level implied by the 1.5% gross revenue tax and 25% profit tax in place in Honduras in the period 2014-2017. Finally, in all but a few countries the minimum corporate tax provision apply to all firms, regardless of size.

Table A7: Summary of minimum tax provisions around the world

Country	**Minimum tax rate**	**Profit tax rate**	**Details**
Bangladesh	0.6%	25%/35%	Companies are exempt if gross revenues are below BDT 5 million. Reduced rates of 1% for tobacco related manufacturers, 0.75% for mobile phone companies and 0.1% for industrial sectors in first three years of operation. Profit tax rate is 25% for publicly traded companies and 35% for private limited companies.
Benin	1%	30%	Reduced rate of 0.75% for industrial companies.
Cambodia	1%	20%	
Cameroon	2%	30%	
Chad	1.5%	35%	Companies are exempt if gross revenues are below XAF 50 million. Minimum of XAF1 million for small companies and XAF2 million for large companies.
Republic of Congo	1.00%	30%	For firms below XAF 10 million the minimum tax is XAF 500,000.
Cote d'Ivoire	0.5%	25%	0.1% for utilities and 0.15% for financial companies. Minimum tax cannot be less than XOF3 million or more than XOF 35 million. Corporations are exempt in first fiscal year.
Dominican Republic	1%	27%	Tax base is gross assets.
Gabon	1%	30%	Minimum of XAF1 million. Newly incorporated companies are exempt for two years.
Guinea	1.5%	25%	Minimum of GNF15 million.
Guyana	2%	25%/40%	Profit tax rate is 25% for commercial companies and 40% for non-commercial companies
India	15%	30%	Tax base is book profits.
Madagascar	0.5%	20%	The minimum tax is calculated as MGA 320,000 (100,000 for some sectors) plus 0.5% of annual gross revenue.
Mauritania	2.5%	25%	Minimum of MRO 750,000.
Morocco	0.75%	10%/31%	Minimum of MAD3,000. Reduced rate of 0.25% petroleum, utilities and some food production sectors. New companies are exempt for three years. Corporate profit tax schedule is progressive with increasing marginal rates of 10, 17.5 and 31%.
Nicaragua	1-3%%	30%	Firms are exempt in first three years of operations.
Pakistan	1.25%	29%	Lower rates applies to oil (0.5%) and pharmaceutical (0.2%) sectors. An additional "alternative minimum tax" of 17% applies to accounting income.
Philippines	2%	30%	Corporations are exempt in the first three years of operation.
Senegal	0.5%	30%	Mininum of XOF500,000 and maximum of XOF5 million. Minimum tax rate applies to gross revenue in preceding fiscal year.

Note: This table provides a non-exhaustive list of countries that adopted some type of corporate minimum tax as of 2019. Tax base is gross revenues (turnover) unless stated otherwise. *Sources*: Ernest Young Worldwide Corporate Tax Guide 2019 and Deloitte Corporate Tax Rates 2020.