

# Not(ch) your average tax system: corporate taxation in a middle income country

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THIS VERSION APRIL 2015. WORK IN PROGRESS

## Abstract

The design of optimal tax policy in low and middle income countries needs to take into account tax evasion and limits to enforcement. Under these constraints, we have limited knowledge of how to set the corporate tax rate to set and what tax base to determine. Costa Rica's corporate income schedule offers an interesting quasi experimental setting to study optimal rate and base under evasion. Using a novel methodology which combines bunching on revenue and discontinuity in profit we recover important behavioral parameters for optimal tax policy. First, the profit elasticity is very large which implies that the revenue maximizing corporate tax rate is much lower than in advanced economies. Second, the revenue elasticity is smaller than the cost elasticity which rationalizes the use of wide tax bases and revenue thresholds for tax enforcement across developing countries. Third, we show strong evidence that tax evasion drives the results. Finally, a simple model of tax evasion where firms can evade on both revenue and cost but where third party information bounds revenue evasion explains the observed patterns.

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# 1 Introduction

While some question the need for a corporate income tax<sup>1</sup>, the necessity of taxing firms can be argued for at least three reasons. First, firms contribute an important share of total tax revenue which is hard to substitute. Second, in markets with imperfect competition the corporate tax acts as a tax on rents. Third, firms act as withholding agents and informers for a range of economic transactions. In addition firms' tax declarations provides statistical information and their registration in the tax system could generate positive externalities along other dimensions. These arguments are particularly relevant for middle income and developing countries where establishing alternative tax bases is hard due to widespread tax evasion and informality, rents are likely to be larger and third party and statistical information are incomplete. Given the aforementioned constraints, developing countries' corporate tax policy might differ from those of advanced economies and the design of optimal tax system must take those constraints into consideration. For example, under imperfect enforcement, the production efficiency theorem (Diamond and Mirrlees, 1971) does not hold and tax systems distorting production could be optimal (Best et al., 2013). This trade-off between production and revenue efficiency has led developing countries' governments to often rely upon size-based tax policies.<sup>2</sup> A few examples are Large Taxpayer Units, VAT thresholds and presumptive tax systems<sup>3</sup> which tax turnover and/or assets, instead of profits. Successful reliance on size-based tax instruments hinges on the assumption that revenue is relatively inelastic compared to costs. Therefore in order to evaluate developing countries corporate taxes, policy makers need not only to know the elasticity of profits but also how responsive revenue and costs are to

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<sup>1</sup>For an example, see Gregory Mankiw's opinion in an August 2014 New York Times article

<sup>2</sup>Size based policies apply different tax rates, rules and filing requirement as a function of size, which is measured by turnover, number of employees or assets depending on the context. The idea being that size measures are more easy to observe than profit which is the true capacity to pay. See Bachas & Jensen (2015) for more examples and a discussion of size based tax policies.

<sup>3</sup>Presumptive tax systems are also often called alternative minimum tax systems. They generate a tax liability equal to the maximum of the profit tax and the revenue/asset tax, such that firms declaring low profits pay taxes proportional to their revenue or assets.

changes in the tax rate. However we currently only have very few estimates of tax elasticities in developing countries, none about corporations and none that separate revenue and cost responses.

To answer these questions we use the 2008 to 2013 corporate tax returns for Costa Rica, a middle income country with limited full informality but widespread tax evasion<sup>4</sup>. We develop a two step methodology that combines notches on revenue and discontinuities on profit to estimate a profit elasticity and decompose it between a revenue and a cost elasticity. First, the resulting profit elasticities are large ( $\epsilon_{\pi,1-t} \sim 3$ ) and imply a low top of Laffer curve tax rate for small Costa Rican firms. Second, revenue is relatively inelastic when compared to cost. Third, we establish with additional data sources that behavioral responses arise principally from underreporting the true tax liability instead of real production responses, division of firms and profit shifting. The large difference between revenue and cost elasticities already rejects a model only of real responses. Informed by the reduced form analysis and the study of behavioral mechanisms, we develop a model of tax evasion where firms can evade both on revenue and on cost. However, third party information on revenue provides a bound on revenue evasion since declaring revenue below third party revenue implies tax evasion. The same does not hold for cost: third party reported cost only provides a lower bound on true cost. This asymmetry combined with the incompleteness of third party information generates different observed revenue and cost elasticities from a similar evasion elasticity.

Costa Rica's corporate tax schedule provides a quasi-experimental setting to study firm revenue and cost reporting behavior. Most corporate tax systems tax profit at a flat rate or at an increasing marginal tax rate. Instead, Costa Rica has increasing average tax rates, where the average tax rate is determined by the firm's revenue even though the base is the firm's profit. As a result the tax system has three rates determined by revenue: micro firms pay 10% tax on their profits, small firms 20% and medium and large firms 30%. The tax schedule generates incentives to declare revenue just below each threshold and those incentives are proportional

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<sup>4</sup>A 2012 IMF study estimates corporate tax evasion at 60%

to the firm's cost. Those features allow identification of a rich set of parameters: a separate estimation of the revenue and cost elasticities, the elasticity of substitution across the two margins and an estimate of the distribution of firm's adjustment costs . Another novelty of the Costa Rican setting is the rich and complementary datasources available. In addition to the universe of corporate tax returns, we have access to central bank records on employment and economic groups, audit data and sales tax data. By combining those, we establish the role of tax evasion as the main driver of behavioral responses and reject alternative mechanisms.

Our main findings are the following. Using the universe of corporate tax returns for 2008-2013, we document large behavioral responses to the revenue thresholds, as evidenced by bunching behavior and a triangular-shaped missing mass area past the threshold. Revenue bunching generates modest but statistically significant revenue elasticities. However the most important finding is that of a large structural break in average profit and cost on either side of the revenue thresholds. Taking into account the previously estimated revenue elasticity we can estimate the cost elasticity from this discontinuity. Cost elasticities are two to four times larger than revenue elasticities and together manipulation in revenue and costs lead to large profit elasticities: above three for the first threshold and above two for the second threshold. We then perform several empirical tests to understand the mechanisms driving behavioral responses. Using additional data, from the central bank's firm registry, social security, monthly sales taxes and audits, we test different potential mechanisms for bunching behavior: real production responses, avoidance responses, such as firm division and revenue shifting and tax evasion. We find strong supporting evidence for tax evasion being the key driver of behavioral responses. On the one hand, variation in audits by sector and data on tax "corrections" supports the existence of large evasion responses and a high degree of substitution between revenue and cost evasion. On the other hand, all statistical tests for real and avoidance responses are rejected: the social security data shows no discontinuity in the number of employees at the threshold, the subsample of monthly sales does not display evidence of revenue shifting across fiscal years and the corporate registry of economic groups held by the central bank only shows

modest evidence of firms dividing themselves. Taken together these are innovative steps in a literature that has often remained agnostic on the mechanisms driving behavioral responses. Motivated by the reduced form empirical results and the evidence of evasion responses we develop a model of tax evasion with two margins of response, cost and revenue reporting, and with possible substitution across the two. We endogenously account for adjustment costs by limiting revenue evasion to the amount of third party information reported on revenue. This third-party revenue binds for some firms which are unable to adjust their income to the threshold. Finally using the parameters estimated from the model we perform tax simulation under different corporate tax systems and discuss the policy implications of our findings.

Our work is relevant to several strands of the economic literature. First, we contribute to the literature on non-linear budget sets to recover structural parameters. The now standard method of estimating elasticities using kinks was developed by Saez (2010) and extended to notches by Kleven and Waseem (2013). Using the Pakistani profit notches of the personal income tax, Kleven and Waseem show large behavioral responses and use the dominated region of the tax schedule to estimate friction costs. They then show that by combining friction costs with bunching, researchers can identify the “structural” or long run tax elasticity. Almunia and Lopez-Rodriguez (2014) directly tests firms’ response to a size based policy. They show bunching at the revenue threshold of the Spanish large taxpayer unit which provides evidence that firms react to higher enforcement. Second, we build on a small but growing literature that analyzes firms response to the tax system and estimates corporate tax elasticities. Devereux et al. (2014) (2013) find a large elasticity for small firms in UK, while Best et al. (2013) show significant responses of small Pakistani firms to the alternative minimum tax scheme. Third, we link our findings to the tax evasion literature (Pomeranz 2013, Best 2014) and in particular to Carrillo et al. (2014) who study reporting responses of Ecuadorian firms to the tax authority’s revelation of its third-party revenue information. Responsive firms match revenue to the third-party levels but compensate by adjusting cost one for one, leaving declared profits unchanged. The authors point out the limitation of third party reporting, which arises due to

the asymmetry between revenue and cost third party information.

## 2 Tax system and revenue elasticity framework

### 2.1 Costa Rica's corporate tax

Figure 1 presents the Costa Rican corporate income tax schedule. A corporation pays an average tax rate of 10%, 20% or 30% on its profit as a function of its revenue. The tax system creates discontinuous increases in tax liability past each revenue threshold: as a firm increases its revenue just over the threshold its average tax rate jumps by 10% and applies to the whole profit base. As a consequence the corporate tax generates strong incentives for firms to declare revenue below the thresholds. In addition, conditional on being in a given revenue interval, the different average tax rates might generate different profit reporting behavior.

Figure 2 shows the theoretical distribution of firms by revenue. Below the first threshold, the observed distribution matches the counterfactual distribution, corresponding to a flat 10% tax rate. At the threshold, some firms with counterfactual revenue above the threshold bunch, which generates an excess density. However firms only bunch if their cost are sufficiently low since their incentives to bunch are proportional to the tax base. For example, a firm with zero profit does not have any tax liability and hence no incentives to change its revenue. More generally, incentives to bunch increase as firms' costs decrease, holding revenue constant. Contrarily to other studies using notches, the strictly dominated revenue interval past the threshold is firm specific and not deterministic. Therefore, even in a frictionless world, some firms with counterfactual revenue past the threshold will not bunch. Taking optimization frictions into account, reduces further the number of firms bunching. To summarize, we expect to observe three types of behavior around the threshold:

- *Bunchers* locate at the threshold. These are firms whose counterfactual revenue is either close to the threshold or whose costs are very low such that their tax base is high.
- *Rational Non-Bunchers* locate past the threshold. These are firms whose cost are large

enough such that given their revenue they have no incentives to bunch.

- *Frictional Non-Bunchers* locate past the threshold. These are firms facing optimization frictions and who would bunch absent frictions.

## 2.2 Revenue and cost relation

In section 3.2, we use bunching at the revenue thresholds to estimate revenue elasticities. Contrarily to the standard bunching methodology, incentives to bunch depend on both revenue and cost. Therefore we need to make an assumption about the revenue and cost relation. Let's consider two different scenarios: locally constant marginal cost and fixed cost. A constant marginal cost implies a proportional relation between revenue and cost. This imposes the restriction that the revenue elasticity equals the profit elasticity. With this assumption we can use the Kleven and Waseem (2013) notch formula to obtain the revenue and profit elasticity<sup>5</sup>. However, we show in section 3 that the data strongly rejects an equal revenue and profit elasticity. In addition, it relies on the response being driven by changes in production (real responses), but we show in Section 4 that the empirical test for real response is insignificant and that revenue responses are driven by tax evasion. In turn, fixed cost seem like a more reasonable assumption for an evasion driven response: production decisions have been realized by the time of the reporting decision and in the neighborhood of the threshold the firm has incentives to evade on the revenue margin<sup>6</sup>. Ultimately none of these assumptions is critical to the results but a discussion is needed to present the revenue elasticity estimation.

## 2.3 Revenue elasticity framework

We assume that each firm is owned by a single individual who provides costly effort.

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<sup>5</sup>Appendix A shows that the the model with a constant marginal cost generates exactly the same formula as in Kleven and Waseem. Intuitively, an increase in revenue generates a proportional increase in profit. elasticities capture percentage changes and therefore are the same for two variables linked by a multiplicative term.

<sup>6</sup>In the case of a fixed cost model, we obtain an elasticity equation that has a small adjustment term for costs but that otherwise is the Kleven and Waseem formula. Since the maginal buncher is very profitable the adjustment term is small. Therefore the cost assumption is not critical to the revenue estimation. See 2.3

This formulations embeds small firms into the standard consumption-earnings model used for individuals (Saez, 2010). By treating the firm as a self-employed individual we ignore issues of corporate structure and management which have been shown to be important for large firms (Chetty and Saez, 2010). However this assumption seems realistic in this setting where firms only have a couple of employees and where profits directly correspond to the owners consumption. The main difference with the standard model is that the tax base (profit) and the determinant of the tax rate (revenue) are different. For the reduced form estimation, we assume that cost are already realized or fixed.

The Main Assumption is that cost is fixed at some level  $\bar{c}$ . Business costs are fully deductible but there are effort costs (for example of evasion) such that:

Profits are:  $\pi(y) = y - \bar{c}$ , where  $y$  is the firm's declared revenue.

The utility of firm owner of type  $n$  is given by:

$$U_i(y) = y - \bar{c} - T(y) - \frac{n}{1 + \frac{1}{\epsilon}} \left(\frac{y}{n}\right)^{1 + \frac{1}{\epsilon}} \quad (1)$$

Under a flat profit tax, tax liability is  $T(y) = t * (y - \bar{c})$

The First order conditions with respect to revenue is:  $y = n[(1 - t)]^\epsilon$

$$\log y = \log n + \epsilon \cdot \log(1 - t)$$

Therefore the resulting revenue elasticity is  $\epsilon_{y,1-t}$

We assume an underlying distribution of types  $n$ , with CDF  $F(n)$  & PDF  $f(n)$  and introduce a proportional tax notch at revenue  $y^*$  such that for all  $y > y^*$  the average tax rate jumps from  $t$  to  $t + \Delta t$ . Then there exists  $\Delta y^*$  &  $\Delta y^D$  with  $\Delta y^* \geq \Delta y^D$  such that:

- All firms with  $(y^*, y^* + \Delta y^D]$  are strictly dominated and would increase utility by locating at the threshold under any elasticity.
- All firms with  $(y^*, y^* + \Delta y^*]$  bunch at threshold and the marginal buncher is indifferent between  $y^*$  and  $y^{Interior}$ .

The marginal buncher, with ability  $n^* + \Delta n^*$ , is indifferent between locating at the threshold versus in the interior:  $U^{Threshold} = U^{Interior}$

$$U^{Threshold} = (1 - t)(y^* - \bar{c}) - \frac{(n^* + \Delta n^*)^{-\frac{1}{\epsilon}}}{1 + \frac{1}{\epsilon}} (y^*)^{1 + \frac{1}{\epsilon}} \quad (2)$$

$$U^{Interior} = (n^* + \Delta n^*)[(1 - t - \Delta t)]^{1 + \epsilon} \left( \frac{1}{1 + \epsilon} \right) - (1 - t - \Delta t)\bar{c} \quad (3)$$

Equating equations (2) and (3) and using the mapping between the ability distribution and the revenue distribution  $n^* + \Delta n^* = \frac{y^* + \Delta y^*}{[(1-t)]^\epsilon}$  we obtain the following formula:

$$\left( \frac{1}{1 + \frac{\Delta y^*}{y^*}} \right) + \frac{(1 - t - \Delta t)\bar{c}}{(y^* + \Delta y^*)(1 - t)} = \frac{1}{1 + \epsilon} \left( 1 - \frac{\Delta t}{1 - t} \right)^{1 + \epsilon} + \frac{1}{1 + \frac{1}{\epsilon}} \cdot \left( \frac{1}{1 + \frac{\Delta y^*}{y^*}} \right)^{1 + \frac{1}{\epsilon}} \quad (4)$$

Equation (4) links the elasticity  $\epsilon$  to the net of tax rate  $1 - t$ , the change in average tax rate  $\frac{\Delta t}{1 - t}$ , the revenue threshold  $y^*$  and the reduction in revenue from the marginal buncher compared to the flat tax counterfactual  $\Delta y^*$ . The change in the average tax rate  $\frac{\Delta t}{1 - t}$  is known and we can estimate the counterfactual earnings of the last buncher  $\frac{\Delta y^*}{y^*}$  using the bunching methodology. Since the marginal buncher has very low costs  $\bar{c}$ , equation (4) is almost equivalent to the Kleven and Waseem, 2013 formula. We can numerically solve the above expression to obtain the elasticity of reported revenue with respect to the net of tax rate  $1 - t$ .

## 3 Behavioral responses and tax elasticities

### 3.1 Data and methodology

We use the universe of yearly corporate tax returns over the 2008 to 2013 period. Firms are required to submit tax declaration D101 (“Declaracion jurada del impuesto sobre la renta”) which contains profit, revenue and cost in addition to industrial classification and location. The corporate income tax raises around 3% of GDP and 20% of total tax revenue. The firms

we study are micro and small enterprises with yearly revenue below 130 Million Costa Rican Colones (\$400,000 in PPP). These represent 80% of the ninety thousand firms filling taxes, 25% of declared profits and 13% of corporate tax revenue.

Figure 3 presents the key features of the data by revenue bins of half million CRC, pooling together the 2008 to 2013 data. Panel A shows the number of firms by revenue bins. We observe a clear excess mass at each revenue threshold as predicted by the incentives of the tax system. Panel B shows the average profit margin by revenue, where profit margin is defined as  $\frac{revenue-cost}{revenue}$ . Profit margin by revenue looks almost like a step function: relatively constant in a given threshold interval and displaying large discontinuities on either side of the thresholds. The novel, reduced form identification strategy combines those two distributions to estimate the profit elasticity and separate it between a revenue and a cost response. In a first step we use the bunching methodology to estimate a revenue elasticity. In a second step we use the discontinuity in profit margin on either side of the thresholds to estimate the profit elasticity. Specifically, we estimate the discontinuity in average cost at the threshold, using the estimated revenue elasticity to correct the revenue of firms past the threshold. The second step provides the cost elasticity, which together with the revenue elasticity generates the profit elasticity.

### 3.2 Revenue elasticity estimation

To estimate the revenue elasticity we look at the distribution of firms by revenue bins and use the point of convergence method described in Kleven and Waseem (2013)<sup>7</sup>. We slice the data in bins of half million CRC for the first threshold and 1 Million CRC for the second threshold. To obtain a counterfactual density we fit a flexible polynomial of degree five excluding the intervals affected by bunching. To the left of the threshold the revenue level at which excess density appears serves as the lower limit,  $z_l^8$ , such that excess bunching is the difference between the observed density and the counterfactual density on the interval

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<sup>7</sup>The notch method builds upon the kink method of Saez(2010) and Chetty et al (2011)

<sup>8</sup>This is decided by the researchers but has no impact on the estimates

$[z_l, z^*]$ . The counterfactual sales of the last bunchers  $z_u = z^* + \Delta z^*$  is identified using the identity that the excess bunching mass to the left of the threshold has to equal the missing mass to the right of the threshold. We iteratively increase  $z_u$  until the excess mass equals the missing mass in the interval  $[z^*, z_u]$ . We bootstrap the standard errors by resampling from the distribution 1,000 times and repeating the estimation procedures. Once  $z_u$  is estimated, we numerically solve equation (4) and obtain the corresponding elasticity. In this case, the method is robust to changes in the polynomial's degree and the size of the interval over which we fit the polynomial.

Figure 4 presents the bunching estimation separately for each threshold. The key parameters are displayed at the top right of each figure. At the first threshold (Panel A), the excess mass is 2.33 times the counterfactual meaning that there is 3.33 times the density that should be expected. In the absence of the notch, the marginal buncher would have an income of 59.5 millions CRC, 12.5 million higher than the threshold, which generates a tax revenue elasticity of 0.14. At the second threshold (Panel B), the excess mass is 0.71 times the counterfactual, while the marginal buncher has revenue of 115 M CRC implying an elasticity estimate of 0.05.

Despite being graphically compelling, the large behavioral responses to the revenue notches only generate modest revenue elasticities. Three points are worth mentioning. First, these are revenue elasticities: on a small profit base a small change in revenue can still generate a large profit elasticity. Second, notches generate very large implicit changes in marginal tax rate and therefore large behavioral responses are consistent with modest elasticities. Third, we have not explored cost heterogeneity which is important for the Costa Rican tax system. As previously discussed the incentives to bunch are proportional to the base. In particular a firm with zero or negative profit<sup>9</sup> has no incentive to bunch since paying a lower rate on zero does not generate any savings. We therefore break down the analysis by reported profit groups.

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<sup>9</sup>Loss carry forwards are not allowed in Costa Rica, except for the agricultural and manufacturing sector, for a three year period. In Appendix XX we look at the behavior of firms declaring losses in those sectors and potential "reverse bunching": firms locating just past the threshold in a loss year to increase their tax refund. We do not find evidence of this behavior.

Figure 5 shows in Panel A the distribution of zero declared profit firms and positive profit firms. Zero profit firms have no incentive to bunch, and we observe a continuous distribution for those firms. Panel B plots the density of firms with positive profit, separating by profit amount. We observe a clear increase in bunching for firms with larger tax bases, indicating that the profit-bunching relation applies more generally. As expected by theory we observe selection into bunching as a function of cost, implying that on average firms at the threshold are very profitable firms while firms just past the threshold are not profitable. Currently we assume that cost are fixed, in Section 5 we model the firm as having realized its production decision but allow for it to jointly determined its declared revenue and cost, consistent with an evasion response driven model.

### 3.3 Cost discontinuity

To estimate a cost and a profit elasticity we return to Figure 3, Panel B which plots average profit margin by revenue bin. Profit margin is the pre-tax difference between revenue and cost, divided by revenue. Before the first threshold the average profit margin is constant by revenue at around 15%, increases up to 23% at the threshold and then drops to 6-7% below the threshold, where it stays fairly constant until it jumps again at the second threshold above 8% and falls again below 5% past the second threshold. As previously discussed the increase in profit margin at the threshold is a result of the selection of firms into bunching as a function of their cost. However the two most striking features of this figure are the large discontinuity in profit margins on either side of the thresholds and the stability of the profit margin on each threshold interval. To study how declared cost are responding to the increase in the average tax rate we first need to correct for the revenue response. To illustrate revenue correction, we focus on firms at the 60M revenue bin: their average cost corresponds to a higher revenue bin, since all firms past the threshold have decreased their reported revenue by more than firms below the threshold. Using the estimated revenue elasticity, we correct for the revenue

response by calculating the counterfactual revenue, absent the notch, for firms observed at revenue of 60M:

$$revenue_{counterfactual} = 60 + \epsilon_{y,1-t} \cdot y \cdot \frac{dt}{1-t} = 60 + 0.14 * 60 * \frac{0.1}{0.9} \approx 60.93$$

Figure 6 Panel A plots average cost by revenue bins at the first threshold. For firms past the threshold we apply the revenue correction term, which shifts the cost line downwards. We then fit separate lines to the right and to the left of the threshold, excluding the interval affected by bunching responses between  $z_l$  and  $z_u$ . The line extrapolation to the threshold on either side provides a counterfactual average cost. In Panel B, we examine the discontinuity in the predicted average cost at the threshold. We observe a large jump in average cost of 2.47 Million on a cost base of 40 Million. Given the net of tax rate increase of 11%, the cost elasticity is -0.56, four times larger than the revenue elasticity. It is important to note that had we estimated larger revenue elasticities, the revenue correction would have shifted the cost line further downwards, potentially explaining the full cost and profit margin discontinuity. However the revenue correction only explains 22% of the cost discontinuity at the first threshold. At the second threshold cost jump by 1 Million on a 90 Million base. The net of tax rate increase of 12.5% generates a cost elasticity of -0.09 about twice the revenue elasticity (Appendix B). The use of the linear extrapolation is justified by the stability and linearity of the revenue and cost relationship in all threshold intervals. In appendix B we show that the coefficient of a quadratic specifications is not significantly different than zero in the regions past the first threshold, before the second threshold and past the second threshold. The region before the first threshold displays marginally significant increasing returns (Graph 2 , Appendix B). The linear extrapolation would then underestimate the jump in cost, and therefore reenforce the results that the cost elasticity is larger than the revenue elasticity.

### 3.4 Profit elasticity

By combining the revenue and cost elasticities we can estimate the profit elasticity. This

is the central parameter to set optimal tax rates and a sufficient statistic for revenue analysis in a flat corporate tax system. The profit elasticity is  $\epsilon_{\pi,1-t} = \frac{\%change\ profit}{\%change\ (net\ of\ tax\ rate)} = \frac{\frac{\Delta\pi}{\Delta t}}{\frac{\Delta y - \Delta c}{1-t}}$ , where  $\Delta\pi = \Delta y - \Delta c$ . We already estimated the threshold change in cost  $\Delta c$  and compute the change in revenue  $\Delta y$  using the revenue elasticity, since  $\Delta y = y * \epsilon_{y,1-t} * \frac{1-t}{\Delta t}$ .

Table 1 summarizes all elasticity estimates. At the first threshold we estimate a profit elasticity of 3.81 and at the second of 2.37. These very large elasticities imply that small firms should face low tax rates. The rate maximizing tax revenue<sup>10</sup> is around 20% for micro firms and 30% for small firms. Any rate above is on the wrong side of the Laffer curve and Pareto dominated. Another novel result is the ratio of cost to revenue elasticity,  $\frac{\epsilon_{c,1-t}}{\epsilon_{y,1-t}}$ , around 4 at the first threshold and 2 at the second threshold. This implies that declared cost reacts stronger to changes in the tax rate than declared revenue.

These large elasticities are a function of the current policy environment and in particular of evasion and avoidance opportunities, which we investigate in detail in section 4. Given the current institutions, a large tax rate on small firm would generate a fall in government revenue as the base diminishes faster than the rate increases. In addition, the high ratio of cost to revenue elasticity, confirms anecdotal evidence from tax authorities that revenue is less elastic than cost and might justify the use of size based policies that determine liability or enforcement based on revenue, the least elastic base.

### 3.5 Robustness and heterogeneity

We discuss three important dimensions of robustness and heterogeneity: elasticity estimates, distributional results and industry variation.

The two step method generates a robust profit elasticity. The reason is the strong negative correlation between the revenue elasticity estimate and the cost elasticity which arise due to the revenue correction term: a larger revenue elasticity, implies a larger revenue correction term and a smaller cost elasticity. Intuitively, the large drops in average profit margins on

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<sup>10</sup>Under a flat corporate tax, the government revenue maximizing rate is  $\tau^* = \frac{1}{1+\epsilon_{\pi}}$

either side of the threshold is the key identifying variation and the two step estimation only decomposes this variation into revenue and cost responses. Therefore an underestimate of the revenue elasticity would lead to an over estimate of the cost elasticity and hardly change the profit elasticity. Using the same logic, the cost to revenue ratio estimate is less robust. It is also possible that the static bunching technique underestimates the true revenue elasticity since notches might not be as salient as tax reforms. Therefore the relative magnitudes of the revenue and cost elasticities should be taken with more caution than the profit elasticity estimate.

Figure 7 shows profit margin quartiles for each revenue bin. The median profit margin drops from 5% to 2% below the threshold and we observe similar drops at the 25th percentile and 75th percentile. Distributional observations reinforce the previous results: drops in profit margin arise from an entire downward shift of the distribution of profit margin and not only by a change in profit of a few high profitability firms.

Finally, some of the results could be driven by industry variation. Figure 8 plots the within industry density (left axis) and average profit margin (right axis) by revenue bins for the nine largest industries at the first threshold. First, all industries display some bunching, however sectors often thought of as having high evasion potential such as construction, real estate and consultancies exhibit particularly large bunching when compared to retailers or manufacturers. Second and most importantly, average profit margin drops discontinuously for all industries. The proportional downward fall is homogeneous and not more pronounced for those industries with high evasion potential. This points to limitations in the manipulation of revenue that might not apply to cost. Those limitations might be linked to the availability of third party information and the detection capacity of each type of evasion. In section 5 we present a simple model that breaks the symmetry of revenue and cost reporting, using the asymmetry of the value of third party information between revenue and cost for evasion detection.

## 4 Mechanisms: understanding behavioral responses

Behavioral responses generated by real, avoidance and evasion responses have similar consequences for government revenue but entail different policy responses. The type of response also implies differences in the efficiency cost of taxation. Nonetheless, the literature has had very limited success in separating the different mechanisms. We discussed how the reduced form cost discontinuity of section 3 indicates avoidance or evasion responses. However revenue response could still be generated by changes in real economic activity. In this section we empirically test for potential mechanisms, using additional data sources. We find support for evasion responses but none for real responses and surprisingly little for avoidance responses.

### 4.1 Real and avoidance responses

Real responses are reductions in economic activity while avoidance responses are legal means of reducing tax liability. We provide three empirical tests, using additional data sources. First we test for division of firms into smaller entities within the same economic group. Second we investigate revenue shifting across time using monthly sales data. Third we test for discontinuity in labor inputs.

#### 4.1.1 Firm division

Given the design of the corporate tax system, it seems an attractive option for a firm to create a small subsidiary on which to “offload” its profits. The small subsidiary has high profits on which it pays a 10% tax rate, while the larger firm has low profits on which it pays a 30% tax rate. To test for the importance of firm division we use the registry of economic groups compiled by the central bank of Costa Rica. This dataset has been carefully constructed for statistical purposes only, by linking corporate groups and their subsidiaries, using the corporate registry of owners, the census and direct visits to firm’s offices. It links firms together by generating an

economic group variable indicating same ownership. In addition, we calculate the “tax savings” that arise from belonging to an economic group. Tax savings is the difference between the counterfactual tax liability of the economic group as a whole (which almost always belongs to the top bracket) and the sum of tax payments from the firms within the group. Figure 9, top panel shows the percentages of firms belonging to an economic group by revenue bins. We separately fit a quadratic relation on each side of the threshold, excluding revenue bins in the bunching and dominated intervals. At both thresholds, bunching firms show a small increase in the probability of belonging to an economic group, from 6% to 7% at the first threshold and 9% to 10% at the second threshold. This 15% increase in the probability of being a subsidiary is in each case at the margin of significance at the 5% level. In the bottom panel we investigate average tax savings by revenue, conditional on being a subsidiary. Tax savings increase by almost 50% compared to the baseline and this increase is statistically significant at both thresholds. However the tax savings is very small on average and only reaches a hundred and fifty thousand Colones at the threshold. The 50% increase in tax savings is the same as the increase in profitability at the threshold: subsidiaries at the threshold are more profitable than subsidiary firms before the threshold but by the same proportion as all firms: furthermore subsidiaries are actually less profitable than the average firm at each revenue bin .

As a second test we look at the frequency of repeated bunchers: within the 2008-2013 period how many times did a given firm locate close and below the threshold. If a subsidiary has been set for tax optimization by a larger firm it should often appear in the threshold vicinity.

To summarize, we only find modest evidence of firms dividing themselves and gaming the tax system which can't explain the excess bunching nor the large difference in profitability on each side of the thresholds. This surprising result might be a combination of three factors. First there are monetary and non-monetary costs of setting up a corporation and keeping it active<sup>11</sup>. Second, the relative ease of evading taxes might make this avoidance strategy sub-

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<sup>11</sup>In addition to large amounts of paperwork, Costa Rica has a registration fee and a yearly stamp duty

optimal. Third, despite the Central Bank's efforts, the data certainly does not capture all economic groups and the Central Bank's dataset is a (large) subset of the universe of tax filling corporations<sup>12</sup>.

#### 4.1.2 Timing response

Another attractive option is to reduce revenue in the last months of the fiscal year or shift some revenue to the beginning of the next fiscal year in order to fall under the threshold. For example firms could close their operations in September, the last month of the fiscal year or date September contracts and sales in October . We use the subsample of firms reporting monthly sales taxes<sup>13</sup> to study bunchers monthly revenue reporting. Table 2 shows that bunchers do not exhibit a different revenue behavior in September or October than slightly smaller and larger firms. We therefore have no evidence of base shifting from one fiscal year to the next. A small caveat is the non applicability of sales tax to all transactions. The subsample of sales tax liable firms belong to sectors with relatively less bunching (retail, restaurants and hotels, car dealers)<sup>14</sup>.

#### 4.1.3 Labor input

To test for response in labor inputs we look for discontinuities in the number of employees and wage bill using data provided by the Central Bank and not available on the tax returns. The Central Bank data combines social security to corporate tax returns from 2010-2013 for a large subset of firms. There are reasons to believe that labor inputs are better reported. First, employees have incentives for correct reporting of their wages as this provides them benefits and social security is generous in Costa Rica. Second evasion on labor income and the

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payment.

<sup>12</sup>The Central Bank's subset contains around 75% of firms filling a tax declaration. See Data appendix for details.

<sup>13</sup>Costa Rica does not have a VAT but a sales tax with some aspects of a VAT.

<sup>14</sup>See Data Appendix.

personal income tax is estimated to be much lower than evasion on other margins<sup>15</sup>. Third, the sum of personal income taxes and payroll taxes is always larger than the CIT. Therefore a firm evading on its wage bill has incentives to under-report labor, even though it increase its corporate tax bill.

Figure 10 shows the average number of employees and wage bill by revenue bins. We separately fit a linear relation on each side of the threshold, excluding revenue bins in the bunching and dominated intervals. Bunchers' employment is not different than that of smaller firms around either thresholds nor is the wage bill at the first threshold. The only possible indication of real responses and/or labor evasion is the significantly lower wage bill at the second threshold<sup>16</sup>. Overall the absence of a dip in employment suggest that firms are not distorting their production to stay below the threshold nor evading on labor inputs. This is important since it minimizes the role of real responses in our bunching results.

## 4.2 Evasion responses

Tax evasion is an illegal reduction in tax liability. Firms can evade by declaring lower revenue or higher cost than realized. We first discuss Costa Rica's enforcement environment and auditing practices and then present two tests of tax evasion. First, The share of firms receiving tax correction notifications, generated by cross checks of third-party information, is larger at the threshold. Second, audit variation at the sector level suggests that bunchers strongly react to an increase in their audit probability by reporting higher revenue but also by substituting evasion away from revenue and toward costs.

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<sup>15</sup>IMF 2012 study.

<sup>16</sup>We are not currently controlling for average profitability (Work in Progress), which could minimize the significant lower tax bill estimated at the 2nd threshold.

#### **4.2.1 Institutional details of tax enforcement in Costa Rica**

Costa Rica audits around 500 taxpayers each year and 300 of those are firms. Therefore audits only cover 0.35% of all firms. Taxpayers are selected following a risk based analysis, that incorporates information from third parties, deviation from industry averages and the history of tax declarations. Figure 11 shows the number of audits performed and the percentage of firms audited for revenue bins of 40M Colones, over the 2009-2010 period. The small firms we study have revenue to the very left of the graph and are rarely audited: just above 100 audits over two years and a 0.2 percentage of audited firms. The percentage of audited firms strongly increases with firm revenue to reach over 3% for large firms.

The scarcity of audits is particularly surprising in the light of their large average returns: the audit department directly recovers 10 times its budget. Although we can not measure the marginal return of audits, the homogeneous large percentage of profits evaded evaluated through audits indicates large marginal returns. Therefore why so few audits? Anecdotically, year to year constraints on the budget force the few auditors to maximize recovered tax revenue and focus their efforts on larger firms. This might maximize the direct amount recovered from audits in a one-shot game but ignores the indirect effects on reporting behavior and risk perception of the many smaller firms. Another possibility is the relative lack of trust of the population in its institutions and in the ministry of finance. As a result, the power granted to auditors for unpopular and partially discretionary decisions is limited. Finally it should be noted that despite their scarcity, audits can generate large cost and be very disruptive for the taxpayer. The tax administration has also recently seen its power to sanction fraud increase a lot, with added sanctions such as store closures, increased fines and asset seizing.

#### **4.2.2 Tax corrections**

The low capacity to conduct full audits is somewhat mitigated by a more extensive automatic warning system: auditors send notification letters to firms raising “red flags” in the

internal data process. During discussions with the audit department, we have heard of two specific tools to raise those flags. First flags are raised anytime there is a discrepancy between self-declared revenue and revenue based on third-parties reports. Second, a presumptive profit is calculated based on third party information and linked to economic activity. The system assumes (not without false positives) that purchases translate into later sales at the going industry markup. An important part of third-party information is collected via tax declaration D151, which requires all firms to declare purchases or sales of a value within the tax year superior to 2,000,000 Colones (\$4,000) and any commission, professional fee or rental agreement superior to 50,000 Colones (\$100). Sales tax retentions, credit card payments, insurance policies and travel information also enter the database. The letters sent by tax auditors ask for a correction or justification of the tax declaration in order to match the amount assessed by the tax administration. Importantly this process does not consider firms around the threshold differently. For legal reasons this information can not be linked to the individual tax records, however we can plot the number of correction letters sent by revenue bins for the year 2012. Figure 12 shows the proportion of firms receiving a letter by revenue bins of 2,000,000 Colones (\$4000). The green line shows the linear fit excluding the zones around the threshold. First around a third of small Costa Rican firms receive correction letters highlighting the high evasion environment. Second, bunchers display large and significant increase in the probability of receiving correction letters: respectively 8.3% and 11.5% more likely at the first and second threshold. Third, firms just past the threshold (potentially dominated firms) are less likely to get flagged and the joint test of significance is positive at both thresholds. The buncher's high ratio could represent a mix of a larger absolute amount of evasion but also increased evasion on revenue compared to costs, which might be more salient to the tax authority.

### 4.2.3 Sectors of special audit attention

A second test for tax evasion uses the variation in audit probability generated at the industry level by the program of “Sectors of special audit attention”. Since 2012 the tax agency determines during the first semester of the calendar year a list of industries assigned to special audit attention, posted on the ministry of finance website. In practical terms, this implies that those sectors get a dedicated group of auditors. Sectors are not randomly selected but determined by their underlying evasion risk and sectors’ growth compared to their tax revenue growth. The twelve sectors selected in 2012 are real estate, private education, hoteling and tourist agencies, transport of merchandise, sale of vehicles, sports team, production of pineapple, yuca, flowers and plants, casinos & betting, performances and recycling. The difference in difference analysis of firms within the audit sectors versus other sectors shows significant growth in reported profits following the assignment of the sector to “special audit attention”. However it is difficult to establish causality due to the selection mechanism mentioned above. Instead we use a triple difference in difference strategy: comparing the change in revenue and profit reporting of bunchers in the sectors of special audit attention versus bunchers in other sectors and non-bunchers in the same sectors. The starting hypothesis is that bunchers are evading more revenue compared to smaller firms and dominated firms. Therefore, when faced with a higher audit probability bunching firms should adjust revenue by more than non-bunchers, since they were initially declaring a lower share of their true revenue.

We estimate the following equation:

$$Y_{ijt} = \beta * Bunch_{i,t=2011} * Audit_j * Post_t + \gamma * Bunch_i * Post_t + \delta * Audit_j * Post_t + Post_t + \alpha_i$$

Where depending on the specification  $Y_{ijt}$  is revenue, cost or profit of firm  $i$  in sector  $j$  at time  $t$ .  $Bunch$  is a firm level variable equal to 1 if the firm declared revenue in the 2,000,000 Colones interval below the threshold in 2011 and zero otherwise.  $Audit$  is a sector level variable that takes the value 1 if the firm belongs to the sectors of special audit attention and zero

otherwise. *Post* is 1 in 2012 and 2013 and 0 in 2011. Table 3 presents the triple difference analysis, using firms too small to bunch (2011 declared revenue 4 to 8 M Colones below the threshold) as a control group in columns (1)-(3) and dominated firms (2011 declared revenue 0 to 3 M Colones above the threshold) as a control group in columns (4)-(6). Columns (1) and (4) presents the main result: bunchers in special audit sectors increase revenue by 10% or more of their initial size compared to non-bunchers. However they also simultaneously increase their reported costs by a large amount in columns (2) and (5), leading to a statistical significant decrease in declared profits of above 1 M Colones column (3) and (6). Placebo treatment effects for previous years are not significant on any of the three margin.

Those results support the idea that bunching firms are evading revenue since bunchers belonging to audit sectors increase their declared revenue substantially more than control groups following an increase in audit probability. Interestingly, reported cost also increase by a large margin, suggesting an important substitution in the evasion technology from revenue under reporting to cost over reporting. A firm with true revenue just above the threshold is motivated to switch to sales evasion in order to decrease both its tax base and its tax rate, while for a firm with true revenue further past the threshold it is equivalent to under-report revenue or over-report costs which only decreases the tax base. This large substitution effect suggests that cost evasion is less costly in terms of detection probability than revenue evasion. In turn this supports the tax auditors experience that detecting added costs is difficult, since firms owner can shift private consumption onto the firm's costs. This result links our research to the recent papers by Carrillo et al. (2014) showing that sales evasion is fully substituted by cost evasion following letter threats in Ecuador.

## 5 A model of tax evasion with two margins of response

### 5.1 Key moments

The reduced form tax elasticity estimates of section 3 did not take into account the simultaneity of the revenue and cost declaration while the evidence on the mechanisms motivates a model of tax evasion. To provide both a rationale for the observed patterns and a simultaneous estimation of the elasticities we need a model of tax evasion that can match the four key moments of the data, presented together in figure 13:

1. *Profitability away from the thresholds.* Away from the thresholds, profit margins are much larger to the left of each threshold than to the right of each threshold. To the left of the first threshold, before the pick, the average profit margin is 14-15% and to the right of the threshold only 6-7%. To the left of the second threshold, the average profit margin is 6% and to the right of the threshold 4%. This relation is the key observation of the paper and importantly can not be explained by the very slightly decreasing profit-size relation.
2. *Profitability around the thresholds.* The profitability of firms just before the threshold is very large and falls dramatically just past the threshold: the average profit margin peaks at 23% and falls dramatically at around 7% just past the first threshold. Similarly at the second threshold the average profit margin peaks at above 7% to then fall at 4%.
3. *Excess density.* Before each threshold there is a large excess firm density: we observe two to three times the number of firms expected under a smooth density.
4. *Dominated regions.* The “bunchers” come from an interval of 10 to 15M after the threshold, and as expected we observe a triangular shaped missing mass past the threshold. However even in the interval just past the threshold where very few firms should be located, there are 70-80% of the expected firms. This points to adjustment costs on revenue.

## 5.2 Model set up

The firm has true revenue and cost  $y_i$  and  $c_i$ , which are exogenously given. It chooses reported revenue and cost  $\hat{y}_i$  and  $\hat{c}_i$  such that revenue evasion is  $E_y = y_i - \hat{y}_i$  and cost evasion  $E_c = \hat{c}_i - c_i$ . To evade income the firm incurs a cost  $g(E_y, E_c)$ . This cost can be thought of as a reduced form equivalent of the audit probability model of Allingham and Sandmo (1972). The cost embeds the probability of being audited and the sanctions that might arise in addition to the effort cost of evasion.

The firm objective is:

$$\max_{\{\hat{y}_i, \hat{c}_i\}} (1-t)(y_i - c_i) + t[E_{y_i} + E_{c_i}] - \frac{p}{1 + \frac{1}{\epsilon}} [E_{y_i} + E_{c_i}]^{1 + \frac{1}{\epsilon}}$$

Subject to the following constraints:

- $\hat{y}_i \geq y_{3P_i}$ , reported revenue must be above third party reported revenue.
- $\hat{y}_i - \hat{c}_i \geq 0$ , reported profit can not be negative.
- $y_i \geq \hat{y}_i$ , reported revenue are below real revenue.
- $\hat{c}_i \geq c_i$ , reported cost are above real cost.

Where the cost of evasion is  $g(E_y, E_c) = \frac{p}{1 + \frac{1}{\epsilon}} [E_{y_i} + E_{c_i}]^{1 + \frac{1}{\epsilon}}$ .  $\epsilon$  is the elasticity of evasion with respect to the net of tax rate and  $p$  an evasion shifter. In the model, evasion on revenue and on cost is equivalent in terms of the cost incurred and therefore the two margins are perfect substitutes from the firm's prospective. This is the most natural formulation, since it remains agnostic about the exact auditing strategy of the tax administration and only considers that the cost of evasion increases with the total amount evaded. However, the constraint that declared revenue has to be as large as third party revenue breaks the symmetry between revenue and cost evasion. The amount of third party revenue binds the firm to a given level of revenue reporting: once that limit is reached any extra evasion has to occur on cost. This constraint exploits the fundamental asymmetry between third-party information on revenue and third-party information on cost, discussed in Carrillo et al. (2014). On the one hand, an

auditor who observes third party revenue above declared revenue automatically knows that the firm is evading revenue, third party revenue is a lower bound on true revenue. On the other hand, third party cost is only a lower bound on cost. If auditors observe third party cost below declared cost they do not know if it is cost over-reporting or incompleteness of third party information.

### 5.3 GMM estimation (In Progress)

We assume that the difference between true revenue and third party revenue is uniformly distributed between zero and  $\alpha$ :  $y_i - y_{3p} \sim U[0, \alpha]$ . The model's two key parameters are therefore  $\alpha$  which determines how binding is third party revenue and  $\epsilon$  the elasticity of evasion. Note that the respective revenue and cost elasticities are a function of  $\alpha$  and  $\epsilon$ : the smaller  $\alpha$  the more often is third party revenue binding and the more evasion is substituted to cost.

We estimate the model with a Generalized Method of Moments estimator that minimizes the distance between the empirical moments and the model's moments.

## 6 Conclusion

Using the design of the Corporate tax system in Costa Rica as a quasi experiment and a novel methodology that combines bunching and discontinuities, we estimate the tax elasticity of profit for small firms and decompose it into a revenue and cost elasticity. First, the profit elasticity estimates are very large ( $\epsilon_{\pi, 1-t} \simeq 3$ ). Second the cost elasticity is much larger than the revenue elasticity ( $\epsilon_c > \epsilon_y$ ). Third, we show that the behavioral response is driven by evasion and that real responses and avoidance responses such as firm division and time shifting of profits are minimal. Fourth we show how a simple model of tax evasion can rationalize the observed patterns. The key insight is the asymmetric value of information generated by third party revenue and cost estimates: observing third party revenue above reported revenue is a direct sign of evasion while observing cost below declared cost might just be caused by

incomplete information.

These results are novel in the public finance and development literature, as it is to our knowledge the first estimate of a corporate tax elasticity for a developing country and the first study to separately identify the revenue and cost responses. In addition, previous studies have typically remained agnostic about the sources of behavioral responses whereas we are able to test several mechanisms.

The results have implications for optimal taxation under imperfect enforcement. First, in such an environment high corporate tax rates for small firms are counterproductive since the profit base is very responsive to the tax rate. Second, the relative inelasticity of revenue compared to cost justifies the use of size-based policies: tax and enforcement thresholds determined by revenue and presumptive taxation which uses revenue as the tax base. Third, the efficiency cost of those policies is small since evasion responses dominate even in a corporate tax system as distortive as the Costa Rican one. However this is endogenous to the relative ease of evasion: increasing enforcement and detection capacity might generate a substitution response away from evasion and towards avoidance or real responses. Finally, the incompleteness of information on transaction in the economy is particularly penalizing for the corporate income tax which allows for many deductions and therefore has two margins of evasion.

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# Figures

Figure 1:  
Corporate Tax schedule in Costa Rica

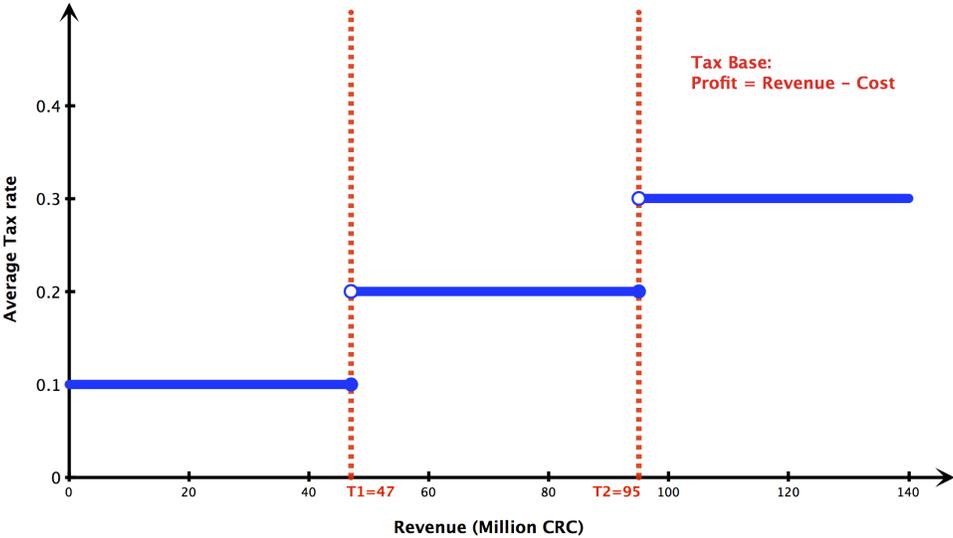


Figure 2:

Bunching illustration

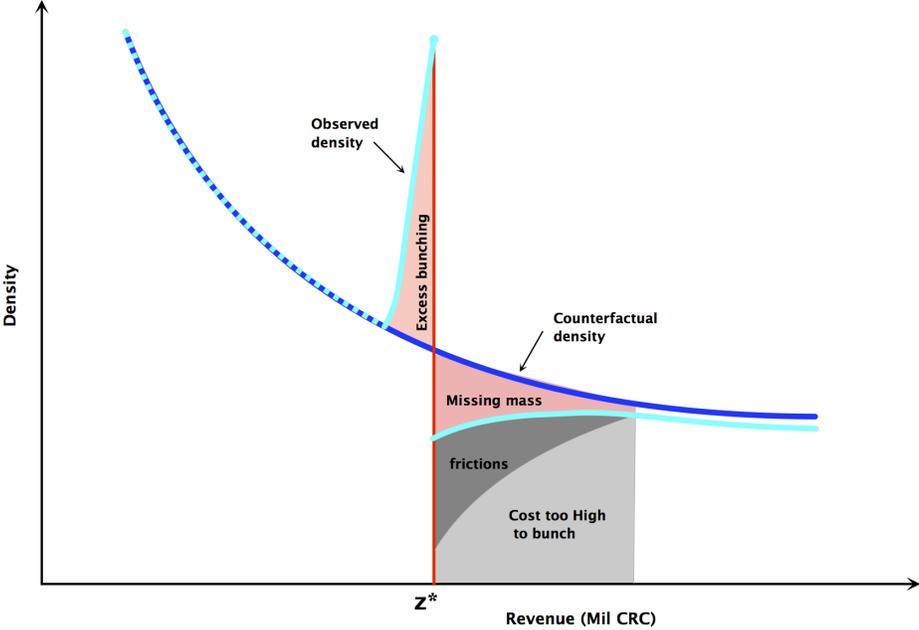


Figure 3:

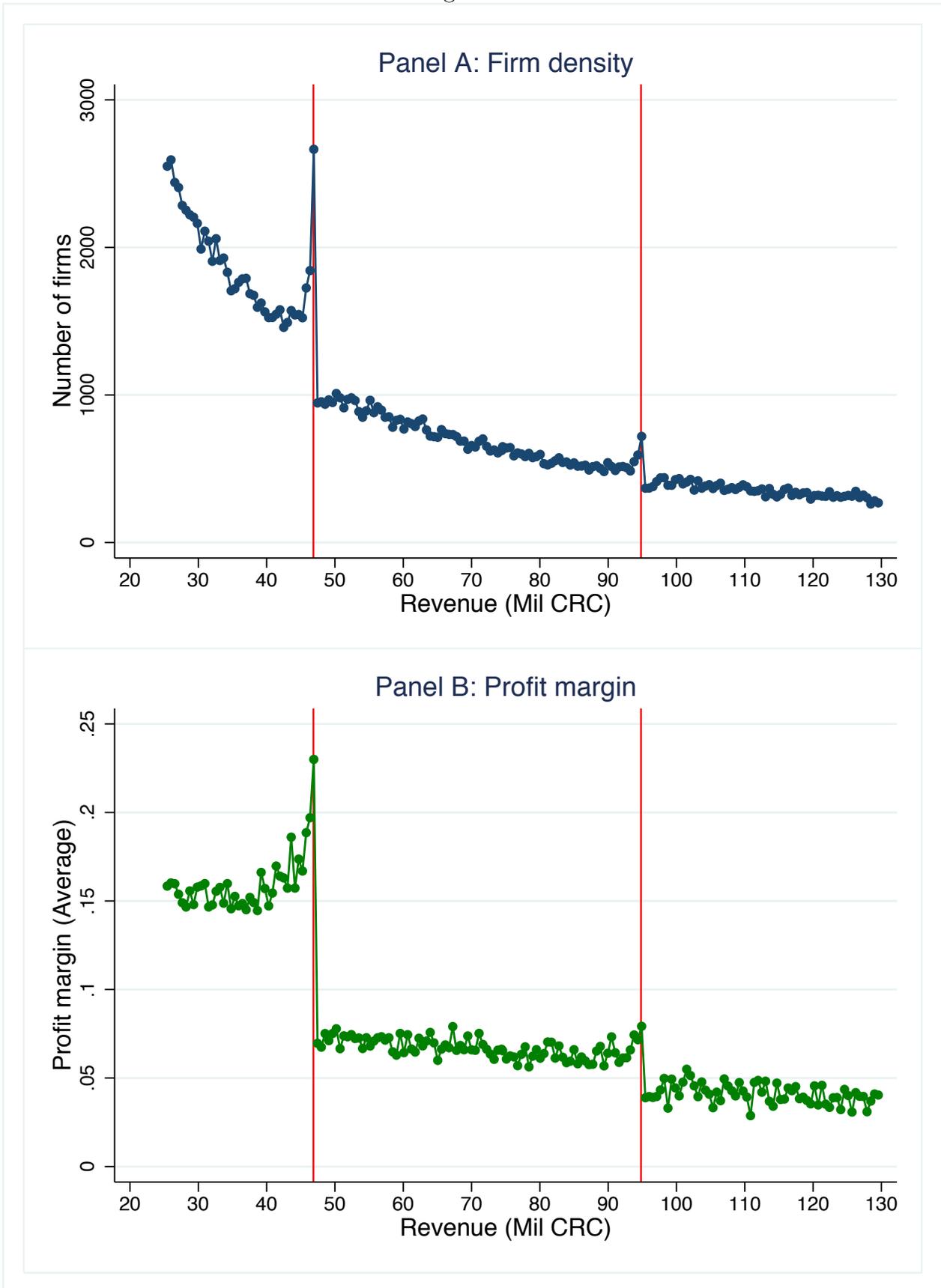


Figure 4:

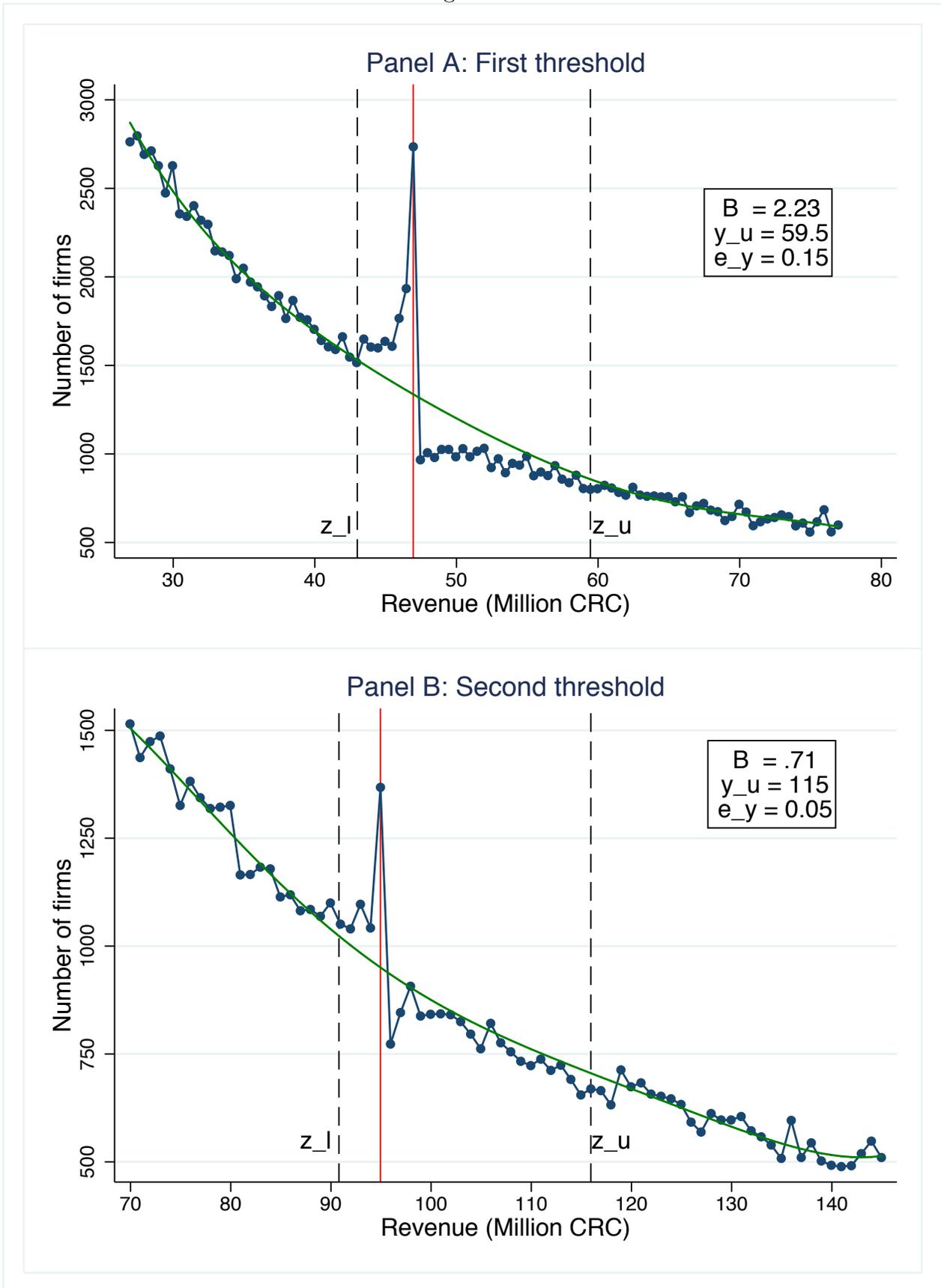


Figure 5:

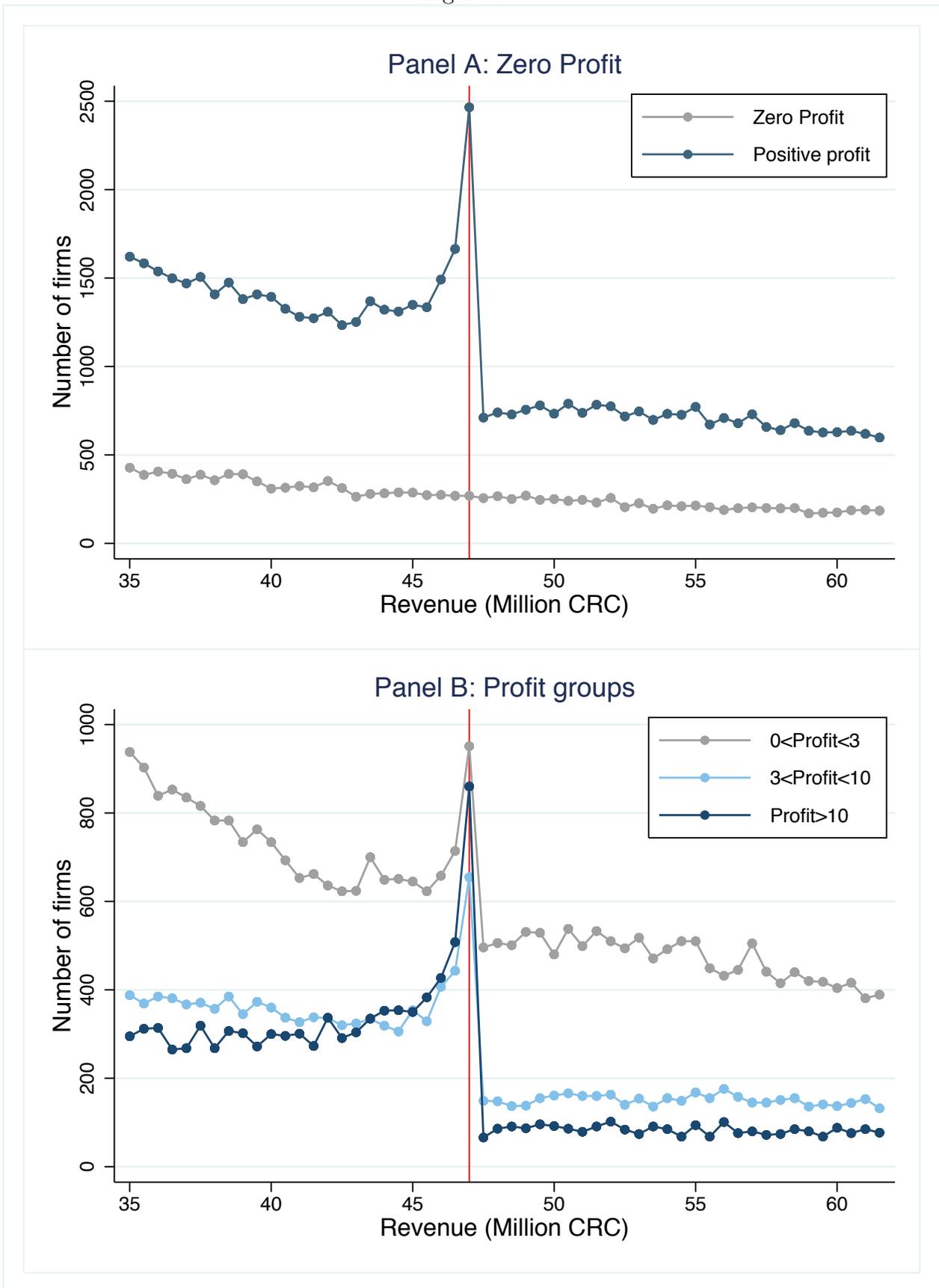


Figure 6:

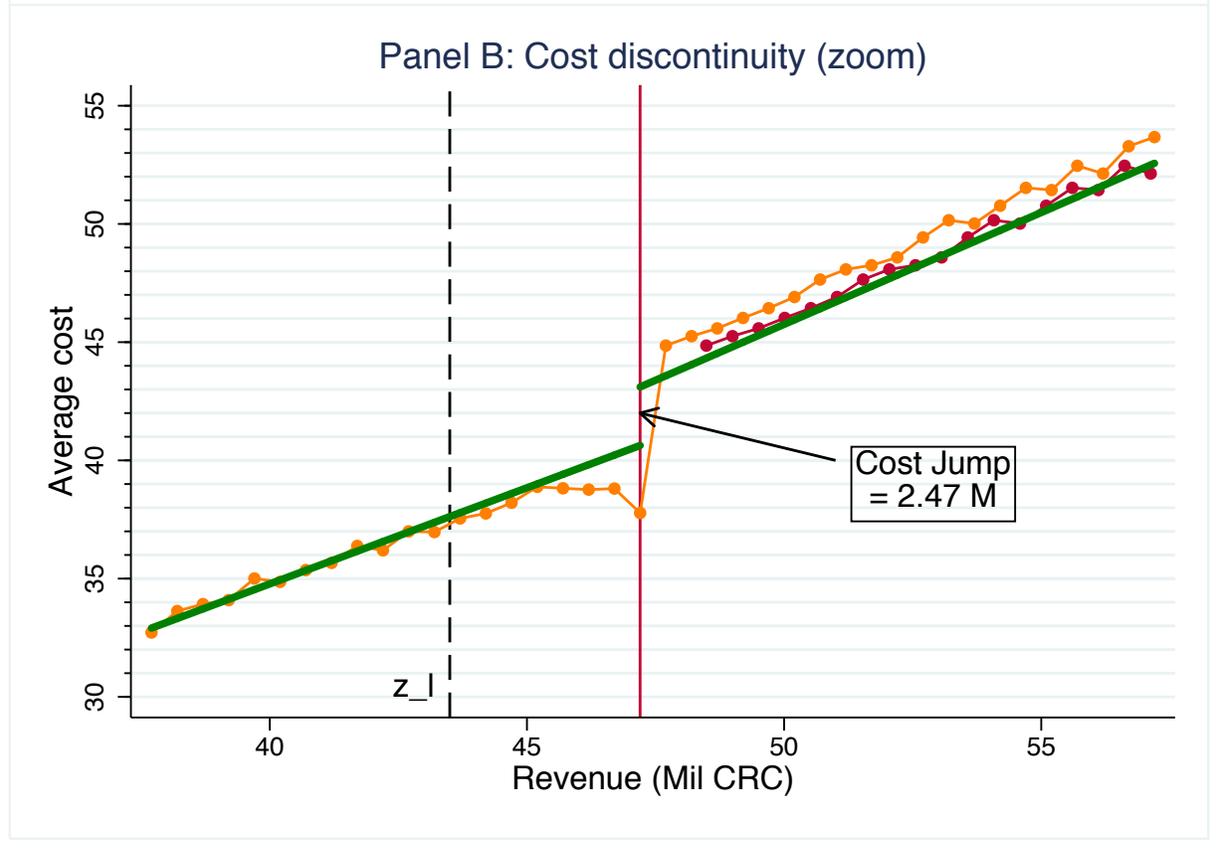
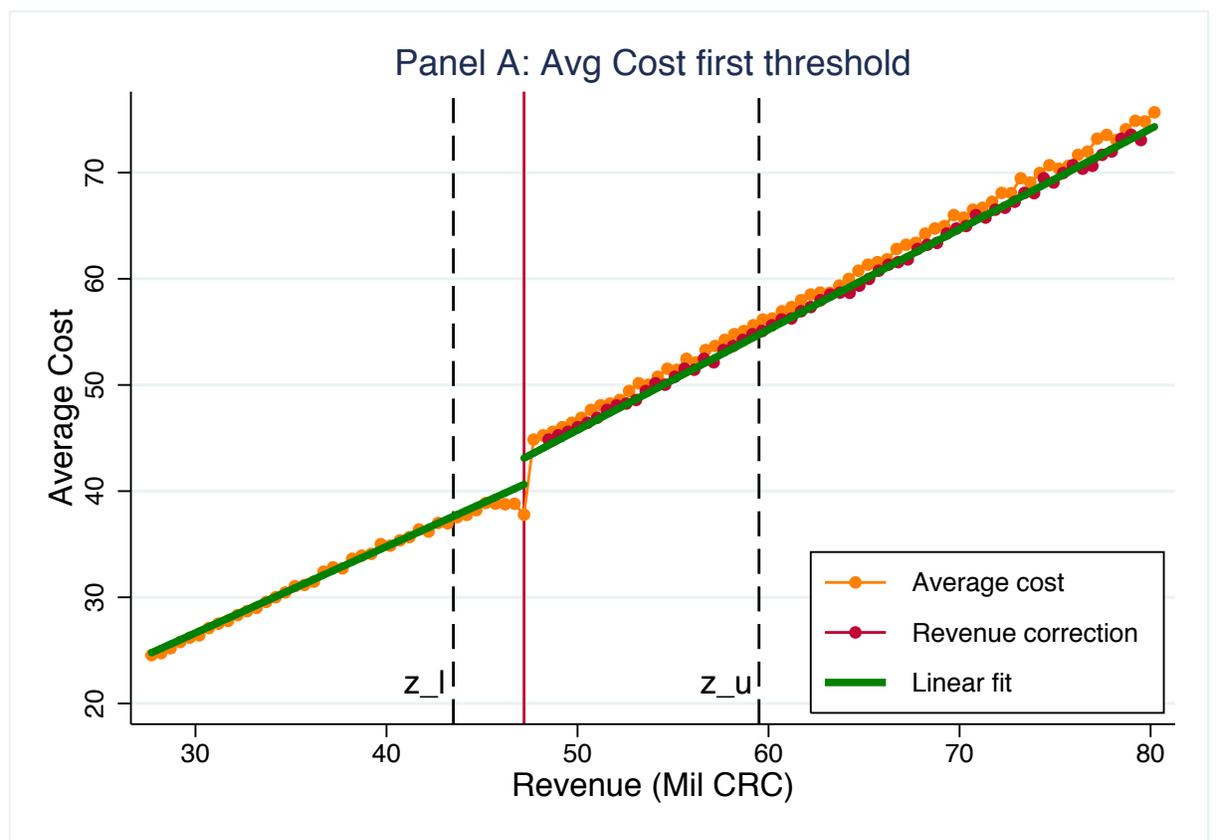


Figure 7:

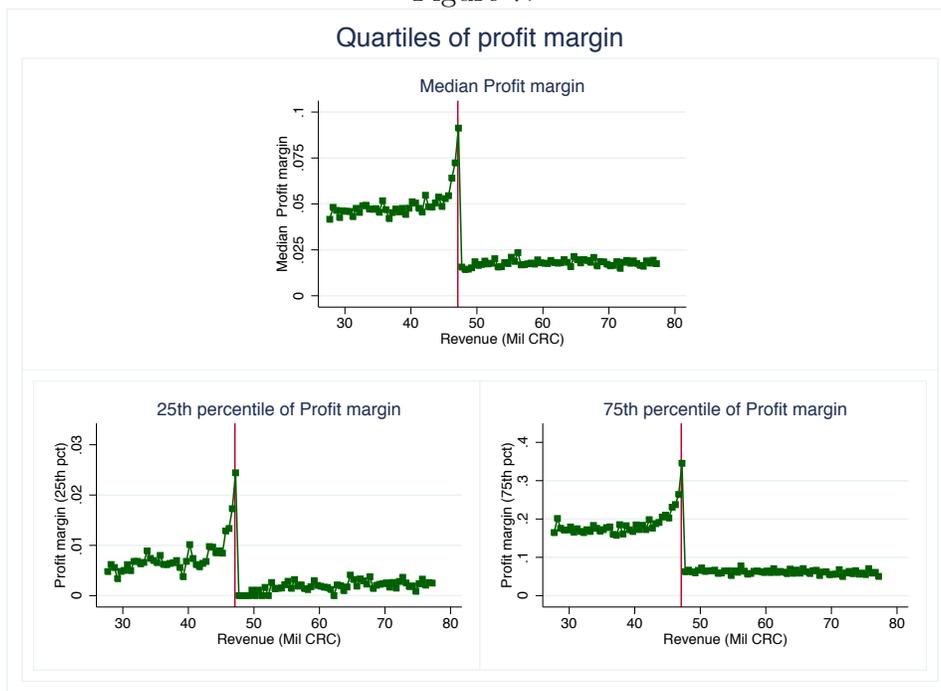


Figure 8:

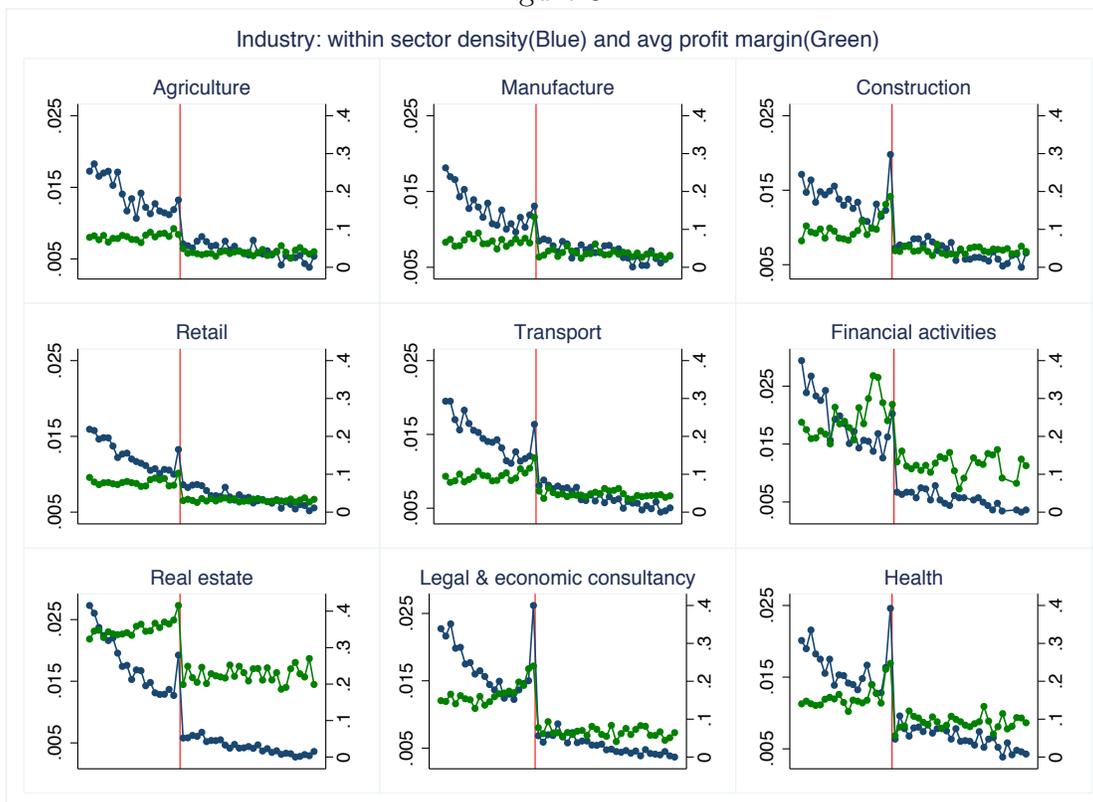


Figure 9:

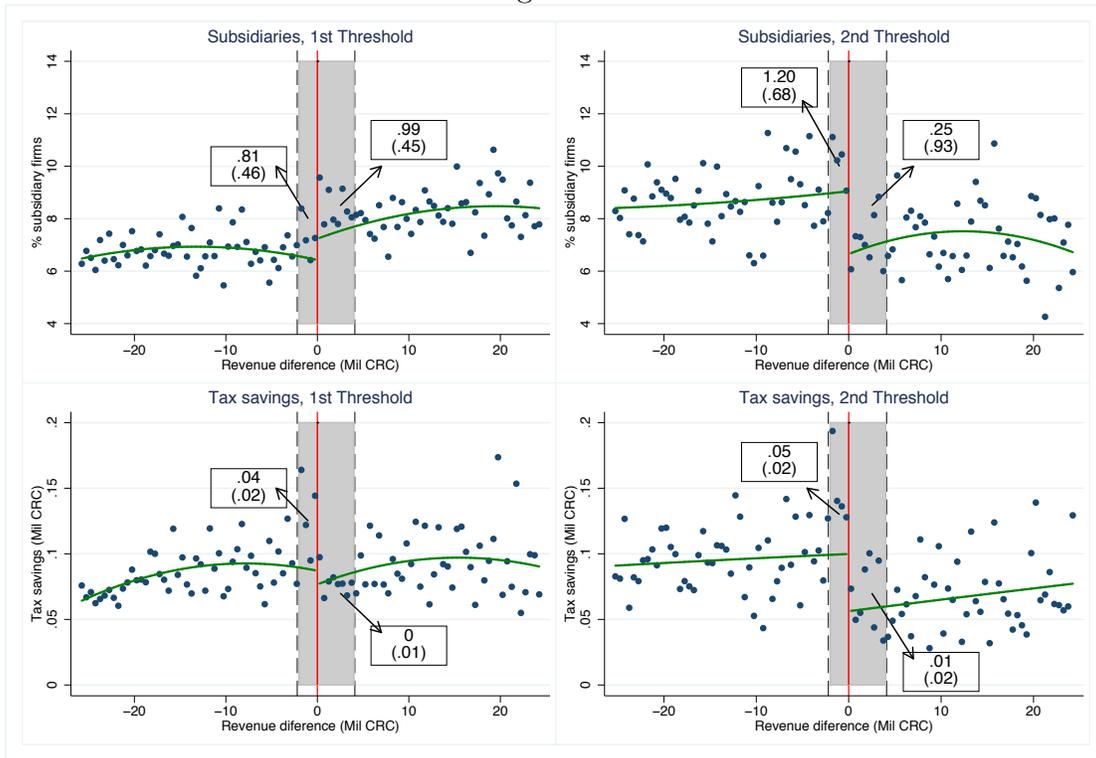


Figure 10:

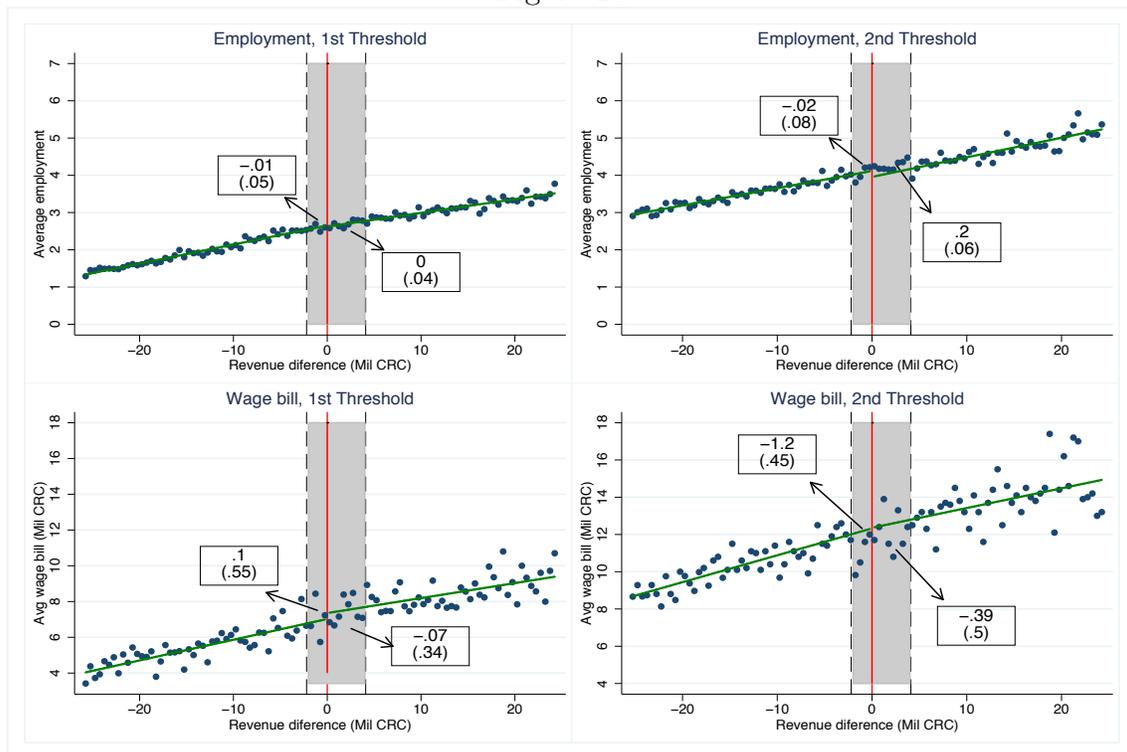


Figure 11:

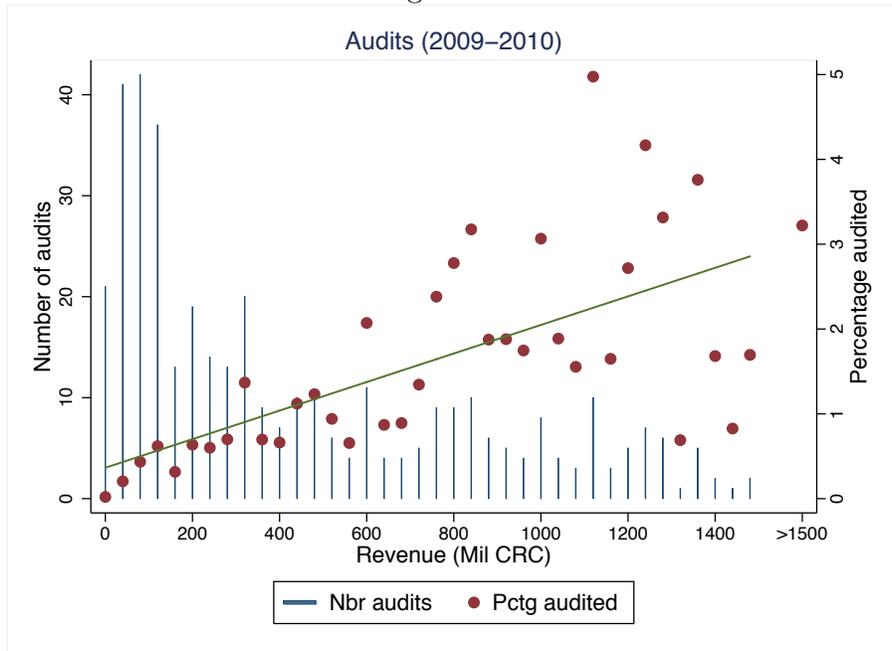


Figure 12:

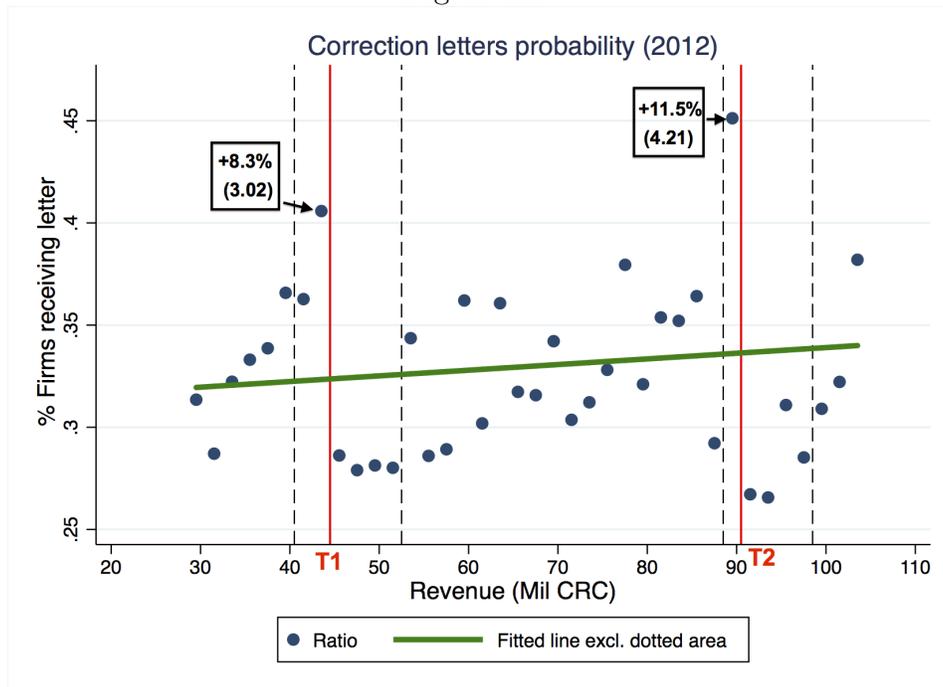
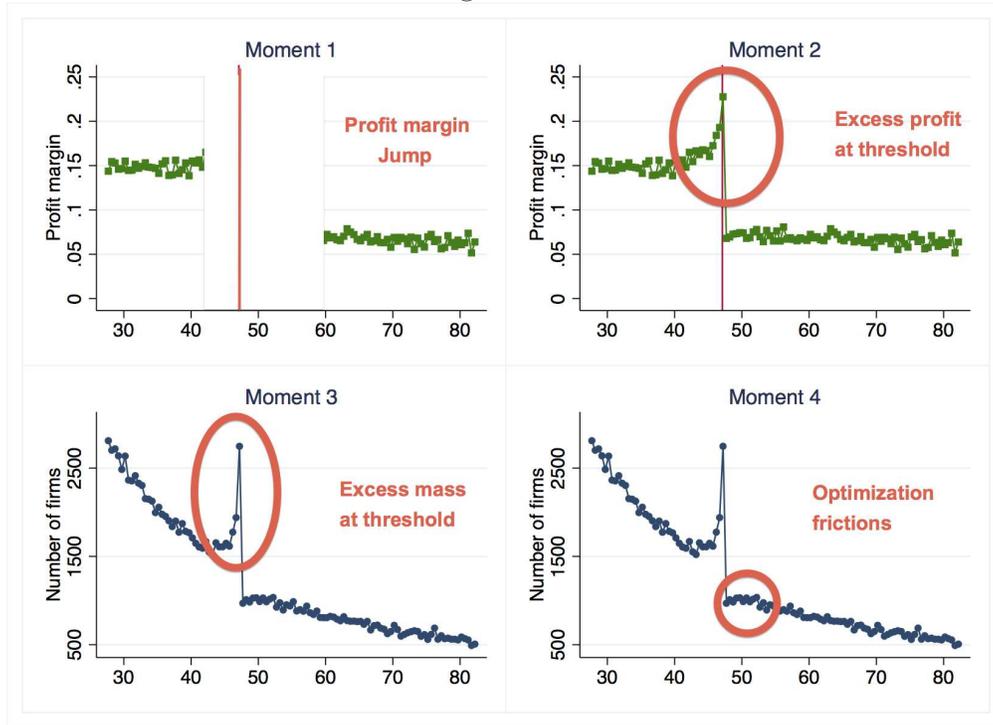


Figure 13:



## Tables

Table 1: Tax elasticities  
Structural elasticities (Point of convergence method)

z	$\Delta t$	1-t	$\Delta z$	Elasticity		
				Revenue	Cost	Profit
47	0.1	0.9	12.5	0.14	-0.56	3.81
95	0.1	0.8	20	0.05	-0.09	2.37

Table 2: Monthly revenue for subsample reporting sales tax

	Monthly Sales	Monthly Sales
Buncher*Sept	111851 (120066)	
Buncher*Oct		-24765 (121734)
Sept	-45013 (40075)	
Oct		-123104 (45176)***
Observations	596705	596705
Firm FE	YES	YES

Difference in difference regression comparing firms with revenue at the threshold (buncher) versus firms with slightly lower revenue, for September and October compared to the rest of the year. The fiscal year ends on September 30th

Table 3: Bunchers' Response to increase in audit probability

	Control 1: Too small to bunch			Control 2: Dominated firms		
	(1) Revenue	(2) Costs	(3) Profit	(4) Revenue	(5) Costs	(6) Profit
<b>Bunch*Audit*Post</b>	<b>4869525</b> (2386323)**	<b>6434446</b> (2240915)***	<b>-1231027</b> (334055)***	<b>6302104</b> (3986056)	<b>9763079</b> (3629485)***	<b>-1677641</b> (569472)***
Bunch*Post	-216725 (2134280)	-482479 (1997322)	-421758 (310586)	881324 (3196469)	1352176 (2813676)	-1498480 (365749)***
Audit*Post	- 5548303 (3100493)*	- 5878526 (3005681)*	1250931 (288029)***	-6980882 (2887592)**	-9207159 (3286119)***	1697545 (651654)**
Post	11200000 (2167619)***	11500000 (2281052)***	120281 (310586)	9370832 (2320630)***	10400000 (2152551)***	1197002 (225727)***
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7203	7203	7203	4672	4672	4672

Standard errors clustered at the Industry level (ISIC 2). \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

The outcome variables are the 2012 and 2013 tax declaration of revenue, cost and profits.

A firm is defined as a buncher if its 2011 revenue fell in the 2Mil CRC interval below the threshold, while it belongs to control group 1 if its 2011 revenue fell in the 4M to 8M CRC interval below the threshold and to control 2 if its 2011 revenue fell in the 3Mil CRC interval above the threshold (dominated range). A firm is an Audit firm if its sector was selected for special audit attention in 2012. Post indicates that the time period is after the sector was selected as special audit attention