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Do Cheaters Bunch Together? Profit Taxes, Withholding Rates and Tax Evasion ⋆

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Abstract

We use firm-level administrative data from Ecuador to study the implications of 'reverse withholding' for firms' tax behavior. Withholding does not affect tax liability of firms, but it may result in a discontinuity in the audit probability around the withholding threshold. Exploiting variation in withholding rates across industries and over time, we find that firms' profit taxes concentrate near the withholding rate. To explore the link between bunching and evasion, we use data from third party reports on sales and costs. We show that the firms that bunch are more likely to conceal their sales and inflate their costs. Finally, we create a profile of the firms that bunch and of their general managers: medium size firms in the coastal region headed by single males are significantly more likely to bunch and, presumably, to evade taxes.

Keywords: Withholding, Reverse Withholding, Firms, Profit Tax, Bunching, Tax Evasion, Ecuador
JEL: H25, H26, O23, O12

1 Introduction

Tax enforcement in developing countries is severely constrained by the weak information base and large informal economy (Goode (1984), Gordon ed. (2010), Stiglitz (2010),

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Boadway and Sato (2009), Gordon and Li (2009), Emran and Stiglitz (2005, 2007)). The challenges faced by tax administration in developing countries are especially daunting when it comes to tackling income tax evasion (Bird and Zolt (2005), Dasgupta and Mookherjee (1998), Goode (1984)). Even in developed countries, income tax evasion is a major problem with certain groups of tax payers, especially the self employed (Shoup (1951), Alm et al. (2004), Soos (1990)). A widely used instrument for reducing income tax evasion and improving compliance by both individuals and firms is withholding by a third party.[1] Income tax withholding at the source by an employer has a long history, and it is now used in almost all developed and developing countries.[2]

While from its inception, withholding as a tax enforcement tool has been applied to employment income (wages and salary), in many developing countries withholding has increasingly been used to ensure compliance by the small firms and self employed. This type of withholding is called "reverse withholding" because a fixed percentage of a firm's sales are withheld by a large firm at the time when a transaction is made. The withheld amount can be typically applied as a payment on the firm's tax liability. Tax withholding can be an effective tool to combat tax evasion, but it also creates a "threshold" that can potentially affect a firm's economic decisions including its reported tax liability. This paper analyzes if the threshold introduced by this policy induces firms to "bunch" near the withholding rate, and it explores the possibility that "bunching" may indicate tax evasion.[3]

The observation that thresholds and other nonlinearities (kinks) in the tax system can affect tax reporting and also cause distortions by altering economic decisions has been the focus of a growing theoretical and empirical literature. Among theoretical contributions, Keen and Mintz (2004) show that value added tax (VAT) thresholds create incentives for firms to bunch just below the threshold, and it distorts the firm size distribution in an economy. Recent empirical works that focus on such thresholds and kinks include Onji (2009) and Saez (2010). Onji (2009) analyzes how Japanese firms' responded to a valueadded tax threshold that provided preferential tax treatment for smaller firms (less than 500 million yen in sales). Onji finds evidence of firms bunching near the imposed threshold. Presumably, large firms had incentives to avoid taxes and "masquerade" as many small firms by separately incorporating business segments. In an interesting paper, Saez (2010) exploits kinks in the U.S. income tax schedule to estimate how individuals' reported income changes as the marginal tax rate increases. He finds that the compensated

[1] For an interesting analysis of the role of third party in improving tax compliance, see Kleven et al (forthcoming).

[2] Withholding or "taxation at source" was introduced first in England when income tax was reenacted in 1803. The principle of "taxation at source" was designed to tackle "the gross fraud and evasion" that characterized the first income tax introduced in 1799 (see Sabine, 1966).

[3] The formal economic literature on the interaction between withholding and evasion is limited. Among the few available papers, Yaniv (1988) constructs a theoretical model to analyze how withholding of wage income by an employer can lead to evasion of the non-withheld taxes through non-filing of individual return.

elasticity of reported income with respect to the marginal tax rate is about zero for wage earners but substantially higher among those with self-employment income. To the best of our knowledge, there is no analysis of the effects of the threshold created by tax withholding in the existing literature.

Note that the threshold created by withholding is different from other thresholds in the tax system produced by exemptions or discontinuities in tax rates. Unlike the thresholds discussed in the literature, for example, due to exemptions from VAT and kinks created by income tax brackets or differential VAT rates, withholding rate does not affect the tax liability of a firm. If nothing else in the tax system is affected by the introduction of withholding or a change in the withholding rate, it should not affect the tax behavior of the firms subject to withholding. But withholding can affect the behavior of firms because such thresholds can and do affect the monitoring of firms by the tax authority in a discontinuous fashion. This is likely to occur, because tax devolutions (when tax liabilities are lower than withheld funds) generally entail higher audit probabilities. [4] The differential monitoring intensity induces some firms to adjust their reported tax liability to match closely with the taxes withheld. The withholding threshold can thus, in principle, lead to tax evasion. We develop a simple model of tax evasion by firms that captures these insights (see section (2) below), and provides the conceptual framework for the empirical analysis reported later in the paper.

Using the universe of firm-level records from the Tax Administration Agency in Ecuador, we compute the distribution of the 2006 firms' 'profit tax/sales revenue' ratio (henceforth tax/sales ratio) and show the existence of obvious spikes just around the firms' withholding requirements. [5] While the theory developed in section (2) below suggests that tax evasion could explain the bunching around the withholding threshold, one cannot rule out other explanations. For instance, spikes in the density of 2006 reported tax/sales ratio could simply be reflecting the shape of the true distribution of firms' profits. It may be possible (though highly unlikely) that the tax administration has a good estimate of the true distribution of profits, and set the "right" withholding rate-one that facilitates taxpayers' compliance. To test if this is the case, we use a quasi-experimental approach. Withholding requirements in Ecuador vary across industries and over time: for some industries (manufacturing, construction and wholesale trade and retail) they increased from 1 to 2 percent in June 2007; for other industries (transportation) they remained constant at 1 percent. We exploit these variations across time and industry in a difference-in-difference framework to estimate the effects of a change in the withholding rate on the tax reporting of the firms.

[4] As noted by Andreoni et al (1998), many tax agencies follow a cut-off rule, and concentrate their audit resources below the cut-off. The withholding rate seems to act as a focal point for establishing such a cut-off for auditing the firms.

[5] Although we use the term 'sales revenue', it may include additional sources of a firm's revenue other than sales.

The evidence presented in this paper show that bunching around the withholding rates is clearly observed in all industries in 2006. More interesting is the finding that the pattern radically changes in 2007 only for those industries where withholding rates were raised. The empirical evidence shows firms that bunch around the withholding rate in 2006 increase their tax/sales ratio by a larger amount after withholding rates went up. This implies that the firms that bunched around the 1 percent threshold in 2006 were systematically underreporting taxes, presumably to take advantage of the discontinuity in the audit function around the threshold. The firms whose true tax obligation exceeds their withheld amount seem to maneuver their tax declarations and report a lower tax that closely matches their withheld funds.

To explore the link between bunching and tax evasion, we use data on sales revenue and costs reported by third parties as an independent source of information. We investigate if the group of firms that bunched in 2006 around the 1 percent threshold is more likely to declare incorrect information to the tax authority (compared to the third party reported information). To achieve this task, we use the database used by the tax administration in Ecuador to cross-check tax declarations.[6] In particular, we have been able to gather information about self-reported and third-party reported revenue (domestic sales plus exports) and costs (intermediate input costs plus imports) for most of the firms in our panel. Having two sources of information allows us to compare whether firms misreport revenue and/or costs on their profit tax returns. Using simple linear regression models, we find that, indeed, firms that bunch are more likely to conceal revenue (sales under-reporting) and inflate input costs (costs over-reporting).[7]

Because firms that bunch around the withholding rate are more likely to misreport taxes, auditing efforts could be focused around them. Hence, for control purposes it is useful to construct a profile of such firms. Besides firms' characteristics, we have gathered information about the demographic characteristics of the firm's general manager, such as his/her gender, age, education and marital status (using administrative records from the Ecuadorian Civil Registry). It is found that medium size firms in the Ecuadorian Coastal region led by a single male general manager are significantly more likely to bunch and, thus, may be more likely to misreport their tax declarations.

To the best of our knowledge this is the first paper in the literature to analyze possible bunching of firms' reported profit tax payments due to withholding, and also provide evidence that bunching around withholding rate may be indicative of tax evasion. Our

[6] Kleven et al. (2010) extend the standard economic model of tax evasion to incorporate third-party reported and self-reported income. While all advanced economies use third-party information to prevent and control tax evasion, some developing countries, including Ecuador, are increasing their efforts to collect third-party data.

[7] Unfortunately, third-party reports are not available for 2006 but only for 2007. Thus, we assess if firms that bunch near the threshold in 2006 are more likely to underreport sales or over report costs in 2007.

empirical analysis exploits an interesting quasi-experiment in Ecuador where withholding rates of only some industries were modified. This provides us with a stronger identification strategy to analyze the impact of withholding threshold on tax reporting. Finally, we are able to compute objective indicators of misreporting (difference between self-reported and thirdparty-reported income and costs), and use it to test if bunching around the threshold is associated with misreporting. Hence, we are able to link bunching around a threshold with tax evasion.

The rest of the paper is organized as follows. To explain the theoretical relationship between withholding rates and bunching, we develop in section 2 a conceptual framework for the empirical work. Section 3 provides institutional details about Tax Administration in Ecuador. In section 4, we analyze how changes in withholding rates affect reported taxes. Section 5 explores the relationship between bunching and misreporting. The sixth section constructs a profile of firms that bunch and, finally, the last section concludes.

2 Conceptual Framework

In this section, we use a simple extension of a conventional model of tax evasion to show how the threshold introduced by the withholding rate can induce bunching of reported taxes. The model also shows that bunching may indicate tax evasion. The model below is based on the Allingham-Sandmo model (Allingham and Sandmo (1972)) which builds on the 'crime and punishment' framework of Becker (1968), and has been widely used to explain agents' optimal tax evasion choices (see Cowell (1990), Sandmo (2005), Slemrod and Yitzhaki (2002), Kleven et al. (2010)).

Assume that risk neutral firms are taxed a sum that is proportional to their profits. Let $\tau\epsilon(0,1)$ be the profit tax rate. We define $\Pi_i = Y_i - C_i$ where Π_i is the profit of firm i, and P_i and C_i are sales and costs respectively. So the true tax liability of firm i is $T_i = \tau\Pi_i$. The firm reports profit $\pi_i \leq \Pi_i$ and its tax payments are $t_i = \tau\pi_i$. When $\pi_i < \Pi_i$, the firm underreports its tax liability and evades taxes. Underreporting profits has consequences. When tax evasion is detected, the firm is forced to pay the evaded tax plus a penalty. Under this scenario, a risk neutral firm chooses π_i to maximize its expected after-tax profit:

$$Max_{\pi_i} W_i = (1-P)[\Pi_i - \tau\pi_i] + P[(\Pi_i - \tau\pi_i) - \tau(1+\theta)(\Pi_i - \pi_i)] \quad (1)$$

where P is the probability of detecting tax evasion and θ is the penalty rate. If the probability of detection is constant, then the first order conditions imply the following

corner solutions:

$$\pi_i^* = \Pi_i \text{ if } P(1+\theta) > 1$$
$$\pi_i^* = 0 \text{ if } P(1+\theta) < 1$$

We now introduce withholding by a third party in the above set-up. The third party withholds a proportion of the sales revenue of the firm . For tractability, we assume that firms cannot hide the sales revenue, and thus tax evasion occurs through over-reporting of costs. But in the empirical implementation, we look for evidence of misreporting of both sales revenue and costs. Let the withholding rate be $\delta < \tau$, so the amount withheld $\omega_i = \delta Y_i$. We define

$$R_i = \omega_i - t_i; \text{ and } \Psi_i = \frac{t_i}{Y_i}; \widetilde{\Psi_i} = \frac{T_i}{Y_i} \tag{2}$$

So R_i is the net refund claimed by firm i, and $\widetilde{\Psi_i}$ and Ψ_i are the true tax liability as proportion of sales revenue and the actual tax payments as proportion of sales revenue respectively. It is common that the tax authority uses the withholding rate as a focal point to allocate its auditing resources. If a firm declares a profit such that $R_i > 0$, and thus claims a refund it triggers a higher probability of audit, and the firm may also incur additional compliance costs to claim the refund. We assume that the probability of detecting tax evasion depends on the actual tax payments as a proportion of sales; $P(\Psi_i)$ is negative function of Ψ_i, but it declines discontinuously when $\Psi_i \geq \delta$ (i.e., when $R_i \leq 0$). This discontinuity in the $P(\Psi_i)$ function can induce the firms to bunch at or around the withholding threshold δ. To see this in a transparent way, we consider a simple step function for $P(\Psi_i)$:

$$P(\Psi_i) = \begin{cases} P_1 \text{ if } \Psi_i < \delta \\ P_2 \text{ if } \Psi_i \geq \delta \end{cases}$$

Now we consider two types of firms separately depending on whether the true tax liability $\widetilde{\Psi_i}$ is lower or higher than the withholding threshold δ.

First consider the firms for which the true tax liability is less than the withheld amount so that we have $\widetilde{\Psi_i} < \delta$. For such a firm the optimal reported profit is the actual profit and the firm optimally choose not to evade taxes if P_i is high enough:

$$\pi_i^* = \Pi_i, \text{ if } P_i > \frac{1}{(1+\theta)}$$

For rest of the discussion, we assume that $P_i > \frac{1}{(1+\theta)}$ holds.[8] Such an auditing scheme where the tax authority concentrates its resources on the firms below a threshold might be optimal as shown in the theoretical literature on optimal auditing (see Reinganum and Wilde (1985, 1986)).[9]

Note that if there is no additional costs associated with claiming the refund, then a firm with $\Psi_i \epsilon [\delta - \varepsilon, \delta]$ will report its tax liability truthfully and claim a small refund. But if there are fixed costs of compliance in claiming a refund, then some firms with true tax liability less than the threshold δ might choose not to claim a refund, thus bunching at δ. This might be more attractive if firm owners incur substantial costs (financial and psychological) when audited; by not claiming a refund it reduces its probability of being audited from P_1 to P_2.

But more interesting and important for our analysis is the behavior of the firms with true tax liability higher than the withheld amount so that $\widetilde{\Psi}_i > \delta$. For these firms it is optimal to underreport and claim a tax liability exactly equal to the withholding threshold if P_2 is lower than a threshold:

$$\pi_i^* = \frac{\delta Y_i}{\tau}, \text{ if } P_2 < \frac{1}{(1+\theta)} \tag{3}$$

The above model, although simple, makes two important points: (i) bunching at the withholding threshold can arise as a result of discontinuity in the auditing probability function at the threshold, and (ii) many of the firms that optimally choose to bunch are the ones with higher tax liability. Thus bunching may be indicative of tax evasion. However, the model yields the stark conclusion that any firm with true tax liability higher than the withholding rate will bunch at the withholding threshold which is clearly unrealistic. This conclusion is driven by the simplifying assumptions that the probability function is a step function, and that there is no heterogeneity among firms in terms of risk preference (and in moral integrity). For concreteness, let us consider heterogeneity in risk preference with the utility function of firm i owner denoted as $\alpha_i log(.)$. We assume that the probability function looks as follows:

[8] One might find the implication that the firms with true tax liability below the withholding threshold do not cheat unrealistic. This feature of our model is, however, shared by all the principal-agent models of tax compliance where tax authority credibly commits to an audit strategy. In a game theoretic model, in contrast, it is possible to have firms cheat below the cut-off of the withholding rate.

[9] Although an optimal cut-off rule for auditing depends on the assumption of risk neutrality, a negative slope of the $P(.)$ function is consistent with more general models. See for example, Andreoni et al. (1998), Slemrod and Yitzhaki (2002).

$$P(\Psi_i) = \begin{cases} P_1 \text{ if } \Psi_i < \delta \\ P_2 \text{ if } \Psi_i \epsilon [\delta, \delta + \varepsilon] \\ P_2 - f(\Psi_i) \text{ if } \Psi_i > \delta + \varepsilon \end{cases}$$

where $f(\Psi_i) \leq P_2$ is an increasing concave function. With such a set-up, there will be some firms with true tax liability higher than the threshold $(\widetilde{\Psi_i}) > \delta + \varepsilon$ who would optimally choose not to bunch at the threshold, especially if they are risk averse enough. Such a model with heterogeneity in risk preference also implies that there will be adverse selection of firms; relatively risk loving firms would tend to bunch at the threshold to evade taxes. For such risk loving firms, we should observe persistence in tax evasion over time, and they would be more likely to evade taxes even if there is no withholding and no discontinuity in the audit probability.

While the theory above suggests that tax evasion could potentially explain any observed concentration of tax reports around the withholding rate, it also points out the possibility that some firms with lower tax liability may choose to bunch to avoid the costs associated with being audited. In addition, one cannot rule out other explanations. For instance, bunching could simply reflect the shape of the true distribution of firms' profits. It is possible (though highly unlikely) that the tax administration has a good estimate of the true distribution of profits, and sets the "right" withholding rate-one that facilitates taxpayers comply and pay the correct tax amount. It is also difficult to differentiate tax evasion from tax avoidance. In the empirical sections below, we show that there is, in fact, bunching around the withholding rate as predicted by the simple model above, and also provide some suggestive evidence that bunching is associated with tax evasion.

3 Tax Administration, Income Tax and Withholding System in Ecuador

In this section, we provide some details about the Tax Administration in Ecuador and the withholding mechanism. The current Ecuadorian Tax Administration Agency - Servicio de Rentas Internas (SRI) - was created in December, 1997 and is an independent institution with administrative, financial and operational autonomy.

Ecuadorian law requires both individuals and firms to pay income taxes. Individuals are taxed a share of their (taxable) income using a progressive tax rate. Firms, on the other hand, are taxed on their profits using a flat tax rate of 25%. Given space constraints and the focus of this study, we describe the tax-filing process of firms only.

Firms are required to file year t tax returns between February and April of year $t+1$. The SRI has devised two mechanisms that allow it to collect profit taxes before returns are due: an advance payment system and a withholding mechanism. Advance payments made during the current year are collected in July and in September. Of course, advance payments made during year t are deductible from the income tax liability to be filed in year $t+1$.

The withholding system is a mechanism where most companies (those that are designated by the SRI to be withholding agents) are required to deduct and withhold a fixed percentage of the payments theymake to other firms. We refer to this fixed percentage as the withholding rate, hereafter. This deduction takes place only if the payment is taxable income for those who receive it. Every month, withholding agents must report and transfer all withholdings to the tax authority. Firms can deduct their withheld funds, including those from previous years (up to five years), from their current tax liability. Sales that firms make to final consumers (rather than to firms) are not subject to withholding.

It is possible that withheld amounts exceed the firm's tax liabilities. When this is the case, the SRI does not automatically grant a refund.[10] However, companies could submit an "excess-payment petition" and ask explicitly for a refund. This process is long (about six months) and requires the firm to file additional documents that support the information on their balance sheets. In many cases, SRI staff will audit firms and review their accounting before a refund can be made. It is clear that the monitoring probability increases significantly if a firm claims a refund.

Withholding rates can be unilaterally changed by the tax authority without any approval of the legislative or executive power. These rates in a given period vary according to the goods or services being purchased, and also have changed over time. Table 1 shows how withholding rates of many categories of products have changed since 2003. In July 1, 2007, withholding rates for sales of tangible goods and other services (including construction) increased from 1 to 2 percent. This was an important change that affected a large share of commercial transactions. Note that, during this period, the withholding rate for sales of transportation services remained constant at 1 percent.

The withholding rates apply to *products* listed on Table 1 rather than to *firms*. For example, a firm that sells both manufacturing goods and transportation services could be subject to different withholding rates.[11] While there is not a one to one correspondence between the firms' ISIC economic activity and the products it sells, we assume that a)

[10] The SRI keeps the difference between all advanced payments (including withheld funds) and the firm's tax liability unless a petition for a refund is filed.

[11] For example, after June 2007, a firm that produces manufacturing goods and transportation services will be subjected to different withholding rates: 2 percent of its manufacturing goods sales and 1 percent of transportation services sales will be withheld.

all firms in the manufacturing and the retail sector are subject to the withholding rates that apply to tangible goods purchases, b) all firms in the construction sector are subject to the withholding rates that apply to real estate construction activities, and c) all firms in the transportation sector are subject to the withholding rates that apply to private passenger transport and public and private freight services. Given these assumptions, in Table 2, we show withholding rates that firms in the construction, manufacturing, retail and transportation sector likely faced during 2006 and 2007. In the empirical sections, we take advantage of the variation in the withholding rates both across industries and over time to analyze the profit tax payments of firms.

4 Does Withholding Lead to Bunching?

In this section, we test if Ecuadorian firms' tax/sales ratio (ie., Ψ_i) oncentrates around the withholding rate δ. We start by describing the data and, later, show graphical and econometric evidence that firms do bunch around the withholding threshold.

4.1 Data

We have collected the universe of firms' profit tax returns using administrative data of the SRI (tax Form 101) for years 2006 and 2007. We focus on firms in the following four economic activities: construction, manufacturing, wholesale trade and retail, and transportation. This allows us to exploit the variation in the withholding rates both across industries and over time that was described in the previous section. After eliminating duplicates and observations with missing data, we are left with a balanced panel of 12,406 firms per year.

Details about the variables and descriptive statistics are provided in Table 3. Ecuadorian firms' assets in these industries averaged \$1.7 and \$1.9 million in 2006 and 2007, respectively. Their mean annual revenue (sales) increased from \$2.9 million in 2006 to \$3.3 million in 2007. Average profit tax liability also increased from \$28,000 to \$35,000. This reveals a rather low tax/sales ratio (close to 0.01). Besides assets, sales, and taxes, we have also collected information about the location of the firm (if it is located in the Coastal region), whether it is involved in any importing or exporting activity of any kind, and if the firm has been designated as a Large Taxpayer Unit (LTU). [12]

[12] Large Taxpayer Units (LTUs) are large firms subject to tighter monitoring and controls from the Tax Authority.

4.2 Bunching: Graphical Evidence

We first provide some graphical evidence about bunching by estimating the distribution of the firms' tax/sales ratio (Ψ_i) in each of the four industries we focus on. The theoretical analysis suggests that bunching should occur exactly at the existing withholding rate. However, even if all firms in our sample would report a tax liability that is exactly equal to their withheld funds, one cannot expect to see a degenerate distribution of the tax/sales ratio. This is because of the simple fact that sales made to final consumers are not subject to withholding, and some firms in our sample sell some of their products to consumers. Moreover, firms can also use withheld funds from previous periods (up to five years) to pay current year tax liabilities. For these reasons, even if all firms in our data declare taxes that are identical to their withheld funds, the distribution of the tax/sales ratio should be concentrated around (rather than exactly at) the withholding requirement. This concentration should be more visible in industries where firms interact less with final consumers (such as construction, for example).

The top parts of Figures 1 to 4 show histograms of the tax/sales ratio in 2006 for firms in the manufacturing, construction, retail and transport sectors, respectively. In all industries, there is a noticeable clustering of firms around the 0.01 bin, which coincides with the withholding requirement of 1%. As expected, the spike in the histogram at 0.01 is more evident in the construction sector but is clearly visible in all industries. These patterns could have two interpretations. First, the observed spikes at 1% in 2006 could simply reflect the true distribution of firms' tax/sales ratio. Perhaps the tax administration is aware of this from past empirical evidence, and set, ex-ante, a withholding rate (of 1%) that facilitates most taxpayers compliance and payment of the correct amount of taxes. Alternatively, as our theoretical model suggests, bunching around the withholding rate could suggest that firms are manipulating their balance sheets to match their tax liabilities to their withheld funds (either by avoiding or evading taxes).

To distinguish between these two hypotheses, we construct the same histograms for the year 2007 when withholding requirements of some industries increased from 1% to 2%. If the 2006 histograms reflect the true profit distribution of Ecuadorian firms, one would not expect to see much change when withholding rates vary. Interestingly, the spike at the 0.01 tax/sales ratio bin completely disappears in 2007 in those industries where withholding rates were modified (construction, manufacturing and trade).[13] Moreover, the spike in the density of the tax/sales ratio for firms in the transportation sector seems to remain constant at 0.01 (the unchanged withholding rate). These observations contradict the

[13] 13Note that the change in withholding rates occurred in the middle of the year (June 2007) and affected only the second half of the year sales. Thus, one cannot expect to see bunching patterns around the new withholding rate of 2%.

first interpretation that the bunching in 2006 at around the withholding threshold is due to underlying heterogeneity in firm characteristics, and are more consistent with the predictions from our simple theoretical model. Note that if selection is important for bunching, we would expect the firms that bunched at around the threshold in 2006 to still evade taxes in 2007 (i.e., they are the 'risk loving' or inherently 'opportunistic' firms), but since they do not expect a discontinuity in the audit probability at that threshold anymore, the resulting tax payments will become much smoother, as seems to be the case in the Figures 1-4.

4.3 How do "Bunchers" Respond to a Change in the Withholding Rate?

When withholding rates change from 1 to 2 percent, the firms do not expect a discontinuity in the audit probability around the 1 percent threshold anymore. This implies that the bunching firms will optimally adjust their tax payments upward in 2007. In this section we estimate a series of simple linear regression models to test if firms that bunch around the withholding rate in 2006 are more likely to declare a larger tax/sales ratio when withholding rates are increased.

As a first and necessary step to implementing the test, we need to specify the empirical definition of "bunching." As discussed before, the firms are expected to bunch around the withholding threshold, rather than locating exactly at the threshold because of sales to consumers and carry-over of withheld funds from previous years. We create three alternative indicators to identify firms that bunch around the withholding rate in 2006 using alternative intervals. The variable B_{ai} equals one if firm i's tax/sales ratio in 2006 is between 0.99% and 1.01%. Similarly, the variables B_{bi} and B_{ci} equal one if the 2006 tax/sales ratio falls within the intervals [0.98%, 1.02%] and [0.97%, 1.03%], respectively. Using these definitions, we identify 157, 304 and 454 firms that "bunch" around the withholding rate, respectively (see bottom of Table 3).

We then use OLS to estimate the following linear model:

$$\Delta\Psi = \beta_1 + \beta_2 B_i + \beta_3 \Delta\delta + \beta_4 (B_i * \Delta\delta) + \beta_5 \Delta X_i + \xi_i \tag{4}$$

where $\Delta\Psi$ is the change in firm i's tax/sales ratio between 2006 and 2007, B_i is a dummy variable that equals 1 if firm i's 2006 tax payment lies in the vicinity of the 2006 withholding rate of 1% ('vicinity' defined by three intervals specified earlier), $\Delta\delta$ is the change from 2006 to 2007 in the withholding rate that a firm is subject to, ΔX_i s a vector with variables that measure changes in the characteristics of firms such as assets, and ξ_i is

the error term. The variable of interest is the interaction term on the right hand side of equation (4) which is the difference-in-difference estimate of the effects of the change in the withholding rate on reported taxes. If we find that $\beta_4 > 0$, it implies that firms who bunched in 2006 around the withholding threshold show systematically larger changes in their reported tax/sales ratio when withholding rates are raised (compared to their counterparts subject to constant withholding rates). So an estimated $\beta_4 > 0$ would indicate the firms that were bunching reported lower tax/sales ratio in 2006 presumably to take advantage of the discontinuity in the audit probability around the threshold.

The results are reported in Table 4. To check robustness of the results, we report estimates from several alternative specifications of equation (4) including three different definitions of bunching discussed above. Specifications displayed in columns (2), (4) and (6) include variables that control for changes in (the natural logarithm of) assets (ΔX_i) while estimates in the other columns do not.

The first three rows of the table show that, in all six specifications, the coefficient on the interaction term, β_4, is positive and statistically significant. For example, estimates from the fourth specification shown in column (4) suggest that firms who bunched around the withholding rate in 2006 (B_{bi}) and that belong to any of the three industries where withholding rates increased from 0.01 to 0.02, increased their tax/sales ratio by about 0.003 more than their counterparts (firms that bunch in the transportation industry). The estimates are notably robust across different specifications.[14]

In sum, the empirical evidence presented in Table 4 suggests that firms that bunch around the withholding rate in 2006 also declare larger increase in their tax/sales ratio after withholding rates went up. These results support the hypothesis that the withholding rate introduces a tax threshold that affects the way firms declare their taxes. Furthermore, it seems that firms who bunch declared systematically lower taxes in 2006. In the next section, we explore the possible link between bunching and tax evasion in more depth.

5 Does Bunching Indicate Evasion?

The model presented in the conceptual framework suggests that tax evasion could explain bunching of reported taxes around the withholding rate. It is difficult, however, to attribute the bunching patterns observed in the data to tax evasion (fraud) rather than to tax avoidance. In this section, we use additional data to test if there is any association between bunching and tax evasion.

[14] While other coefficients on Table 3 are interesting, we do not discuss them here for the sake of brevity.

5.1 Indicators of Tax Evasion

Our first task consists of finding indicators of tax evasion. Ideally, we would like to compare actual sales and costs of firms with the sales and costs reported in tax returns. This comparison would enable us to find if firms are, for example, concealing part of their sales or overstating their costs, or indulging in both (mal)practices.[15] While it is nearly impossible to get data on the actual sales and costs incurred by firms, we are able to gather third-party reports about each firm's sales and intermediate input costs. Third-party data were taken from an Annex that most firms-as withholding agents- file every month to the SRI and from the Ecuadorian Customs Agency where all imports and exports are registered. Unfortunately, the data from third party reporting is available only for the 2007 fiscal year. We thus cannot test if the firms that bunched around withholding threshold in 2006 also reported systematically lower revenue and higher costs in the same year compared to the third party reporting. But we can test if the firms that bunched in 2006 report systematically lower revenue and higher costs in 2007. Note that the withholding rate was changed in July 2007, so for the affected firms first half of the year 2007 withholding rate was 1 percent, and for the second half it was 2 percent. So we should not expect any bunching around 1 percent or 2 percent thresholds for the year 2007. However, as discussed in the theoretical model in section (2) above, if the bunching in 2006 reflects self-selection by more risk taking firms or firms owned by individuals with low moral costs of cheating the government, then we would expect persistence in the behavior of these firms; they are more likely to evade taxes than an average firm even in 2007. We test if this prediction is borne out by the data.

We first compute the variable D_1 as the difference between the natural logarithm of third-party reported sales and exports-what other firms report to have purchased from a particular firm plus what the Ecuadorian customs report this firm has exported- and the natural logarithm of the firm's self-reported sales and exports. If third-party reports about the firm's sales and exports are larger than self reported data, it is likely that the company is underreporting its revenue. In the second column of Table 5 we present descriptive statistics of this variable.[16] Because third party information on many large firms is not reported to the tax authority (SRI), it is not surprising that, on average, self-reported sales are larger than third-party reports. However, more important for our analysis is the fact that self-reported sales are smaller than third-party reports in more than 10 percent of cases. The relevant question is if these are the same firms that bunched around the withholding threshold in 2006.

[15] This is precisely what audits do. Unfortunately, the number of firms that have been audited in our sample is very small and, due to confidentiality issues, we could not access this information.

[16] Due to missing observations, when combining all data sources we lose about 9% of our sample. That is, we use 11,228 observations.

Our second indicator of misreporting, D_2, is the difference between the natural logarithm of third-party reported sales of intermediate goods to the firm and imports-what other firms report have sold to a particular firm plus what the Ecuadorian customs report this firm has imported- and the natural logarithm of the firm's self-reported intermediate input costs and imports. The third column of Table 5 shows the relevant descriptive statistics. Although on average self-reported input costs are larger than third-party reports, the relevant question for us is whether the "bunchers" inflated costs more than an average firm in the sample.

5.2 Bunching and Tax Evasion

To explore if firms who bunch are more likely to misreport information on their tax returns, we use simple linear models:

$$D_{1i} = \gamma_1 + \gamma_2 B_i + Z_i'\Gamma + \nu_i \tag{5}$$

$$D_{2i} = \lambda_1 + \lambda_2 B_i + Z_i'\Upsilon + e_i \tag{6}$$

where Ds are indicators of tax misreporting by firm i (using the two definitions explained above), the vector Z includes characteristics of the firm (listed on Table 3), and B_i is the dummy for bunching as defined earlier in three alternative ways. We focus on the coefficients γ_2 and λ_2 that measure systematic differences in the dependent variable between those firms who bunch and their counterparts.

5.2.1 Bunching and Under-Reporting of Sales Revenue

We first focus on D_1 (equation 5 above). Note that firms can lower their tax liabilities by underreporting their revenue (sales and exports) and that this could be detected when third-party reported income is larger than self reported revenue; that is, when $D_1 > 0$. Hence, if firms that bunch around the tax threshold are more likely to underreport revenue, a positive coefficient would be expected, i,e. $\gamma_2 > 0$. The larger this coefficient is, the greater is the difference between underreporting of revenue of firms that bunch and the firms that do not.

The results from estimating equation (5) are reported in Table 6. To check robustness, several specifications are estimated. For instance, separate models have been estimated for each of the definitions of bunching described before (that is, we use B_{ai}, B_{bi} and B_{ci}). In addition, some models include a larger set of covariates that describe the characteristics of the firms (such as its size, economic activity, location, etc.). In all six specifications we

consider, the estimate of γ_2 is positive and statistically significant at conventional levels, and notably robust across specifications suggesting that firms that bunch around the tax threshold in 2006 are more likely to underreport revenue in 2007. These differences are large in magnitude; firms that bunch appear to underreport revenue by about 35 percent more than their counterparts.

The coefficients on the other parameters are interesting and deserve attention. Firms in the wholesale and retail sector underreport sales by about 70% less than firms in the omitted category (transportation sector). On the contrary, differences between third-party reported revenue and self-reported revenue is much larger for construction firms and for firms that are involved in importing or exporting goods.

5.2.2 Bunching and Cost Over-Reporting

We now turn to the analysis of the relationship between bunching and costs over-reporting. Firms can lower their tax liabilities by inflating the costs of their intermediate inputs (including products that have been imported). Because third-party information about the firm's costs is available, costs over-reporting may be more likely to occur the lower the value of D_2. Hence, if firms who bunch around the tax threshold are more likely to over-report costs, a negative coefficient is expected, i.e., λ_2.

The estimated results for equation (6) are reported in Table 7. The same six specifications used in Table 6 are employed to explain the relationship between D_2 and the explanatory variables. Consistent with our previous findings, in all specifications we consider the estimate of λ_2 is negative although it is not always statistically significant at conventional levels. These results suggest that firms that bunch around the tax threshold are more likely to inflate costs compared to their counterparts that do not bunch. Coefficients of other covariates on Table 7 are consistent with results shown on Table 6. That is, it seems that the same type of firms that underreport revenue ($D_1 > 0$) are the ones that over-report costs ($D_2 < 0$). For example, the difference between third-party and self-reported costs (revenue) is 18% (37%) smaller (larger) for firms that are involved in importing or exporting activities.

In sum, the data on revenue and sales from third-party reporting provide strong evidence that the observed bunching around the withholding threshold indicates tax evasion practices (fraud).

5.3 Determinants of Bunching

The bunching patterns described in section (4) have been linked to tax evasion practices. For auditing and control purposes it may be thus important to find the determinants of bunching. The Tax Administration may then be able to construct a profile of firms that should be subjected to tighter controls and create initiatives to prevent and deter fraud.

In addition to firms' characteristics, we have been able to collect data about the demographic characteristics of the firm's general manager (CEO), such as his/her gender, age, education and marital status. These data come from the Ecuadorian Civil Registry administrative records.[17] Because we are interested in explaining the determinants of firms' bunching in 2006, CEO's characteristics correspond to the same year. The average CEO of the firms we study is a 46 year old married male with college education. The description and descriptive statistics of these variables are shown in Table 8.

We use simple binary models to estimate the determinants that a firm bunches. To be specific, we let the probability that a firm's reported tax/sales ratio is close to the withholding rate ($B_b = 1$)[18] be a function of a vector of firm's characteristics and a vector of general manager's characteristics.

Results are shown on Table 9. The first three columns of this table use a linear probability model, while the last three columns display marginal effects of a probit model (evaluated at the sample means). Because data about the characteristics of firms and CEOs may not always be readily available, we create separate profiles. We first consider how the characteristics of firms alone are correlated with the likelihood of bunching (columns 1 and 4). In columns (2) and (4) we perform the same exercise but use only the characteristics of the CEO as explanatory variables. Finally, we estimate a model with the full set of covariates (columns 3 and 6).

Results provide many interesting insights. For example, it seems firms in the construction sector are notably more likely (about 3.2 probability points) to bunch around the withholding rate than their counterparts in other sectors. Firm size, measured through the logarithm of assets, shows a non-linear (concave) relationship with the dependent variable. For instance, the likelihood of bunching increases with assets until total assets reach \$85,000, and it decreases afterwards.[19] These results could be explained in part by differentiated monitoring intensity from the SRI to the firms: small and medium firms are

[17] SRI Form 101 has to be signed by the firm's CEO. We use a unique person identifier available in Form 101 to link each CEO with the Civil Registry database and collect its demographic characteristics. All confidential information has been handled and processed in strict compliance with Ecuadorian confidentiality laws.

[18] For the sake of brevity and to avoid cluttering, we only analyze the determinants that the variable $B_b = 1$. Similar results are found, however, when the variables B_a or B_c are used instead.

[19] These estimates have been computed using estimates displayed on Table 8, column 3.

subject to little monitoring while larger firms, particularly LTUs, are subject to tighter controls. Results also suggest that firms that are involved in any type of international trade (importer/exporter) and those located in Ecuador's Coastal region are more likely to bunch.

The gender and marital status of the general manager are correlated with the probability of bunching. For instance, companies with male CEOs are about 1 probability point more likely to bunch than firms lead by women. Similarly, married general managers are less likely (about 1 probability point) to declare a profit-tax/revenue ratio close to the withholding rate compared to non-married managers. Finally, we find that other demographic characteristics of the CEO, such as age and education, are not correlated with bunching.

In sum, small and medium size firms that belong to the construction sector or are engaged with international trade (exporting or importing) activities, located in the Coastal region, and whose manager is an unmarried man, evidence a notably higher probability of bunching around the profit-tax withholding rate. We have shown in the previous section that bunching is correlated with tax evasion. Thus, we hope that the discussion above helps authorities design better customized control mechanisms to deter and prevent tax fraud.

6 Conclusions

Using a rich firm level data set on tax returns in Ecuador, we analyze the implications of a threshold introduced by a withholding mechanism for firms' tax reporting. We show that the threshold introduced in the tax system by the imposition of a withholding rate for a firm's sales can significantly affect the tax behavior of firms. Withholding creates substantial bunching of firms' tax payments around the threshold. This finding is interesting because withholding rates do not affect the tax liability of a firm, unlike other thresholds and kinks in the tax system discussed in the literature such as VAT threshold and kinks due to income tax brackets in a progressive income tax schedule.

We develop a simple model of tax evasion in the tradition of Allingham and Sandmo (1972) that incorporates a discontinuity in the audit function around the withholding threshold. This is motivated by the fact that the probability of auditing is much higher when a firm declares tax payments lower than the withheld amount and claims a refund. The theoretical analysis also indicates that bunching may occur primarily through underreporting by firms with higher tax liability and thus may be indicative of evasion.

For the empirical analysis, we take advantage of a quasi-experiment in Ecuador where the withholding rate was increased for some of the industries and thus allowing us to use a difference-in-difference strategy to estimate effects of changing withholding rates on tax reporting of firms. We find that the bunching around the 1 percent threshold observed in 2006 vanished in 2007 for only those firms where the withholding rate changed from 1 percent to 2 percent in June 2007. The evidence shows that the firms that bunched in 2006 reported higher taxes in 2007 indicating that they were under-reporting taxes in 2006, presumably to take advantage of the non-linearity in the audit probability around the threshold. Finally, using revenue and cost data reported by third parties, we provide additional evidence that the firms who bunch systematically understate revenue and overstate costs compared to other firms in 2007. This implies that even though they increased their tax payments when the withholding rate changed, the bunching firms are still more likely to evade taxes irrespective of the withholding threshold. This evidence is consistent with a theoretical model where at least part of the bunching is due to the adverse selection of firms where more risk takers (or owners with low moral costs of cheating) bunch around the withholding threshold.

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7 Graphs and tables

Figure 1. Profit-Taxes Reported by Manufacturing Firms

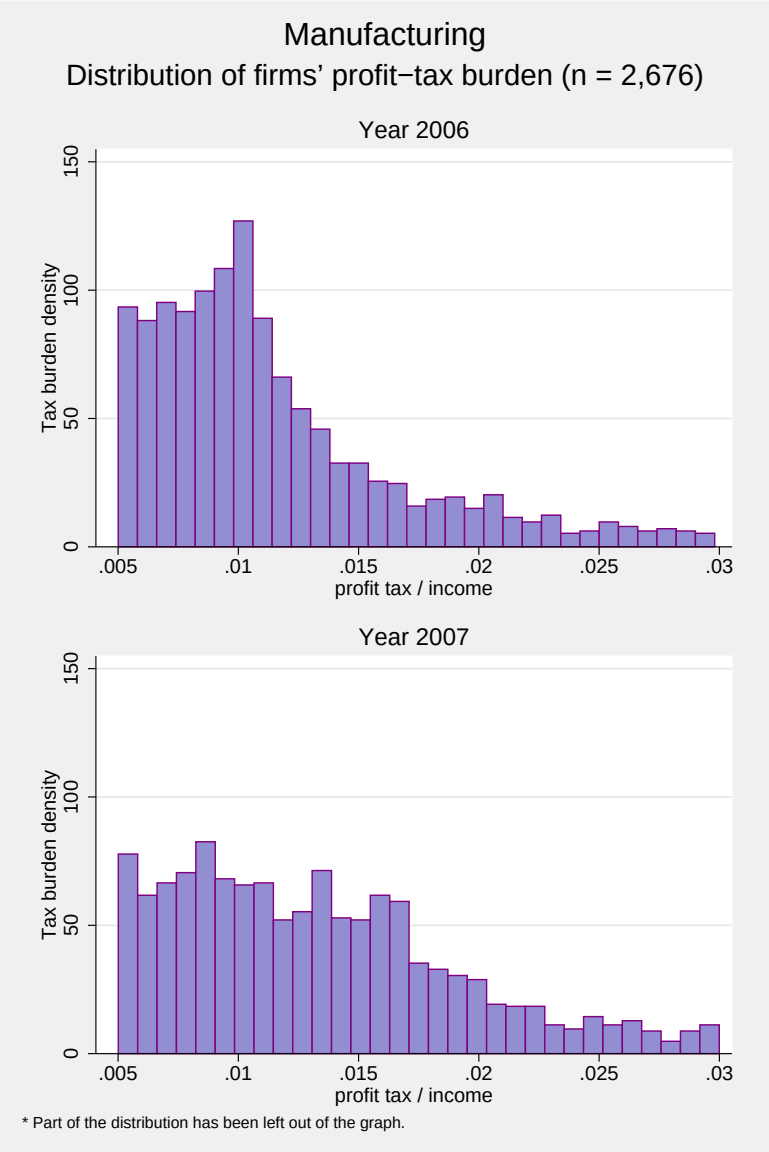

Figure 2. Profit-Taxes Reported by Construction Firms

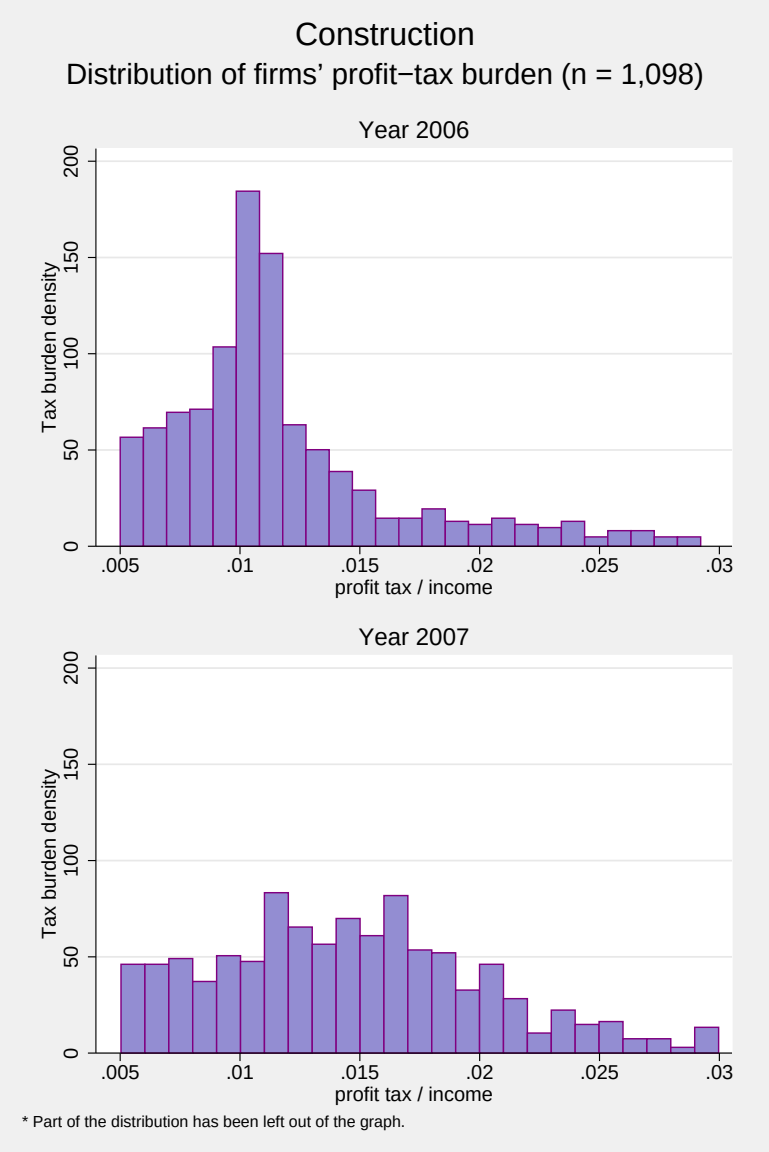

Figure 3. Profit-Taxes Reported by Trade Firms

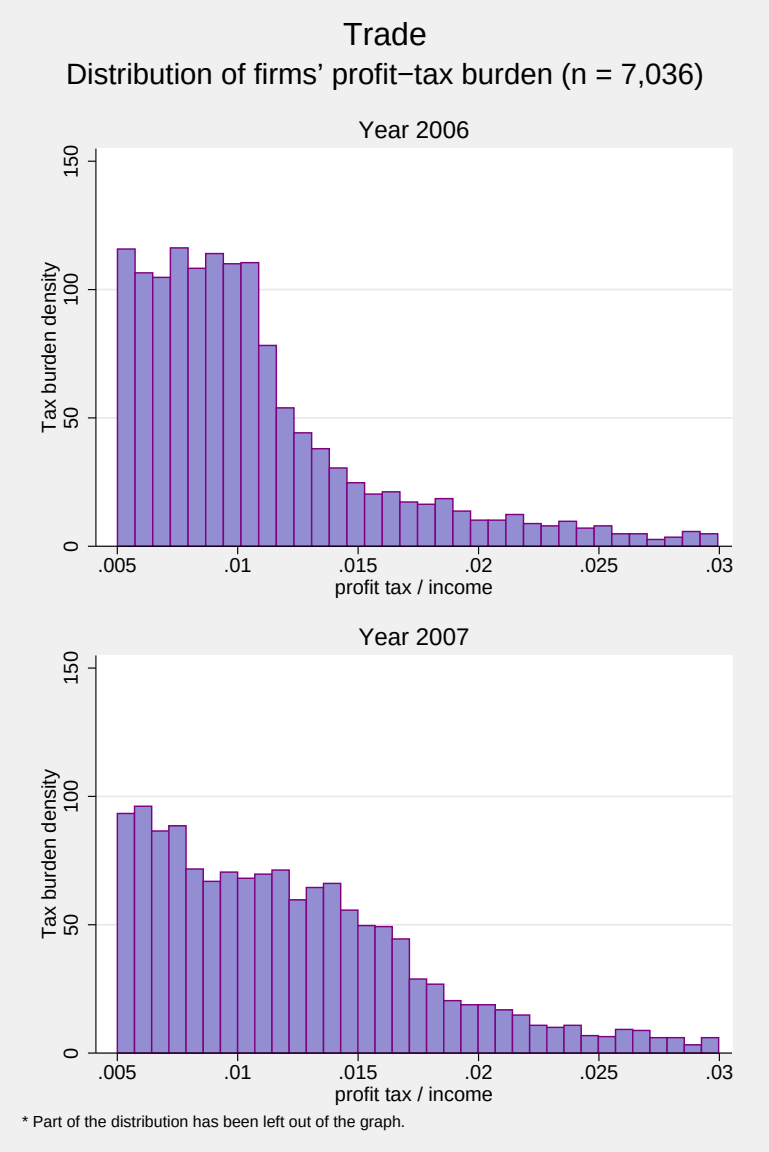

Figure 4. Profit-Taxes Reported by Transport Firms

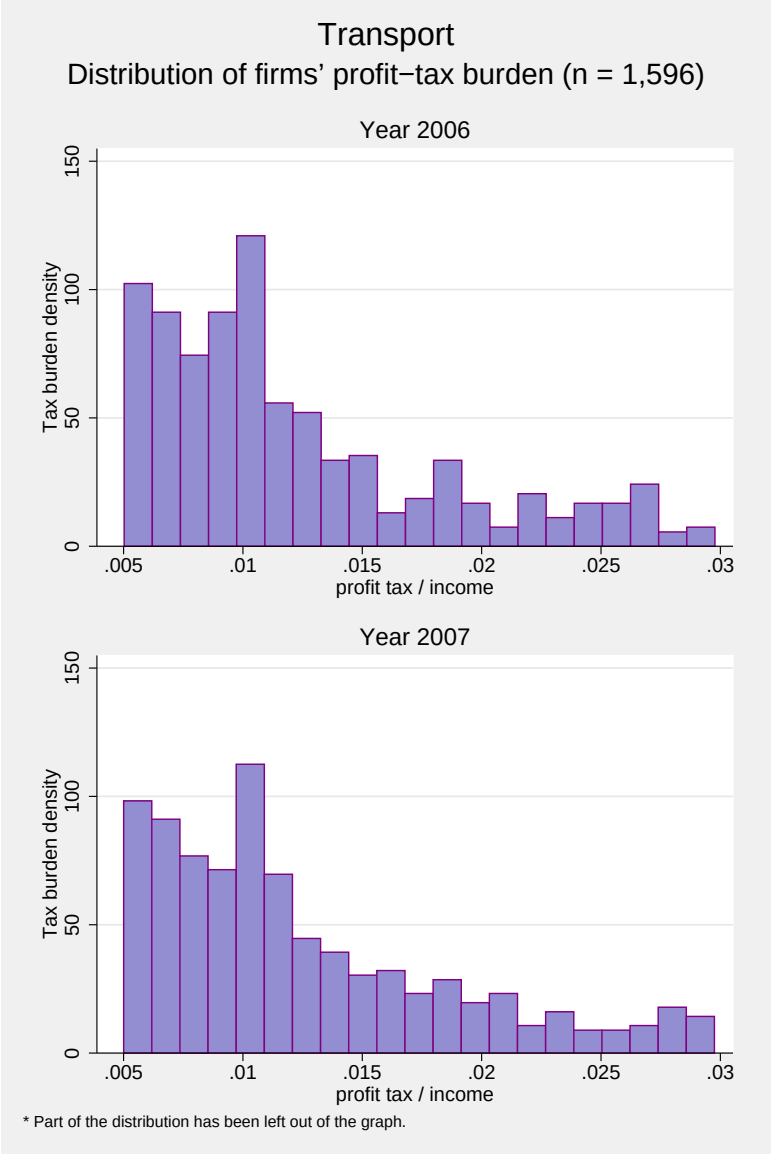

Table 1: Witholding Rates in Ecuador (Withholding as a Percentage of Sales)

Products	Withholding rates		
	From Apr/1/2003 to Dec/31/2006	From Jan/1/2007 to July/1/2007	From July/1/2007 to Mar/20/2008
Private passenger transportation and public and private freight services	1%	1%	1%
Tangible goods purchases (except fuels)	1%	1%	2%
Real estate construction activities, urbanization, division into lots and the like	1%	1%	2%
Services performed by individuals where manpower prevails over intellect	1%	1%	2%
Financial gains (interests, discounts, etc.)	5%	5%	2%
Leasing of real estate owned by firms	5%	5%	8%
Leasing of real estate owned by individuals	8%	5%	8%
Fees, commissions, royalties and other payments of professional or other services where intellect prevails	8%	5%	8%
Real estate and fuel purchases	0%	0%	0%

Notes: Data was gathered from the Servicio de Rentas Internas, Resoluciones de Conocimiento General (Resolutions for the public knowledge). Due to space constraints, other categories that have not been included in this table.

Table 2: Profit-Tax Witholding Rates (Withholding as a Fraction of Sales)

Industry	From Jan. 06 to June 07	From July 07 to Dec. 07
Manufacturing	0.01	0.02
Construction	0.01	0.02
Wholesale and Retail	0.01	0.02
Transportation	0.01	0.01

Notes: Based on the information provided on Table 1, Table 2 summarizes the withholding rate that generally applies to the typical firm in each of the four industries above.

Table 3: Characteristics of the Firm

Number of Observations per Year: 12,406

		2006		2007	
Variable Name	Description	Mean	St. Dev.	Mean	St. Dev.
Sales	Total sales ($ thousands) reported by firms in tax return.	2,914.0	28,300.0	3,338.2	30,100.0
Tax	Profit-tax ($ thousands) declared by firms in tax return.	28.2	349.6	35.1	387.1
Assets	Total assets ($ thousands) reported by firms in tax return.	1,686.8	12,900.0	1,893.0	14,700.0
Tax/Sales	Reported profit-tax as a share of total sales.	0.009	0.018	0.011	0.018
Manufacturing	Equals 1 if Manufacturing firm.	0.216	0.411	0.216	0.411
Construction	Equals 1 if Construction firm.	0.089	0.284	0.089	0.284
Wholesale/Retail	Equals 1 if Wholesale or Retail Trade firm.	0.567	0.495	0.567	0.495
Transportation	Equals 1 if firm Transportation firm.	0.129	0.335	0.129	0.335
Firm in Coastal Region	Equals 1 if firm is settled near the coast line.	0.424	0.494	0.424	0.494
Importer/Exporter	Equals 1 if firm's economic activity includes importing or exporting goods and services.	0.513	0.500	0.513	0.500
Large Taxpayer Unit	Equals 1 if the firm is a Large Taxpayer Unit (LTU). LTUs are large firms that receive tighter controls from the Ecuadorian Tax Administration.	0.177	0.382	0.177	0.382
B_a	Equals 1 if firm's 2006 tax / sales ratio is between 0.99% and 1.01%.	0.013	0.112		
B_b	Equals 1 if firm's 2006 tax / sales ratio is between 0.98% and 1.02%.	0.025	0.155		
B_c	Equals 1 if firm's 2006 tax / sales ratio is between 0.97% and 1.03%.	0.037	0.188		

Table 4: Witholding Rates and Bunching

Dependent Variable is the Difference Between the Firm's 2007 Tax/Sales Ratio and its 2006 Tax/Sales Ratio

	(1)	(2)	(3)	(4)	(5)	(6)
B_a*[Change in W. Rates ($\Delta\delta$)]	0.466***	0.471***				
	(0.173)	(0.169)				
B_b*[Change in W. Rates ($\Delta\delta$)]			0.330**	0.347**		
			(0.151)	(0.149)		
B_c*[Change in W. Rates ($\Delta\delta$)]					0.339***	0.342***
					(0.130)	(0.124)
B_a: 1(|tax/sales - δ|<.0001)	-0.0039***	-0.0038***				
	(0.0014)	(0.0014)				
B_b: 1 (|tax/sales - δ| < .0002)			-0.0018	-0.0019		
			(0.0013)	(0.0013)		
B_c: 1 (|tax/sales - δ| < .0003)					-0.0024**	-0.0024**
					(0.0012)	(0.0011)
Change in Witholding Rates ($\Delta\delta$)	0.181***	0.202***	0.179***	0.200***	0.175**	0.196***
	(0.069)	(0.068)	(0.069)	(0.068)	(0.070)	(0.069)
Change in Log Assets		0.0064***		0.0064***		0.0064***
		(0.00236)		(0.00236)		(0.00236)
Change in (Log Assets Squared)		-0.0002**		-0.0002**		-0.0002**
		(0.00010)		(0.00010)		(0.00010)
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Number of observations	12,406	12,406	12,406	12,406	12,406	12,406

Note: Table shows results from a linear OLS model. Dependent variable is the change in firm's profittax/revenue ratio from 2006 to 2007. Robust standard errors in parenthesis. *, **, ***, denote significance at the 10, 5, and 1 percent level, respectively. δ is the 2006 withholding rate.

Table 5: Differences Between Third-Party and Self-Reported Data

Descriptive Statistics	D1	D2
Mean	-0.78	-0.74
Standard Deviation	1.66	1.10
Number of observations	11,228	11,595
Percentile		
5th	-3.64	-2.79
10th	-2.49	-2.08
25th	-1.13	-1.05
50th	-0.39	-0.44
75th	-0.09	-0.15
90th	0.01	-0.01
95th	0.21	0.22

Notes: D1 is the difference between the natural logarithm of third-party reported sales and exports-what other firms report to have purchased from a particular firm plus what the Ecuadorian customs report this firm has exported- and the natural logarithm of the firm's selfreported sales and exports. D2 is the difference between the natural logarithm of third-party reported sales of intermediate goods to the firm and imports-what other firms report have sold to a particular firm plus what the Ecuadorian customs report this firm has imported- and the natural logarithm of the firm's self-reported intermediate input costs and imports. All data correspond to the 2007 fiscal year.

Table 6: Bunching and Sales Misreporting

Dependent Variable is D1: the Difference Between the Natural Log of Sales and Exports Reported by Third Parties and the Natural Log of Self-Reported Sales and Exports During 2007

	(1)	(2)	(3)	(4)	(5)	(6)
B_a: 1(|tax/sales - δ| < .0001)	0.380 ***	0.355 ***				
	(0.123)	(0.124)				
B_b: 1(|tax/sales - δ| < .0002)			0.325 ***	0.302 ***		
			(0.073)	(0.074)		
B_c: 1(|tax/sales - δ| < .0003)					0.363 ***	0.351 ***
					(0.056)	(0.057)
Manufacturing	-0.042	-0.161 *	-0.043	-0.162 *	-0.043	-0.161 *
	(0.096)	(0.096)	(0.096)	(0.096)	(0.096)	(0.096)
Construction	0.251 **	0.230 **	0.246 **	0.227 **	0.243 **	0.224 **
	(0.113)	(0.112)	(0.113)	(0.112)	(0.113)	(0.112)
Wholesale/Retail	-0.598 ***	-0.700 ***	-0.597 ***	-0.699 ***	-0.595 ***	-0.695 ***
	(0.095)	(0.095)	(0.095)	(0.095)	(0.095)	(0.095)
Log of Assets		-0.627 ***		-0.628 ***		-0.631 ***
		(0.075)		(0.075)		(0.075)
Log of Assets Squared		0.025 ***		0.025 ***		0.025 ***
		(0.003)		(0.003)		(0.003)
Importer/Exporter		0.372 ***		0.370 ***		0.370 ***
		(0.036)		(0.036)		(0.036)
Large Taxpayer Unit		-0.164 ***		-0.164 ***		-0.162 ***
		(0.044)		(0.044)		(0.044)
Firm in Coastal Region		0.051 *		0.050		0.047
		(0.031)		(0.031)		(0.031)
Constant	-0.433 ***	3.306 ***	-0.436 ***	3.312 ***	-0.443 ***	3.320 ***
	(0.093)	(0.480)	(0.093)	(0.480)	(0.093)	(0.480)
Number of Observations	11,228	11,228	11,228	11,228	11,228	11,228

Note: Table shows results from a linear OLS model. Robust standard errors in parenthesis. *, **, ***, denote significance at the 10, 5, and 1 percent level, respectively. δ is the 2006 withholding rate of 0.01.

Table 7: Bunching and Costs Misreporting

Dependent Variable is D2: the Difference Between the Natural Log of Intermediate Inputs and Imports Costs Reported by Third Parties and the Natural Log of Self-Reported Inputs and Imports During 2007

	(1)	(2)	(3)	(4)	(5)	(6)
B_a: 1(|tax/sales - δ| < .0001)	-0.076	-0.033				
	(0.106)	(0.104)				
B_b : 1(|tax/sales - δ| < .0002)			-0.152 **	-0.102		
			(0.071)	(0.070)		
B_c : 1(|tax/sales - δ| < .0003)					-0.157 ***	-0.116 **
					(0.058)	(0.057)
Manufacturing	0.594 ***	0.478 ***	0.595 ***	0.478 ***	0.595 ***	0.478 ***
	(0.052)	(0.054)	(0.052)	(0.054)	(0.052)	(0.054)
Construction	0.328 ***	0.261 ***	0.332 ***	0.263 ***	0.334 ***	0.265 ***
	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)
Wholesale Retail	0.557 ***	0.505 ***	0.557 ***	0.505 ***	0.557 ***	0.504 ***
	(0.050)	(0.052)	(0.050)	(0.052)	(0.050)	(0.052)
Log of Assets		0.157 ***		0.158 ***		0.159 ***
		(0.049)		(0.049)		(0.049)
Log of Assets Squared		-0.003 *		-0.003 *		-0.003 *
		(0.002)		(0.002)		(0.002)
Importer/Exporter		-0.183 ***		-0.182 ***		-0.182 ***
		(0.022)		(0.022)		(0.022)
Large Taxpayer Unit		0.208 ***		0.208 ***		0.208 ***
		(0.024)		(0.024)		(0.024)
Firm in Coastal Region		-0.164 ***		-0.163 ***		-0.162 ***
		(0.020)		(0.020)		(0.020)
Constant	-1.231 ***	-2.474 ***	-1.229 ***	-2.480 ***	-1.227 ***	-2.483 ***
	(0.049)	(0.317)	(0.049)	(0.317)	(0.049)	(0.318)
Number of Observations	11,595	11,595	11,595	11,595	11,595	11,595

Note: Table shows results from a linear OLS model. Robust standard errors in parenthesis. *, **, ***, denote significance at the 10, 5, and 1 percent level, respectively. δ is the 2006 withholding rate of 0.01.

Table 8: Characteristics of Firm's General Manager (CEO)

Number of Observations: 12,045

		2006	
Variable Name	Description	Mean	St. Dev.
CEO Male	Equals 1 if firm's CEO is male and 0 otherwise.	0.807	0.395
CEO Age	CEO's age in years (in 2006).	45.6	11.5
CEO College	Equals one if the firm's CEO has college education.	0.519	0.500
CEO Married	Equals 1 if the firm's CEO is married.	0.775	0.417
CEO born in Coastal Region	Equals 1 if the firm's CEO was born in the Coastal Region.	0.388	0.487

Table 9: Determinants of Firms' Bunching

Dependent Variable Equals One if Firm's 2006 Tax/Sales Ratio is Between 0.98% and 1.02%

	Linear Probability Model			Marginal Effects Probit Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Manufacturing	0.005		0.005	0.005		0.006
	(0.005)		(0.005)	(0.006)		(0.006)
Construction	0.032 ***		0.032 ***	0.033 ***		0.032 ***
	(0.008)		(0.008)	(0.011)		(0.011)
Wholesale/Retail	-0.004		-0.004	-0.003		-0.003
	(0.004)		(0.004)	(0.005)		(0.005)
Log of Assets	0.016 ***		0.017 ***	0.0194 ***		0.0202 ***
	(0.004)		(0.004)	(0.006)		(0.006)
Log of Assets Squared	-0.001 ***		-0.001 ***	-0.001 ***		-0.001 ***
	(0.000)		(0.000)	(0.000)		(0.000)
Importer/Exporter	0.013 ***		0.013 ***	0.012 ***		0.012 ***
	(0.003)		(0.003)	(0.003)		(0.003)
Large Taxpayer Unit	-0.0004		0.0003	-0.0002		0.0003
	(0.005)		(0.005)	(0.004)		(0.004)
Firm in Coastal Region	0.012 ***		0.010 **	0.011 ***		0.010 **
	(0.003)		(0.005)	(0.003)		(0.005)
CEO Male		0.008 **	0.008 **		0.007 **	0.006 **
		(0.003)	(0.004)		(0.003)	(0.003)
CEO Age		-0.001	-0.001		-0.001	-0.001
		(0.001)	(0.001)		(0.001)	(0.001)
CEO Age Square		0.000	0.000		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)
CEO College		0.001	-0.003		0.001	-0.002
		(0.003)	(0.003)		(0.003)	(0.003)
CEO Married		-0.010 **	-0.008 **		-0.009 **	-0.007 **
		(0.004)	(0.004)		(0.004)	(0.003)
CEO born in Coastal Region		0.010 ***	0.001		0.010 ***	0.001
		(0.003)	(0.005)		(0.003)	(0.004)
Constant	-0.073	0.043 **	-0.057 **			
	(0.021)	(0.021)	(0.029)			
Number of Observations	12,045	12,045	12,045	12,045	12,045	12,045

Note: Dependent variable is the variable B_b. Marginal effects of probit model are evaluated at sample means. *, **, ***, denote significance at the 10, 5, and 1 percent level, respectively.