

# Production vs Revenue Efficiency With Limited Tax Capacity

## Theory and Evidence From Pakistan

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# Production Efficiency

- ▶ **Production Efficiency Theorem** (Diamond & Mirrlees 1971):  
*Any second-best optimal tax system maintains production efficiency*
- ▶ **Important policy implications:**
  - ▶ Permits taxes on consumption, wages and profits
  - ▶ Precludes taxes on inputs, trade and turnover
- ▶ The theorem has been influential in the policy advice given to developing countries

# Production Efficiency vs Revenue Efficiency

- ▶ Production Efficiency Theorem **assumes perfect tax enforcement**  
→ This is violated everywhere, but especially in developing countries
- ▶ **Tax evasion** introduces a trade-off between production-efficient vs. revenue-efficient tax instruments
- ▶ In the context of firm taxation in Pakistan, our contribution is:
  - ▶ **Stylized model** on the optimal production-revenue efficiency trade-off
  - ▶ **Quasi-experimental evidence** on the importance of evasion
  - ▶ **Link model & evidence** to quantify optimal policy

## Quasi-Experimental Setting

- ▶ **Minimum Tax in Pakistan:** firms whose profits tax liability falls below a threshold are taxed on turnover
  - ▶ The policy is motivated by tax compliance
- ▶ **Non-standard kink** where both the tax rate and the tax base change
  - ▶ Kink changes real and evasion incentives differentially
  - ▶ Facilitates a novel method for estimating tax evasion
  - ▶ Empirical strategy is based on a bunching approach
- ▶ **Wide applicability** of our approach since such minimum tax schemes are used in many developing countries

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Empirical Results

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# Stylized Framework

- ▶ Two decisions for the firm:
  - ▶ How much to produce? Produce output  $y$  at cost  $c(y)$
  - ▶ How much to report? Declare cost  $\hat{c}$  at (expected) penalty  $g(\hat{c} - c(y))$
- ▶ Two tax instruments for the government:
  - ▶ Tax rate and tax base
  - ▶ Tax liability:

$$T = \tau \times [y - \mu \hat{c}]$$

- ▶ Two extreme alternatives:
  - ▶  $\mu = 1$ : profit tax (narrow base, high rate)
  - ▶  $\mu = 0$ : turnover tax (broad base, low rate)

## Firm Behavior: Real vs Evasion Responses

- ▶ Effective tax rate  $\omega = \tau \frac{1-\mu}{1-\tau\mu}$  vs. Evasion incentives  $\rho = \tau\mu$

$$\begin{aligned}c'(y) &= 1 - \omega \\g'(\hat{c} - c(y)) &= \rho\end{aligned}$$

- ▶ Two extremes:
  - ▶ **Profit tax** ( $\mu = 1$ ): production efficient ( $\omega = 0$ ), but revenue-inefficient ( $\rho = \tau\pi$ )
  - ▶ **Turnover tax** ( $\mu = 0$ ): production inefficient ( $\omega = \tau_y$ ), but revenue-efficient ( $\rho = 0$ )
- ▶ Optimal combination of tax rate and base depends on the importance of evasion responses vs. production responses



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## (Stylized) Minimum Tax Scheme

- ▶ Combination of profit tax ( $\mu = 1$ ) and turnover tax ( $\mu = 0$ ):

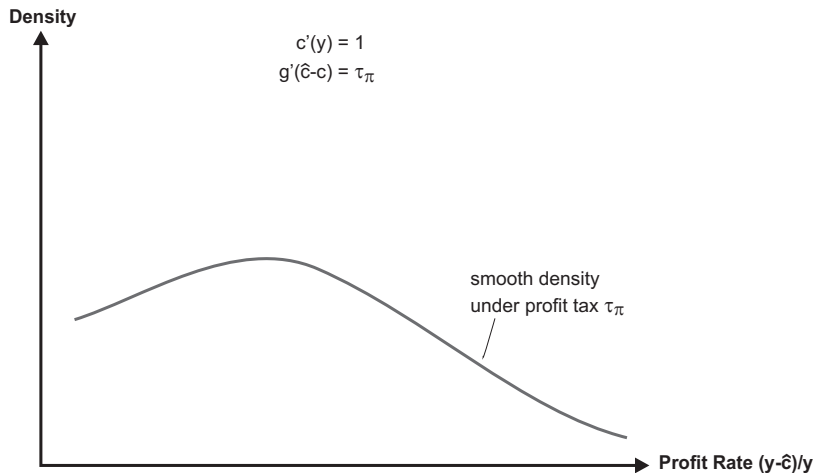
$$T = \max \{ \tau_{\pi} (y - c); \tau_y y \} \text{ with } \tau_{\pi} \gg \tau_y$$

- ▶ Firms switch between the two taxes depending on profit rate  $p$ ,

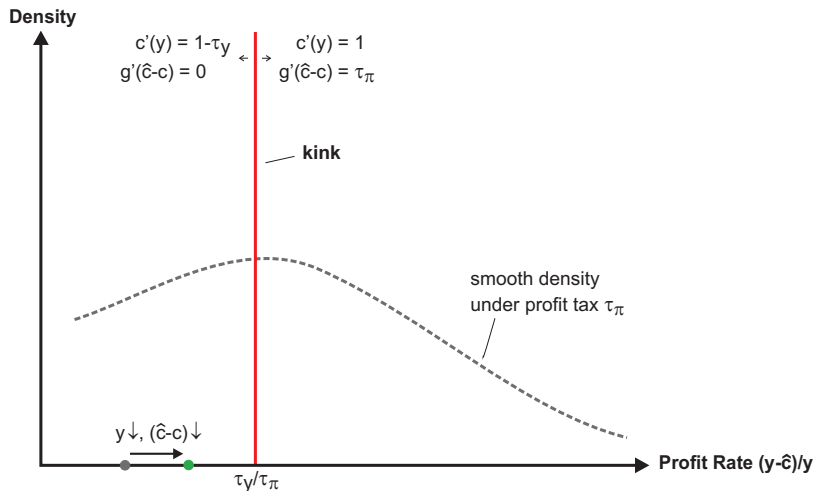
$$\tau_{\pi} (y - c) = \tau_y y \quad \Leftrightarrow \quad p \equiv \frac{y - c}{y} = \frac{\tau_y}{\tau_{\pi}}.$$

- ▶ **Kink: tax base and marginal tax rate change discontinuously, but tax liability is continuous**

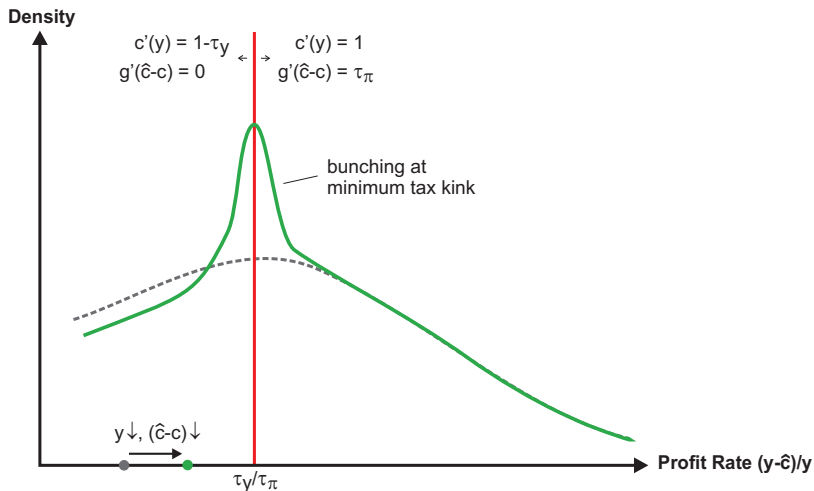
# Bunching at the Minimum Tax Kink



# Bunching at the Minimum Tax Kink



# Bunching at the Minimum Tax Kink



# Minimum Tax Kink Ideal for Eliciting Evasion

- ▶ **Real output response:**

- ▶ Firms choose real output based on  $1 - \omega$
- ▶ At the kink, effective tax rate  $\omega$  changes from 0 to  $\tau_y$  ( $\approx 0$ )  
⇒ almost no variation and therefore limited real response

- ▶ **Evasion response:**

- ▶ Firms choose evasion based on  $\rho$
- ▶ At the kink,  $\rho$  changes from  $\tau_\pi (\gg 0)$  to 0  
⇒ large variation and therefore large evasion response

- ▶ **Bunching at the minimum tax kink identifies (mostly) evasion**

- ▶ Robust to generalizations; output evasion, distortions due to profit tax, other distortions due to turnover tax ▶ Robustness

# Data

- ▶ **Administrative data** from FBR Pakistan
- ▶ **All corporate tax returns from 2006-2010** (about 15,000 returns per year)
- ▶ New electronic data collection system in place for this time period
- ▶ In each year, about half of the firms are turnover taxpayers and half of them are profit tax payers

# Variation in Kink

- ▶ **Variation in profit tax rate  $\tau_{\pi}$  across firms:**
  - ▶ High rate of 35%, low rate of 20%  
[depends on incorporation date, turnover, capital, #employees]
- ▶ **Variation in turnover tax rate  $\tau_y$  over time:**
  - ▶ 2006-07: tax rate of 0.5%
  - ▶ 2008: turnover tax scheme withdrawn
  - ▶ 2009: tax rate of 0.5%
  - ▶ 2010: tax rate of 1%



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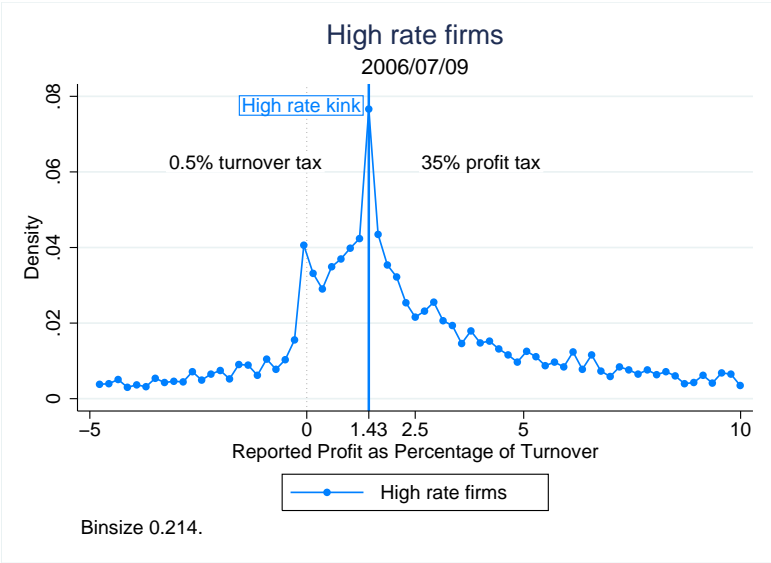
**Empirical Results**

Bunching Evidence

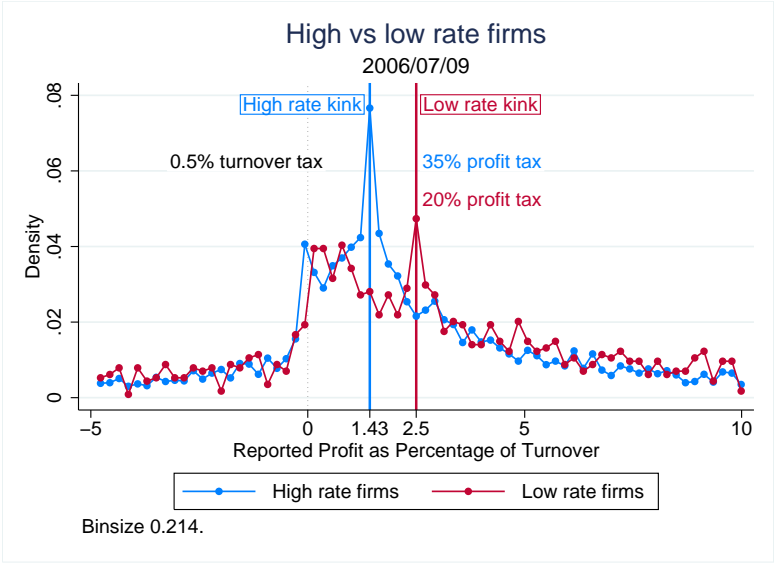
Estimating Evasion

Policy Implications

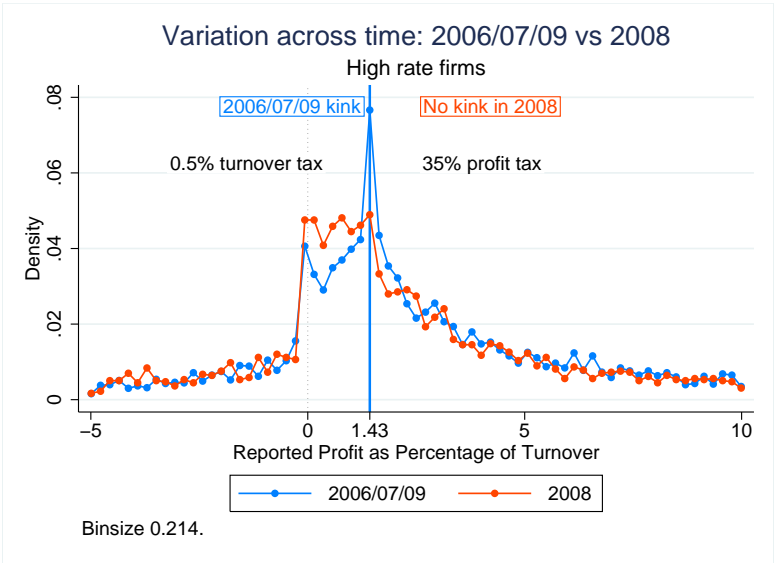
# Bunching Results



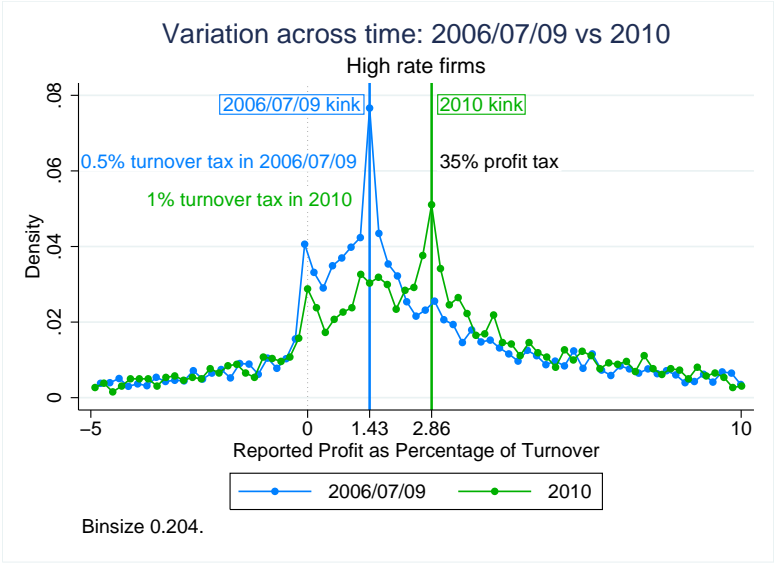
# Bunching Results



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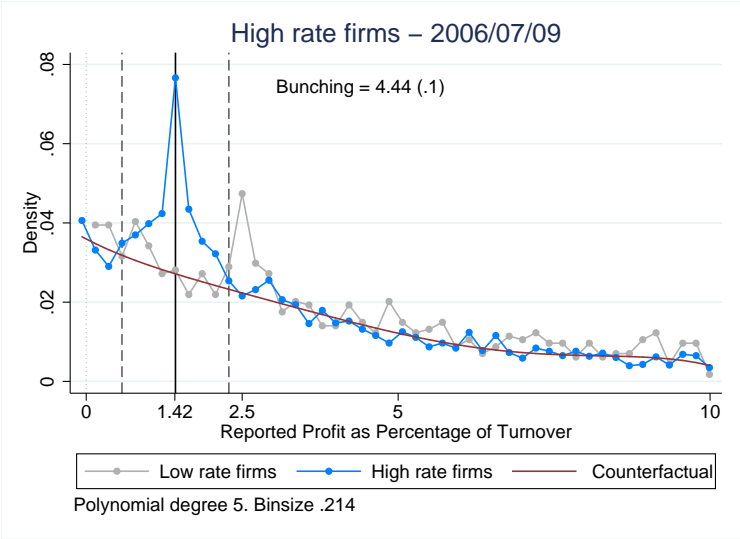
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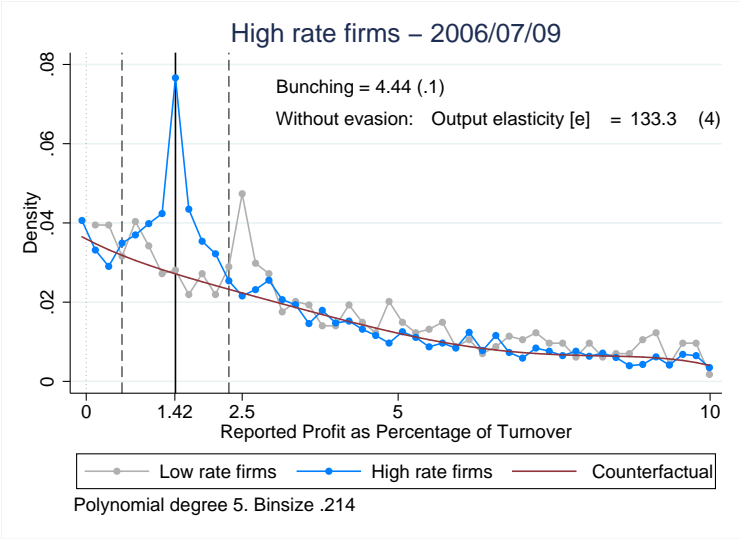
Policy Implications

# Estimating Evasion



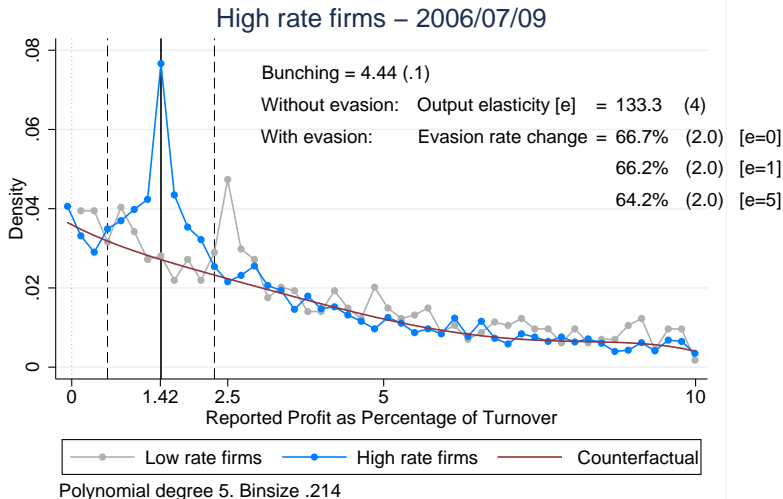
► Estimation Details

# Estimating Evasion





# Estimating Evasion



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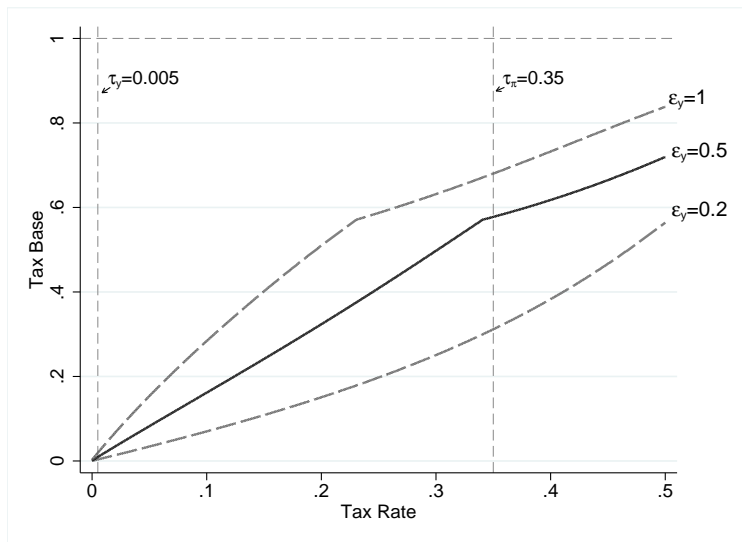
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Policy Implications

# Policy Implications

- ▶ Large loss of revenues under profit tax due to evasion by incorporated firms
  - ▶ our estimates suggest that two thirds of profit tax revenues are foregone
  - ▶ returns to better tax enforcement seem high
- ▶ Clear trade-off between raising the rate or raising the base
  - ▶ our estimates are sufficient to characterize this trade-off
  - ▶ due to the large evasion response, a profit tax base is suboptimal when taxed at 35 percent
  - ▶ further increase in the tax base is desirable when decreasing the tax rate
- ▶ **Caveat:** Welfare analysis is partial

## Trade-off: Tax Rate vs. Tax Base



# Conclusion

- ▶ Robustness of tax policy results in context of developing countries is underexplored
- ▶ Use quasi-experimental variation & admin data to analyze behavioral responses to minimum tax
- ▶ Large evasion responses we estimate for Pakistan justify deviations from a production-efficient profit tax

## Empirical Methodology

- ▶ Estimate counterfactual density following Chetty et al (2011):

$$d_j = \sum_{l=0}^q \beta_l (z_j)^l + \sum_{k=z_L}^{z_U} \gamma_k \cdot \mathbf{1}[z_j = k] + v_j.$$

- ▶ Estimate excess mass:

$$b = \frac{\sum_{k=z_L}^{z_U} \hat{\gamma}_k}{\sum_{k=z_L}^{z_U} \hat{d}_k / N_k}$$

- ▶ Excess mass indicates the profit rate change  $\Delta p$  for marginal buncher.

## Heterogeneity in evasion rates

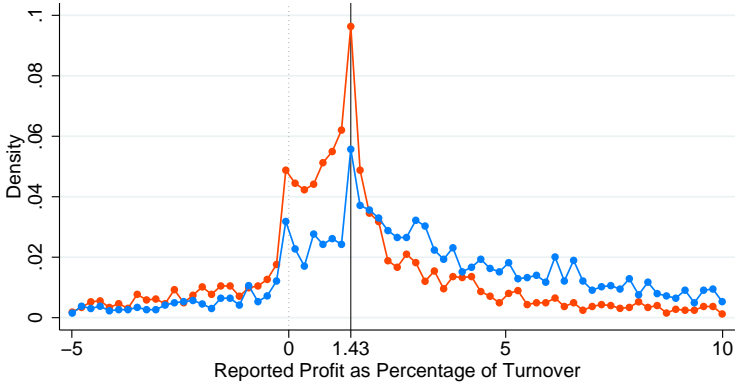
### Theory predicts more evasion among firms that are

- ▶ **small** in number of employees (Kleven et al, 2009):
  - ▶ Collusive evasion is more sustainable in a small group
  - ▶ Proxy for firm size: salary payments, turnover
- ▶ less dependent on **financial intermediation** (Gordon & Li, 2009)
  - ▶ Access to formal credit creates a paper trail
  - ▶ Proxy for credit needs: interest payments (scaled by turnover)
- ▶ selling to **final consumers** (e.g, Pomeranz, 2013)
  - ▶ Paper trail is lacking for transactions with final consumers
  - ▶ Compare “retailers” and “non-retailers”

# Heterogeneity

## Heterogeneity – by salary over turnover

High rate firms, 2006/07/09

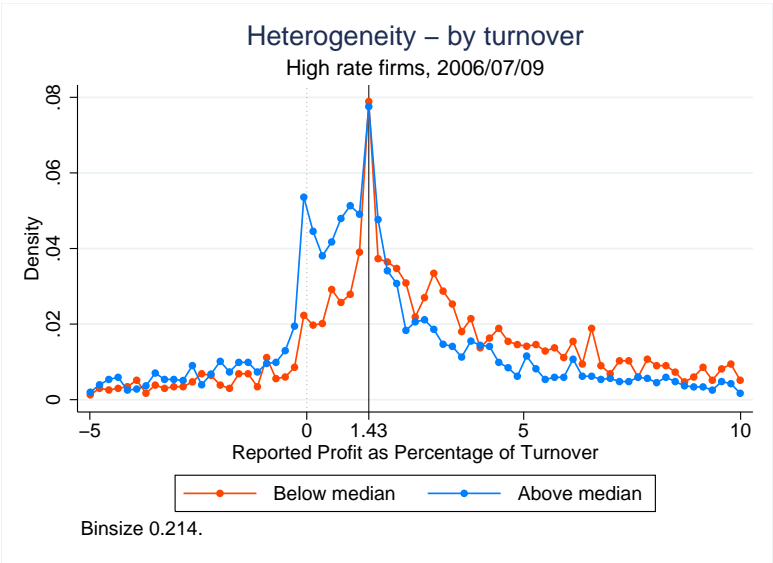


Below median Above median

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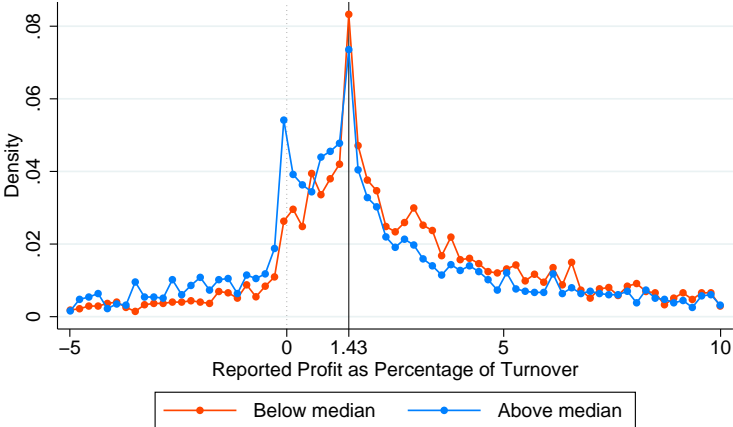


# Heterogeneity



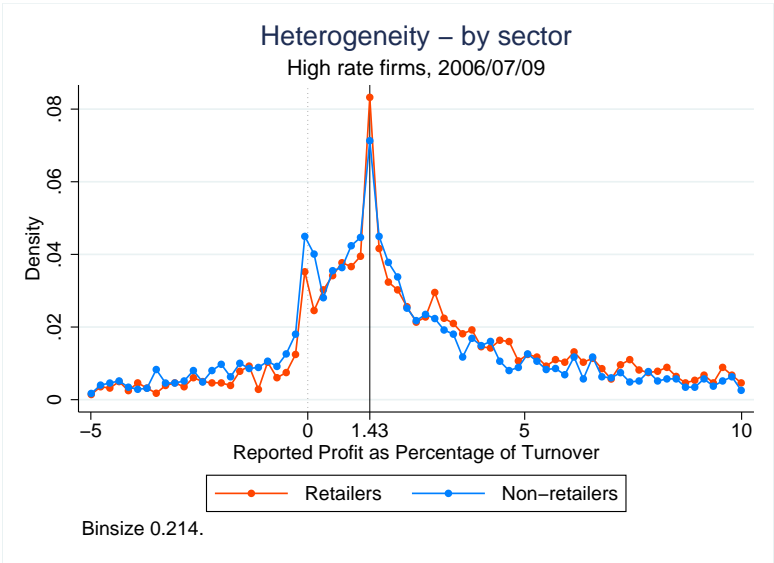
# Heterogeneity

Heterogeneity – by interest payments over turnover  
High rate firms, 2006/07/09



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# Heterogeneity



# Robustness of Identification

## ▶ Distortionary profit tax

- ▶ if  $\omega$  is positive under profit tax, minimum tax may increase real incentives
  - ⇒ firms under minimum tax *move away* from the threshold

## ▶ Distortionary output tax

- ▶ low  $\tau_y$  introduces small distortion for individual firm, not necessarily for the economy as a whole (e.g., cascading)
  - ⇒ general equilibrium effects *do not affect bunching*

## ▶ Output evasion

- ▶ if firms can underreport output, lower rate under minimum tax decreases output evasion
  - ⇒ bunching identifies *differential* evasion