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# **L'optimisation fiscale au sein des entreprises : le cas des ajustements de chiffres d'affaires**

## **Résumé**

Le code de l'impôt sur les sociétés peut créer des encoches; des situations où le profit après impôt diminue quand les ventes avant impôt augmentent. Les entreprises réagissent de façon endogène à ces encoches, ce qui entraîne un excès de masse dans la distribution de la taille de l'entreprise. Nous étudions une réforme fiscale transitoire mise en place en 1997 qui a augmenté l'impôt sur les bénéfices de 15 % pour les entreprises dont le chiffre d'affaires dépasse 50 millions de francs. Nous utilisons deux approches distinctes et complémentaires pour estimer l'ampleur de l'optimisation fiscale : a) le recours à des entreprises éloignées de l'encoche fiscale (et donc peu susceptibles d'y répondre) au cours de la même année et b) la répartition de la taille totale des entreprises avant la réforme fiscale. Les deux stratégies donnent des résultats semblables en ce qui concerne l'étendue de l'optimisation fiscale. Nous montrons que les entreprises qui évitent l'impôt sont celles dont les coûts d'ajustement calibrés sont les moins élevés et celles dont les bénéfices sont les plus élevés. Le comportement d'optimisation fiscale provient principalement de l'augmentation des stocks et de la diminution des ventes.

**Mots-clés :** taxes sur les entreprises, optimisation fiscale, production des entreprises

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## **Tax avoidance in French Firms: Evidence from the Introduction of a Tax Notch**

### **Abstract**

Corporate tax codes can have notches; values where after-tax profits decrease in before-tax sales. Firms endogenously respond to notches, leading to excess mass in the firm-size distribution. We study a 1997 policy reform in which the French government implemented a transient tax reform that increased profit taxes by 15% for firms with over 50 million Francs in turnover. We use two distinct and complementary approaches to estimate the extent of tax avoidance: (a) using firms far away from (and therefore unlikely to be responsive to) the tax notch in the same year and (b) the entire firm size distribution before the tax reform. Both strategies generate similar results for the extent of tax avoidance. We show that the firms who avoid the tax are the ones with the lowest calibrated adjustment costs and those with the larger profits. The tax avoidance behavior comes mostly from increases in inventories and decreases in sales.

**Keywords:** Business Taxes, Tax Evasion, Firm Production

**Classification JEL :** H25 H26 H32 D24

## I Introduction

Firms avoid paying taxes through a variety of strategies, including misreporting, transfer pricing, and changing “real” behavior (Desai, Foley, and Hines, 2006; Liu, Schmidt-Eisenlohr, and Guo, 2017; Zucman, 2014). Even within the category of changed behavior, there are a variety of options available to firms: they can adjust their input mix or shift sales over time. We leverage a 1997 tax increase in France in order to quantify if and how firms adjusted their behavior to avoid paying taxes. The reform increased profit taxes for firms with over 50 million Francs in turnover by 15%. As a result, firms with fairly similar sales faced different average (and marginal) tax rates, giving firms incentives to stay just below the threshold relative to just above.

We focus our attention on two questions. First, do firms distort their behavior in order to avoid paying additional taxes? Second, are there specific types of firms who are more likely to be affected, and how do they avoid taxation? Since it is difficult to credibly survey firms on if and how they avoid taxes, we use reported firm behavior in order to back out avoidance responses.

For the first question, we are interested in measuring the endogenous response of excess mass in the firm-size distribution: “too many firms” just below the cutoff, and correspondingly “too few” just above<sup>1</sup>. We use complementary but distinct approaches to estimate the extent of excess mass. First, following a large literature<sup>2</sup> we assume that the firm size distribution is “well behaved” in any given year. This implies that firms far away from the tax threshold do not adjust their behavior in response to the policy, and so we can use the distribution (of turnover) of those firms in order to estimate a counterfactual avoidance-free firm size distribution. We compare the avoidance-free counterfactual distribution to the actual firm-size distribution around the cutoff to back out how firms change their behavior. This approach assumes that the firm-size distribution would otherwise be “well-behaved” around the cutoff. In order to validate this assumption, we show that the method neither identifies excess mass in the years before the policy was enacted nor in the years after it was phased out.

We also use the time-series dimension of the data in order to estimate excess mass by estimating a counterfactual avoidance-free distribution using years when the policy was not

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<sup>1</sup>Almunia and Lopez-Rodriguez (2017); Bachas and Soto (2018); Garicano, Lelarge, and Van Reenen (2016); Gourio and Roys (2014); Kleven and Waseem (2013); Liu and Lockwood (2016); Onji (2009)

<sup>2</sup>Aghion et al. (2017); Bach (2015); Chetty et al. (2011); Dee et al. (2016); Diamond and Persson (2016); Kleven (2016); Kleven and Waseem (2013); Lardeux (2018); Barbanchon (2016); Saez (2010)

in effect.

Using the cross-sectional information we find that there were around 150 firms who changed their sales in response to the new tax regime out of roughly one thousand firms concerned. We find similar results using the time-series information. This corresponds to a tax elasticity of sales of 0.16.

We then turn to identifying which firms adjust their sales. We do this by studying the ex-ante characteristics of firms below the tax cutoff (as in Diamond and Persson (2016)). If, for instance, firms who normally have high profits adjust their sales more, then we would observe more of those types of firms just below the cutoff than we would expect (for instance, by using their prevalence when the tax cutoff was not in effect).

In addition to finding that high-profit firms are more likely to avoid the tax, we also find that firms with larger adjustment costs are less likely to bunch. We start by classifying their firms using their estimated with capital adjustment costs (Asker, Collard-Wexler, and Loecker, 2014). We show that bunchers are, depending on the years, between 3% and 15% more likely to have capital adjustment cost within the lowest tercile. Furthermore, consistent with the logic that material inputs generally more flexible than capital inputs, we find that firms who bunch tend to have larger elasticity of output with respect to materials and lower elasticity of output with respect to capital.

We then turn to estimating how firms avoid the extra taxes. Firms have many potential margins of adjustment, including affecting their production decisions, prices, and inventories. As in (Diamond and Persson, 2016; Bachas and Soto, 2018; Dee et al., 2016), we note that a similar logic to the bunching estimator can help us back out firm behavior. We compare firms in the avoidance region to firms outside it (either firms who are too small/large, or firms of similar sizes in different years). If firms change some characteristics in order to shrink, then we will see differences in that characteristic in the avoidance. For instance, we find that firms avoid increasing their sales by instead increasing their inventories. In the data, this shows up as firms in the avoidance region overall having more inventories than would be predicted by the out-of-sample counterfactuals. Note that an RD-type of estimate (comparing firms just below to just above the cutoff) is unlikely to generate the causal mechanisms for tax avoidance since the firms who choose to avoid taxes are ex-ante different along a variety of dimensions. In order to avoid the selection issue, we compare all of the firms who might be affected by avoidance to those who are not.

We find that while firms do lower their production as they lower sales, the primary driver of the avoidance is an increase in change in inventories and capitalized production.

This suggests that adjusting production is relatively more costly than either stocking the production or reinvesting it in the production process. Since the changes “add up,” this implies that the values we find are real effects of tax avoidance, not just tax evasion through simple misreporting or fraud (Best et al., 2015).

## II Institutional setting and Data

### II.A Institutional Setting

As in other countries, entrepreneurs in France choose between two kinds of tax regimes: taxes on income (IR) or corporate income taxes (IS). Around 2/3 of firms, representing 1/5 of aggregate value added, is in the former group. Each firms’ sector determines what category of taxes it pays, with firms with benefits mostly from services (BNC) in one category, and firms in trade and manufacturing activity (BIC) or agricultural activity (BA) choosing between a regular (BRN) or simplified (RSI) setup. Around half of firms, but only around 5% of value added, are in the latter group. Around 90% of aggregate value added comes from firms in the regular tax regime (See Table 1 for the exact values).

Over the 1995-2000 period there were several changes in the corporate income tax rates. In 1995-1996 the basic corporate income tax was of 33.33% and firms had to pay a *contribution additionnelle* of 10%<sup>3</sup> such that the corporate income tax rate was of 36.33%. In 1997-1998, the corporate income tax rate was increased by 15% through a *contribution exceptionnelle* (to 42.16%) for enterprise firms with sales above fifty million Francs (around seven million of Euros).<sup>4</sup> At the same time the basic marginal tax rate on profit below 200 thousand Francs (around 38 thousand Euros) was reduced from 33% to 19% for firms with sales below the same threshold.<sup>5</sup> In 1999 the *contribution exceptionnelle* rate was lowered to 10%. In 2000 this *contribution exceptionnelle* was removed and the reduced marginal corporate income tax rate on profits below 200 thousand Francs increased to 25%.<sup>6</sup>

The incentives to distort one firm’s behavior to avoid the *contribution exceptionnelle* and potentially benefit from the reduced marginal corporate income tax rate were small but

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<sup>3</sup><https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000737653&categorieLien=id>

<sup>4</sup>Loi no 97-1026 du 10 novembre 1997 portant mesures urgentes à caractère fiscal et financier <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000185577&categorieLien=id>

<sup>5</sup>On November 27 1995, France’s Prime Minister Alain Juppé announced a “plan PME pour la France”, i.e. a package of reforms that aimed at alleviating credit constraints for SME, fostering their ability to accumulate capital and to settle in urban areas and finally reducing taxes they pay. There is however no evidence that the *contribution exceptionnelle* was part of this announcement

<sup>6</sup>Eligibility to the reduced marginal tax rate and exemption to the *contributions* were conditioned on 75% of firms’ share capital owned by physical people and all of share capital paid-up.

significant. Figure 1 shows the differential of tax rates above and below the threshold.<sup>7</sup> This allows us to infer the gains by profit to becoming eligible to an exemption of the contribution and to taking advantage of the reduced marginal tax rate. For a firm with profits of 1.5 million Francs (roughly the sample mean), avoiding the tax would save 75 thousand Francs.

## II.B Data

We use three datasets collected by the Direction Générale des Impôts and the French National Institute of Statistics (INSEE): the BRN files, the RSI files as well as *Enquête sur les liaisons financières* (LiFi). In France, each firm has an identifier, SIREN, which facilitates its interaction with the different administrations. This identifier is present in these three datasets which allows us to merge BRN and RSI files to LiFi, and to follow firms across the years. The BRN files contain balance sheet information contained in tax forms filled by firms affiliated to the BRN regime. Those files have often been used in academic research (see for instance (Caliendo, Monte, and Rossi-Hansberg, 2015)). Recent work has integrated smaller firms as those affiliated to the RSI regime in their analysis as well (see for instance (Garicano, Lelarge, and Van Reenen, 2016)). The RSI files contain balance sheet information collected from tax forms of firms affiliated to the RSI regime. LiFi contains information on firm conglomerate membership. We use it to restrict or sample to firms that could avoid the additional tax burden, as conglomerate members had to pay the additional tax *contributions* and weren't eligible to the reduced marginal tax rate even with turnover below the threshold.

With the BRN-RSI files we build a panel of firms that spans the 1995-2000 period. This period is well-suited for the analysis of the 1997-1999 reform as it contains two years before its implementation that we can use as counterfactual and one year after to analyze the persistence of its consequences.<sup>8</sup> The BRN-RSI files contain about 1.6 million firms each year. They cover the universe of firms within the BIC category affiliated to the regular and simplified regimes.<sup>9</sup>

The BRN-RSI files provide all the relevant firms characteristics, namely inputs of production, value-added, turnover, profits, and inventories. We use nonimal values as the eligibility threshold of 50 million Francs was not indexed to inflation. To assess the weight of BRN and RSI regimes in the economy and compare it with the excluded BNC regime (Table 1), we use

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<sup>7</sup>Tax rates are the combination of the marginal tax rates, the *contribution additionnelle* and the *contribution exceptionnelle*.

<sup>8</sup>In 2001 there were further changes to the tax code preventing us from doing longer follow-up analyses.

<sup>9</sup>Our dataset does not include firms in the *Bénéfice Non Commercial* regime, who were unaffected by the reform, nor *Bénéfice Agricole* regime firms who tend to be very specific types of firms mostly in the agricultural sector.

FICUS<sup>10</sup> that also contains aggregated information on BNC firms. For our main analysis we use the BRN-RSI files instead of FICUS as FICUS doesn't provide any information on the type of tax regime firms have opted for (either IR or IS).

A drawback of BRN-RSI files relative to FICUS is that they provide rawer information. As a consequence we make two restrictions to our main sample and clean the dataset. First, we remove extreme values of capital shares above 10. Second, we exclude firms that report negative values of inputs.

We add information on conglomerate membership from the *Enquête sur les liaisons financières* (LiFi), collected by INSEE since 1980 and available every years of the 1995-2000 period. INSEE surveys every year all firms with sales above 393 million Francs, equity portfolio above 7.9 million Francs or with more than 500 employees. Moreover the institute includes in its sample firms that were in the dataset the preceding year or firms that belong to foreign firms.

We further restrict the sample to firms with turnover between 20 million Francs and 100 million Francs, as well as to firms eligible to the tax cut. The BRN-RSI dataset allows us to keep only firms affiliated to the IS regime. Due to data limitation on share capital's ownership -on which the second eligibility criteria applied- we exclude all firms that belong to a conglomerate.

Table 2 presents the descriptive statistics. The average output level is 20 million Francs, the average level of turnover is 40 million Francs, material capital and labor average values are respectively 7 million Francs, 90 million Francs and 6 million Francs. The average number of employees is 37. The average profit of firms in our sample is 1.5 million Francs. Firms in our sample are on average twice as large as than the average French firm.

### III Theoretical framework

Firms maximize revenues minus costs, where costs come from production, adjustment, taxes, and potentially inventories. The force encouraging firms to hold inventories are adjustment costs: if a firm's frictionless optimal sales level is too far from baseline (in the case of a tax increase, firms would want to produce less) then firms might want to increase their sales and put some goods in inventory.<sup>11</sup> Pushing against this force is that inventory is also

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<sup>10</sup>FICUS is a production of the French census bureau (INSEE), which confronts the balance sheet information obtained from tax forms collected by the tax office (DGFIP) and gathered in the BRN-RSI files with one of its internal sources of information, the EAE survey.

<sup>11</sup>For simplicity of exposition, we model the choice of the firm statically: it does not take into account its current production choices on either the bliss point or the ability to draw down future inventories. We think this is reasonable for two reasons: first, it is only towards the end of the year that firms discover that they may end up benefiting from adjusting their sales, so long-term adjustments are less relevant. Second, while

costly. Given convex inventory and adjustment costs, under some regularity assumptions the optimal choice of the firm is to produce less than the bliss point, but still put some goods in inventory.

The set-up is straightforward. Firms who sell  $x$  units of a good earn profits of

$$R(x_i) - c(q_i) - \gamma_s A(q_i^* - q_i) - \tau(R(s_i) - \tilde{c}(s_i)) - I(q_i - s_i) \quad (1)$$

where  $R(\cdot)$  is the revenue function,  $c(\cdot)$  is the constant-returns-to-scale production cost,<sup>12</sup>  $A(\cdot)$  is the twice-differentiable convex adjustment cost coming from producing other than  $q^*$ ,  $\gamma_s$  is how expensive the adjustment cost is at the sector level,  $q$  is the quantity produced  $\tau(\cdot)$  is the (profits) tax, and  $I(\cdot)$  is the twice-differentiable convex inventory cost.<sup>13</sup> We solve for optimal firm behavior in two steps: first by showing that for a *given*  $s$ , there is an optimal production/inventory decision for the firm, and then solving for  $s$  in the profit function.

Given  $s < q^*$ , a firm seeks to minimize

$$c(q_i) + \gamma_s A(q_i^* - q_i) + I(q_i - s_i).$$

Defining  $c' = \phi_i$ ,

$$\gamma_s A'(q_i^* - q_i) = \phi_i + I'(q_i - s_i) \quad (2)$$

If the firm chooses to overproduce to the bliss point ( $q_i = q_i^*$ ), then the left hand side is zero, and the right hand side will be positive, which will not minimize costs. If  $s$  is “far enough” away from  $q_i^*$  then a similar logic holds for if a firm chose to produce  $q_i = s$ : the left-hand-side would be larger than the right. Given the intermediate value theorem and the continuity and convexity of the adjustment and inventory costs, this implies that there is a unique production decision  $q_i$  for each optimal sales quantity  $s_i$ , and correspondingly a convex and twice differentiable function  $C(\cdot)$  which captures the production, adjustment, and inventory costs.

We can therefore rewrite Equation 1 as

$$R(s_i) - C(q_i) - \tau(R(s_i) - \tilde{c}(s_i)) \quad (3)$$

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inventories is a dynamic decision we use a static reduced-form representation.

<sup>12</sup>We assume taxes are paid on good sold for exposition purposes with the equality  $\tilde{c}(s_i) = c(q_i)$

<sup>13</sup>The tax is a function of goods sold.

which if  $\tau(\cdot)$  is differentiable has the traditional solution of

$$R'(s_i) = C'(q_i) - \tau'(R(s_i) - \tilde{c}(s_i)) [R'(s_i) - \tilde{c}'(s_i)].$$

However, if there is a jump in the tax schedule at the threshold  $\theta$ :

$$\begin{cases} \tau = 0 & s_i \leq \theta \\ \tau = .15 & s_i > \theta \end{cases}$$

then some firms will have to make a discrete choice: comparing profits at  $s_i = \theta$  to the best choice at  $\tau = .15$ . As in (Kleven and Waseem, 2013) there will be a cutoff  $\tilde{\theta}_i$  for which a firm would weakly prefer to sell  $\theta$  then anything in  $(\theta, \tilde{\theta}_i)$ . Furthermore, if  $q_i^* > \theta$ , then it is straightforward to show that decreasing  $\gamma_s$  increases  $\tilde{\theta}_i$ , as does decreasing  $\phi_i$ . One way that firms might have lower adjustment costs might be due to idiosyncratic firm-specific features, such as better access to capital markets.

Following Asker, Collard-Wexler, and Loecker (2014), we interpret the dispersion in the marginal product of the inputs of production as a proxy for idiosyncratic adjustment costs (since with no adjustment costs the dispersion would be zero). The production function literature assumes that capital adjustment costs are the largest ones, followed by labor adjustment costs and then material adjustment costs (Ackerberg, Caves, and Frazer, 2015; Asker, Collard-Wexler, and Loecker, 2014; Levinsohn and Petrin, 2003; Olley and Pakes, 1996). This assumption implies that firms whose production is relatively more sensitive to materials face in average lower adjustment costs.

## IV Empirical Approach

### IV.A Discontinuity Estimates

If firms endogenously lower their size in order to avoid the extra taxes, there will be excess mass in the distribution below the threshold and correspondingly too little mass above. We follow the standard approaches in the literature to measure excess mass, McCrary (2008).<sup>14</sup> As a robustness test, we also follow Cattaneo, Janson, and Ma (2016), who have a similar intuition but do not require prebinning of the data.

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<sup>14</sup>This approach consists in implementing the local linear density estimator and suggests a bandwidth selection algorithm.

## IV.B Bunching Estimators

### Using Predictions from Distribution away from the Threshold as Counterfactual

An alternative approach to measuring bunching is to use firms far from the threshold. We estimate a fifth degree polynomial of the density on firms far enough from the threshold so that their distributions is not affected by the threshold but close enough so that the polynomial they allow identifying is relevant to firms at the thresholds. We then follow the polynomial to the hold-out avoidance region. Firms to estimate the counterfactual density is The difference between the estimated density and the actual density captures the extent of avoidance (and is a placebo check in years with no discontinuous tax threshold).

To be precise we estimate the following estimation:

$$c_j = \alpha + \sum_{i=1}^5 \beta_i^{prediction} \cdot (z_j)^i + \sum_{i=r(z_L)}^{r(z_U)-1} \gamma_i^{prediction} \cdot \mathbb{1}[j = i] + \epsilon_i \quad (4)$$

where  $c_j$  counts the number of firms in bin  $j$ .  $z_j$  is turnover level in bin  $j$ .<sup>15</sup>  $r(\cdot)$  is the bin number associated to turnover  $z$ . Given that the variable of interest counts the number of firms per year, we follow standard practice in the litterature and rely on a Poisson regression.  $\beta_i^{prediction}$  is the coefficient of order  $i$  of the fifth degree polynomial in turnover.  $\gamma_i^{prediction}$  identifies the excess or lack of firms in bin  $i$  compared to the counterfactual estimated with the polynomial.  $z_L$  is the beginning of the avoidance region and  $z_U$  its end.<sup>16</sup> We determine  $z_L$  by eyeballing the distribution (Figure 2) and  $z_U$  is determined such that excess bunching,<sup>17</sup> i.e. the sum of firms in excess below threshold in the avoidance region equals missing mass, i.e. the sum of firms that are missing compared to the counterfactual above threshold in the avoidance region.

Formally we determine  $z_U$  as the smallest turnover level such that

$$\hat{M} = \sum_{i=z_T}^{z_U} \hat{c}_j^{cf} - c_j = \sum_{i=z_L}^{z_T-1} c_j - \hat{c}_j^{cf} = \hat{B}, \quad (5)$$

where  $z_T$  is turnover level at the threshold, i.e. 50 million Francs. The number of firms per

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<sup>15</sup>We take bins of 150 thousand Francs for all the analysis such that one of them start at the threshold.

<sup>16</sup>When we can't eyeball any avoidance, we estimate bunching to be zero as we can't identify any avoidance region that is necessary to estimate bunching with this methodology.

<sup>17</sup>This is the standard procedure in the litterature, see e.g. (Chetty et al., 2011)

bin in the counterfactual distribution is determined from

$$\hat{c}_j^{cf} = \alpha + \sum_{i=1}^5 \beta_i^{prediction} \cdot (z_j)^i. \quad (6)$$

To normalize the amount of bunching we estimate the average bunching  $b_{av}$  that is defined as the ratio of excess bunching over mean density in the avoidance region below threshold. Empirically we define it as:

$$\hat{b}_{av} = \frac{\hat{B}}{\frac{1}{2} \sum_{i=z_L}^{z_T-1} \hat{c}_j^{cf}} \quad (7)$$

**Using Past Years as Counterfactual** Another way to investigate the apparition of distortions in the firm-size distribution over time is to compare distributions of firms across times around the threshold. We use distributions in years during which there is no incentive to bunch as counterfactual distributions and compare them to the distribution under the policy.

To be precise we estimate the following equation:

$$c_{jt} = \alpha \cdot Post_t + \sum_{i=r(z_L)}^{r(z_n)} \beta_i^{time-series} \cdot \mathbb{1}[j \in [i, i+2]] \mathbb{1}[i \equiv 0[3]] + \\ \sum_{i=r(z_L)}^{r(z_n)} \gamma_i^{time-series} \cdot \mathbb{1}[j \in [i, i+2]] \mathbb{1}[i \equiv 0[3]] * Post_t + \epsilon_{it} \quad (8)$$

where m is the number of bins below cutoff and n the number above cutoff.  $c_{jt}$  counts the number of firms in bin j in year t.  $Post_t$  refers to years 1997-1998 when the 1995-98 period is under study.  $z_j$  is turnover level in bin j. Given that the variable of interest counts a number of firms per bin, the natural choice for the estimation is to rely on poisson regression.<sup>18</sup>

For the sake of clarity, we only report the coefficients of the interaction terms  $\gamma_i^{time-series}$  around the threshold and report exponentiated coefficients in figure 3. It shows that there is excess bunching in the 1997-1998 distribution compared to the 1995 and 1996 distributions:<sup>19</sup> there are three positive and significant coefficients below the threshold and three negative and significant coefficients above.

To quantify the size of the distortion we rely on an estimation procedure that looks similar to the one presented in the previous paragraph. We pool 4 consecutive years to

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<sup>18</sup>In the figures we use bins that are three times larger to reduce noise.

<sup>19</sup>We include 1996 as counterfactual year as there is no evidence of anticipation effect in the cross-section results and because we were unable to find any evidence of announcement of the reform prior to year 1997.

increase statistical precision and because we can gather years by the actual incentive level firms face. In particular we gather years 1995 and 1996 where firms face no incentives for avoidance and years 1997 and 1998 where firms above threshold paid 15% more taxes on profit.

The coefficients of the interacted terms ( $\gamma_i^{time-series}$ ) in equation 8 allow us to estimate missing mass and excess bunching. They indicate how many additional firms there is per bin below the cutoff. The product of the exponential of the coefficients of the interacted term  $\gamma_i^{time-series}$  and of the dummy variable for bin  $i$  tells us by how much we must multiply the number of firms in the excluded bin to estimate the number of firms that are in bin  $i$ . Subtracting the number of firms that were in this bin in years during which there was no incentives to bunch gives the number of firms that bunch in this bin. The sum of firms that bunch in each bin below the threshold where the interacted coefficients are significant gives us the amount of excess bunching. We similarly estimate the number of missing firms in bins above the threshold to obtain the missing mass.

We can describe the size of the distortion with formal expressions for excess bunching ( $\hat{B}$ ) and missing mass ( $\hat{M}$ ):

$$\begin{aligned}\hat{M} &= \sum_{i=z_T}^{z_U} \hat{c}_{iTreat} - \hat{c}_{iControl} \\ \hat{B} &= \sum_{i=z_L}^{z_{T-1}} \hat{c}_{iTreat} - \hat{c}_{iControl}\end{aligned}\tag{9}$$

where:  $\hat{c}_{iTreat}$  refers to the average predicted number of firms per year within bin  $i$  during the period of treatment (1997-99) and  $\hat{c}_{iControl}$  to the average predicted number of firms per year within this bin during control years.

$z_L$  is the turnover level of the group of bins that precedes the bunch of ones with significant coefficients below threshold.<sup>20</sup> In our context, 47,600,000 Francs is the lower end of the valley. This is an advantage of our estimation strategy compared to usual techniques of

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<sup>20</sup>We do not take the smaller level of turnover of this bunch of coefficients because there might be bunchers in the group of bins that precedes it and missing them may misinform us about the characteristics of the bunchers if those that we miss have particular characteristics that would drive a change of the results. On the contrary including non bunchers in the avoidance region does not affect the estimated numbers of bunchers since the coefficient of the interaction term on this group of bins is close to zero. It does not either affect the determination of bunchers characteristics that compare the characteristics of firms below threshold in the avoidance region within years with or without incentives to bunch. Firms below threshold that are not bunching should indeed have the same characteristics in years with and in years without incentives to bunch.

bunching that eyeball the lower end of the avoidance region.

To back out the upper end of the valley we use prediction from the estimations. We follow Kleven and Waseem (2013) and pin down  $Z_U$  by the equality  $\hat{M} = \hat{B}$ .

#### IV.C Identifying Bunchers' Characteristics

Conditional on identifying bunching in the firm size distribution, we are also interested in understanding what are the ex-ante characteristics of the firms that avoid taxes. Below, we describe our approach, which builds on Diamond and Persson (2016).

##### Using Predictions from Distribution away from the Threshold as Counterfactual

In the language of potential outcomes, we can consider the firms below the cutoff in 1995 (before the policy reform) to be “always takers,” and firms above to be both “never takers” and “compliers.” The difference between the observed characteristics of firms above the cutoff and the no-avoidance counterfactual value is due to the compliers leaving (and similarly below the threshold). As a result, we use the difference between observed and counterfactual characteristics of firms to estimate the types of firms who change their size in response to the policy change. In particular, we estimate the characteristics of the bunchers ( $X^{compliers}$ ) as the average of the two methods:

$$\bar{X}^{compliers} = 0.5 * \left( \frac{N_{down}^{tot}}{N_{down}^{tot} - N_{down}} * \bar{X}^{down\_all} - \frac{N_{down}}{N_{down}^{tot} - N_{down}} * \bar{X}^{down} \right) + \\ 0.5 * \left( \frac{N_{up}}{N_{up} - N_{up}^{tot}} * \bar{X}^{up} - \frac{N_{up}^{tot}}{N_{up} - N_{up}^{tot}} * \bar{X}^{up\_all} \right) \quad (10)$$

Where  $\bar{X}^{compliers}$  is defined as the average of the mean values of X for firms that are “missing” above the threshold and for firms that are bunching.  $\bar{X}^{down\_all}$  (resp.  $\bar{X}^{up\_all}$ ) is the average of characteristic X for firms that are in the avoidance region below (resp. above) threshold. and  $\bar{X}^{down}$  (resp.  $\bar{X}^{up}$ ) is the average of X for firms that would have been in the avoidance region below threshold (resp. above threshold) had there been no avoidance.

$\bar{X}^{down}$  and  $\bar{X}^{up}$  are obtained by regressing X on a polynomial of turnover of order 5 for firms outside the avoidance region and predicting levels of X within the avoidance region by extrapolating this relationship. In a sense, we extend the traditional estimation of the number of firms per bin ( $c_{jt}$ ) to the average characteristics of firms per bins. We are able to predict the characteristics, that *conditional* on its turnover level, the firm would have had had there been no manipulation.

$N_{up}^{tot}$  (resp.  $N_{down}^{tot}$ ) is the number of firms that fall into the avoidance region above (resp. below) the threshold. They are the number of never takers and the sum of the number of always takers and of compliers.  $N_{up}$  (resp.  $N_{down}$ ) is the number of firms that would have fallen into the avoidance region above (resp. below) the threshold had there been no avoidance. It is the sum of the number of never takers and the number of compliers (resp. the number of always takers). Note that the parameter  $N_{up} - N_{up}^{tot}$  (resp.  $N_{down}^{tot} - N_{down}$ ) identifies the number of compliers which we estimate using the method detailed in the previous section.

We are interested to compare the characteristics of the compliers to the characteristics of the firms that are eligible to bunching i.e. those that would have been above threshold absent avoidance. With Diamond and Persson (2016) notation this means we are interested in estimating:

$$E[\Delta X] = E[X^{compliers}] - E[\bar{X}^{up}]. \quad (11)$$

We estimate this raw difference of means as well as a difference of means net of sector fixed effects. In practice, we restrict the sample to firms within the avoidance region. For firms above the threshold, we estimate  $X_i^{up}$  the characteristics they would have had, had there been no avoidance, filling in the relation between turnover and the characteristics of interest outside the manipulation region. We duplicate the observations corresponding to those firms and flag the duplicates with a dummy *compliers*. For all<sup>21</sup> the initial observations *compliers* take value 1, for the duplicates it takes value 0.

We estimate for all firms within the avoidance region (the initial observations) the firm level counterpart of equation (10) i.e. for firms below threshold  $X_i^{compliers} = x_i * \frac{N_{down}^{tot}}{N_{down}^{tot} - N_{down}} - \hat{x}_i * \frac{N_{down}}{N_{down}^{tot} - N_{down}}$  and for firms above the threshold  $X_i^{compliers} = \hat{x}_i * \frac{N_{up}}{N_{up} - N_{up}^{tot}} - \frac{N_{up}^{tot}}{N_{up} - N_{up}^{tot}} * x_i$ , where  $x_i$  is the observed characteristics of the firm and  $\hat{x}_i$  is the characteristics it would have had, had there been no avoidance given its turnover level. We then define  $X_i$  as  $X_i^{up}$  when *compliers* takes value 0 and  $X_i^{compliers}$  when *compliers* takes value 1. Then we estimate the following equation, with and without fixed effects:

$$X_i = \eta \cdot \text{compliers}_i + \mu_s + \epsilon_i, \quad (12)$$

where  $\mu_s$  indicates sector fixed effects at the 16-sector French classification of industries. The coefficient of interest is the  $\eta$  that directly gives us the difference of means between the two populations of interest. We estimate standard errors by bootstrapping the regression.

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<sup>21</sup>not only those above threshold

**Using past years as counterfactual** In addition to estimating the counterfactual characteristics of firms in the avoidance region using firms in the same year who are larger, we also can do so using the observed data in the pre-policy years. After the policy change, the compliers move from above to below the cutoff, in order to avoid excess taxation. The difference between the firms above the cutoff before and after the policy change is due to the compliers leaving, and similarly the difference below the cutoff is due to the compliers joining. The expression of bunchers' characteristics become:

$$\bar{X}^{compliers} = 0.5 * \left( \frac{N_{down}^{tot}}{N_{down}^{tot} - N_{down}} * \bar{X}_{Treatment}^{down} - \frac{N_{down}}{N_{down}^{tot} - N_{down}} * \bar{X}_{Control}^{down} \right) + \\ 0.5 * \left( \frac{N_{up}}{N_{up} - N_{up}^{tot}} * \bar{X}_{Control}^{up} - \frac{N_{up}^{tot}}{N_{up} - N_{up}^{tot}} * \bar{X}_{Treatment}^{up} \right), \quad (13)$$

where  $\bar{X}_{Treatment}^{down}$  is the average, when the policy is in place, of the mean values of X for bunching firms (“compliers”) and firms that are naturally present below the threshold absent the policy (“always-takers”). It is obtained by estimating the mean of the characteristic X of interest in the avoidance region below threshold over years with incentives to bunch (treatment years).  $\bar{X}_{control}^{down}$  is the mean of the characteristic X of interest in the avoidance region below the threshold over years with no incentives to bunch (control years). It is therefore the mean of the characteristics of interest for the “always takers”.

Similarly  $\bar{X}_{Treatment}^{up}$  is the mean of the characteristic of interest X in the avoidance region above threshold over years with incentives to bunch. It is the average level of X for never takers.  $\bar{X}_{Control}^{up}$  is the mean of the characteristic of interest X in the avoidance region above the threshold in control years. It is therefore the average of the means of X for never takers and compliers.

$N_{up}^{tot}$  (resp.  $N_{down}^{tot}$ ) is the number of firms that fall into the avoidance region above (resp. below) the threshold in treatment years. They are the number of never takers and the sum of the number of always takers and of compliers.  $N_{up}$  (resp.  $N_{down}$ ) is the number of firms that fall into the avoidance region above (resp. below) the threshold in control years. It is the sum of the number of never takers and the number of compliers (resp. the number of always takers).

Our analysis might be subject to a change in the variables due to an underlying trend in their evolution. As a result we are interested in the de-trended variables defined as  $\tilde{X} = X - \bar{X}_{below}$  where  $\bar{X}_{below}$  is the average of X in the region neighboring the avoidance

region below the threshold (Turnover  $\in [45000-47600]$ ) and during years with no incentives to bunch. We use the region below the part of the avoidance region below the threshold because we are sure there is no compliers in this region in years with no incentives to bunch.

Here we also compare the characteristics of the compliers to the characteristics of the firms that would have been above threshold absent avoidance, which in this case are the firms that are in the avoidance region above threshold in years with no policy. We therefore seek to estimate:

$$E[\Delta \tilde{X}] = E[\tilde{X}^{compliers}] - E[\tilde{X}_{Control}^{up}]. \quad (14)$$

$E[\tilde{X}^{compliers}]$  is obtained as the average of the observed characteristics of firms in the avoidance region below and above threshold when or before the policy was implemented, weighted as indicated in equation 13. In practice we multiply each characteristics by the appropriate weight<sup>22</sup> (and obtain a variable  $\tilde{X}_i$  at the firm level). To estimate  $E[\tilde{X}_{Control}^{up}]$ , we duplicate observations in the avoidance region above threshold in years with no policy. We identify these additional observations with a dummy variable *compliers* that takes value 1 for the initial observations and value 0 for the new observations. When *compliers* takes value 0 we define  $\tilde{X}_i$  as firm  $i$  characteristics. The average of  $\tilde{X}_i$  over firms for which *compliers* take value 0 identifies  $E[\tilde{X}_{Control}^{up}]$ . To estimate  $E[\Delta \tilde{X}]$  we simply estimate  $\eta$  of the following equation with and without fixed effects:

$$\tilde{X}_i = \eta \cdot \text{compliers}_i + \mu_s + \epsilon_i. \quad (15)$$

#### IV.D Measuring Adjustment Cost and Output Elasticities

One characteristic of firms that we are interested in is the cost of adjustment. First, we can measure adjustment costs using the dispersion of the revenue share of capital within each sector. Optimally, marginal products (the production function elasticity) should equal marginal costs (the revenue share, as in Asker, Collard-Wexler, and Loecker (2014); Hall (1988)). Adjustment costs can prevent equalization, and so the dispersion of the revenue share is a proxy for industry-level adjustment costs. Formally we define adjustment cost as:

$$\text{Adjustment cost}_{it} = SD_{it}(\alpha_i + y_{jt} - k_{jt}), \quad (16)$$

where  $\alpha_i$  refers to sector  $i$  logarithm of output elasticity with respect to capital,  $y_{jt}$  refers

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<sup>22</sup>only the multiplication by + or - the inverse of the number of compliers as the numerators of the weights are already captured by the number of firms within the different regions

to firm  $j$  log-level of production on year  $t$ ,  $k_{jt}$  refers to firm  $j$  log-level of capital on year  $t$  and SD is the standard deviation operator.

Second, following a long tradition in production function estimation, e.g. Levinsohn and Petrin (2003) and Olley and Pakes (1996), we use production function elasticities themselves in order to measure the costs of adjustment. If materials are the most flexible input, the firms for whom the elasticity of output with respect to materials are the highest should have the lowest-cost in quickly adjusting their outputs (and firms with high capital elasticities the highest costs). In order to estimate production function elasticities, we follow the Wooldridge (2009) adaptation of Levinsohn and Petrin (2003).

#### IV.E Identifying Bunchers' Choices

In addition to measuring the ex-ante characteristics of the bunchers, we are also interested in what they do in order to lower their sales below the threshold. An RD strategy (comparing firms just below to those just above the cutoff) is not appropriate for estimating causal effects in this context. This is for two reasons. First, the firms who are able to (barely) avoid the extra tax may be different than those who do not, and so the RD estimate may suffer from selection bias. Second, conditional on sales the firms who are avoiding the extra tax may behave identically to non-avoiding firms.<sup>23</sup> Note that this isn't an issue for ex-ante characteristics, which are not directly affected by firm choices. To estimate firm choices, we compare *all* of the firms in the avoidance region to their counterfactual counterparts.

**Using Past Years as Counterfactual** In our setting, in order to compute the average value of the outcome of interest, had there been no avoidance, there is no need to predict the average value of the outcome of interest based on its relationship with the running variable outside the avoidance region. We can simply use the average value of the outcome of interest in years during which there was no incentives to bunch as counterfactual. To make sure our estimate is not driven by temporal changes in the outcome of interest, we detrend the outcome of interest by subtracting from it the mean of the outcome of interest in the region neighboring the avoidance region (i.e. the regions just below and just above). Our intent to treat estimate simplifies to :

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<sup>23</sup>Consider the following stark example: sales is a deterministic (continuous) function of materials. As a result, complier firms who choose to lower their sales will have the same materials use as the never-takers, and there would be no discontinuity at the policy cutoff.

$$ITT = E(\tilde{Y} | \text{firms avoid taxes}) - E(\tilde{Y} | \text{firms don't avoid taxes}) = E_{\text{Avoid}}^{\text{Treat}}(\tilde{Y}) - E_{\text{Avoid}}^{\text{Control}}(\tilde{Y}), \quad (17)$$

where *Treat* in exponent indicates that the expectation is taken over observation during the treatment years, while *Control* indicates that the expectation is taken over observation in years during which there was no incentives to bunch.  $\tilde{Y}$  is the de-trended characteristic of interest.

**Using Predictions from Distribution away from the Threshold as Counterfactual**  
We also follow Diamond and Persson (2016) as a robustness test. Their strategy consists in predicting the value of the outcome of interest for firms in the avoidance region, had there been no avoidance. In that order, we regress the characteristic of interest on a polynomial of turnover of order 5 for firms outside the avoidance region and predict levels of Y within the avoidance region by extrapolating this relationship. As a result the Intent To Treat estimator is estimated as :

$$ITT = E(\tilde{Y} | \text{firms avoid taxes}) - E(\tilde{Y} | \text{firms don't avoid taxes}) = E_{\text{Avoid}}^{\text{Observed}}(\tilde{Y}) - E_{\text{Avoid}}^{\text{Predicted}}(\tilde{Y}), \quad (18)$$

## V Empirical Analysis

In this section we describe the results of our data analysis. First we show the existence of bunching in the firm size distribution consistent with the theory. We then describe the characteristics of firms who bunch and then the way that they do so.

### V.A Excess Mass

Figure 4 shows the raw firm size distribution around the tax cutoff. Before the tax reform (in 1995 and 1996) and after (in 2000) there is no visual break in the firm size distribution, but it is clearly visible in 1997-1999. We calculate a counterfactual distribution far away from the cutoff as a solid line. The vertical lines show the excess mass (and under mass) for those years, where the extra mass on the left is equal to the undermass on the right. The avoidance region is fairly symmetric around the threshold. Figure 2c shows, just for the years 1997-1998, the observed difference in densities around the cutoff relative to the pre-reform years of 1995-1996.

Table 3 presents discontinuity estimates from McCrary (2008) estimation technique which show the bunching only appear in the years with the discrete jumps in the average tax rates.

Table 4 shows the size of the avoidance region, where both for the cross sectional and panel estimates we find excess mass of around or above 150 firms just below the increase tax rate. Column (3) shows consistent average bunching estimates using both techniques. Finally, we are able to estimate from this discontinuity the tax elasticity of sales of 0.16, using the *R* package *bunchr* that implements the methodology well described in Chetty et al. (2011).

The size of the avoidance region is not enormous. One important question is when firms realize that it may be profit maximizing to adjust their sales. In Figure 5 we show that firms who end up in the avoidance region have a wide range of turnover the previous year. Furthermore, the distribution of previous-year turnover does not shift after the policy, suggesting that it is difficult for firms to predict at the start of the financial year that the tax cutoff will be near their ultimate turnover.

## V.B Characteristics of Excess Mass

In this subsection we describe the types of firms who shrink their size in order to avoid paying taxes. First we show differential bunching by profit level. Since the tax rate is on profits, firms who, e.g., have no profits should not be affected by the policy. Consistent with this, we see in the right panel of Figure 6 that the lowest profitability firms do not demonstrate excess bunching in any of the years (while in 1997 there is a spike to the left of the cutoff, there is no corresponding valley to the right). For the most profitable firms, however, we do see sales adjustment, consistent with the theory. In Figure 7 we use firm profitability in 1995 (instead of in the current year) and find a similar result.

In Figure 8 we run the same exercise, but using adjustment costs (as measured using (Asker, Collard-Wexler, and Loecker, 2014)). The results are less clean than for profits, but again consistent with theory that firms with the lowest adjustment costs bunch the most.

Table 5 runs the estimation of equation 4, and finds consistently that the higher-profit and lower capital adjustment cost firms show more bunching

## V.C Characteristics of Compliers

An alternative approach to measuring who bunches is to instead look within the avoidance region (Diamond and Persson, 2016). In Tables 6 and 7 we report the estimates corresponding to equations 15 and 12 using respectively predictions from firms away from the threshold and previous years as counterfactual. In the first rows, we extend the results from the previous

subsection: compliers are more likely to have low adjustment costs and high profits. Results are robust to the inclusion of region and sector fixed effects as shown in the columns headed with "FE". We can also examine the production function characteristics of the compliers: they are more likely to have a lower capital elasticity and a higher materials elasticity. This is consistent with the oft-stated argument that materials inputs are more flexible (Ackerberg, Caves, and Frazer, 2015; Asker, Collard-Wexler, and Loecker, 2014; Levinsohn and Petrin, 2003; Olley and Pakes, 1996): the types of firms who find it easier to adjust their sales are those whose output is more responsive to materials. As a robustness check we run the same analysis on the sub sample of firms that have input shares below 1 and for which the sum of the input shares is lower than 2. Tables C.1 and C.2 show that our results are stable to this restriction.

#### V.D Behavior of Compliers

We can undertake a similar exercise to show the behavioral changes of the compliers (Tables 8 and 9 that estimate equations 17 and 18). Here we consider the entire avoidance region relative to its counterfactual prediction either in the cross section or the panel. Not surprisingly, we see that turnover is lower: this is the direct effect of tax avoidance. Sold production falls by more<sup>24</sup> than output does: inventories and capitalized production are higher for the firms adjusting their sales. As a robustness check we run the same analysis on the sub sample of firms that have input shares below 1 and for which the sum of the input shares is lower than 2. Tables C.4 and C.3 show that our results are stable to this restriction.

The behavior of the compliers is also informative for understanding the extent to which inputs are flexible. Firms who lower their production presumably do so by decreasing their input intensity (instead of by decreasing their TFP, which would not be profit maximizing). This implies that, for a given quantity of sales, firms who adjusted inputs in order to avoid the tax should be using relatively *more* of the less flexible inputs, and correspondingly less of the more flexible inputs. In tables 11 and 10 we find evidence consistent with this. In Table 11, using cross-sectional information, we find higher capital/output and lower materials/output ratios for firms in the avoidance region. In Table 10, using the panel, we find similar effects for capital although not materials.

Revenue shares are measured with error, so as before we run robustness checks for different levels of cleaning. In Appendix Tables C.6 and C.5 we show our results are similar when we are less conservative in our data cleaning choices. In particular when instead of restricting to the sub sample of firms that have input shares below 1 and for which the sum of the input

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<sup>24</sup>admittedly not significantly

shares is lower than 2, we focus our analysis to our main sample where the restriction is on having capital shares below 10.

## VI Discussion

In this paper we describe how firms respond to increases in the profit tax. The nature of our setting, the introduction of a new tax above a specific sales threshold, allows us to estimate many important parameters determining firm responses. First, we use the firms who adjust their sales below the threshold to estimate the tax elasticity of sales. We find a value of 0.16. Second, we describe the characteristics of those firms: those with high profits (and therefore high incentives to lower their tax rate) and those with low adjustment costs, measured in several ways. Third, we show that firms adjust their turnover by lowering production and increasing inventories.

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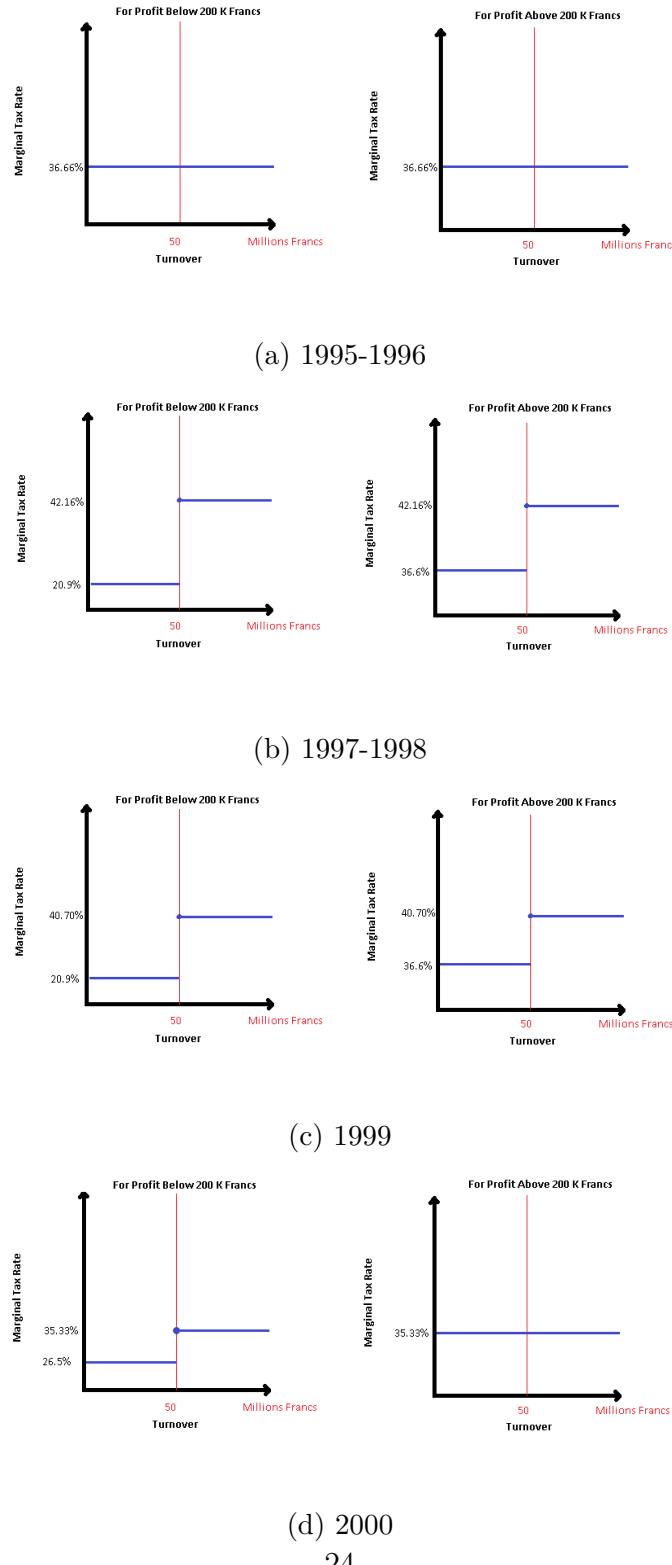
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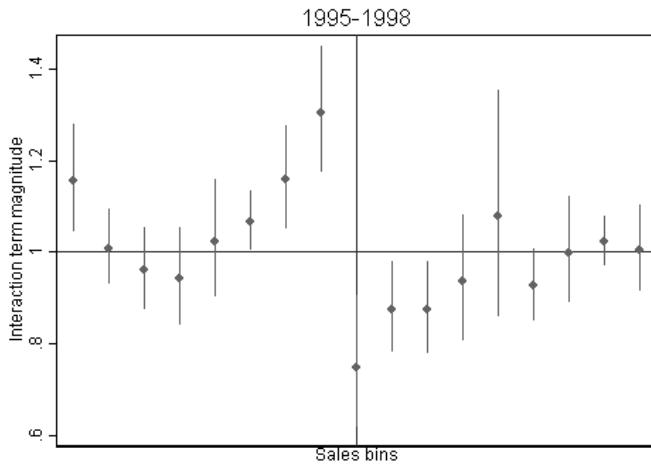
## A Figures

Figure 1: Evolution of the Tax Schedule



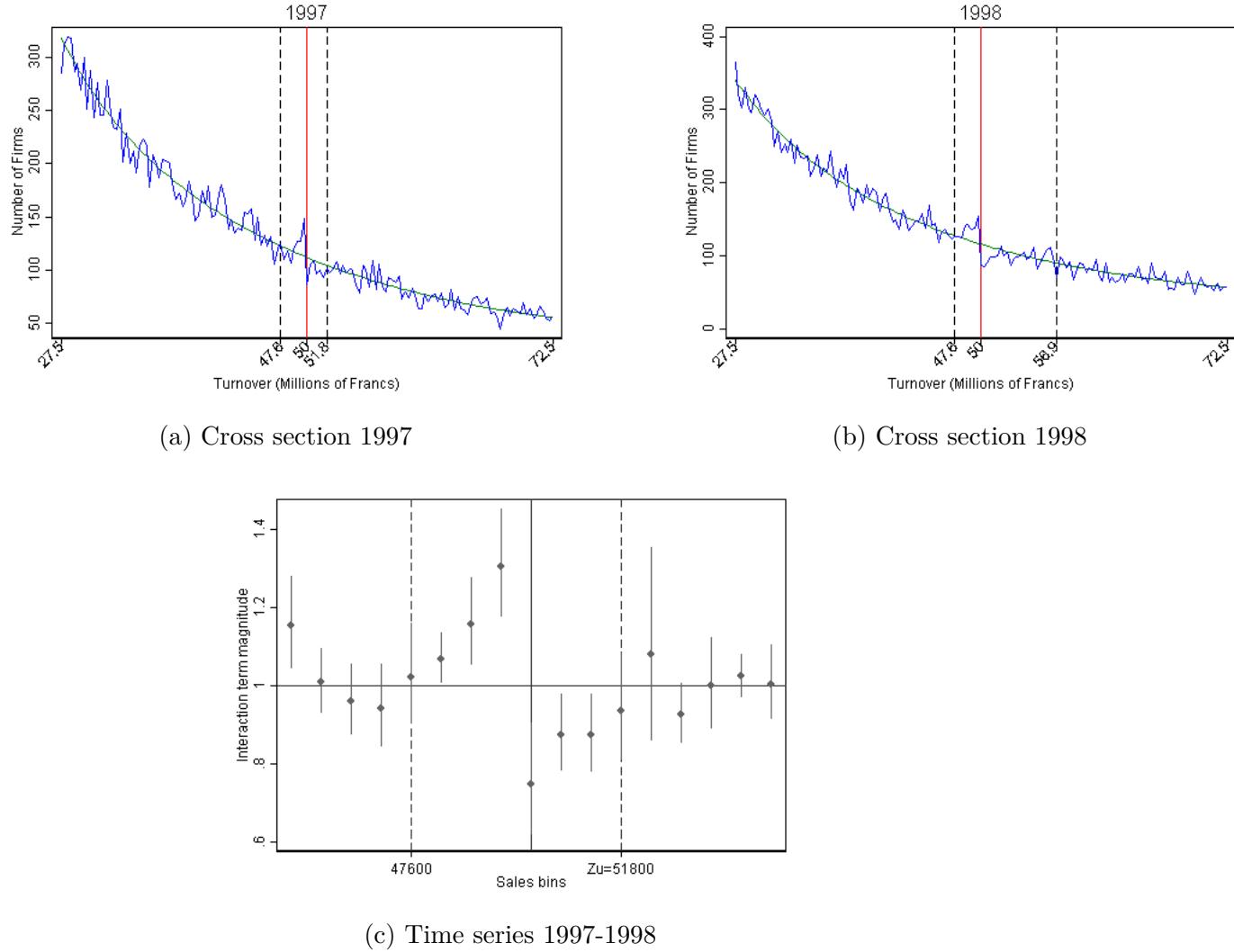
This figure presents the marginal rates of firms eligible to either the reduced corporate income tax or not. The marginal tax rates are the sum of three terms: the *contribution exceptionnelle*, the *contribution additionnelle* and the corporate income tax rate.

Figure 3: Representing bunching compared to counterfactual obtained from years during which there was no incentive to bunch



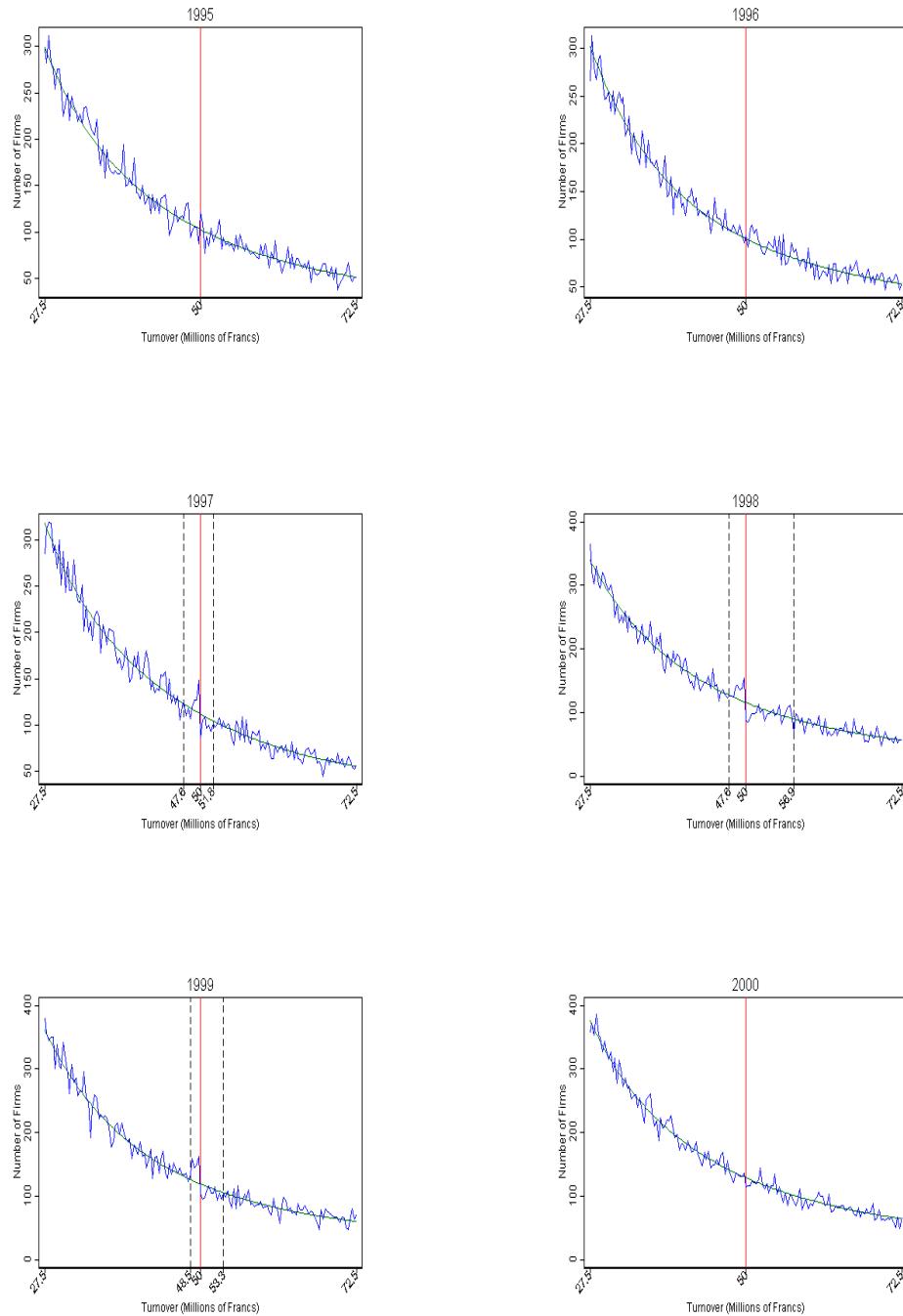
The figure plots the differential number of firms in bins around the threshold in years during which there was incentives to bunch compared to years during which there was no incentives. Each point comes from an interaction term between the bin indicator and the indicator of incentives. 95% confidence intervals are constructed using robust standard errors clustered at the bin level.

Figure 2: Estimating the width of the valley



The figure reports the avoidance region. It illustrates the lower end  $z_L$  that is determined either eyeballing where the distribution starts being different from the counterfactual (a) and (b) or as the lower end of the group of bins that precede the bunch of coefficients that are significant below threshold (c).  $z_U$  is determined from the equality of missing mass and excess bunching as reported in Table4

Figure 4: A transient discontinuity in firms' sales distribution



The distribution of firms with sales between 28 million Francs and 73 million Francs, restricting to firms that are paying corporate income tax and excluding firms that belong to a conglomerate.

Figure 5: Pdf Conditional on Being in the Avoidance Region the Following Year

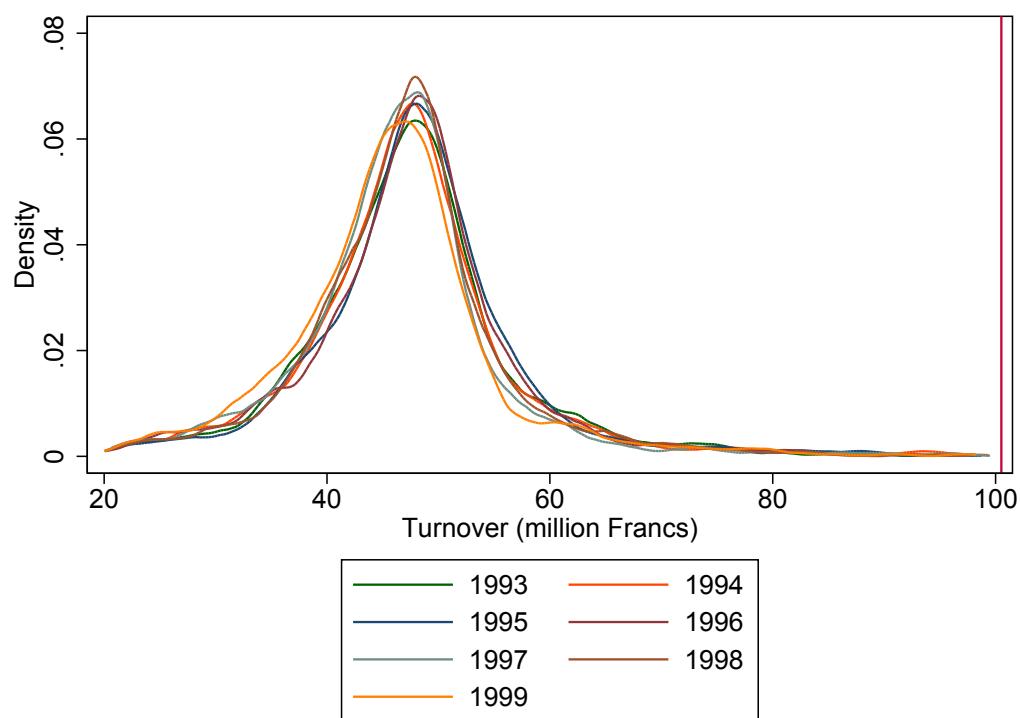
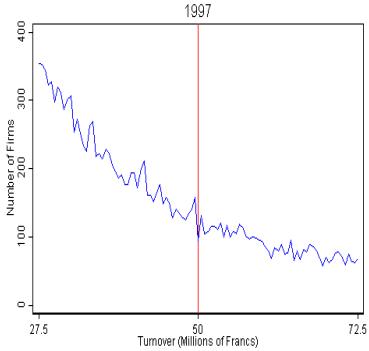
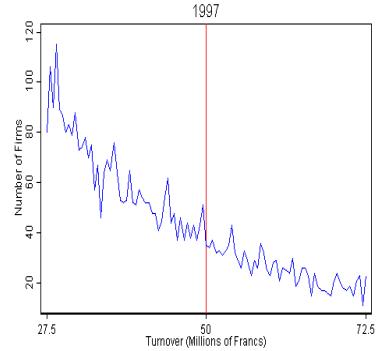


Figure 6: Differential bunching by profit level

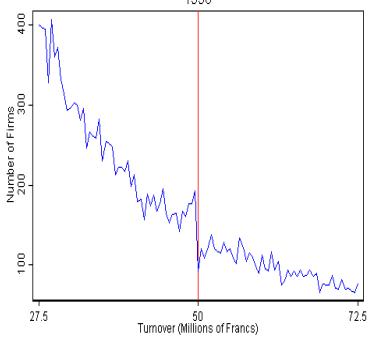
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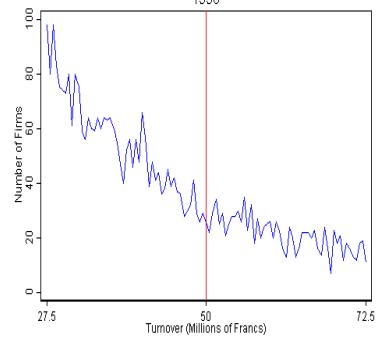
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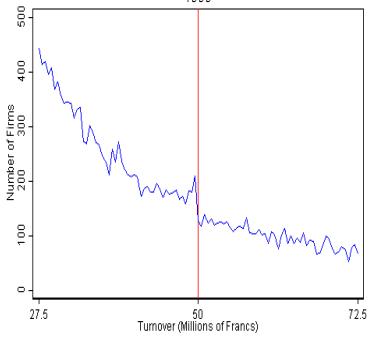
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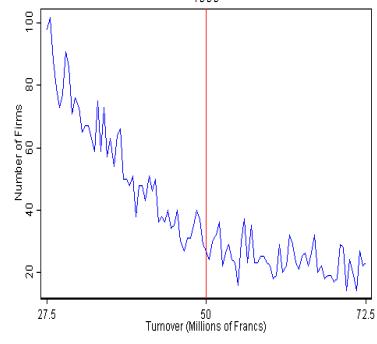
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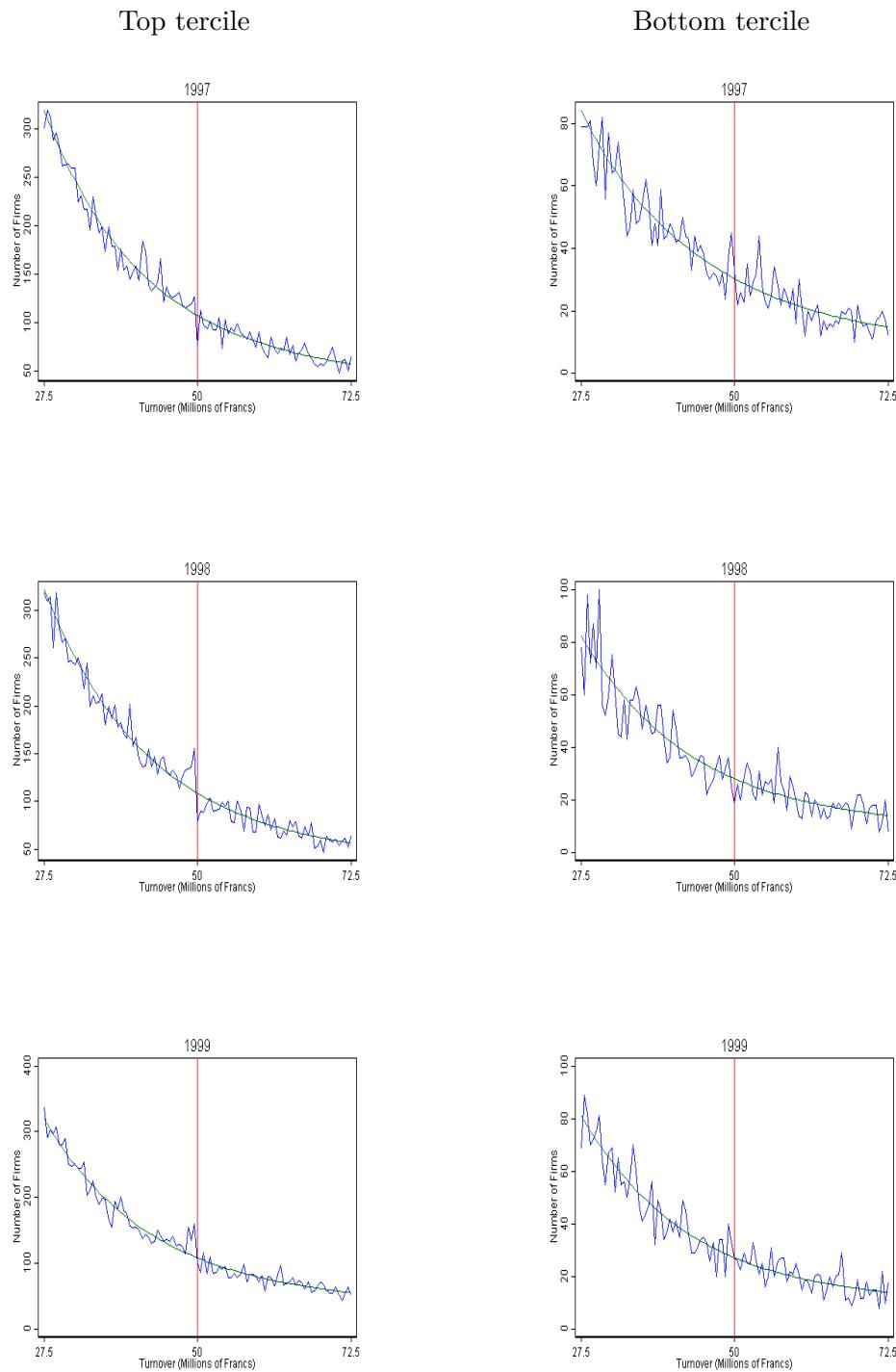


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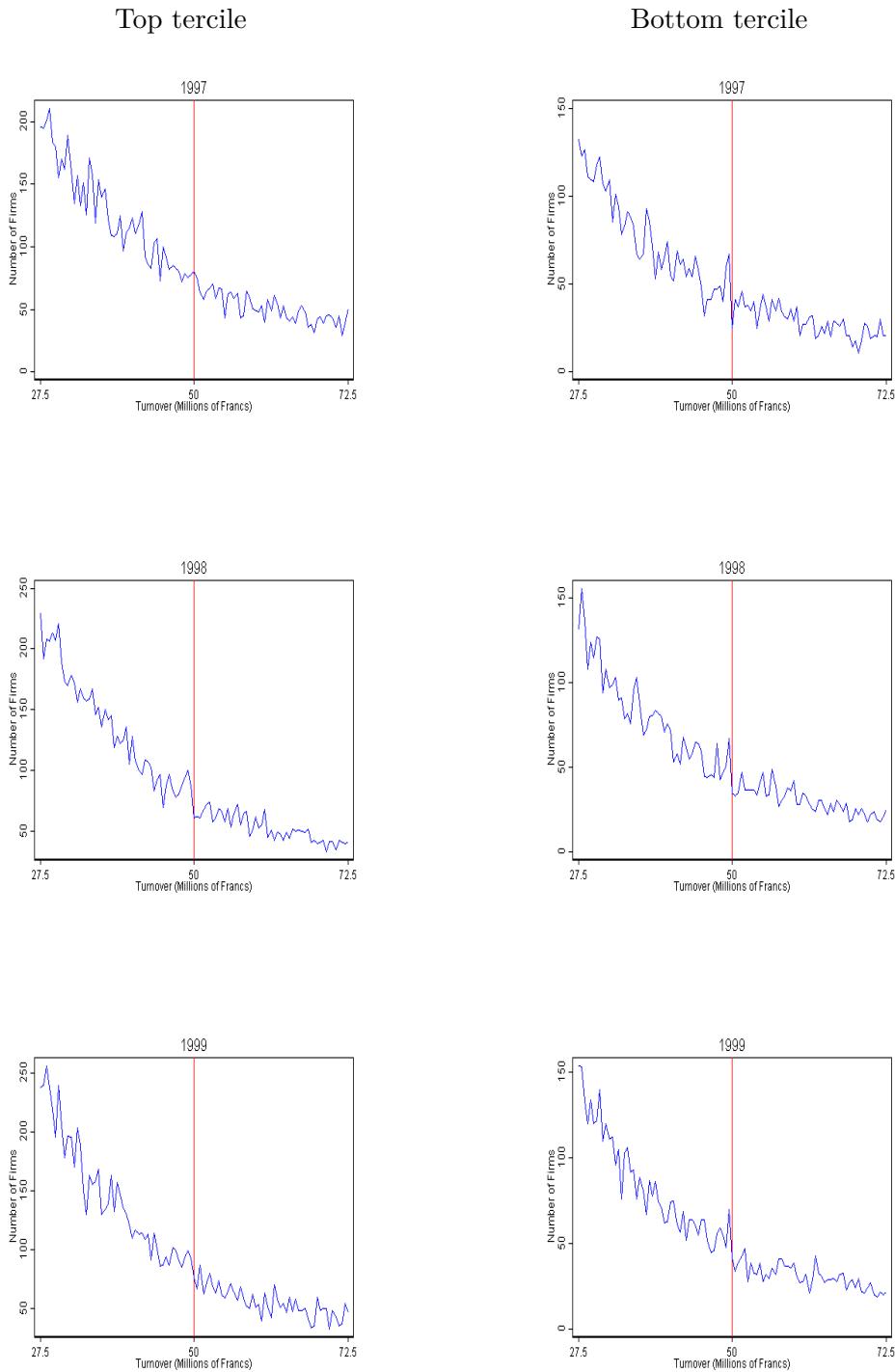
The distribution of firms with sales between 28 million Francs and 73 million Francs, restricting to firms that are paying corporate income tax and excluding firms that belong to a conglomerate.

Figure 7: Differential bunching by profit level in 1995



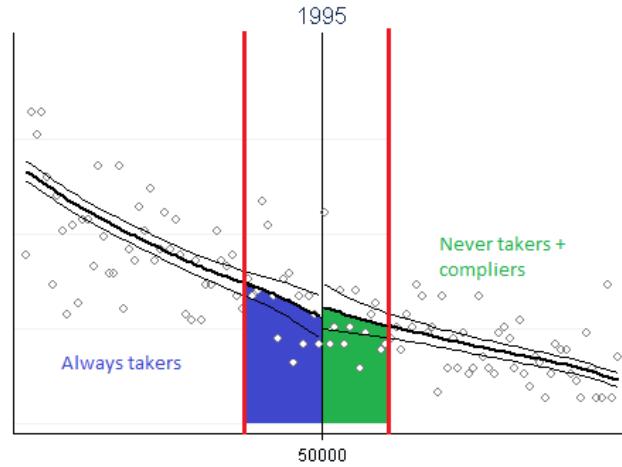
The distribution of firms with sales between 28 million Francs and 73 million Francs, restricting to firms that are paying corporate income tax and excluding firms that belong to a conglomerate, by level of profit.

Figure 8: Differential bunching by Adjustment cost

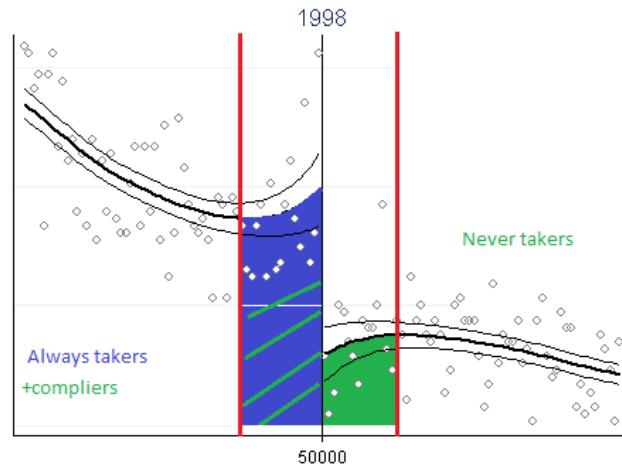


The distribution of firms with sales between 28 million Francs and 73 million Francs, restricting to firms that are paying corporate income tax and excluding firms that belong to a conglomerate, by level of adjustment cost measured as in (Asker, Collard-Wexler, and Loecker, 2014).

Figure 9: Assessing the Characteristics of the Bunchers



(a) Control



(b) Treatment

These graphs borrow on Diamond and Persson (2016). The additional tax can be interpreted as a treatment to which bunching firms are compliers.

## B Tables

Table 1: Share of Firms Affiliated to the Different Tax Regimes

Obs.	Nb	Share					VA value	VA share				
		BNC	BRN	RSI	IS	IR		B NC	BRN	RSI	IS	IR
1995	2,034,117	0.19	0.32	0.49	0.33	0.67	611.33	0.05	0.89	0.06	0.78	0.22
1996	2,226,769	0.18	0.31	0.51	0.33	0.67	627.47	0.05	0.88	0.07	0.80	0.20
1997	2,262,301	0.19	0.30	0.51	0.34	0.66	645.21	0.05	0.88	0.07	0.82	0.18
1998	2,297,619	0.19	0.30	0.51	0.35	0.65	719.77	0.05	0.89	0.07	0.84	0.16
1999	2,323,909	0.20	0.30	0.51	0.35	0.65	792.03	0.04	0.89	0.06	0.80	0.20
2000	2,325,726	0.19	0.30	0.50	0.36	0.64	821.33	0.04	0.89	0.06	0.81	0.19

*Note:* This table present the share of firms affiliated to the different regimes in the economy. Columns 3,4,5 9,10,11 are obtained using FICUS dataset. Columns 6,7,12,13 are obtained using BRN-SI files.

Table 2: Descriptive statistics

	mean	count	sd
<b>Sample</b>			
Output	20,160	191,511	21,680
Turnover	39,546	203,609	18,870
Profit	1,305	203,609	9,378
Materials	6,999	145,538	10,366
Capital	8,865	199,005	37,887
Wage Bill	5,437	200,754	5,234
Employee	37	203,609	39
<b>All firms</b>			
Output	8,463	8,510,565	1,022,583
Turnover	10,060	10,682,393	925,310
Profit	1,028	10,682,393	277,244
Materials	2,867	5,498,696	207,403
Capital	5,414	9,147,730	796,084
Wage Bill	1,801	6,769,965	70,909
Employee	7	10,682,393	336

*Note:* The sample is restricted to eligible firms paying a corporate income tax and with turnover between 20 million Francs and 100 million Francs. We also drop observations with capital share larger than 10 and observations with negative inputs values.

Table 3: Discontinuity estimates

**Raw dataset**

	(McCrory, 2008) estimates	standard errors	(Cattaneo, Janson, and Ma, 2016) p-values
1995	.058	(.092	0.9661
1996	.001	(.076)	0.6937
1997	-.331	(.083)	0.0002
1998	-.598	(.089)	0.0000
1999	-.714	(.114)	0.0002
2000	-.143	(.110)	0.1280

**Balanced dataset**

	(McCrory, 2008) point estimates	standard errors	(Cattaneo, Janson, and Ma, 2016) p-value
1995	.274	(.210)	0.6291
1996	.110	(.184)	0.3414
1997	-.647	(.193)	0.0384
1998	-.919	(.201)	0.0153
1999	-.617	(.155)	0.0052
2000	-.056	(.150)	0.2822

*Note:* This table reports discontinuity estimates for the two samples. The balanced dataset is the dataset restricted to the set of firms that have filled tax forms each years of the 1995-2000 period. Column 1 and 2 report the point estimates and standard errors obtained from (McCrory, 2008) estimation procedure, column (3) reports the p-value.

Table 4: Bunching estimators

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<b>Panel A: Cross-Section Estimates</b>			
	$\hat{B}$	$\hat{M}$	$\hat{b}_{av}$
1997	49.724	60.947	0.958* (0.633)
1998	114.278	134.700	2.198*** ( 0.587)
1999	86.100	95.980	1.511*** ( 0.370)

<b>Panel B: Time-series Estimates</b>			
1997-1998	204.264	225.945	0.415

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*Note:* This table reports the bunching estimators estimated with usual techniques (Panel A) and the bunching estimators obtained from the technique that uses past years as counterfactual (Panel B).  $\hat{M}$  is missing mass and  $\hat{B}$  excess bunching.  $\hat{b}_{av}$  refers to average bunching

Table 5: Bunching Estimation by Subgroups

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	Capital adjustment cost		Profits		Profits in 1995	
	Top	Bottom	Top	Bottom	Top	Bottom
1997	0	1.017	0.490	0	0.329	0.651
	-	(0.304)***	(0.332)	-	(0.321)	(0.312)**
1998	0.722	0.616	0.879	0	0.832	0.170
	(0.271)***	(0.270)**	(0.210)***	-	(0.248)***	(0.374)
1999	0.376	0.719	0.653	0	0.657	0.288
	(0.228)*	(0.310)**	(0.194)***	-	(0.198)***	(0.392)

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*Note:* This table reports the bunching estimators for different subgroups of firms. Values are zero if we do not estimate any bunching.

Table 6: Characteristics of the compliers: Panel

<b>Adjustment cost, Incentives, Ability to bunch</b>						
	Low adjustment cost of capital		Large profit		Large profit in 1995	
	(1)	(2) FE	(3)	(4) FE	(5)	(6) FE
Compliers	0.0364** (0.0152)	0.0341** (0.0133)	0.00519 (0.0133)	0.00144 (0.0133)	-0.00906 (0.0133)	-0.0123 (0.0103)
Observations	6344	6277	6405	6338	5424	5378

<b>Production function characteristics</b>						
	Large elasticity wrt K		Large elasticity wrt L		Large elasticity wrt M	
	[1em] Compliers	-0.0404*** (0.0144)	-0.0387*** (0.0135)	0.00849 (0.0131)	0.00890 (0.0139)	0.0363** (0.0152)
Observations		6344	6277	6344	6277	6344

*Note:* This table estimates the different characteristics of the bunchers compared to other firms that were eligible to bunching. Firms eligible to bunching are the firms that were above threshold in the avoidance region in years during which there was no incentives to bunch. Characteristics of the bunchers are identified following Diamond and Persson (2016) technique. Variables are centered with the mean of the variable in the region just below the avoidance region: Turnover in 45000-47600. Standard errors reported in parentheses are obtained by bootstrapping 500 times the test for the difference of characteristics. Columns (2) (4) and (6) report estimation with region and 16 industry fixed effects. Output elasticities are computed following (Levinsohn and Petrin, 2003) estimation procedure. Adjustment cost of capital is determined from (Asker, Collard-Wexler, and Loecker, 2014) estimation procedure.

Table 7: Characteristics of the compliers: Cross-Section

<b>Adjustment cost and Incentives to bunch</b>						
	Low adjustment cost of capital		Large profit		Large profit in 1995	
	(1)	(2) FE	(3)	(4) FE	(5)	(6) FE
Compliers	0.166* (0.0864)	0.166* (0.0936)	0.486*** (0.0835)	0.441*** (0.0824)	0.277*** (0.0705)	0.241*** (0.0664)
Observations	1326	1326	1334	1334	1178	1178
<b>Production function characteristics</b>						
	Large elasticity wrt K		Large elasticity wrt L		Large elasticity wrt M	
	0.0123 (0.0906)	0.0520 (0.0943)	0.150* (0.0847)	0.126 (0.0962)	0.0808 (0.0892)	0.0530 (0.0930)
Observations	1326	1326	1326	1326	1326	1326

*Note:* This table estimates the different characteristics of the bunchers compared to other firms that were eligible to bunching. Firms eligible to bunching are the firms that were above threshold in the avoidance region in years during which there was no incentives to bunch. The sample is restricted to 1997. Characteristics of the bunchers are identified following Diamond and Persson (2016) technique. Standard errors reported in parentheses are obtained by bootstrapping 500 times the test for the difference of characteristics. Columns (2) (4) and (6) report estimation with region and 16 industry fixed effects. Output elasticities are computed following (Levinsohn and Petrin, 2003) estimation procedure. Adjustment cost of capital is determined from (Asker, Collard-Wexler, and Loecker, 2014) estimation procedure.

Table 8: Consequences of Avoidance on Production Process: panel

	(1)	(2)	(3)	(4)	(5)
	Turnover	Y	Sold production	Change in inventories	Capitalized production
Avoidance	-86.97** (38.71)	-170.3 (275.5)	-329.0 (274.4)	120.7** (53.35)	38.01* (22.23)
Observations	5274	5274	5274	5274	5274

*Note:* This table estimates bunchers' choices.

Table 9: Consequences of Avoidance on Production Process: Cross Section

	(1)	(2)	(3)	(4)
	ln Y	ln Sold production	Change in inventories	Capitalized production
Avoidance	0.0937 (0.0723)	0.0839 (0.0771)	92.36 (74.63)	19.02 (44.13)
Observations	2278	2276	2278	2278

*Note:* This table estimates bunchers' choices in 1997.

Table 10: Consequences of Avoidance on Input Choices: Panel

	(1)	(2)	(3)	(4)
	Y	M over Y	L over Y	K over Y
Avoidance	-632.7* (370.2)	0.00766 (0.00562)	0.00388 (0.00463)	0.0311** (0.0151)
Observations	3691	3691	3691	3691

*Note:* This table estimates bunchers' choices. The sample is restricted to firms without extreme values of material, labor and capital shares nor negative values of inputs.

Table 11: Consequences of Avoidance on Input Choices: Cross Section

	(1) ln Y	(2) ln M/Y	(3) ln L/Y	(4) ln K/Y
Avoidance	-0.219*** (0.0843)	-0.206*** (0.0743)	0.000148 (0.00963)	0.0832** (0.0337)
Observations	1772	1764	1764	1764

*Note:* This table estimates bouchers' choices. The sample is restricted to firms without extreme values of material, labor and capital shares nor negative values of inputs and to year 1997.

## C Appendix

Table C.1: Characteristics of the Compliers: Panel

<b>Adjustment cost, Incentives, Ability to bunch</b>						
	Low adjustment cost of capital		Large profit		Large profit in 1995	
	(1)	(2) FE	(3)	(4) FE	(5)	(6) FE
Compliers	0.0495*** (0.0174)	0.0464*** (0.0160)	0.0277* (0.0146)	0.0237* (0.0143)	0.00351 (0.0165)	0.000422 (0.0163)
Observations	4439	4386	4494	4441	3881	3841
<b>Production function characteristics</b>						
	Large elasticity wrt K		Large elasticity wrt L		Large elasticity wrt M	
	[1em] Compliers	-0.0526*** (0.0184)	-0.0492*** (0.0187)	-0.00200 (0.0188)	-0.00163 (0.0173)	0.0598*** (0.0185)
Observations	4439	4386	4439	4386	4439	4386

*Note:* This table estimates the different characteristics of the bunchers compared to other firms that were eligible to bunching. The sample is restricted to firms without extreme values of input shares. Firms eligible to bunching are the firms that were above threshold in the avoidance region in years during which there was no incentives to bunch. Characteristics of the bunchers are identified adapting Diamond and Persson (2016) technique to the time series setting. Variables are centered with the mean of the variable in the region just below the avoidance region: Turnover in 45000-47600. Standard errors reported in parentheses are obtained by bootstrapping 500 times the test for the difference of characteristics. Columns (2) (4) and (6) report estimation with region and 16 industry fixed effects. Output elasticities are computed following (Levinsohn and Petrin, 2003) estimation procedure. Adjustment cost of capital is determined from (Asker, Collard-Wexler, and Loecker, 2014) estimation procedure.

Table C.2: Characteristics of the Compliers: Cross-Section

<b>Adjustment Cost and Incentives to Bunch</b>						
	Low adjustment cost of capital		Large profit		Large profit in 1995	
	(1)	(2) FE	(3)	(4) FE	(5)	(6) FE
Compliers	0.205** (0.0797)	0.154* (0.0834)	0.270*** (0.0550)	0.222*** (0.0588)	0.181*** (0.0477)	0.147*** (0.0553)
Observations	906	906	912	912	801	801

<b>Production Function Characteristics</b>						
	Large elasticity wrt K		Large elasticity wrt L		Large elasticity wrt M	
	-0.0512 (0.0695)	-0.0171 (0.0831)	-0.0118 (0.0789)	-0.0417 (0.0907)	0.191** (0.0752)	0.155* (0.0831)
Observations	906	906	906	906	906	906

*Note:* This table estimates the different characteristics of the bunchers in 1997 compared to other firms that were eligible to bunching. Firms eligible to bunching are the firms that were above threshold in the avoidance region in years during which there was no incentives to bunch. Characteristics of the bunchers are identified following Diamond and Persson (2016) technique. Standard errors reported in parentheses are obtained by bootstrapping 500 times the test for the difference of characteristics. Column (2) (4) and (6) report estimation with region and 16 industry fixed effects. Output elasticities are computed following (Levinsohn and Petrin, 2003) estimation procedure. Adjustment cost of capital is determined from (Asker, Collard-Wexler, and Loecker, 2014) estimation procedure.

Table C.3: Consequences of Avoidance on Production Process: panel

	(1)	(2)	(3)	(4)	(5)
	Turnover	Y	Sold production	Change in inventories	Capitalized production
Avoidance	-79.03** (38.88)	-632.7* (370.2)	-815.7** (363.2)	130.7* (72.82)	52.26* (30.60)
Observations	3691	3691	3691	3691	3691

*Note:* This table estimates bunchers' choices. The sample is restricted to firms without extreme values of material, labor and capital shares nor negative values inputs.

Table C.4: Consequences of Avoidance on Production Process: cross section

	(1)	(2)	(3)	(4)
	ln Y	ln Sold Production	Change in inventories	Capitalized production
Avoidance	-0.219*** (0.0843)	-0.227*** (0.0803)	45.51 (53.68)	23.58 (61.68)
Observations	1772	1770	1772	1772

*Note:* This table estimates bunchers' choices. The sample is restricted to firms without extreme values of material, labor and capital shares nor negative values of inputs and to year 1997.

Table C.5: Consequences of Avoidance on Input Choices: Cross-Section

	(1) ln Y	(2) ln M/Y	(3) ln L/Y	(4) ln K/Y
Avoidance	0.0937 (0.0723)	-0.170** (0.0784)	0.0546*** (0.0121)	0.129*** (0.0282)
Observations	2278	2270	2270	2270

*Note:* This table estimates bunchers' choices. The sample is restricted to firms without extreme values of capital shares nor negative values of inputs and to year 1997.

Table C.6: Consequences of Avoidance on Input Choices: Panel

	(1) Y	(2) M over Y	(3) L over Y	(4) K over Y
Avoidance	-170.3 (275.5)	-0.199 (0.384)	0.155 (0.114)	0.137** (0.0550)
Observations	5274	5274	5274	5274

*Note:* This table estimates bouchers' choices. The sample is restricted to firms without extreme values of capital shares nor negative values of inputs and to year 1997.

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