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

- **Key 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

Novel Quasi-Experimental Approach

- **Minimum Tax Scheme:** firms are taxed on either profits or turnover (lower tax rate on turnover) depending on which tax liability is larger
  - This production inefficient policy is motivated by tax compliance
- **Non-standard kink** where both the tax rate and the tax base jump
  - Kink changes real and evasion incentives differentially
  - Novel method for estimating tax evasion based on a bunching approach
- **Wide applicability** of our approach since such schemes are ubiquitous

Contributions to Previous Literature

- **Public Finance & Development**: Kleven & Waseem (2013), Pomeranz (2013), Kumler et al. (2013)
- **Optimal taxation 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)
- **Corporate taxation**: Hassett & Hubbard (2002), Auerbach et al. (2010), Devereux et al. (2013)
- **Bunching methodology:** Saez (2010), Chetty et al. (2011)

Outline

Outline

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

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

- **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 enforcement**, the optimal tax base is pure profits* $(\mu = 1)$

*With **imperfect enforcement**, the optimal tax base is in between pure profits and turnover* $(0 < \mu < 1)$ *and depends on the evasion-output elasticity ratio*

$$\underbrace{\frac{\tau}{1-\tau} \times \frac{\partial \omega}{\partial \tau}(\mu)}_{\text{effective MTR} \downarrow \text{ in } \mu} = \underbrace{G(\mu)}_{\text{tax gap} \uparrow \text{ in } \mu} \times \underbrace{\frac{\varepsilon_{\hat{c}-c}}{\varepsilon_y}}_{\text{elasticity ratio}}$$

Outline

Minimum Tax Scheme

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

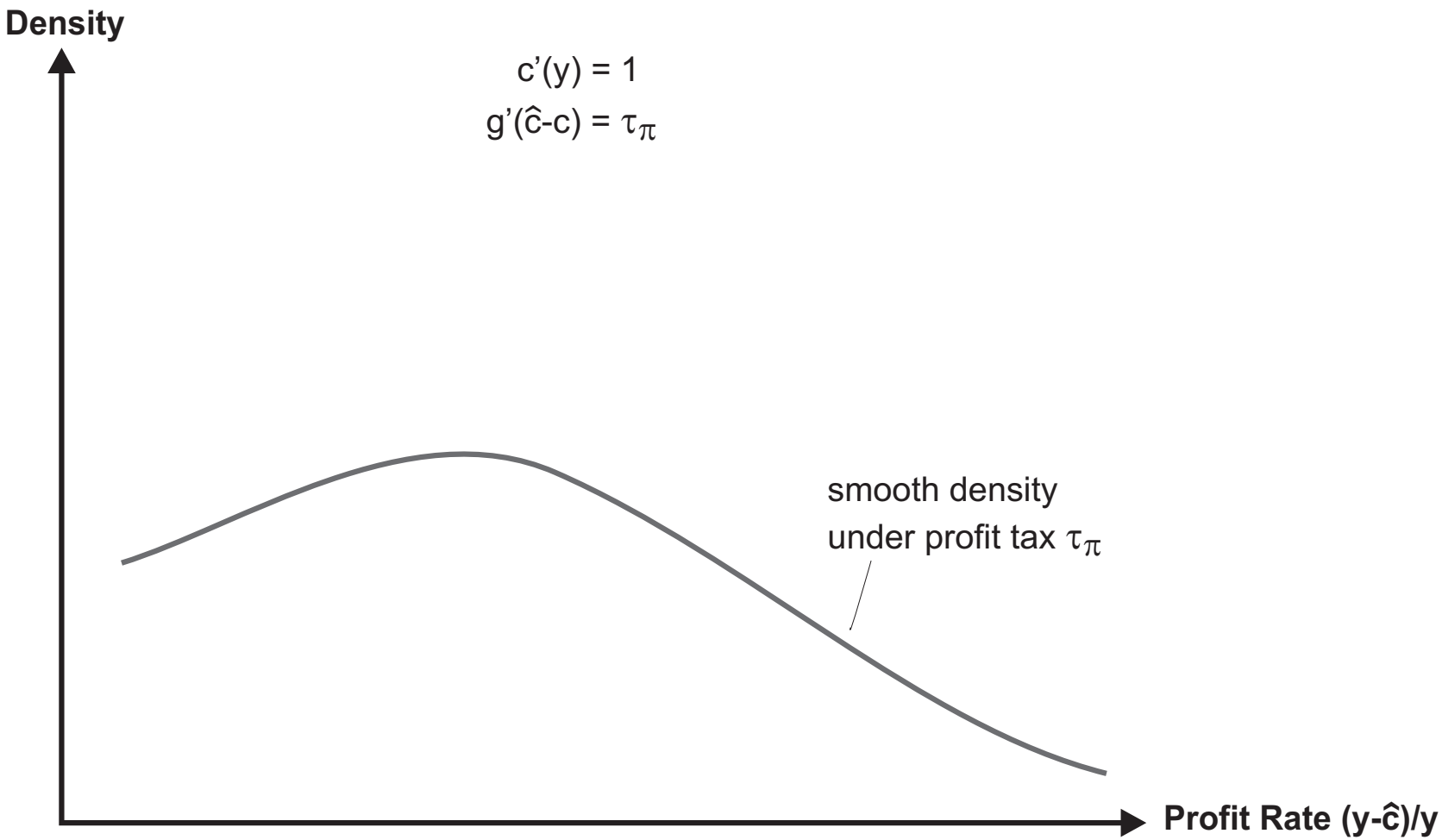
$$T = \max\left\{\tau_\pi\left(y - c\right); \tau_y y\right\}.$$

- 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



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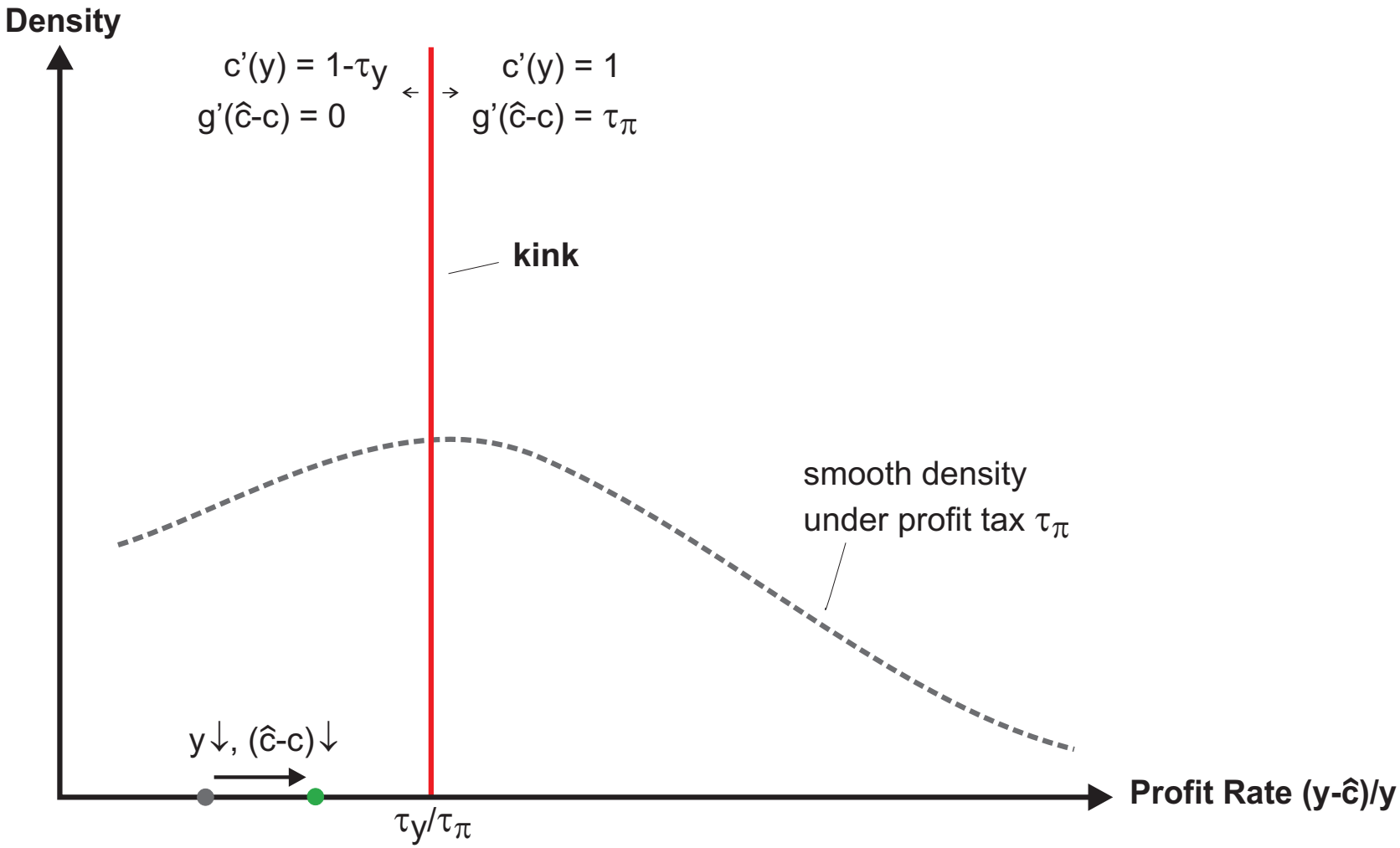

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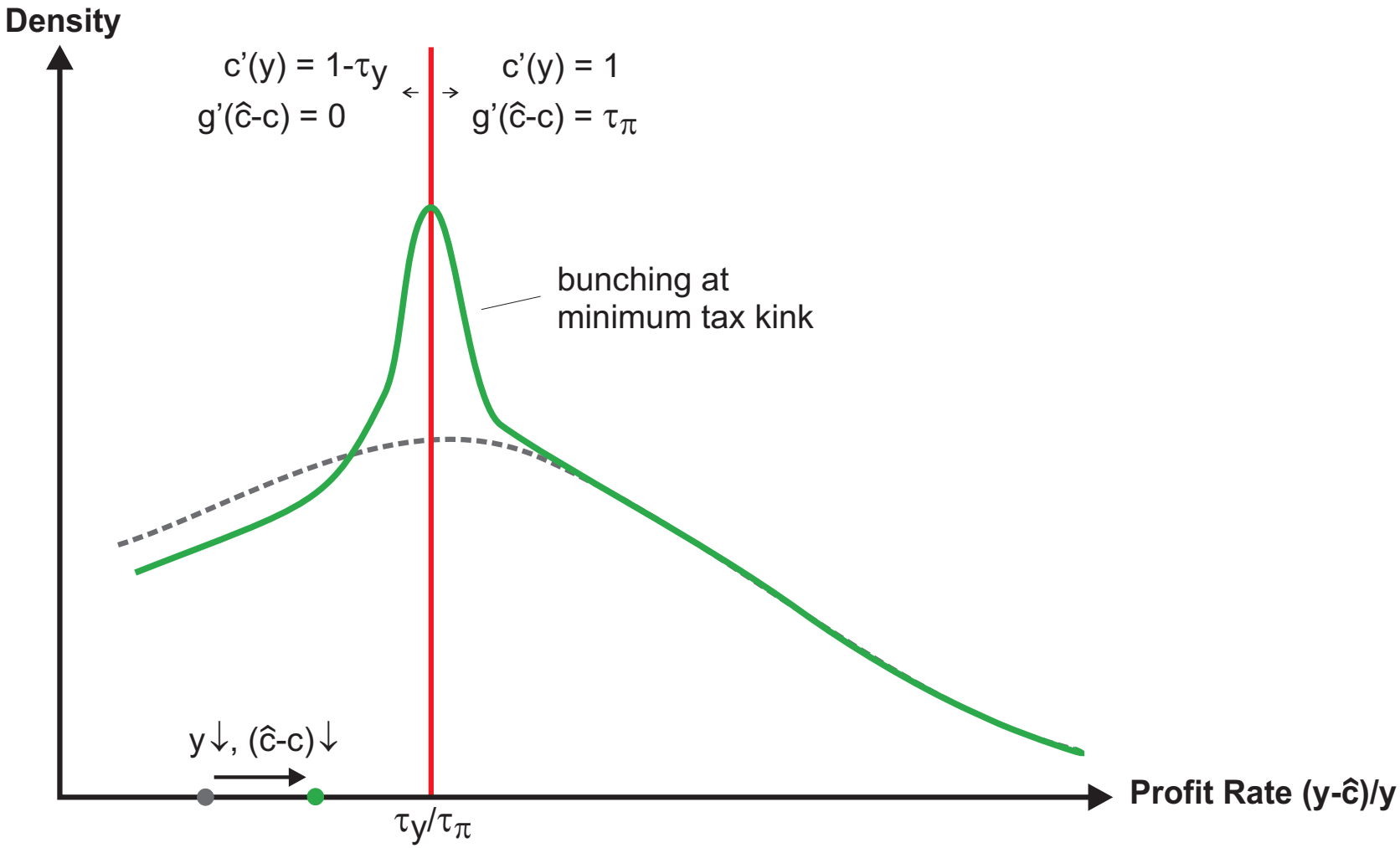


Minimum Tax Kink Ideal for Eliciting Evasion

- **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 small real response
- **Evasion response:**
  - Firms choose evasion based on $\tau\mu$
  - At the kink, $\tau\mu$ changes from τ_π ($\gg 0$) to 0
    $\Rightarrow$ large variation and therefore large evasion response
- **Bunching B identifies (mostly) evasion:**

$$B \propto \frac{\tau_y^2}{\tau_\pi}\varepsilon_y - \frac{\Delta(\hat{c}-c)}{y}$$

Robustness

- **Distortionary profit tax**
  - If $\omega > 0$ under profit tax, then turnover tax may improve real incentives

    $\Rightarrow$ firms move away from the kink and **create a hole**

- **Distortionary turnover tax**
  - Small τ_y may create big distortions via cascading and extensive margin

    $\Rightarrow$ GE effects and extensive responses **do not affect bunching**

- **Output evasion**
  - If firms can underreport output, the turnover tax reduces output evasion (due to $\tau_y < \tau_\pi$) in addition to cost evasion

    $\Rightarrow$ bunching identifies **differential evasion from output and costs**

Outline

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

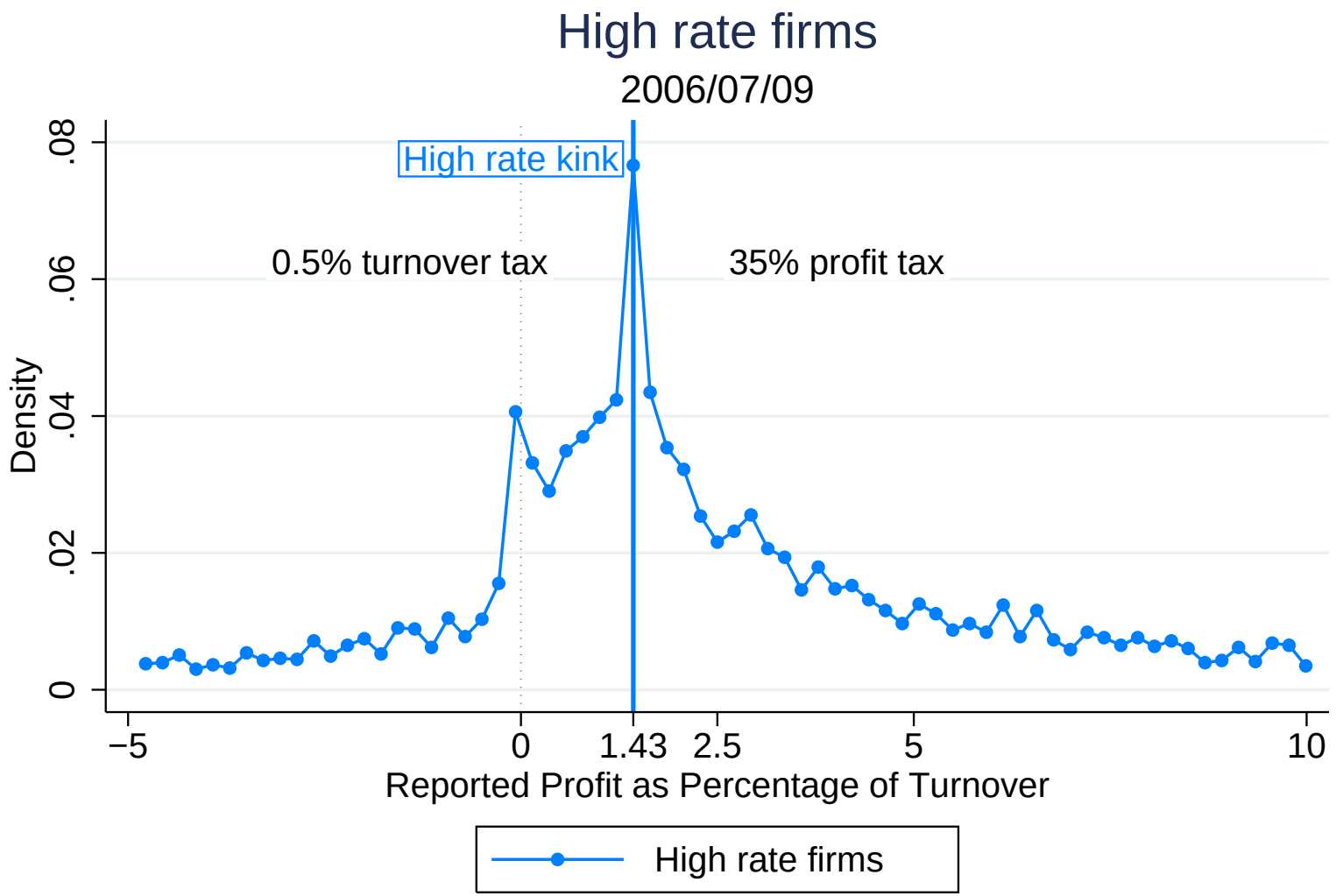
Variation in Minimum Tax Kink

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

Bunching Evidence



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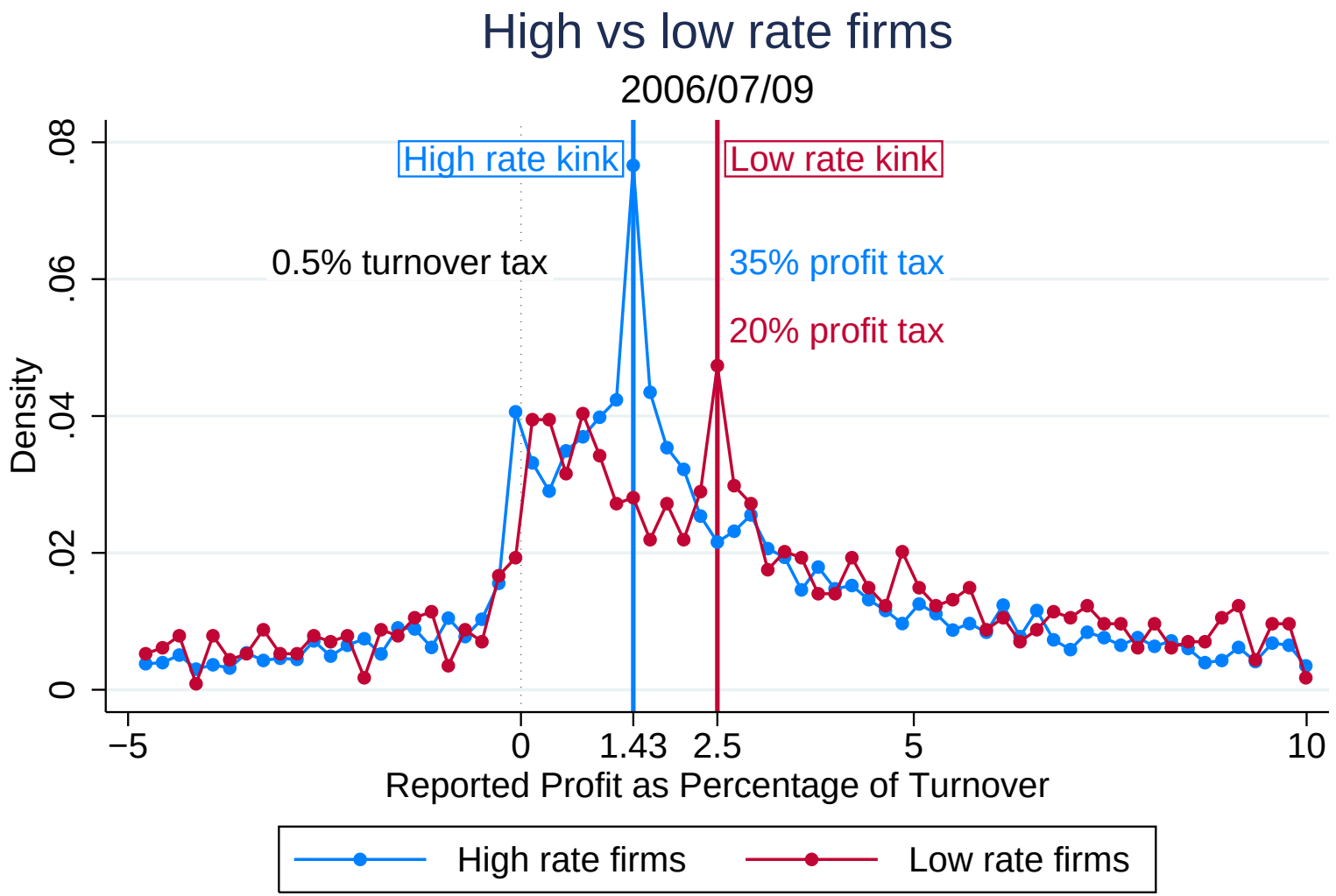

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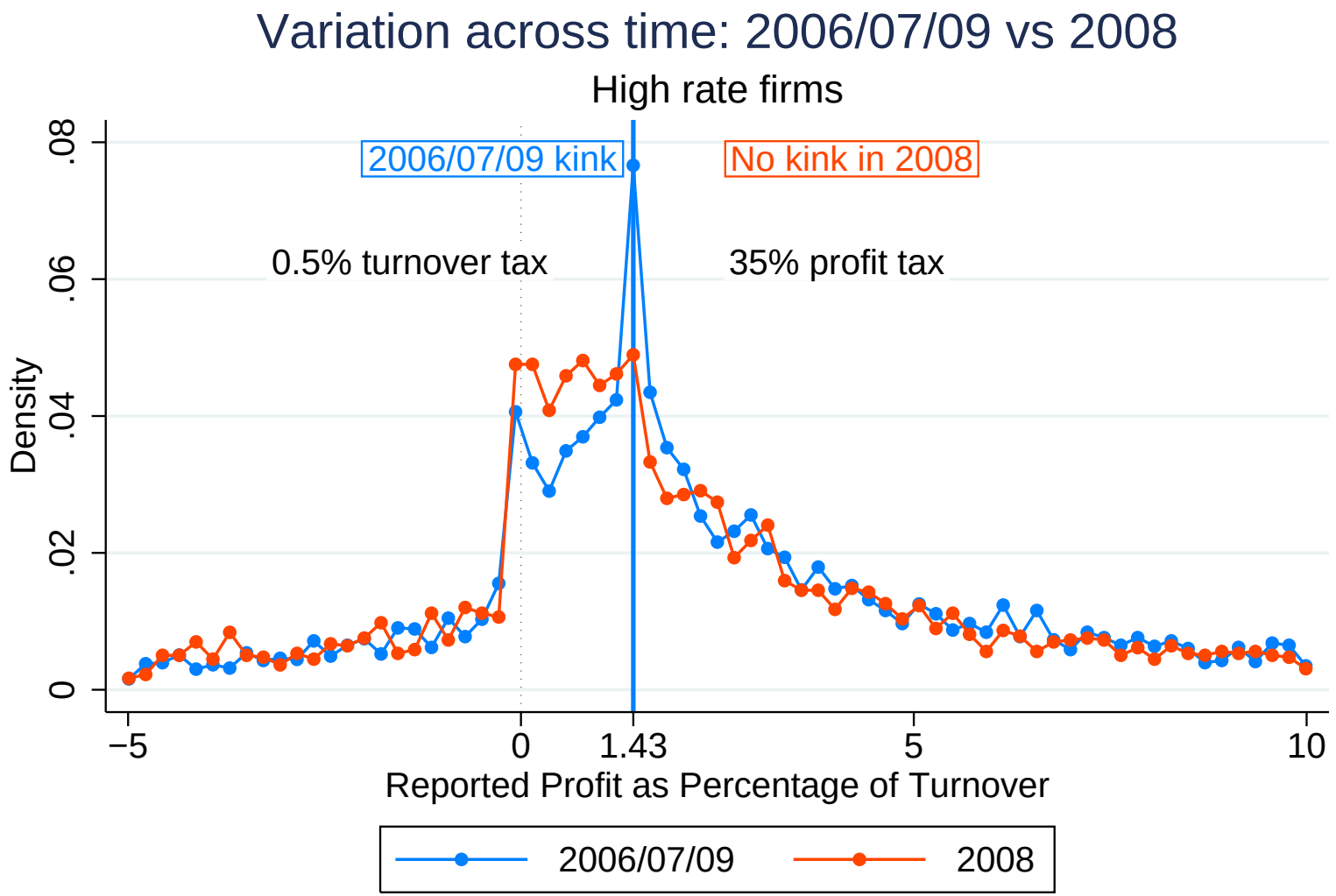

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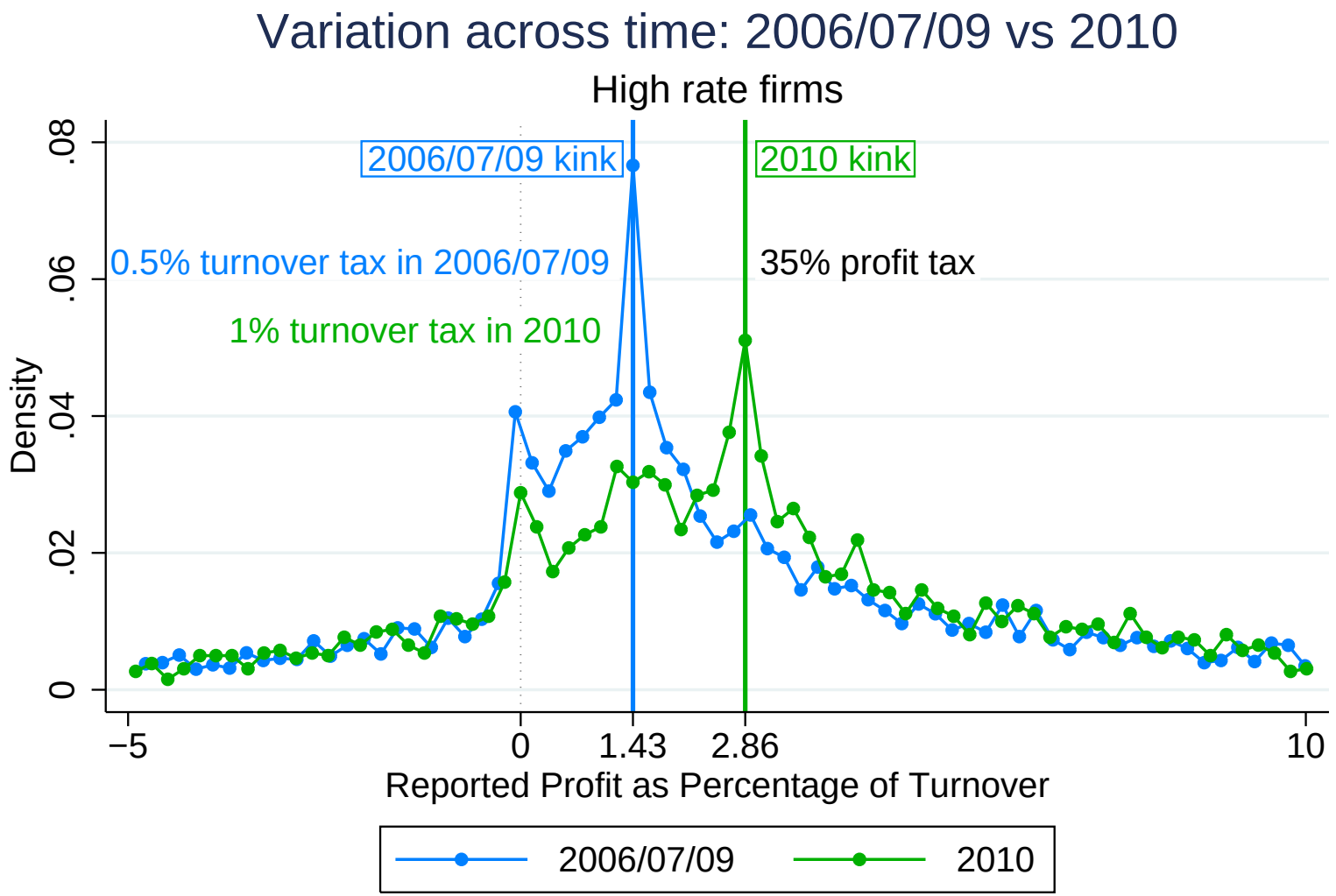
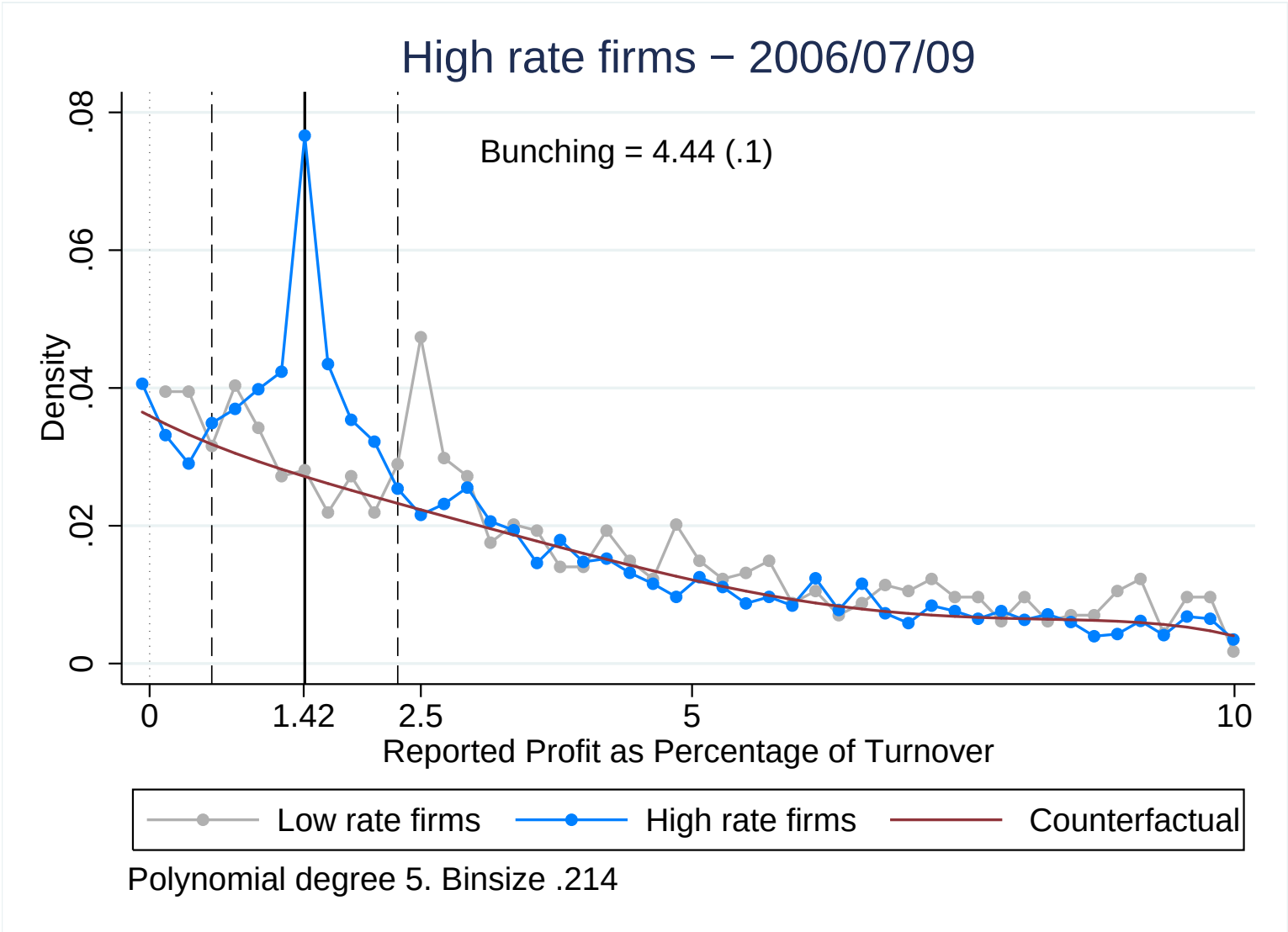


▸ Heterogeneity

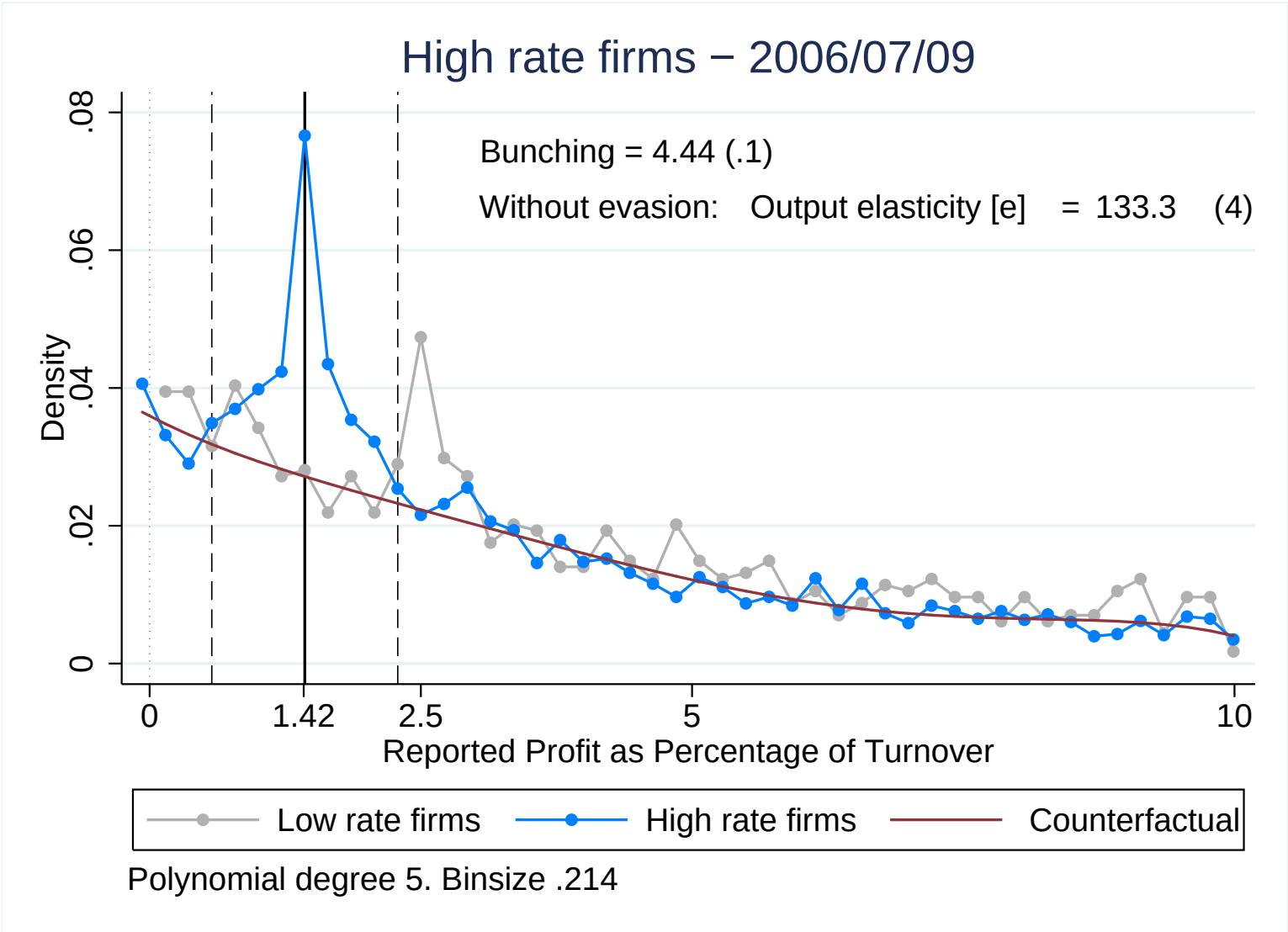
Outline

Estimating Evasion



▸ Counterfactual

Estimating Evasion



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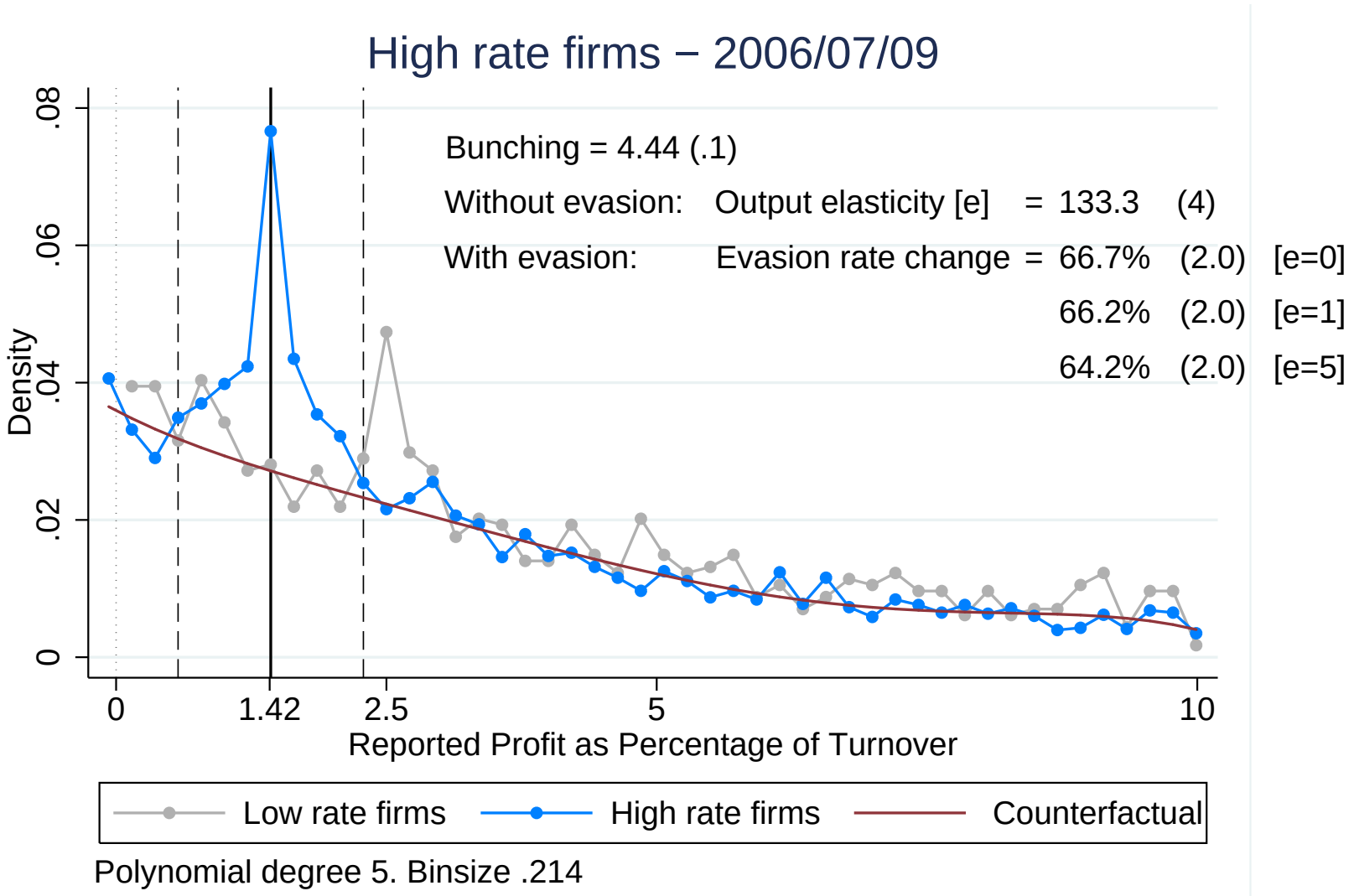

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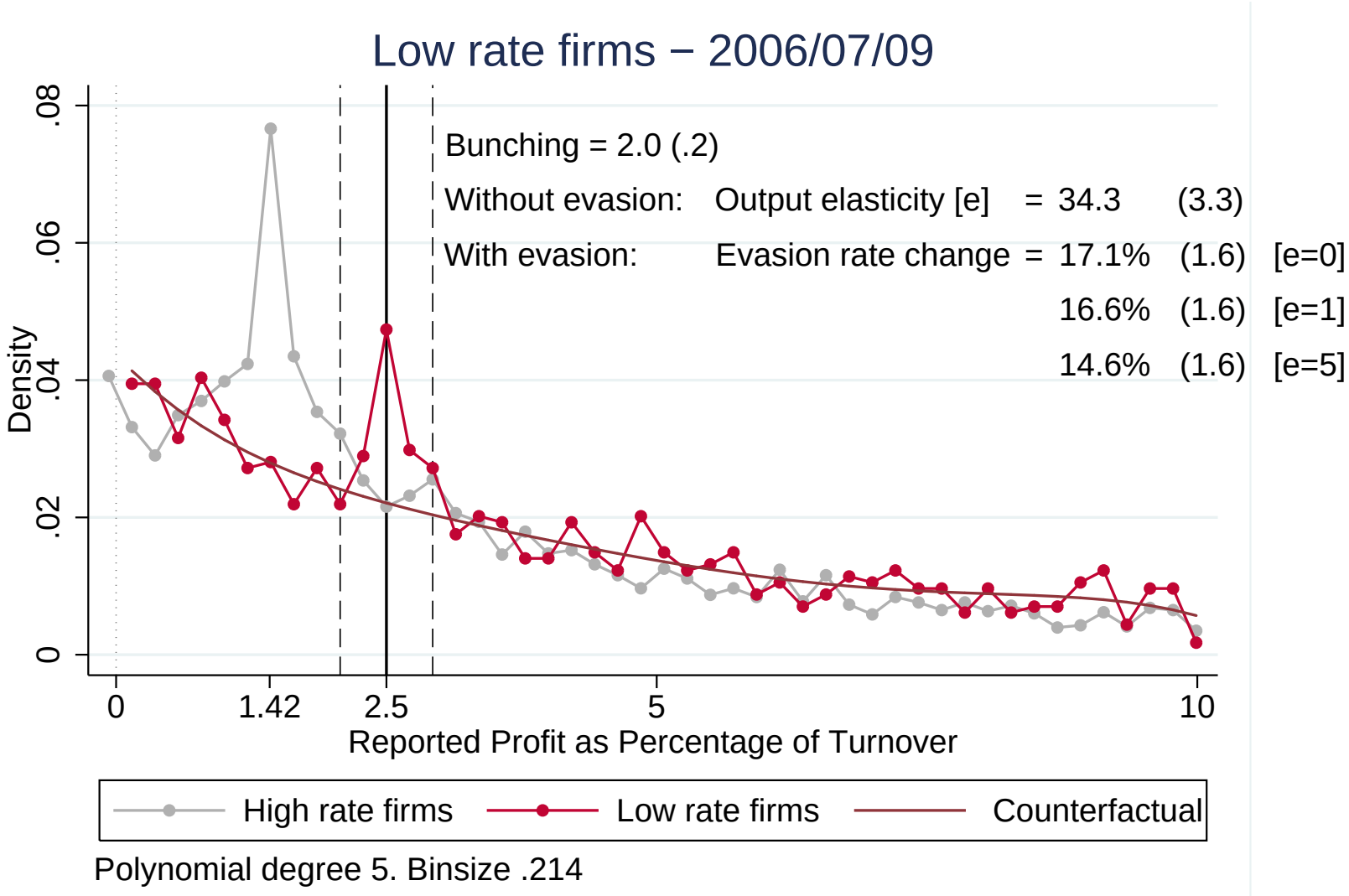
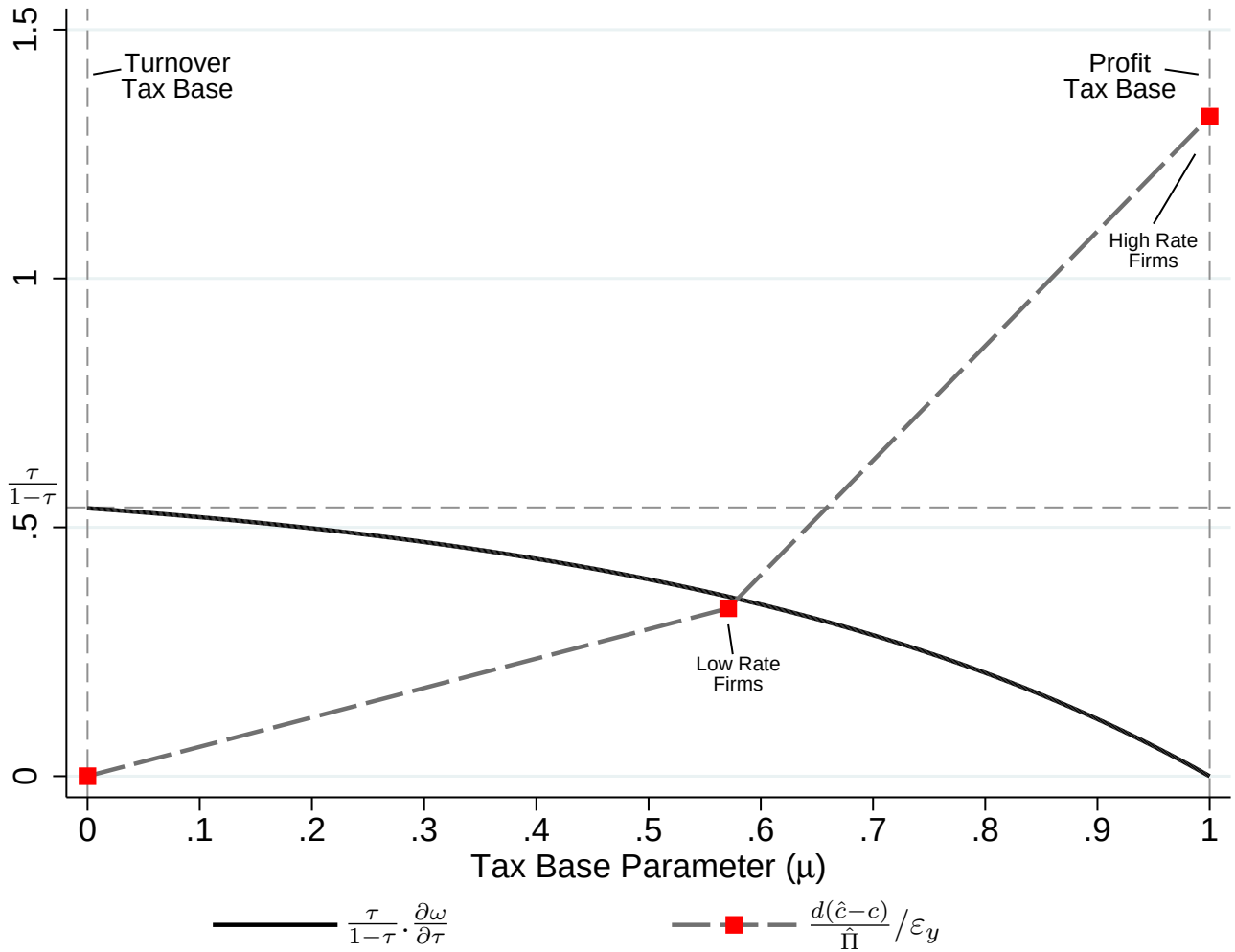


▸ Counterfactual

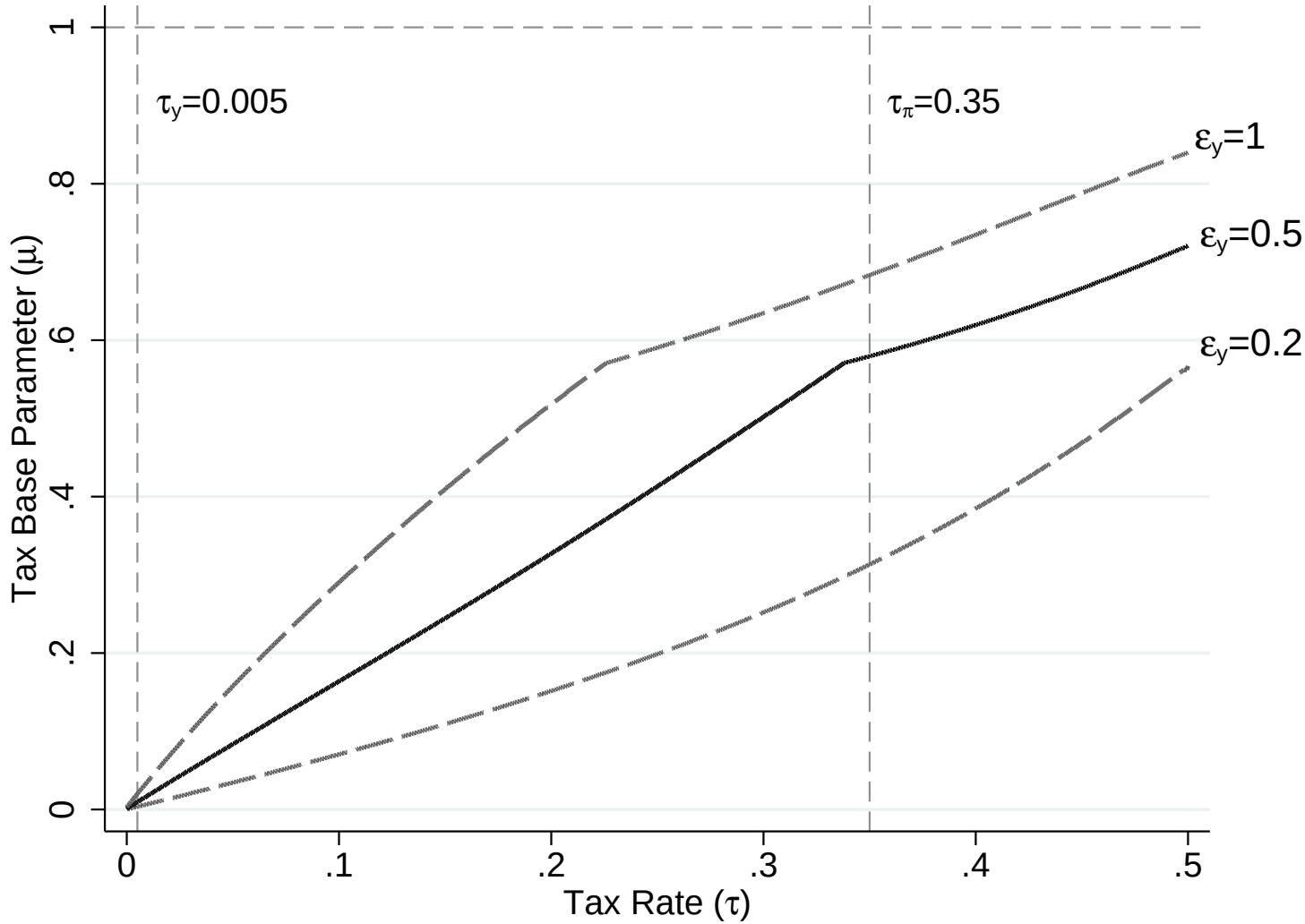
Outline

Optimal Tax Base (Given τ and ε_y)

$$\frac{\tau}{1-\tau} \times \frac{\partial \omega}{\partial \tau}(\mu) \simeq -\frac{\Delta(\hat{c}-c)}{\hat{\Pi}}(\mu) \times \frac{1}{\varepsilon_y}$$



Optimal Tax Base (Varying τ and ε_y)



Conclusion

- Production inefficient policies like turnover taxes may be optimal under imperfect enforcement
- Novel quasi-experimental approach using minimum tax schemes for estimating evasion responses to switches between profit taxes and turnover taxes
- Large evasion responses to such switches in Pakistan, which justify deviations from a production efficient profit tax
- Returns to improved tax enforcement are high: up to 2/3 of profit tax revenues are lost due to underreporting by corporations

Counterfactual Estimation

- 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.

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Bunching Heterogeneity by Evasion Proxies

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"

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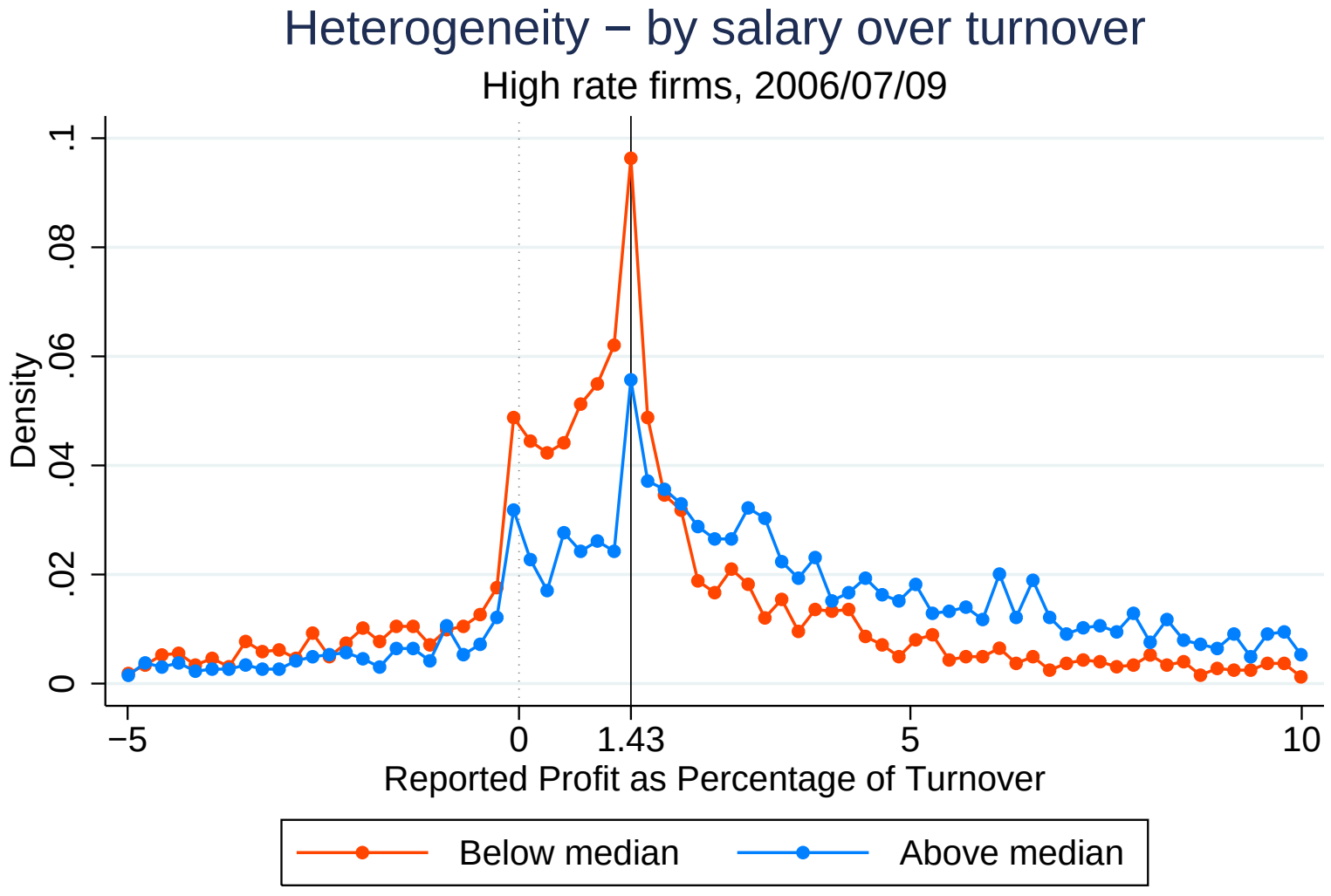
Bunching Heterogeneity



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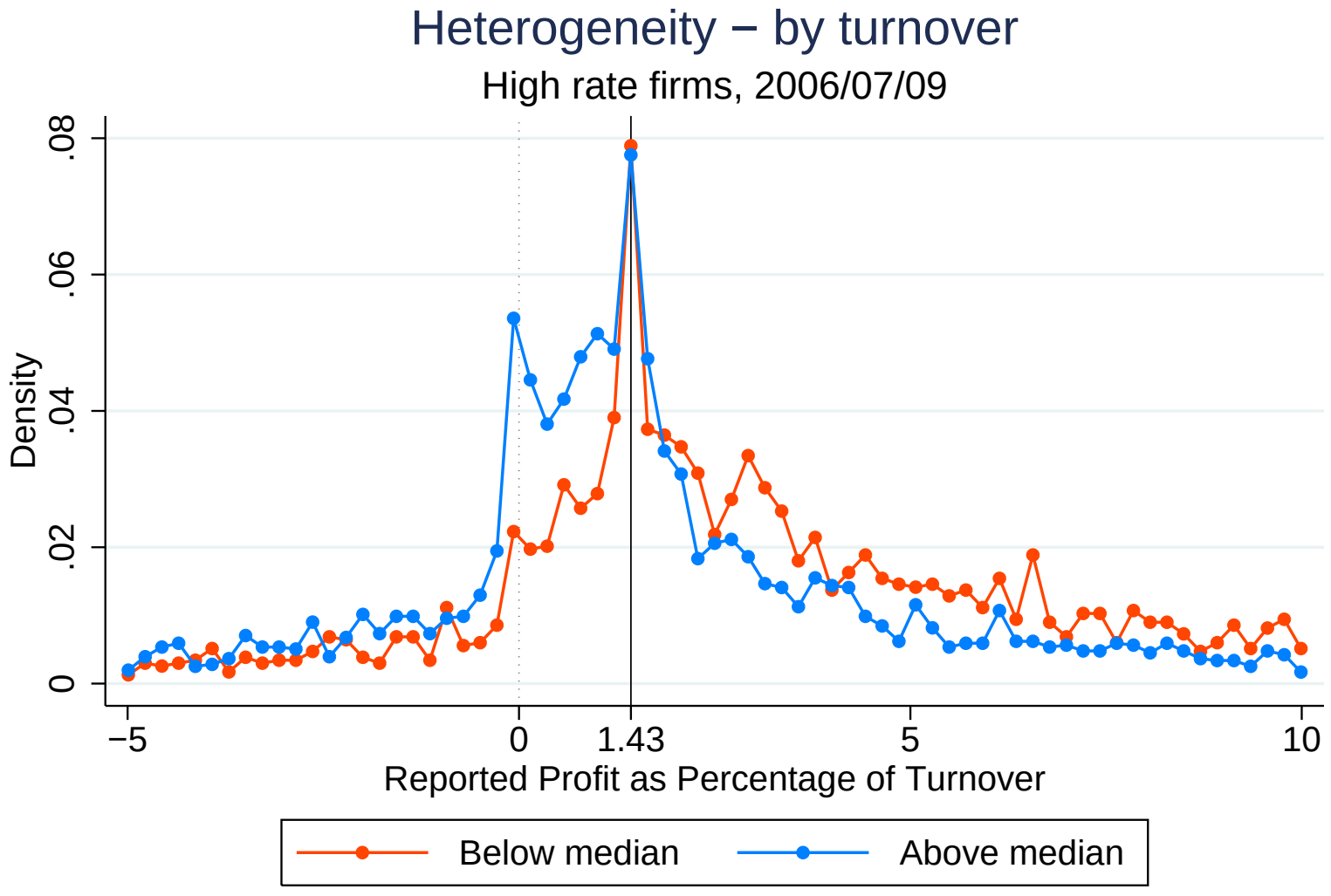

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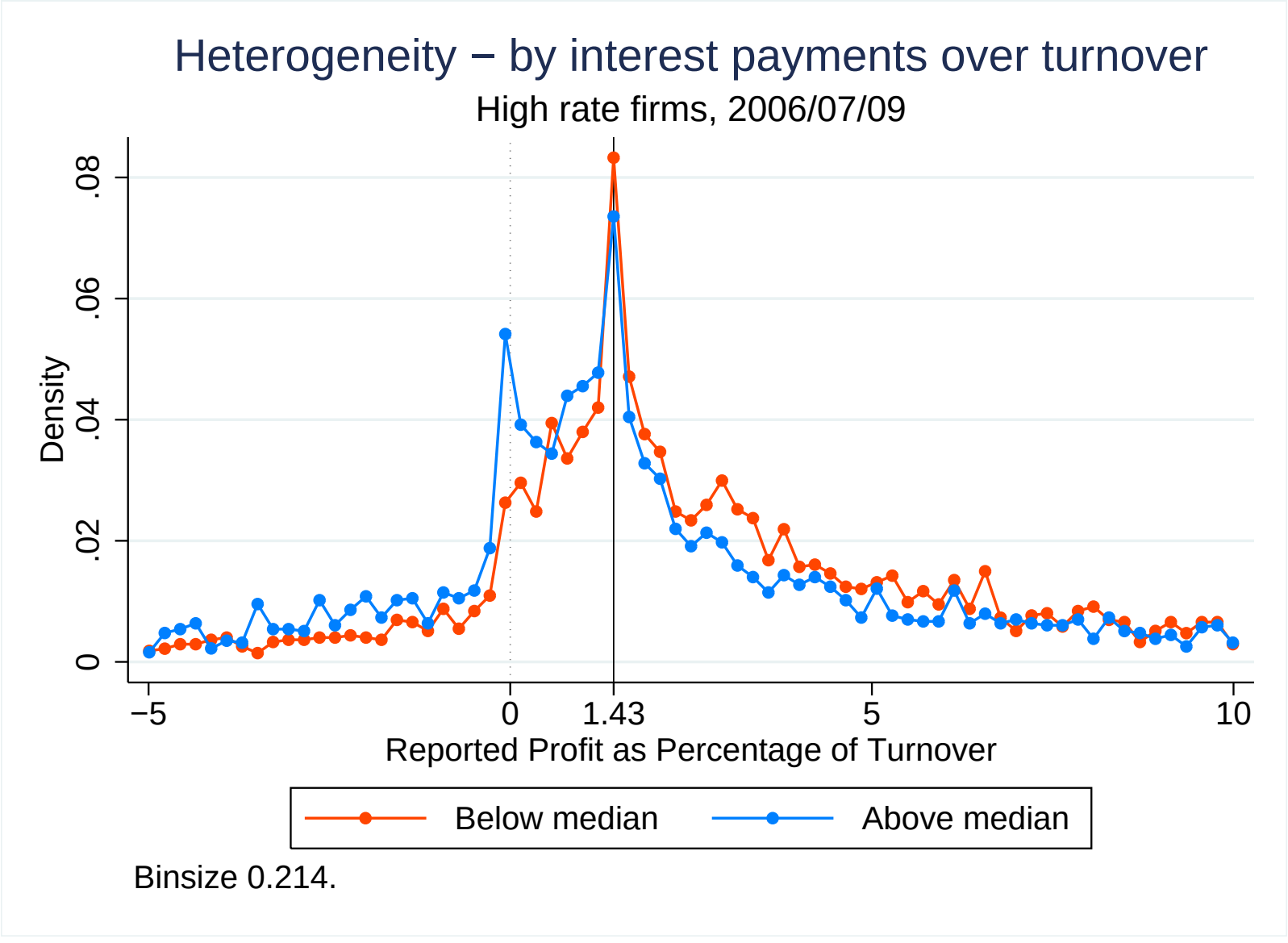

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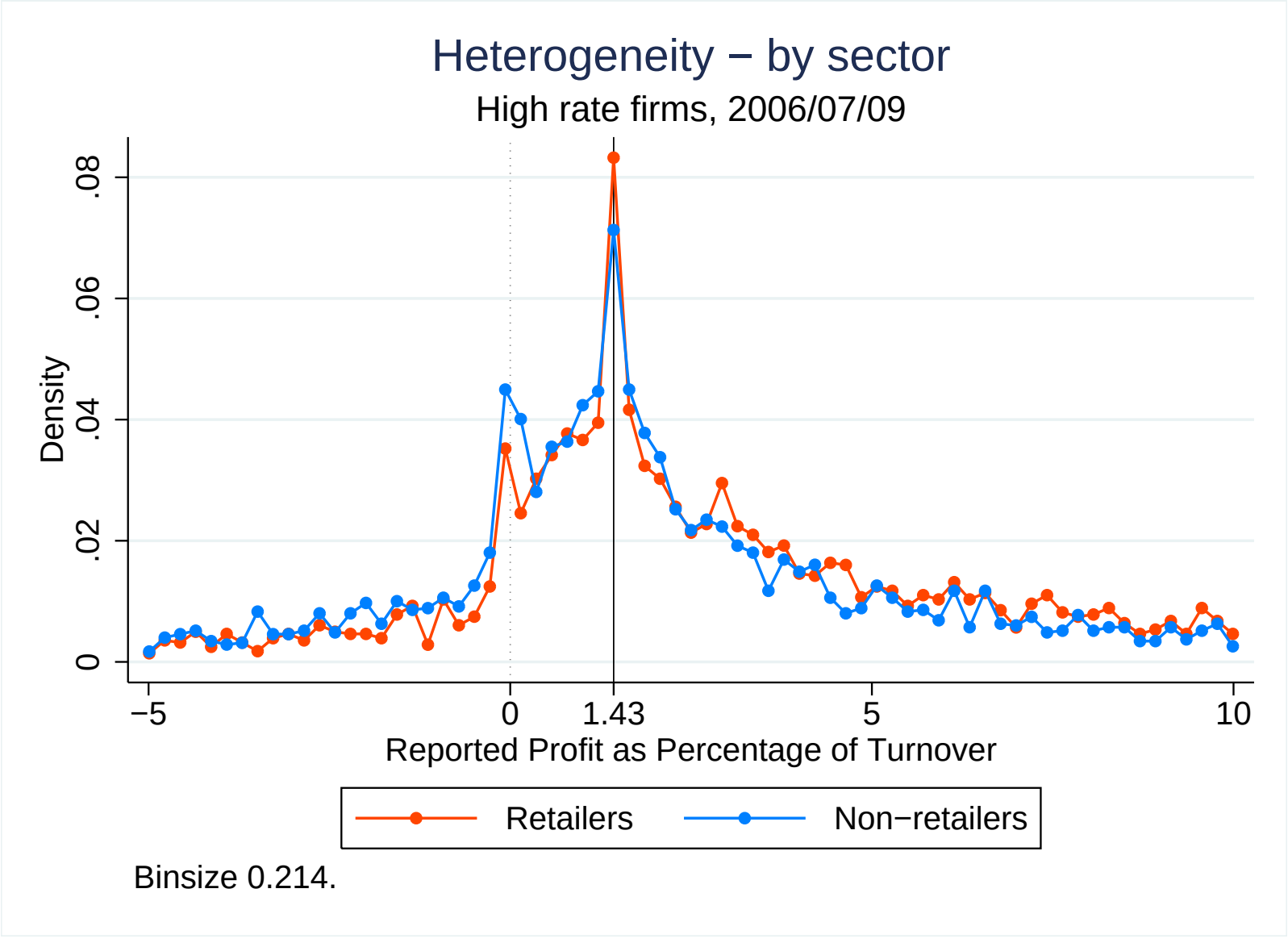

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