Production vs Revenue Efficiency With Limited Tax Capacity

Theory and Evidence From Pakistan

Michael Best, Anne Brockmeyer, Henrik Kleven, Johannes Spinnewijn, Mazhar Waseem

London School of Economics

June 2013

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, turnover and trade

- 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**
  $\rightarrow$ This is violated everywhere, but especially in developing countries
- **Tax evasion** introduces a trade-off between production and revenue efficiency in tax design
- In the context of firm taxation in Pakistan, our contribution is:
  - **Simple model** on the optimal production-revenue efficiency trade-off
  - **Quasi-experimental evidence** on the evasion elasticity w.r.t taxes
  - **Link model & evidence** to quantify optimal policy

Quasi-Experimental Setting

- **Minimum Tax in Pakistan:** firms whose profits tax liability falls below an (endogenous) 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
  - Empirical strategy is based on a bunching approach
  - Kink changes real and evasion incentives differentially
  - Facilitates a novel method for estimating tax evasion
- **Wide applicability** of our approach since such minimum tax schemes are used in many developing countries

Related literature

- **Public Finance & Development**: Kleven & Waseem (2013), Pomeranz (2013)
- **Optimal tax policy with enforcement problems**: Emran and Stiglitz (2005), Gordon & Li (2009), Kleven et al. (2009)
- **Estimating tax evasion**: Andreoni et al. (1998), Slemrod (2007), Kleven et al. (2011)
- **Tax policy, investments and corporate income**: Hassett & Hubbard (2002), Gruber and Rauh (2007), Bach (2012), Devereux et al. (2013)

Outline

Introduction

Conceptual Framework

Empirical Methodology

Empirical Results

- Bunching Evidence
- Estimating Evasion

Policy Implications

Outline

Introduction

Conceptual Framework

Empirical Methodology

Empirical Results
- Bunching Evidence
- Estimating Evasion

Policy Implications

Firm Behavior: Real vs Evasion Responses

- Real output y, real cost $c(y)$, declared cost $\hat{c}$, penalty $g(\hat{c} - c(y))$
- Tax liability $T = \tau[y - \mu\hat{c}]$
- Maximization of after-tax profits yields

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

- **Production wedge** $\omega = \tau\frac{1-\mu}{1-\tau\mu}$:
  - $\omega = 0$ for a profit tax $\mu = 1$ [**production efficiency**]
  - $\omega = \tau$ for a turnover tax $\mu = 0$ [**production inefficiency**]

Proposition [Production Inefficiency]

*With **perfect tax enforcement**, the firm's profit is the optimal tax base, i.e., $\mu = 1$.*

*With **imperfect tax enforcement**, we have:*

1. *Optimal tax base is in between profits and turnover, $\mu \in (0, 1)$*
2. *Optimal tax system satisfies*

$$\frac{\tau}{1-\tau} \times \underbrace{\frac{\partial \omega}{\partial \tau}(\mu)}_{\searrow \text{ in } \mu} = \underbrace{\frac{\hat{c} - c}{\hat{\Pi}}(\mu)}_{\nearrow \text{ in } \mu} \times \frac{\varepsilon_{\hat{c}-c,\tau\mu}}{\varepsilon_{y,1-\omega}}$$

Outline

Introduction

Conceptual Framework

Empirical Methodology

Empirical Results

- Bunching Evidence
- Estimating Evasion

Policy Implications

(Stylized) Minimum Tax Scheme

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

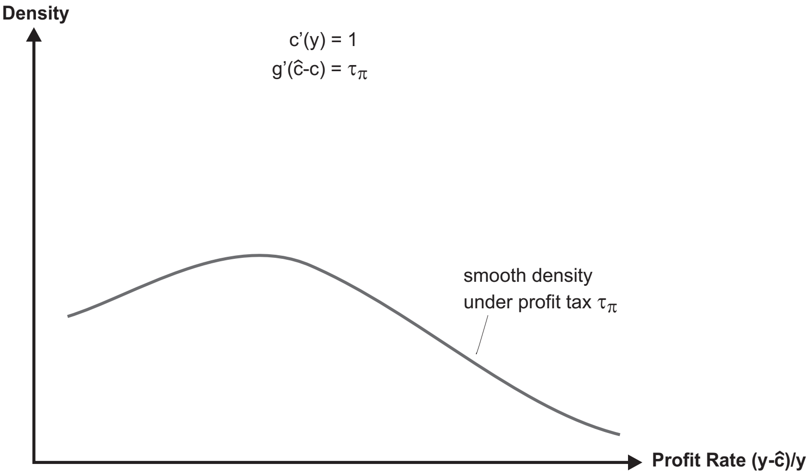
$$T = \max\left\{\tau_\pi\left(y - c\right); \tau_y y\right\}.$$

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

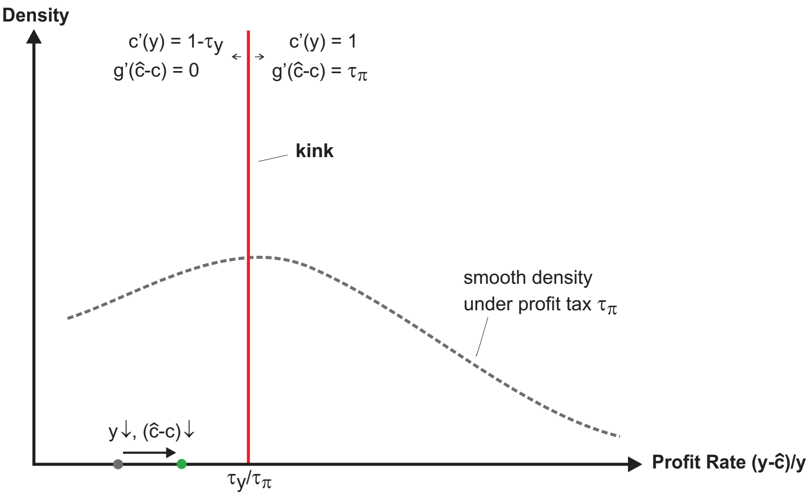
$$\tau_\pi\left(y - c\right) = \tau_y y \quad \Leftrightarrow \quad p \equiv \frac{y - c}{y} = \frac{\tau_y}{\tau_\pi}.$$

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

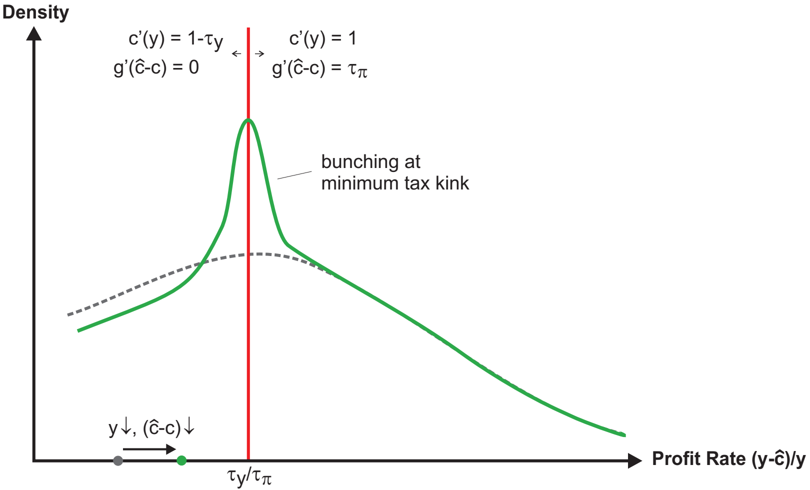
Bunching at the Minimum Tax Kink



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, production wedge ω changes from 0 to τ_y (≈ 0)
    $\Rightarrow$ almost no variation and therefore limited real response
- **Evasion response:**
  - Firms choose evasion based on $\tau\mu$
  - At the kink, $\tau\mu$ changes from $\tau_\pi (\gg 0)$ to 0
    $\Rightarrow$ large variation and therefore large evasion response
- **Bunching at the minimum tax kink identifies (mostly) evasion:**

$$\Delta\hat{p} = [\frac{\hat{c}}{y} - c'(y)]\frac{\Delta y}{y} - \frac{\Delta(\hat{c} - c)}{y}$$

$$\cong \frac{\tau_y}{\tau_\pi}^2 \varepsilon_{y,1-\omega} - \frac{\tau_y}{\tau_\pi}\frac{(\hat{c} - c)}{\hat{\Pi}}\varepsilon_{\hat{c}-c,\tau\mu}$$

Robustness of Identification

- **Distortionary profit tax**
  - if ω is positive under profit tax, minimum tax may increase real incentives

    $\Rightarrow$ firms under minimum tax *move away* from the threshold
- **Distortionary output tax**
  - low τ_y introduces small distortion for individual firm, not necessarily for the economy as a whole (e.g., cascading)

    $\Rightarrow$ general equilibrium effects *do not affect bunching*
- **Output evasion**
  - if firms can underreport output, lower rate under minimum tax decreases output evasion

    $\Rightarrow$ bunching identifies *differential* evasion

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 τ_π across firms:**
  - High rate of 35%, low rate of 20%
    [depends on incorporation date, turnover, capital, #employees]
- **Variation in turnover tax rate τ_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%

Outline

Introduction

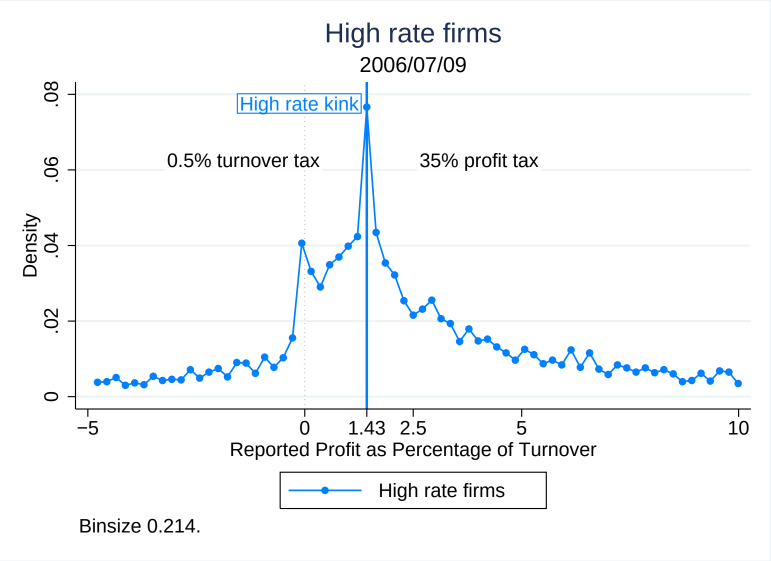
Conceptual Framework

Empirical Methodology

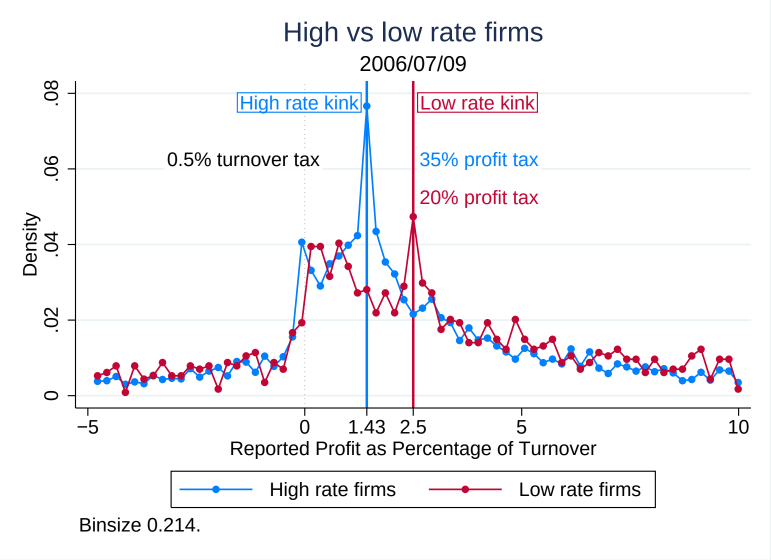
Empirical Results
- Bunching Evidence
- Estimating Evasion

Policy Implications

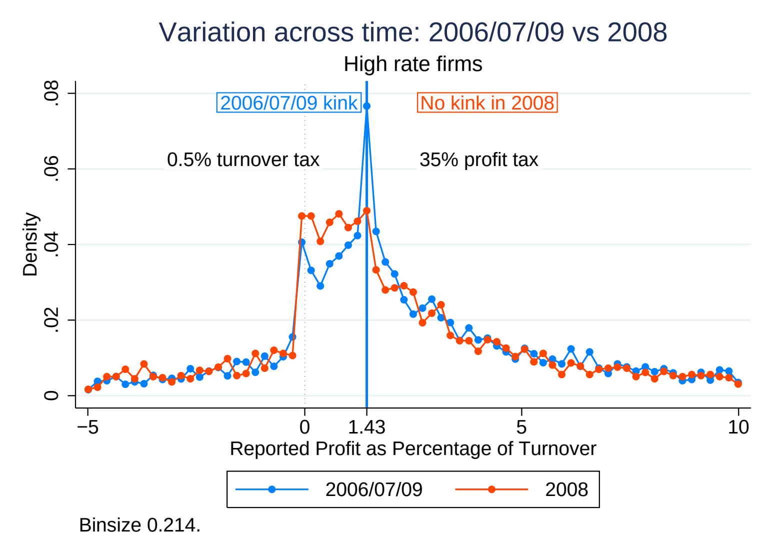
Bunching Results



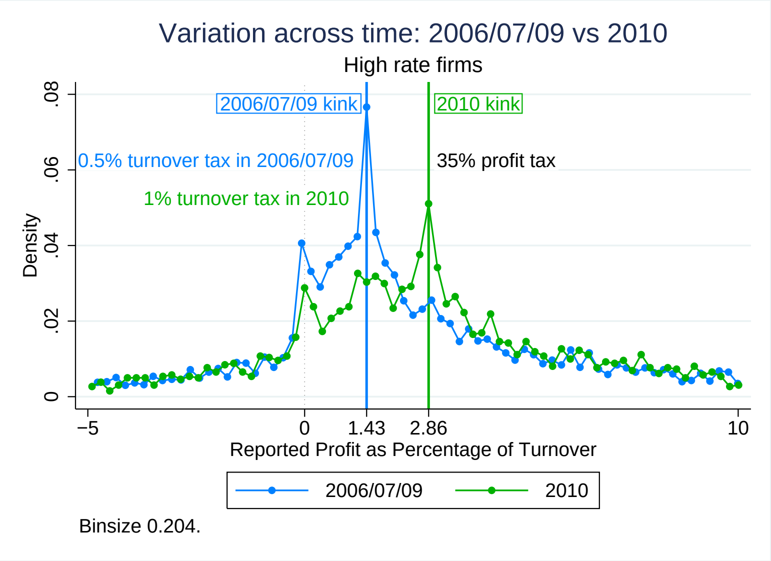
Bunching Results



Bunching Results



Bunching Results



▸ Heterogeneity

Outline

Introduction

Conceptual Framework

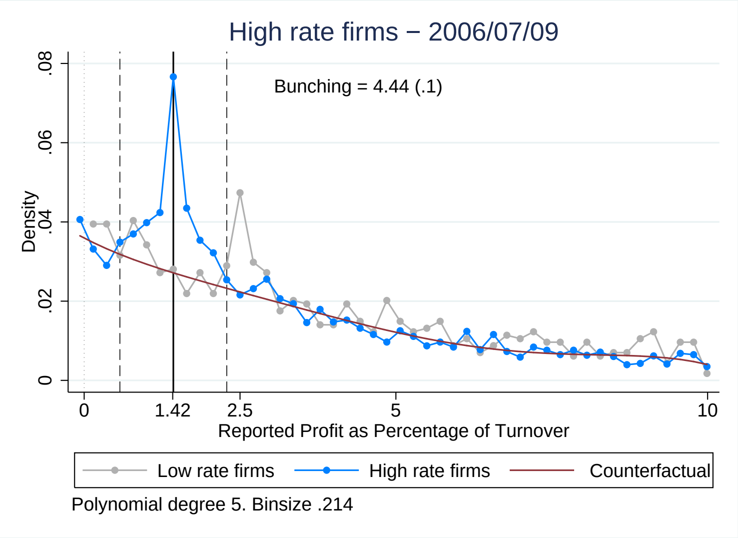
Empirical Methodology

Empirical Results

- Bunching Evidence
- Estimating Evasion

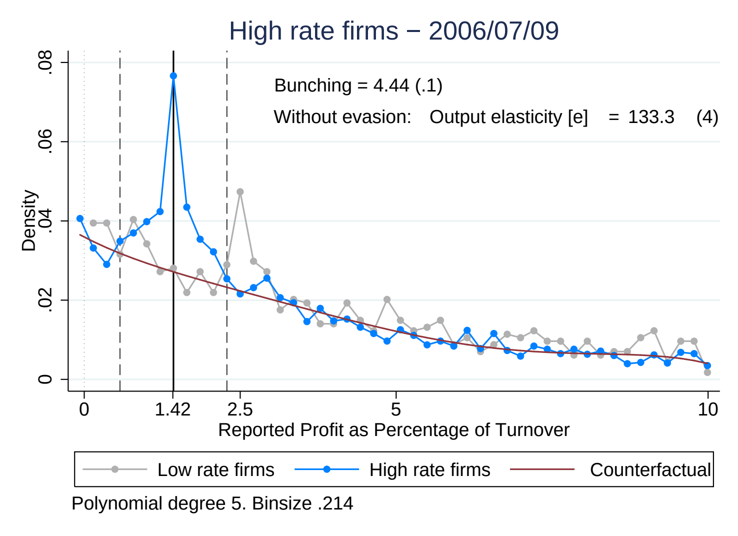
Policy Implications

Estimating Evasion

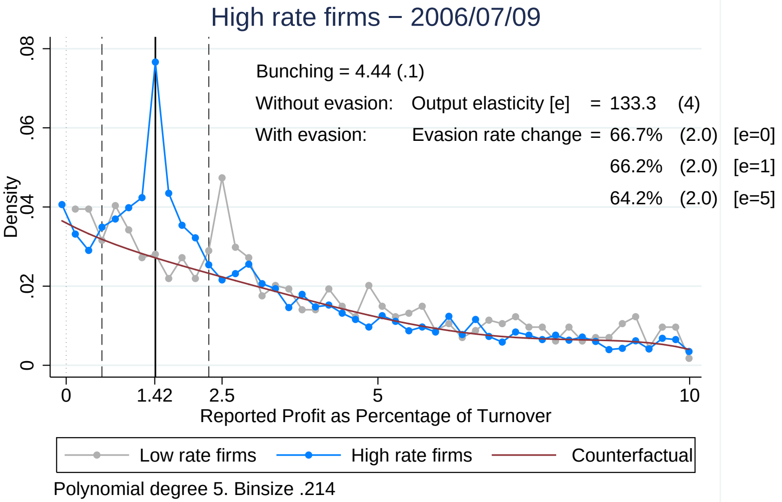


▸ Estimation Details

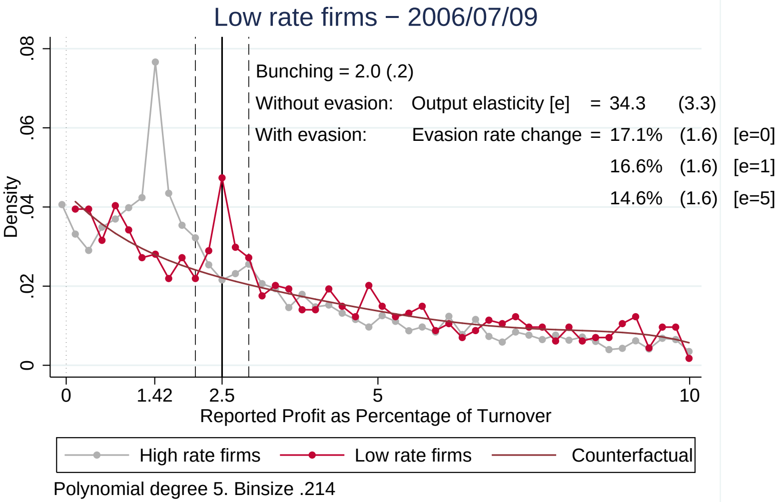
Estimating Evasion



Estimating Evasion



Estimating Evasion



Outline

Introduction

Conceptual Framework

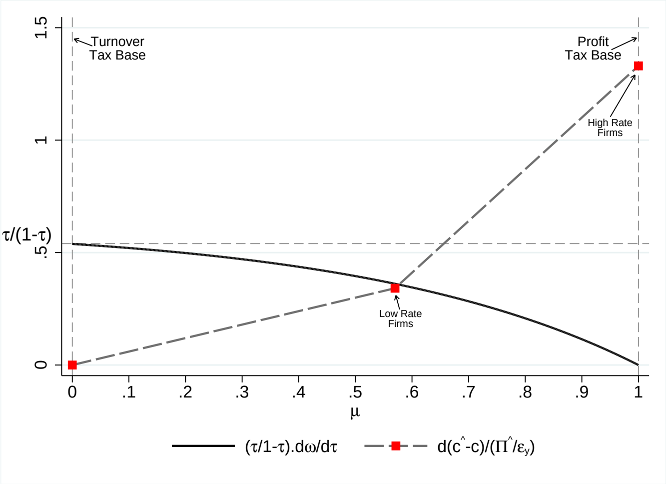
Empirical Methodology

Empirical Results
- Bunching Evidence
- Estimating Evasion

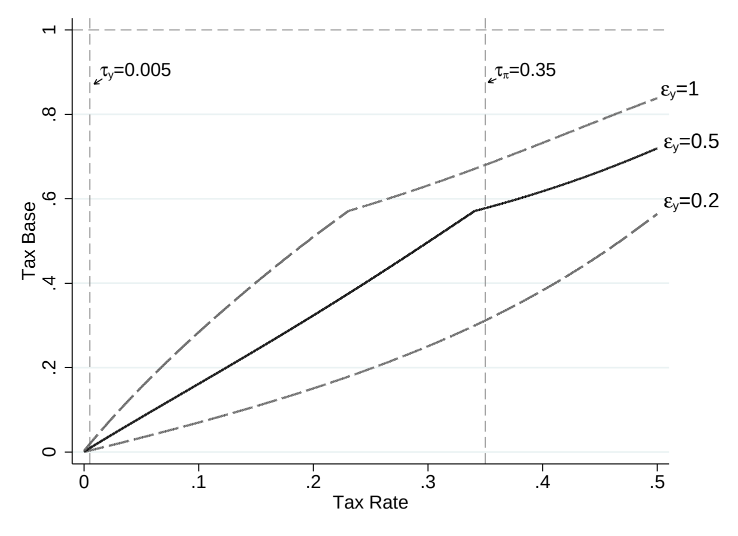
Policy Implications

Optimal Tax Rule in (Partial) Framework

$$\frac{\tau}{1-\tau} \times \frac{\partial \omega}{\partial \tau}(\mu) \simeq \frac{\Delta(\hat{c}-c)}{\hat{\Pi}}(\mu) / \varepsilon_{y,1-\omega}$$



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
- Returns to better tax enforcement are high; two thirds of profit tax revenues seem foregone due to evasion by incorporated firms

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 Δp for marginal buncher.

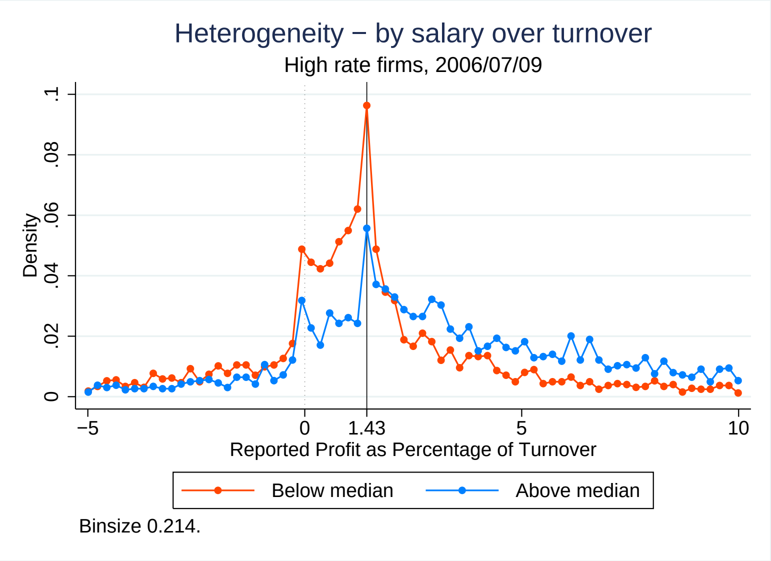
Back

Heterogeneity in evasion rates

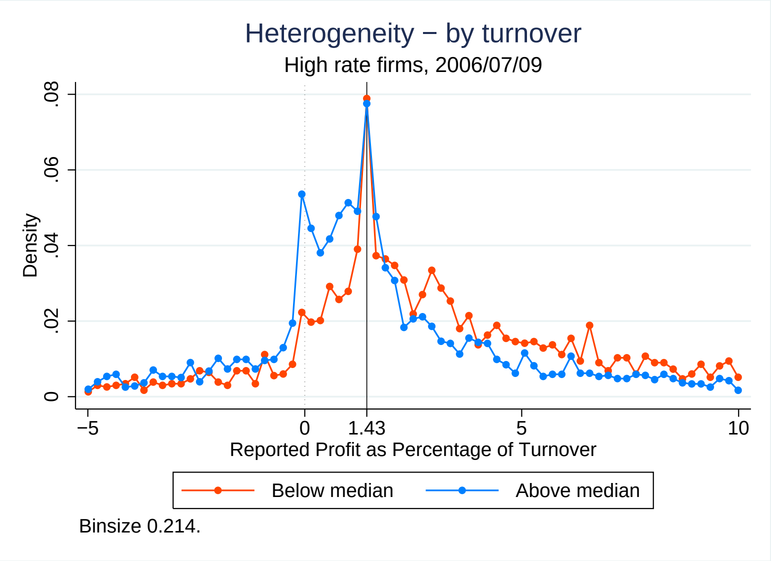
Theory predicts more evasion among firms that are

- **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"

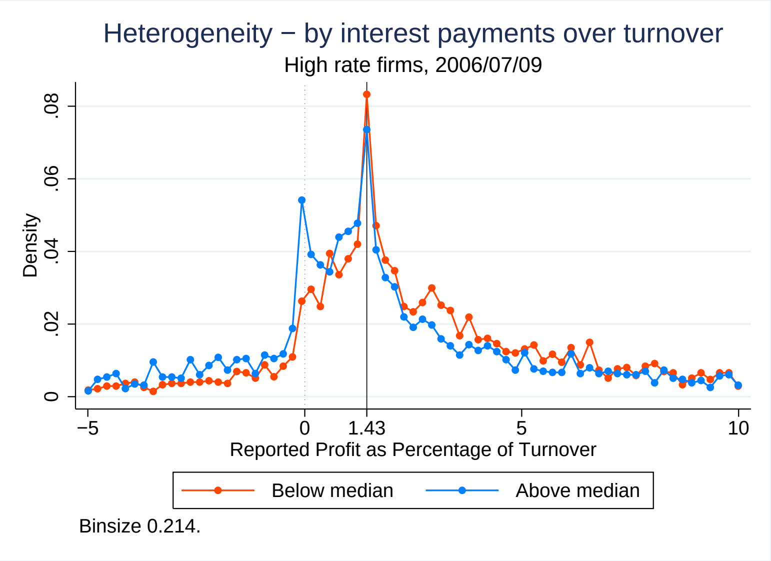
Heterogeneity



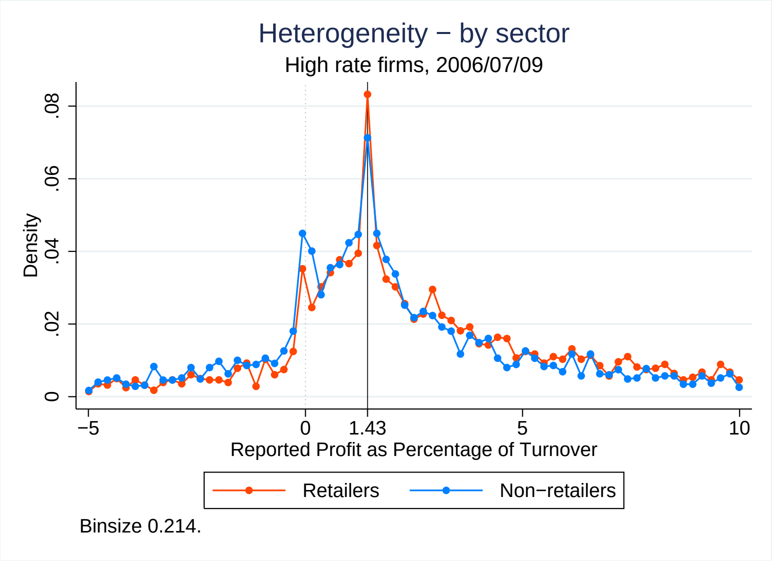
Heterogeneity



Heterogeneity



Heterogeneity



Back