Audit Rule Disclosure and Tax Compliance

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[†]We thank *Agenzia delle Entrate* for data access. All views expressed are our own.

Transparency and the design of compliance incentives

- **Small businesses report high tax gaps but face low audit risk**
  - ▸ Across countries
  - ▸ IRS
  - ▸ HRMC
  - ▸ Italy
  - ▸ WES
  - ▸ Bachas et al. (2019)

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- **Can disclosure of audit rules improve compliance at low cost?**
  - Lazear (2006): when misbehavior costs and monitors' budget are low

This paper: estimating the tax base effect of disclosure

- **A unique disclosure policy: the Sector Studies in Italy**
  - firms adjust to revealed **thresholds** above which **audit risk drops**
  - 26.6 million files by small firms and the self-employed, 2007-2016

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  - need to reconstruct counterfactuals with constant audit risk
  - **structural** model with bunching and welfare analysis, 2007-2010

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- **Question 1: can disclosure raise reported revenues?**
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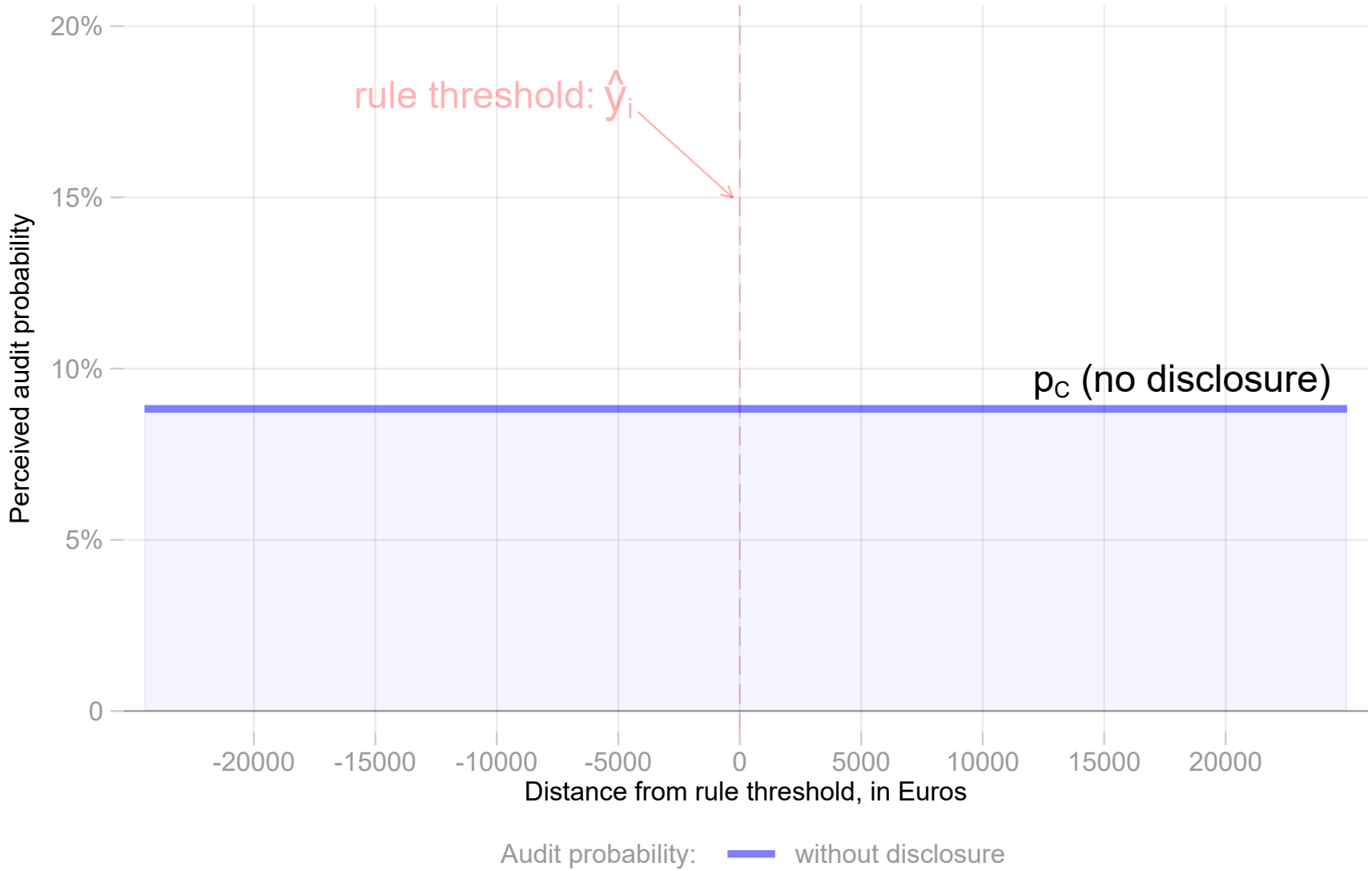
  - **structural** model with bunching and welfare analysis, 2007-2010

- **Question 2: can disclosure raise reported profits?**
  - taxpayer could offset higher revenues with higher costs
  - **event study** with a natural experiment: 2011 "reward regime" reform

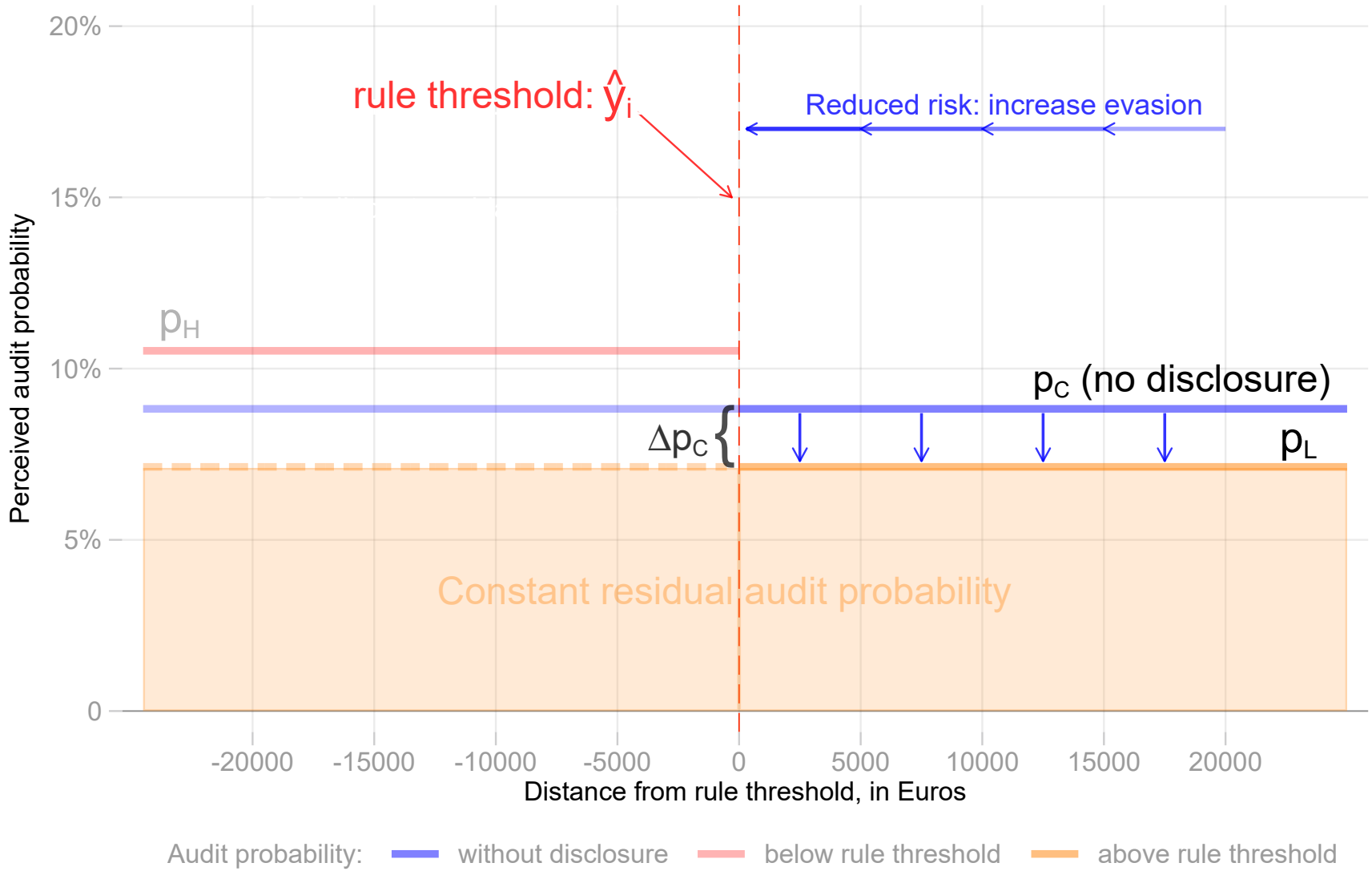
▸ Sector Studies ▸ Data ▸ Compliance strategies

1. Disclosure and firm revenues: a structural approach

Audit rule disclosure: tax compliance tradeoff



Audit rule disclosure: tax compliance tradeoff



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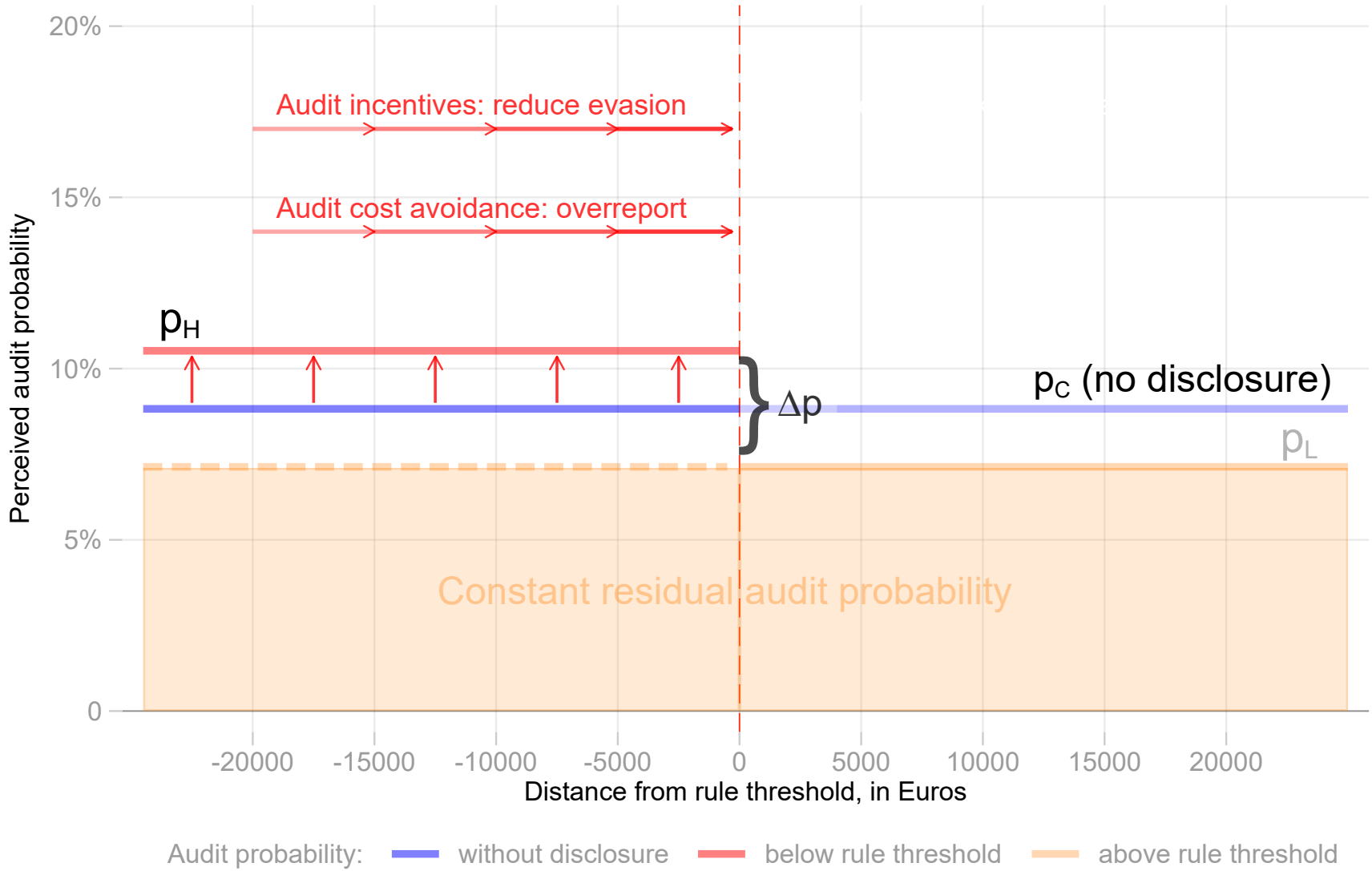

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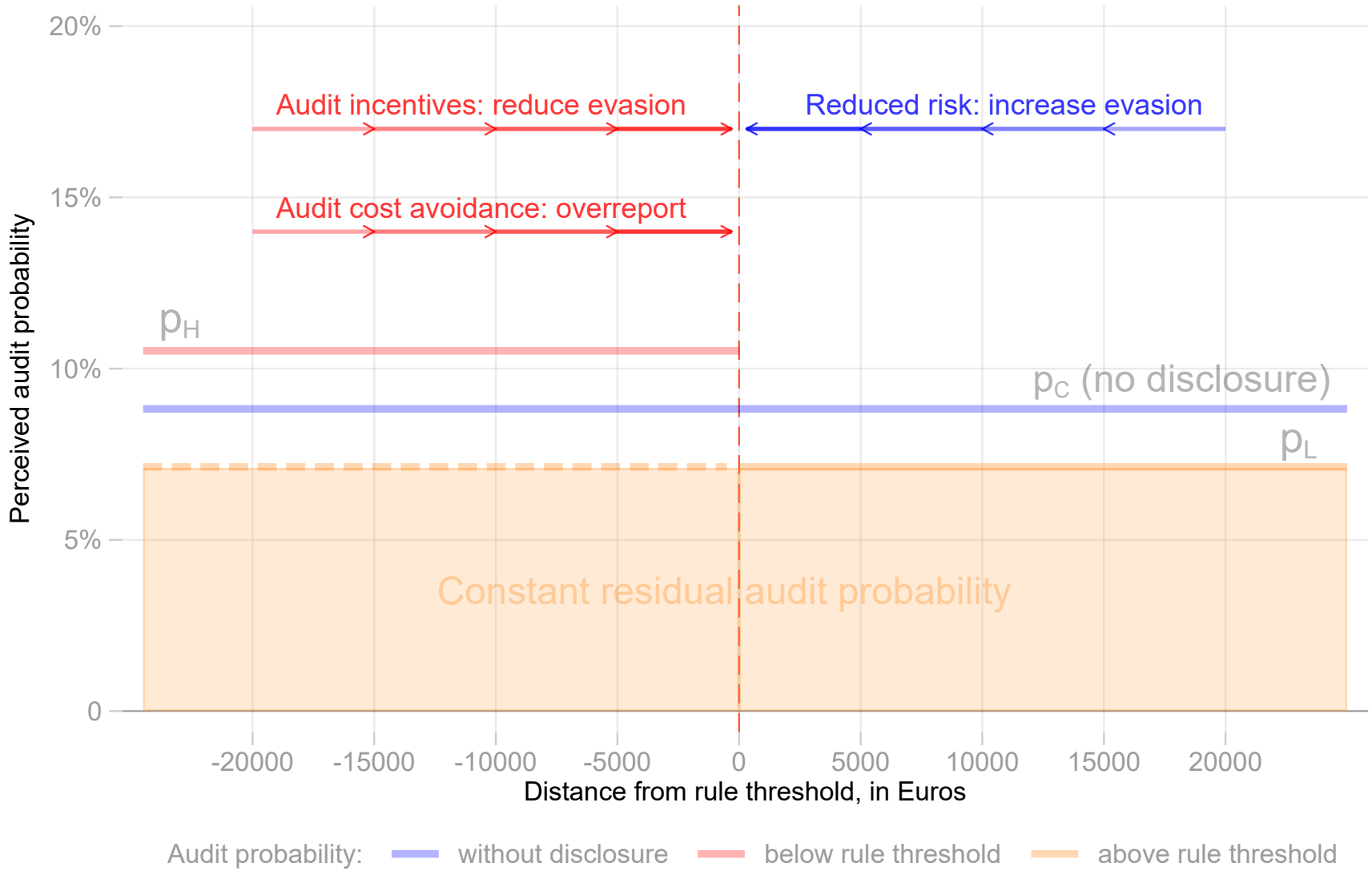
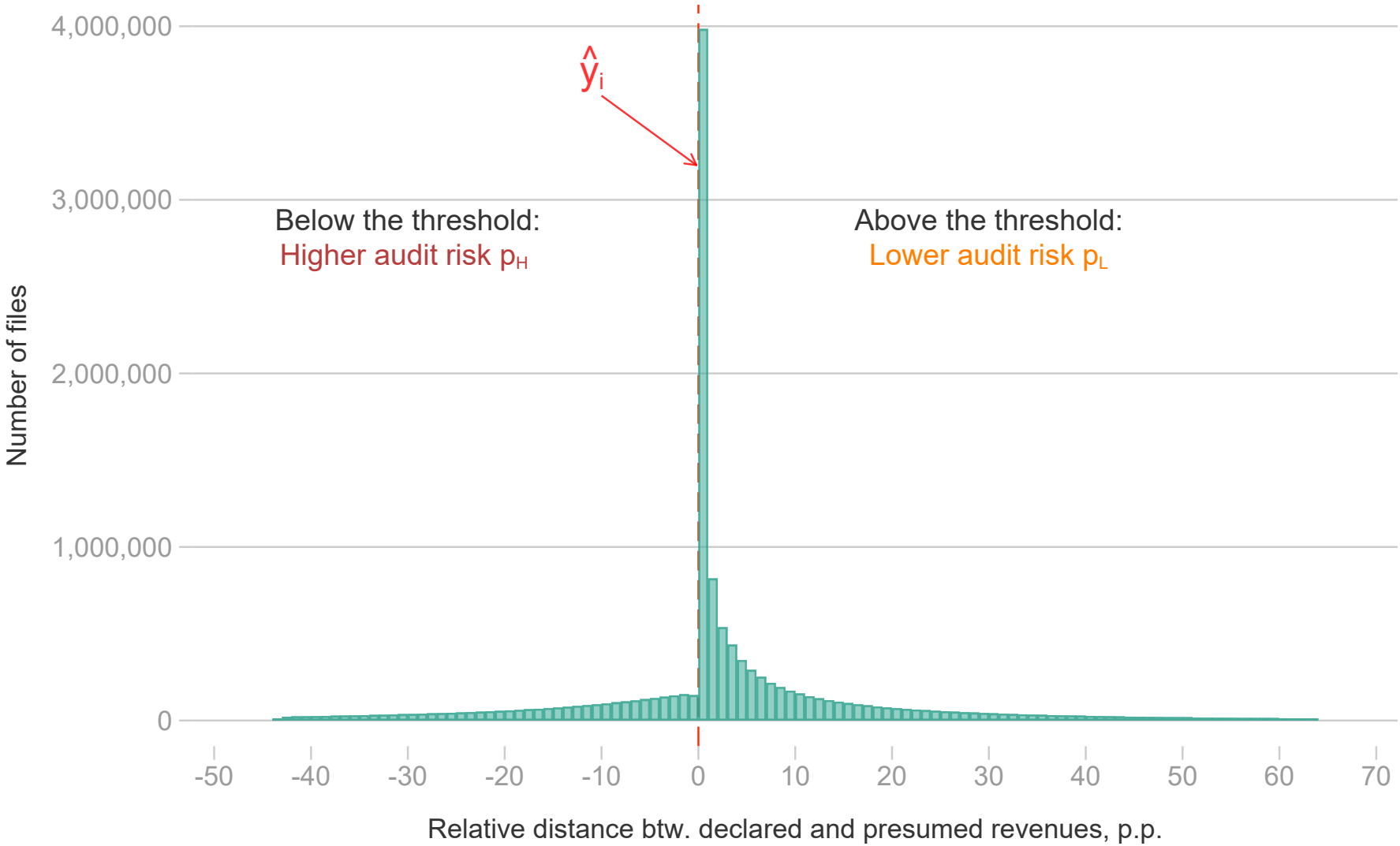
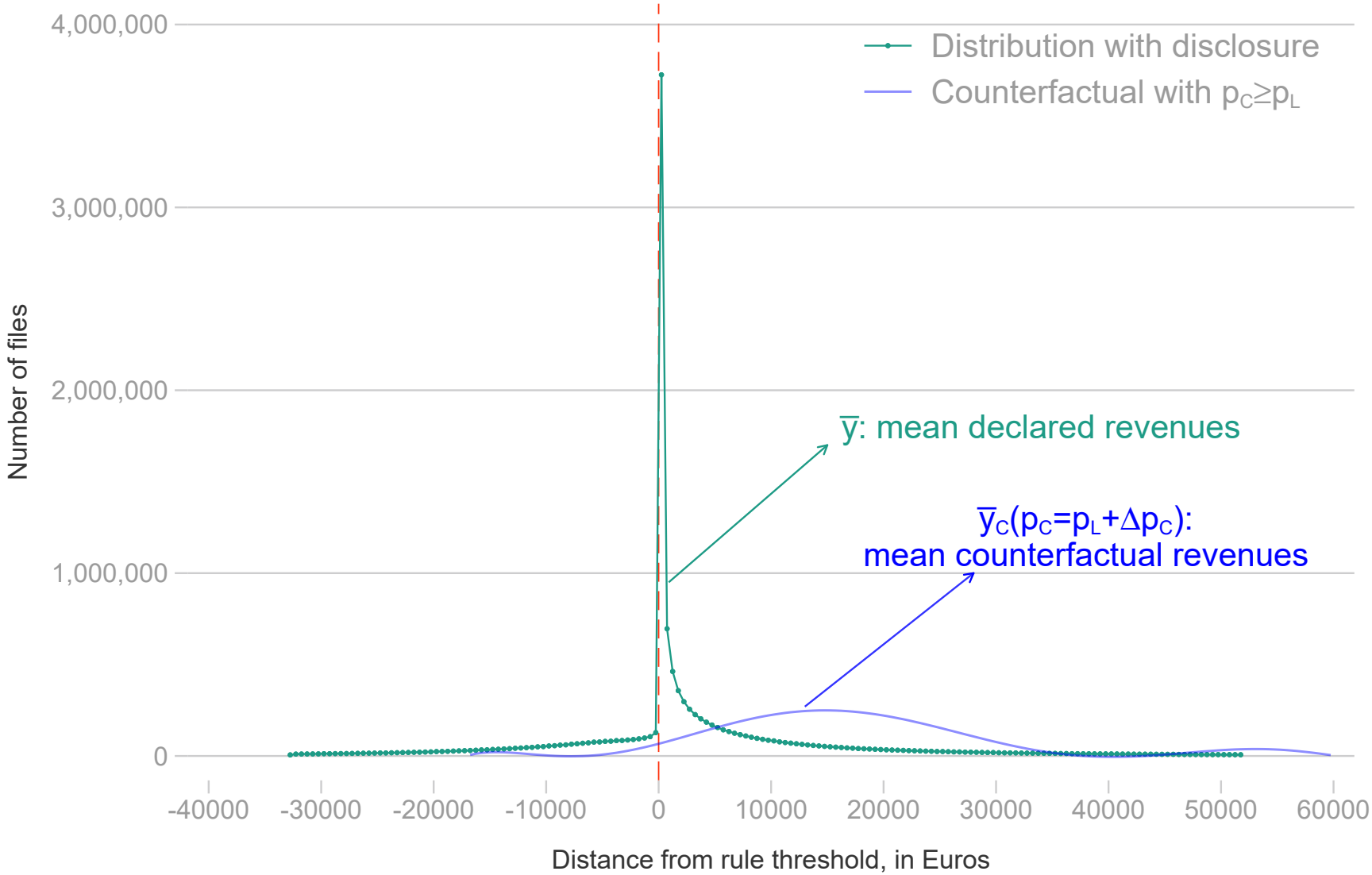


Sizable bunching at revealed thresholds, 2007-2010

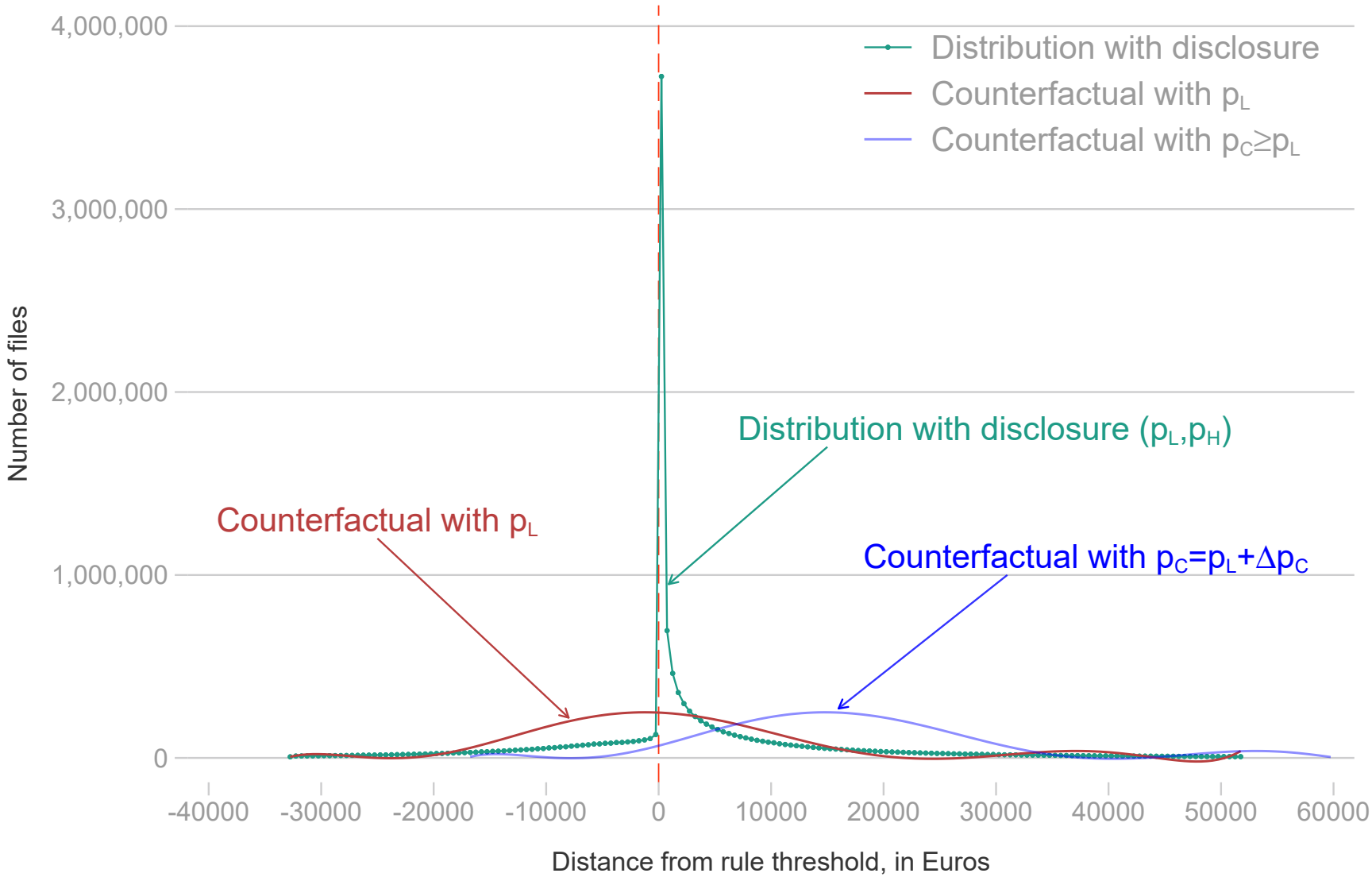


Notes: Presumed revenues threshold in red at 0. Sample trimmed 5th-95th percentile

Computing disclosure effects on mean revenues, $\bar{y} - \bar{y}_C$

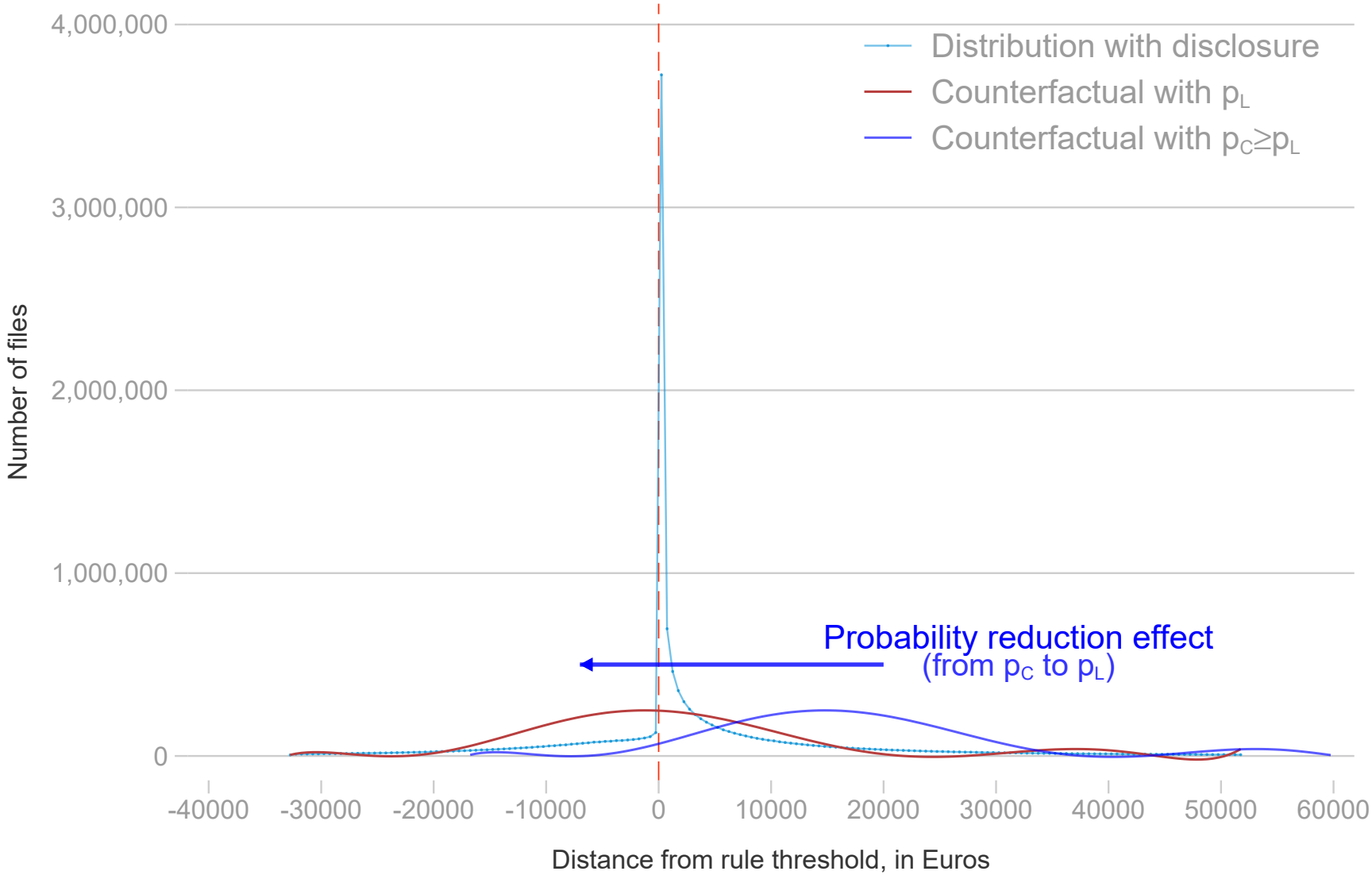


Extrapolating the bunching counterfactual ($p_C = p_L$)



Revenue losses from disclosure, $\bar{y}_C - \bar{y}_L$

▸ Concept



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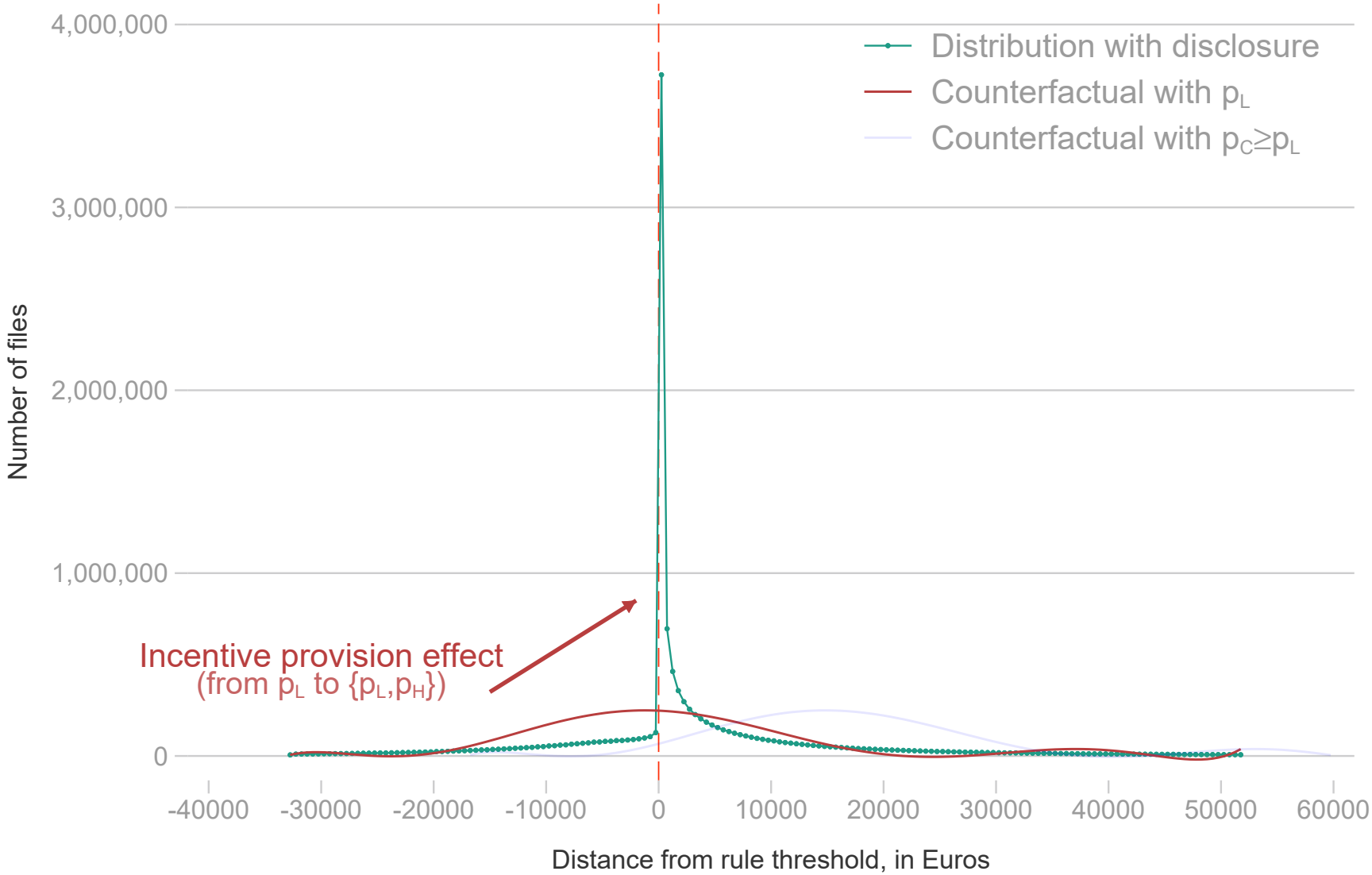
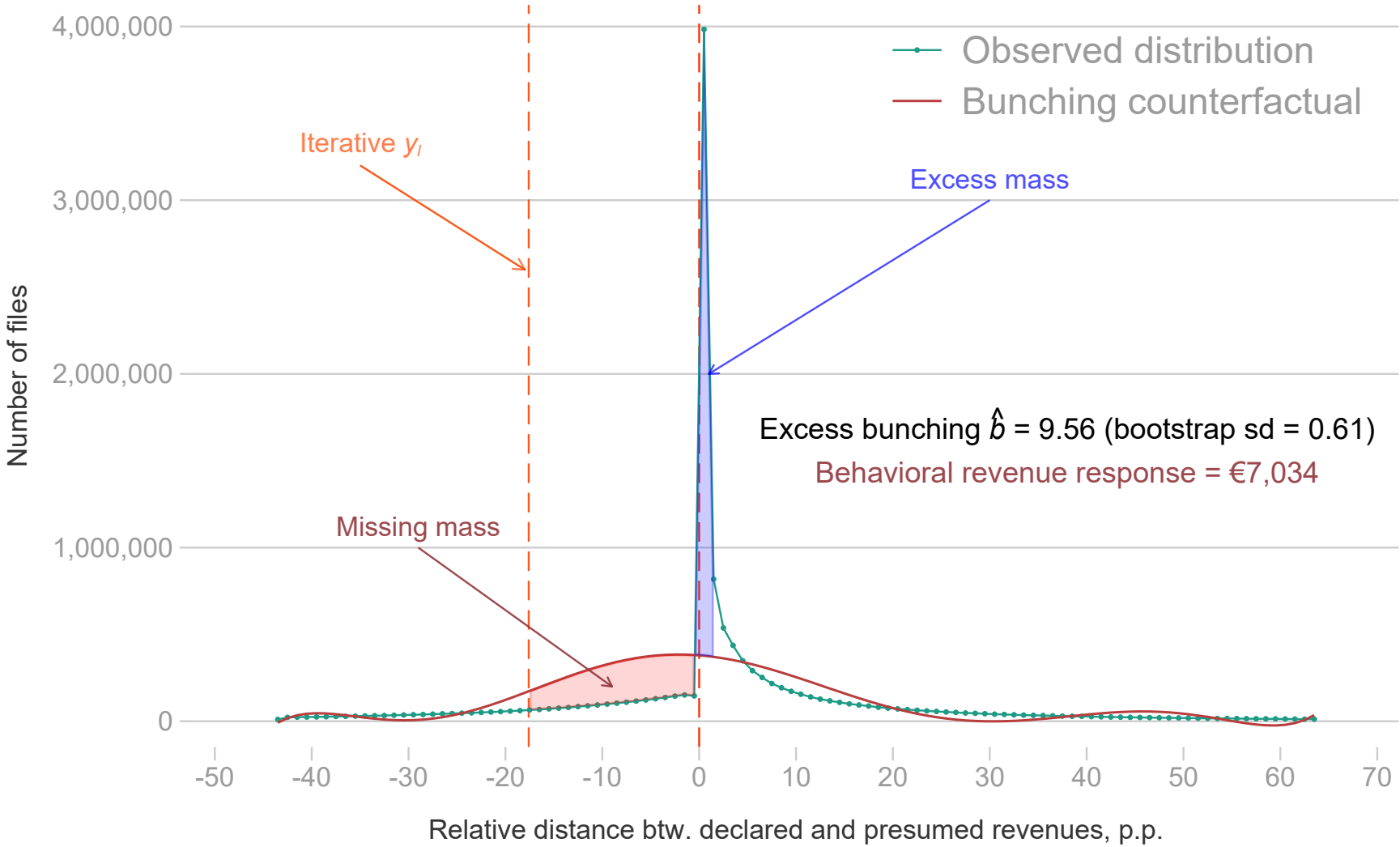


Bunching estimate in filers universe ($p_C = p_L$), 2007-2010



Notes: Presumed revenues threshold in red at 0. Sample trimmed 5th-95th percentile

Revenue response reflects bunching interval in exercise with €500 bins. ▸ Map ▸ Coef

Structural estimation of disclosure effects, 2007-2010

1. **Model firm behavior with constant and discontinuous risks**
   - disclosure: if $y < \hat{y}$, higher risk reduces evasion benefit $\tau - \tau\gamma p_C$
   - Sector Studies allow to separate reporting from production margin

Structural estimation of disclosure effects, 2007-2010

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3. **Evaluate disclosure effects at different levels of $p_C \in [p_L, p_H]$**
   - compare mean revenues under rule disclosure vs. rule secrecy

▸ Correlates ▸ Model ▸ Equilibrium ▸ IC ▸ Audit costs ▸ Implications ▸ Costs ▸ ID ▸ Validation

Structural result: disclosure increases reported revenues

- SeS disclosure raises mean reported revenues: +6.3-7.7% ▸ Effects

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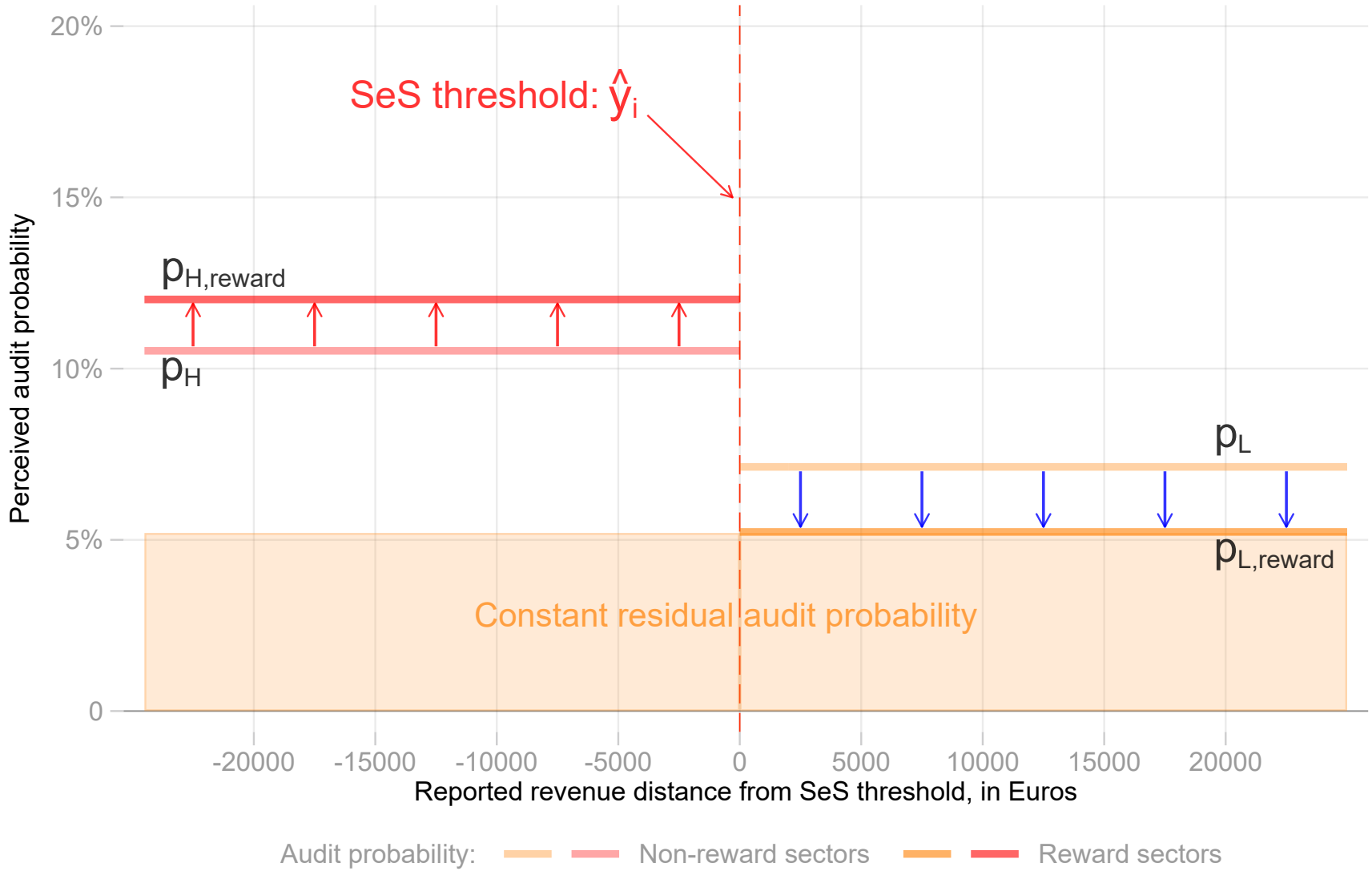
Structural result: disclosure increases reported revenues

- SeS disclosure raises mean reported revenues: +6.3-7.7% ▸ Effects

- Why? We reason through our model and setting:
  - ε holds a larger role in revenue losses, $\Delta p \geq \Delta p_C$ in revenue gains
  - Fix enforcement: within regions, bunching-tax correlations are *small*
  - then, SeS audit risks drive bunching more than elasticity does ▸ Corr

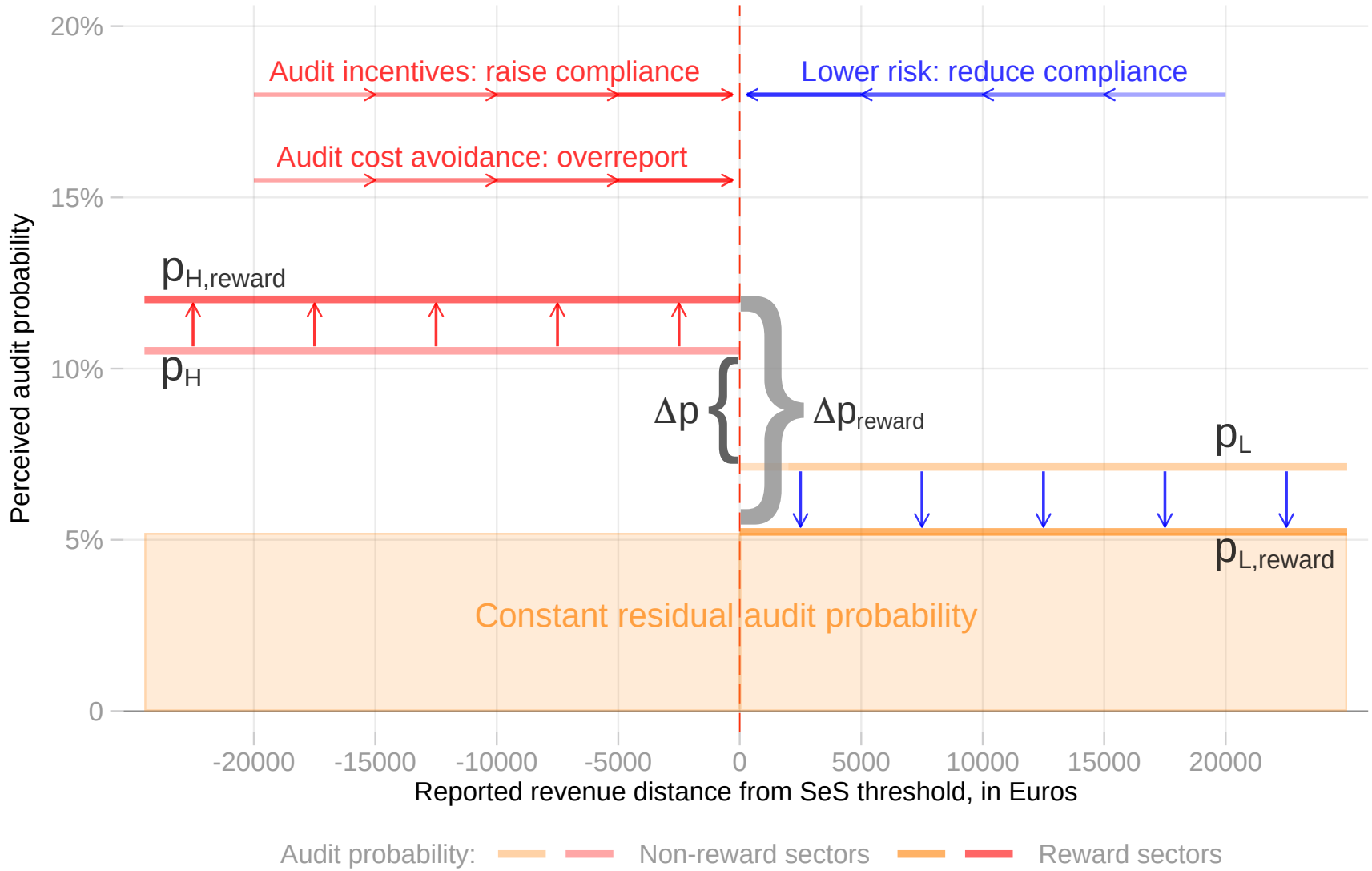
2. Disclosure and firm profits: a natural experiment

Effects of the 2011 reward regime

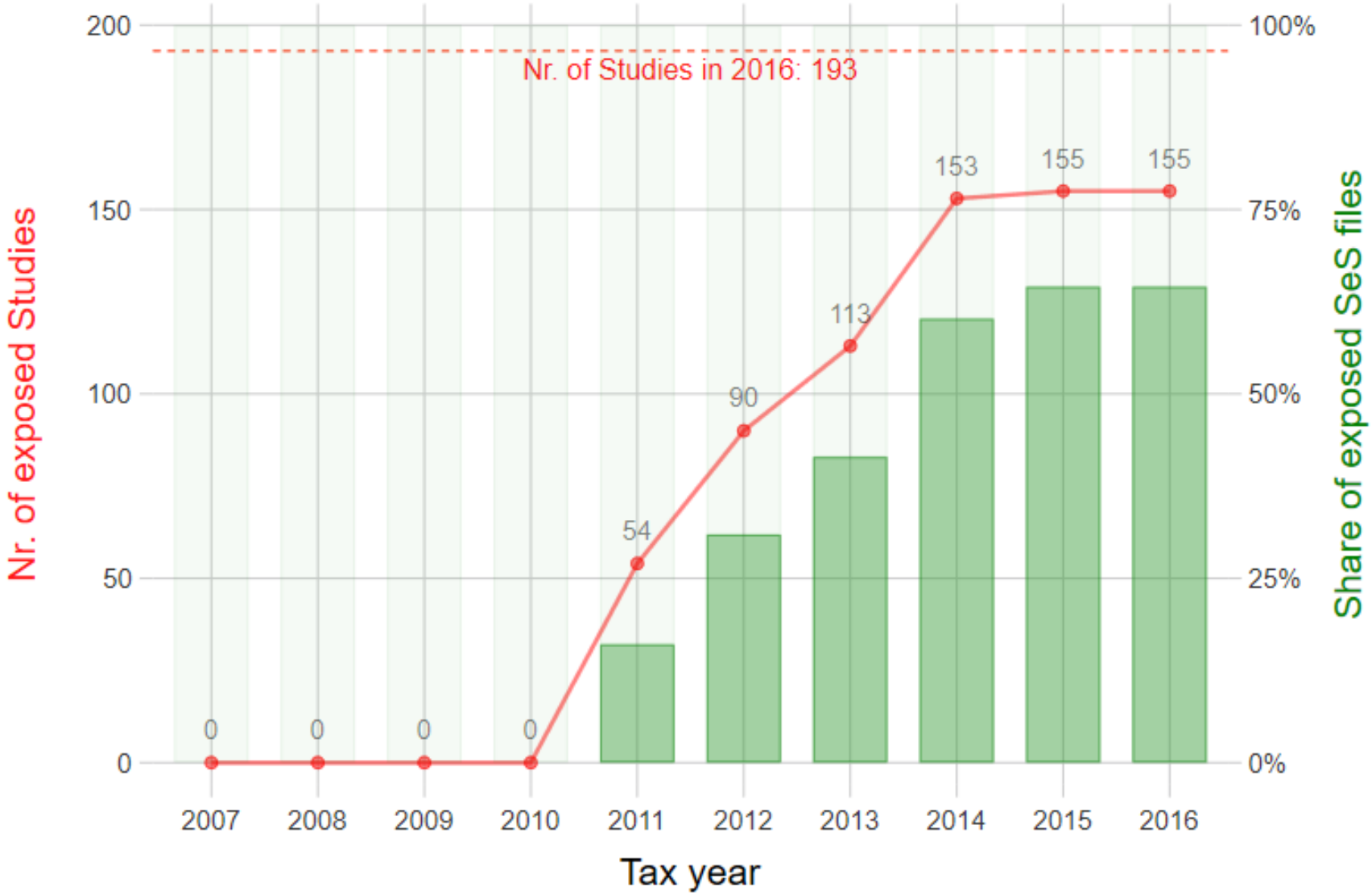


Effects of the 2011 reward regime

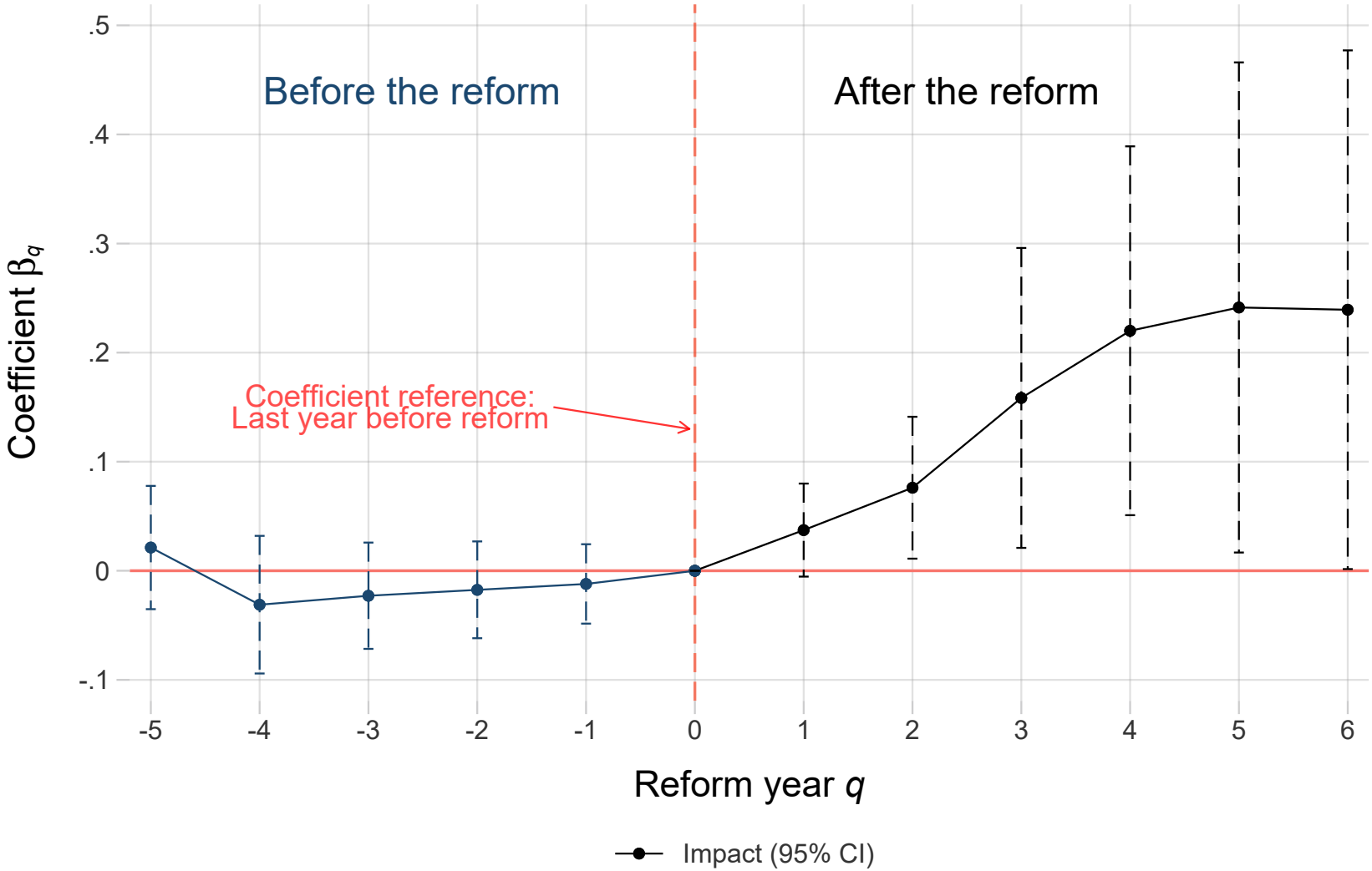
▸ Rewards



Gradual roll-out across Sector Studies, 2011-2016



Mean gross profits rise with regime exposure (+3.7-23.9%)



Notes: 2007-2016 balanced panel. Sample: 1550 sector-years from sectors with regime access over 2011-2016. Outcome is the log of mean gross profits. ▸ Specification ▸ More

Audit rule disclosure can stimulate tax compliance

- **In Italy, the Sector Studies for small businesses:**
  - use disclosure to **raise revenues by 6.3-7.7%** among PIT-payers
  - reinforce disclosed incentives to **raise gross profits by 16.2%**

- **Tax agencies can raise the tax base by reducing audit secrecy**
  - provide a **clear link** between reporting behavior and audit risks
  - cost-effective **communication** policy akin to central banks' guidance

▸ Effectiveness ▸ MVPF ▸ Contributions ▸ Comparison

Thank you!
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email me: *edigregorio@imf.org*

Appendix

Alternative compliance strategies

1. **Mailing audit-relevant information**
   - Kleven et al. (2011), Pomeranz (2015), Bergolo et al. (2017), Carrillo et al. (2017a), Brockmeyer et al. (2019)

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   - size-dependent enforcement: Almunia and Lopez-Rodriguez (2018), Basri et al. (2019), Bachas et al. (2019)
   - tax & accounting regime: Best et al. (2015), Alejos (2017), Aghion et al. (2017)

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3. **Redesigning reporting incentives**
   - for taxpayers: Dunning et al. (2017), Carrillo et al. (2017b), Al-Karablieh et al. (2021)
   - for others: Naritomi (2019), Kumler et al. (2020), Choudhary and Gupta (2019)

▸ Overview ▸ Literature

References: a non-exhaustive list

1. **Comparative tax compliance and enforcement**
   - Andreoni et al. (1998), Luttmer and Singhal (2014), Slemrod (2019)
   - Slemrod (2007), Kleven et al. (2011), Artavanis et al. (2016); Bachas et al. (2019)
2. **Optimal tax administration and disclosure of monitoring content**
   - Reinganum and Wilde (1985), Keen and Slemrod (2017); Lazear (2004, 2006)
3. **Policies aimed at raising business tax compliance**
   - Letter-based communication: Kleven et al. (2011), Pomeranz (2015), Bergolo et al. (2017), Carrillo et al. (2017a), Brockmeyer et al. (2019)
   - Taxpayer units and other regimes: Almunia and Lopez-Rodriguez (2018), Basri et al. (2019); Best et al. (2015), Alejos (2017), Aghion et al. (2017)
   - Incentives: Dunning et al. (2017), Carrillo et al. (2017b), Al-Karablieh et al. (2021), Naritomi (2019), Kumler et al. (2020), Choudhary and Gupta (2019)
4. **Tax compliance and auditing in Italy**
   - Galbiati and Zanella (2012), Santoro (2017), D'Agosto et al. (2017), Battaglini et al. (2020)
   - Sector Studies: Santoro (2008), Santoro and Fiorio (2011)
5. **Empirical methods**
   - Structure with bunching: Kleven and Waseem (2013), Aghion et al. (2017)
   - Event-study designs: Borusyak and Jaravel (2017), Sun and Abraham (2020), de Chaisemartin and D'Haultfoeuille (2020)
   - Welfare analysis with MVPF: Hendren (2016), Hendren and Sprung-Keyser (2020)

▸ Overview ▸ Compliance strategies ▸ Contributions

Self-employment tax compliance across countries

Non-compliance for similar taxpayers is similar across countries:

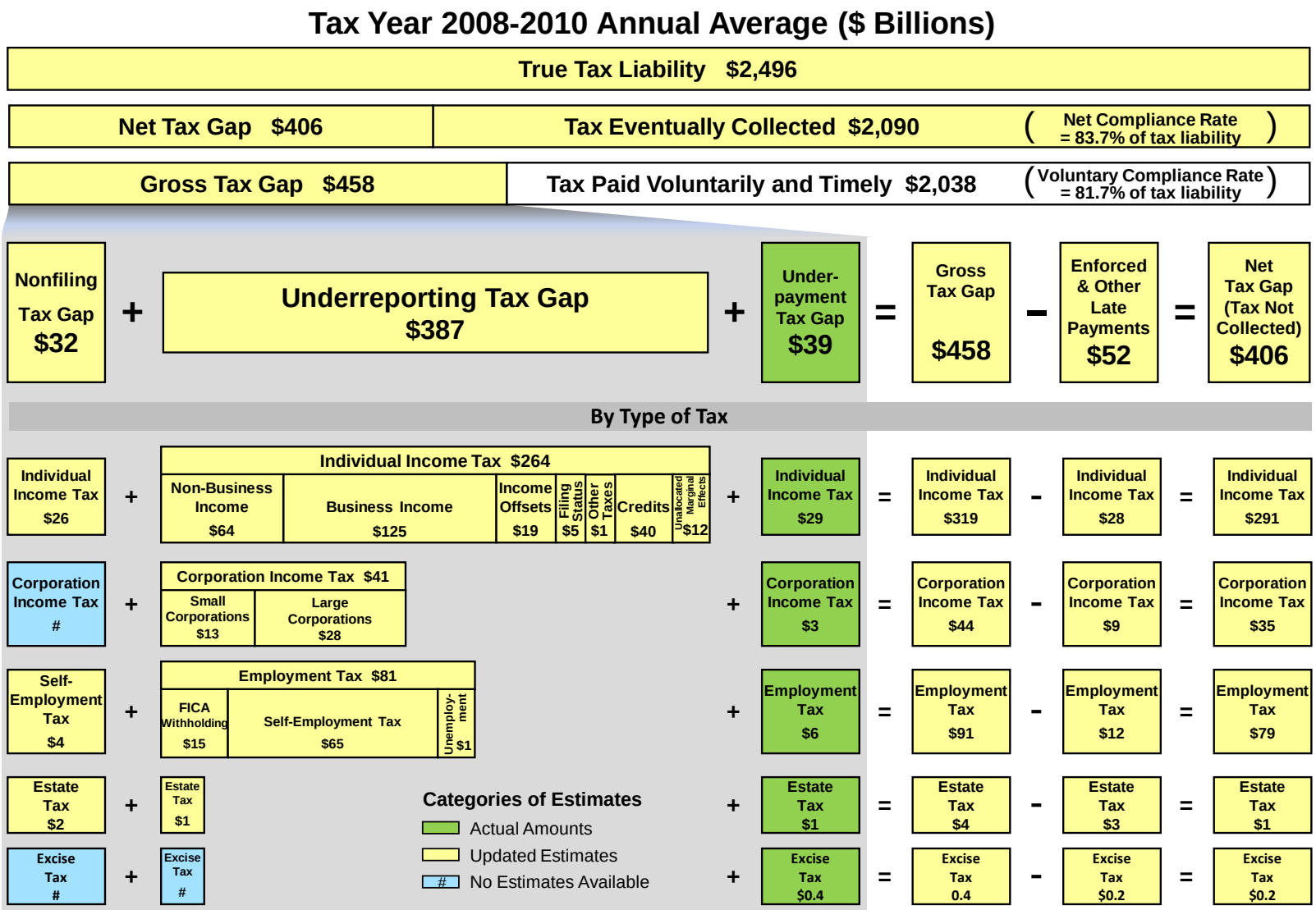
Source	Country	Unreported Tax Base	Tax Gap	Data Year
Galbiati and Zanella (2012)	IT	46.4%	55.2%	1987
Slemrod (2007)	US	–	52-57%	2001
Kleven et al. (2011)	DK	41.5%	–	2007
HMRC (2019)	UK	–	17.2%	2005/ 2006

Sources: noisefromamerika.org (2012), HRMC (2019).

▸ Introduction

IRS: US tax gap estimates, 2008-2010

▸ Introduction



Internal Revenue Service, April 2016

Detail may not add to total due to rounding . Not to scale.

IRS: US tax gap estimates, 2011-2013

▸ Introduction

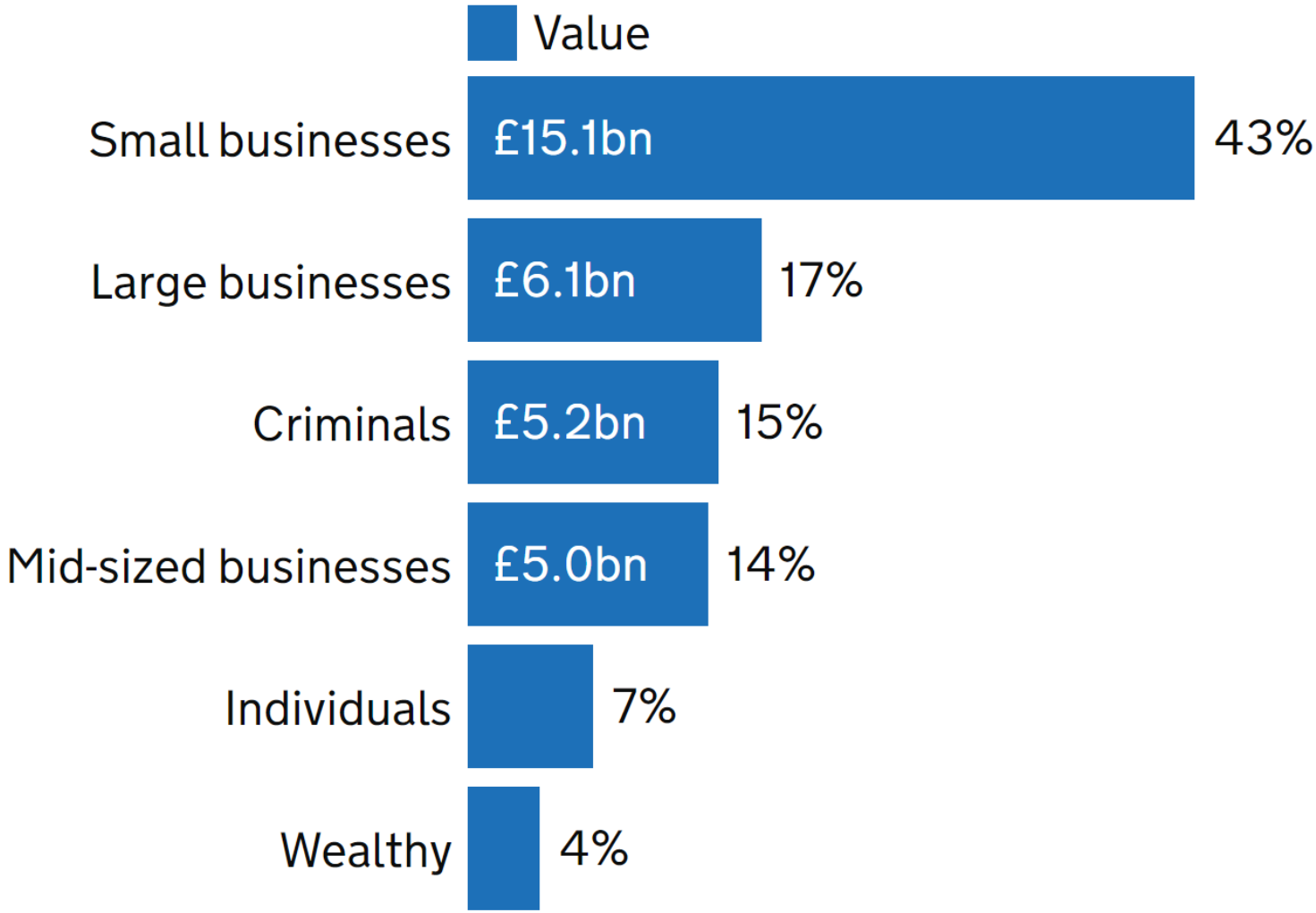
Table 2. Tax Gap Estimates for Tax Years 2011–2013[1]

[Money amounts are in billions of dollars]

Tax Gap Component	TY 2011-2013[1]	Share of Gross Tax Gap
Estimated Total True Tax	**$2,683**	
Gross Tax Gap	**$441**	**100%**
Voluntary Compliance Rate	***83.6%***	
Enforced and Other Late Payments	**$60**	
Net Tax Gap	**$381**	
Net Compliance Rate	***85.8%***	
Nonfiling Gap	**$39**	**9%**
Individual Income Tax	$31	7%
Self-Employment Tax	$6	1%
Estate Tax	$2	[2]
Underreporting Gap	**$352**	**80%**
Individual Income Tax	**$245**	**56%**
Non-Business Income	$57	13%
Business Income	$110	25%
Adjustments, Deductions, Exemptions	$20	4%
Filing Status	$5	1%
Other Taxes [4]	$1	[2]
Unallocated Marginal Effects [5]	$10	2%
Credits	$42	10%
Corporation Income Tax	**$37**	**8%**
Small Corporations (assets under $10M)	$11	2%
Large Corporations (assets of $10M or more)	$26	6%
Employment Tax	**$69**	**16%**
Self-Employment Tax	$45	10%
Uncollected Social Security and Medicare Tax	$1	[2]
FICA and Unemployment Tax	$24	5%
Estate Tax	**$1**	[2]
Underpayment Gap	**$50**	**11%**
Individual Income Tax	$38	9%
Corporation Income Tax	$5	1%
Employment Tax	$6	1%
Estate Tax	[3]	[2]
Excise Tax	[3]	[2]

HRMC: UK tax gap shares, 2019-2020

▸ Introduction



Source: HRMC (2021). Tax gap estimates are ∼£35 bn (5.3% of tax liabilities). Group breakdown was broadly stable over the previous 5 years.

Non-compliance in Italy: references

Underreporting rates for small firms and the self-employed in Italy:

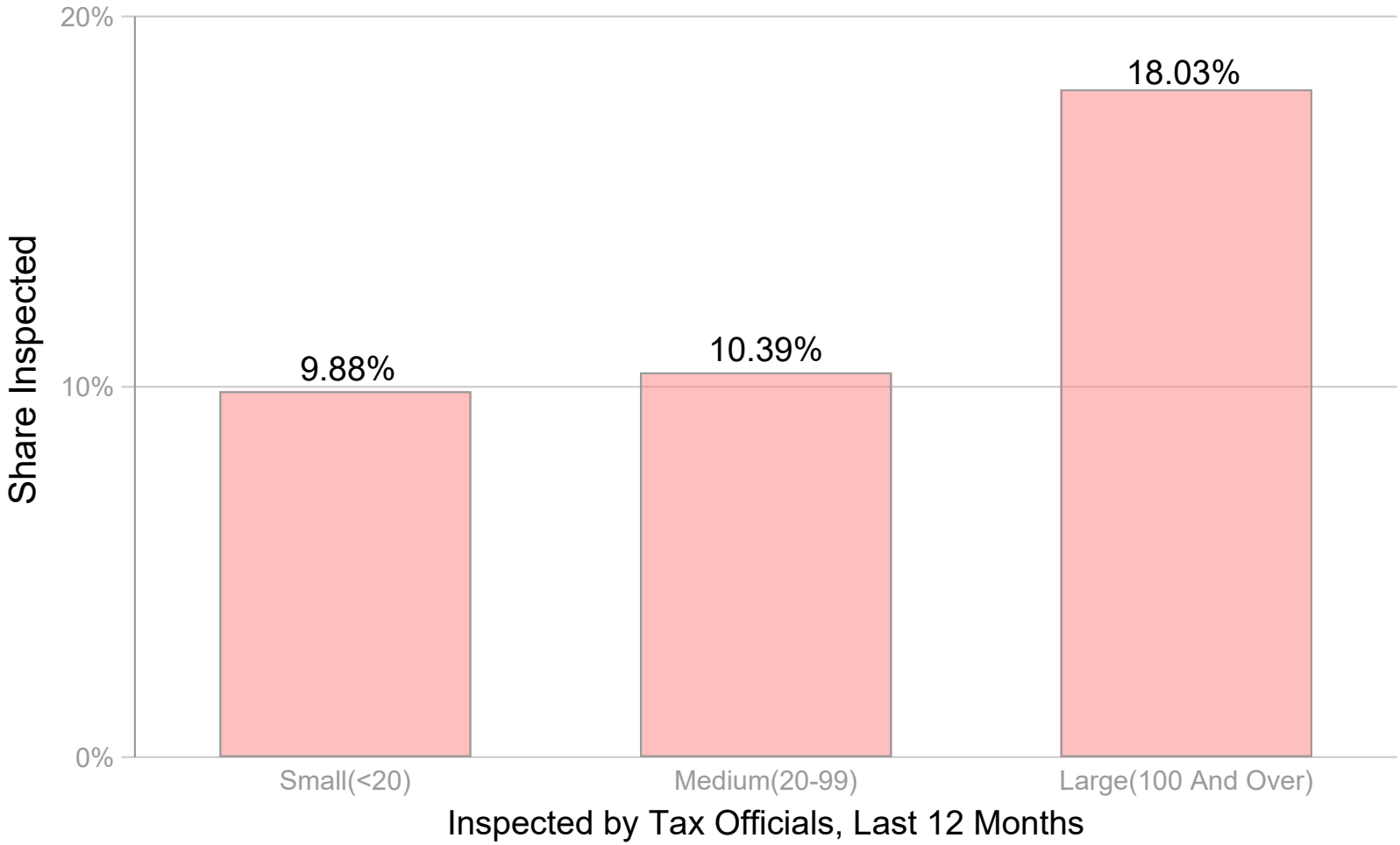
- **Ministry of the Economy and Finance (2016)**, Tab. 3.H.1. and 3.H..2
  - Approach: *top-down* (national accounts) and *bottom-up* (audit data)
  - 2010 PIT gap by self-employed and firms: **52.7%**, 20 bln Euros

- **Galbiati and Zanella (2012)**, Tab. 2, Col. 3 and 4
  - Data source: 1987 universe of *Guardia di Finanza* (Tax Police) audits
  - Concealed personal income rate: **46.4%**; PIT gap: **55.2%**

- Note: these statistics do *not* only account for revenue manipulation.

▸ Introduction

Small firms have relatively lower audit rates: Italy

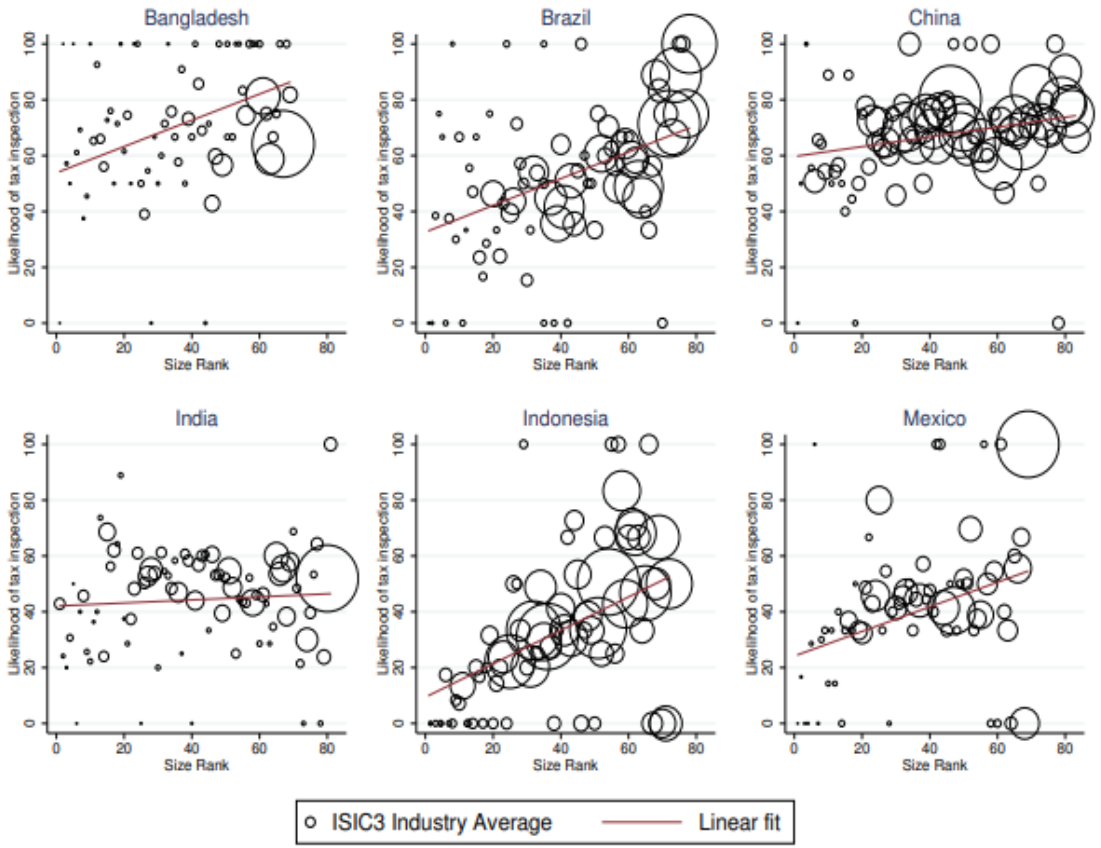


Note: data source is the 2019 World Bank Enterprise Survey, with 748 Italian firms by workforce size.

▸ Introduction ▸ Audit risks

Small firms have relatively lower audit rates: cross-country

FIGURE 4: INDUSTRY SIZE AND TAX INSPECTION IN MAJOR COUNTRIES



Source: World Bank Enterprise Surveys 2003-2015.
Figure 4 plots each ISIC 3 industry by its firm size rank on the probability of tax inspection in the six most populous countries, as discussed in Section 4.1. When multiple surveys exist for a country we use the latest survey. The size of the dots is the share of total employment (in our sample) within the country. Therefore dot size are not comparable across countries but only show relative size of industries within a country. The red line plots the linear fit of size rank on tax inspection.

Source: Bachas et al. (2019). ▸ Introduction

Disclosing audit rules: the Italian Sector Studies (SeS)

- Businesses with revenues $\leq$ €5.2 mln, in any of $\sim$ 200 sectors
- **Revenue presumption** by Revenue Agency via statistical models:

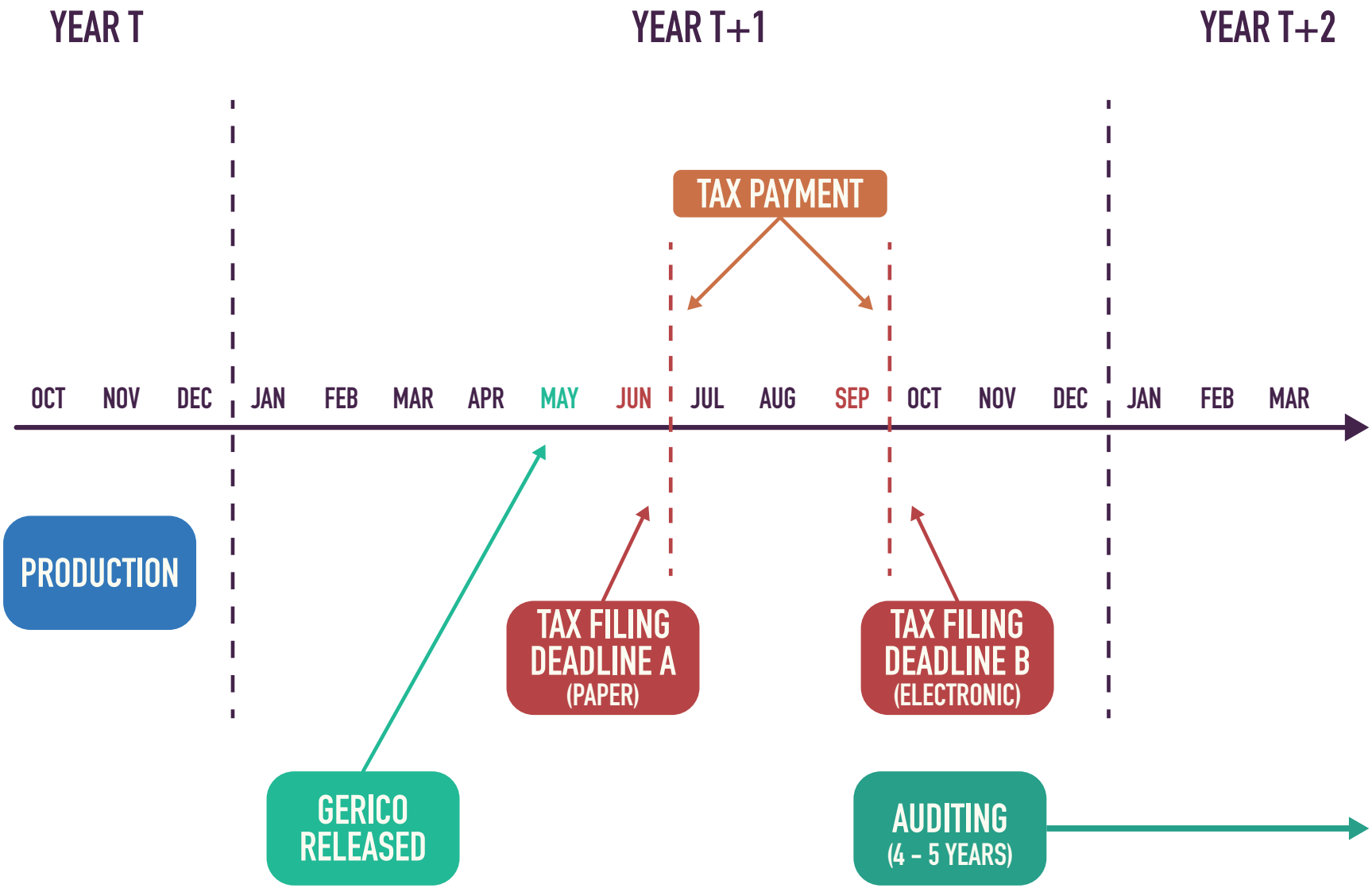
Firms **declare** revenues and inputs y_i, X_i → Agency **presumes** revenues $\hat{y}_i = \hat{\beta} X_i$ → Firms **compare** declared vs. presumed y_i vs. $\hat{y}_i$

- *Just* ahead of tax season, firms can learn $\hat{y}_i$ via **GERICO** ▸ Google
- **Law forbids SeS-based audits** for firms reporting $y_i \geq \hat{y}_i$ ▸ Law 146/98

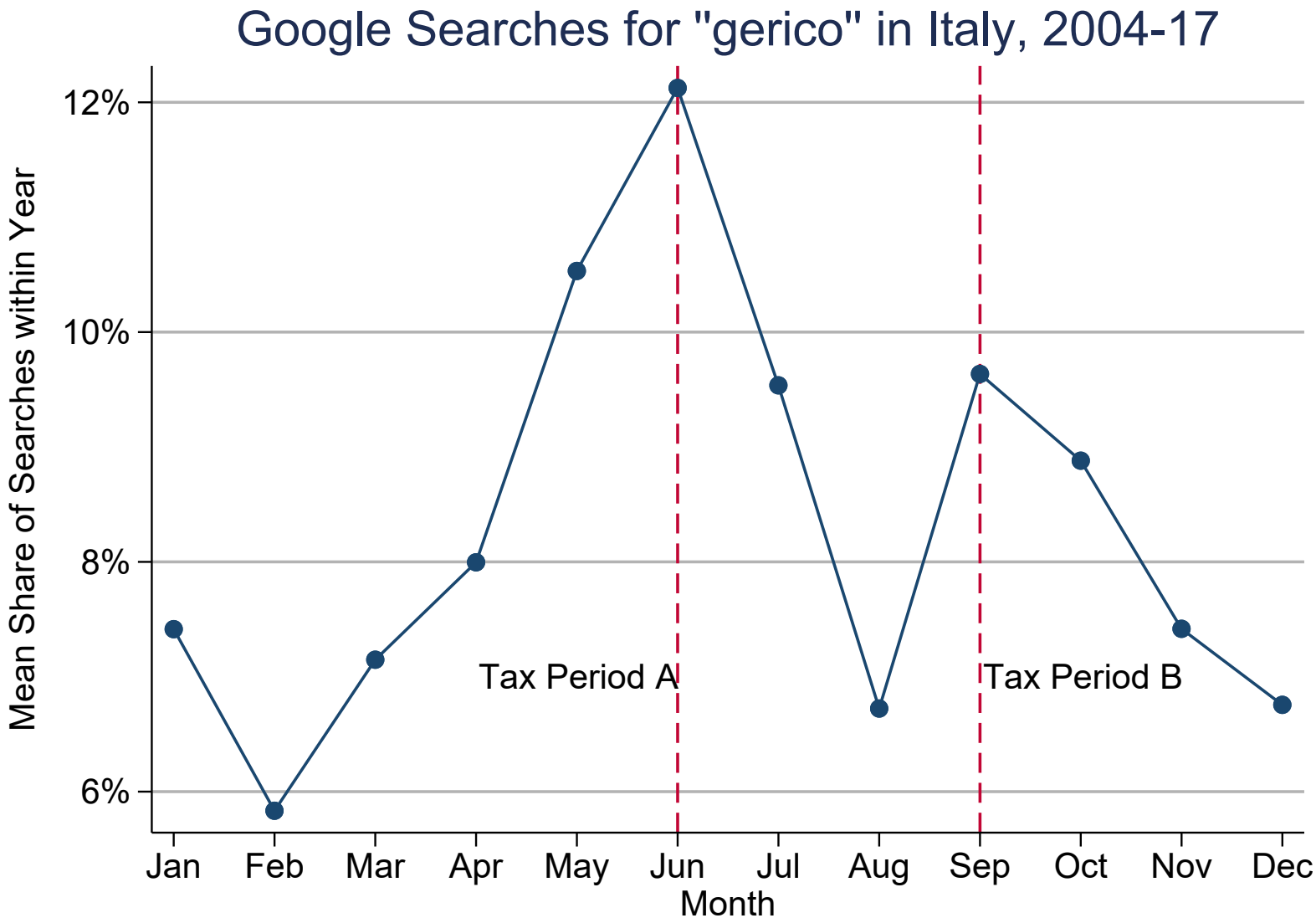
▸ Paper overview

Disclosure timing discourages production responses

Firms produce *before* acquiring exact knowledge of audit rule:



GERICO searches spike in tax periods



▸ SeS overview

SeS: a discontinuous audit process

▸ SeS overview

SeS-based revenue audits (our main focus)

- zero probability above the "presumed" revenues threshold
- positive probability below

Law n. 146/1998, Article 10

"The tax assessments based on the Sector Studies [...] shall apply to taxpayers [...] when declared revenues or remunerations are less than the revenues or remunerations which may be determined on the basis of such Studies."

Other audits:

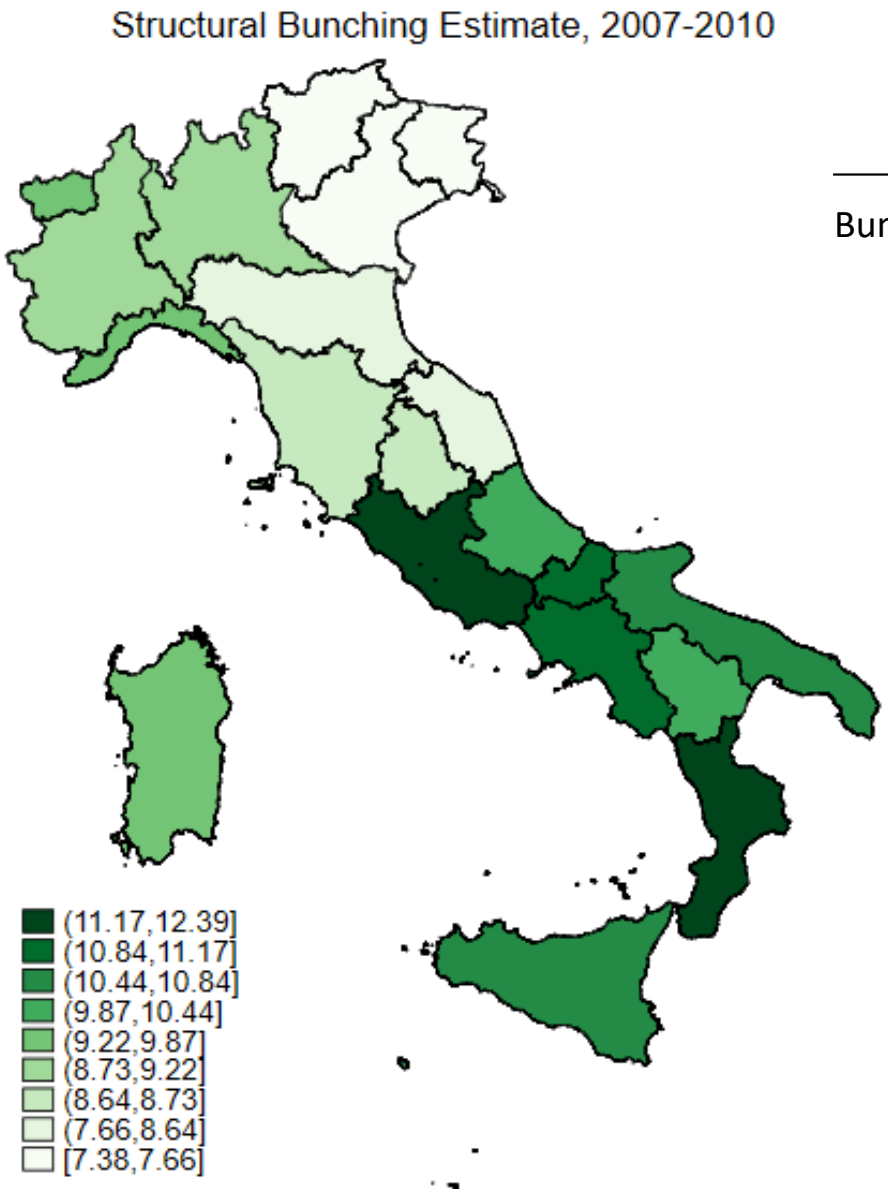
- from any other clue of misreporting (from SeS or not)
- constant *residual* audit risk around presumed revenues threshold

SeS database overview

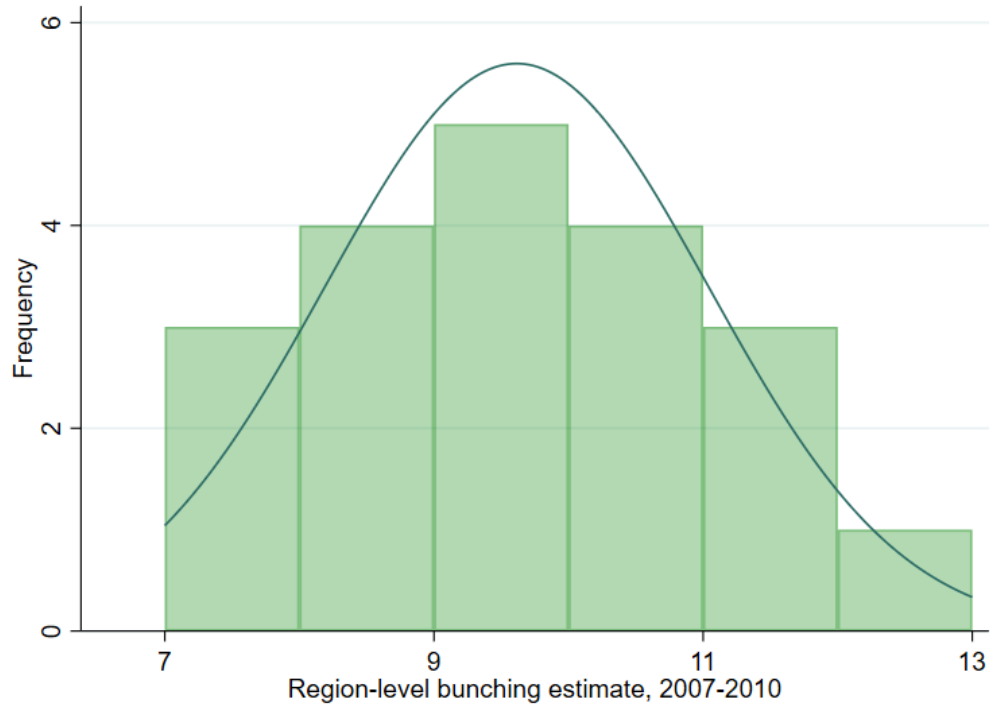
▸ Paper overview

- Previously unexploited population data from Italian Revenue Agency
- SeS declarations filed by Italian small firms and self-employed (revenues $\leq$ €5.2 mln), 2007-2016
  - **Universe (2007-2010)** vs. **Panel (2011-2016)**
  - 26.6 mln declarations by 4.7 mln taxpayers
  - $\sim$3.4 mln declarations per year in 2007-2010
- Variables include (from SeS files):
  - declared revenues and presumed revenues
  - sector, geography, legal entity type
  - others: profits, labor force, operating costs, physical capital

SeS bunching across Italian regions, 2007-2010

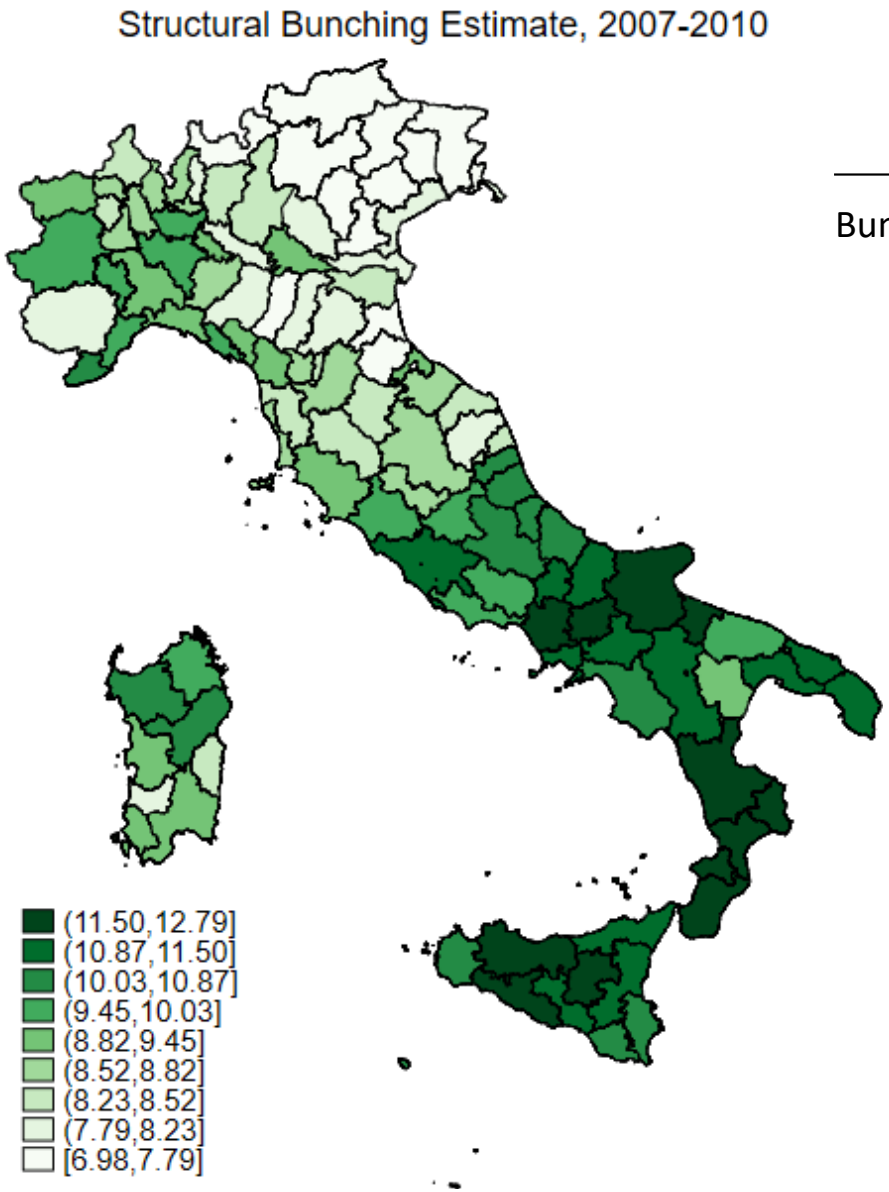


	N. Obs.	Mean	Median	SD	Min	Max
Bunching	20	9.61	9.46	1.43	7.38	12.39

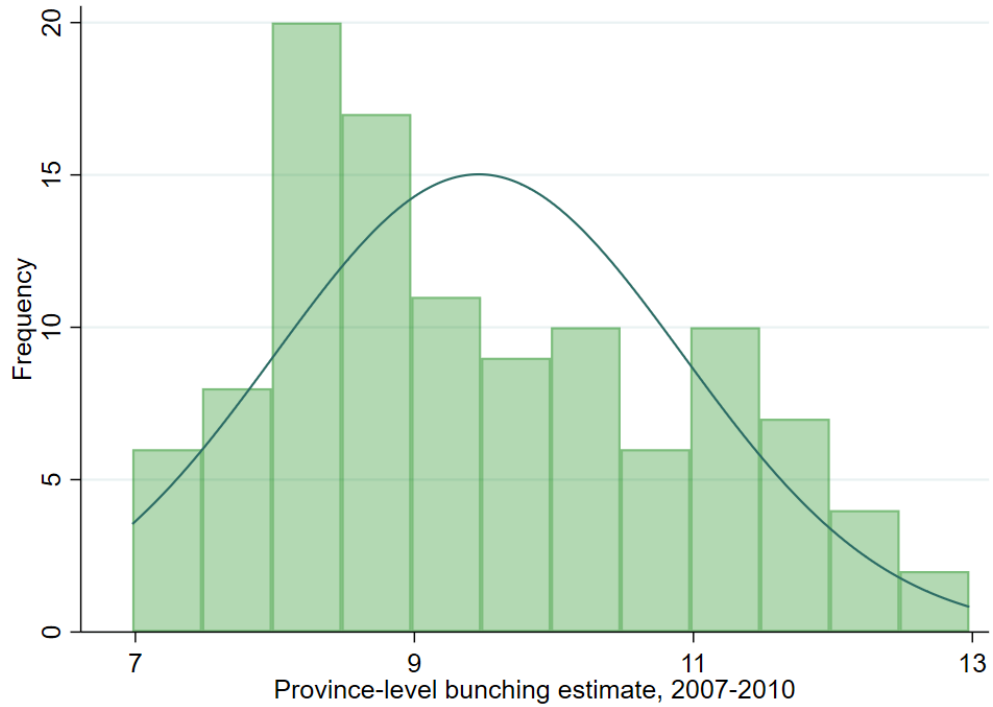


▸ Bunching ▸ Evasion proxies

SeS bunching across Italian provinces, 2007-2010

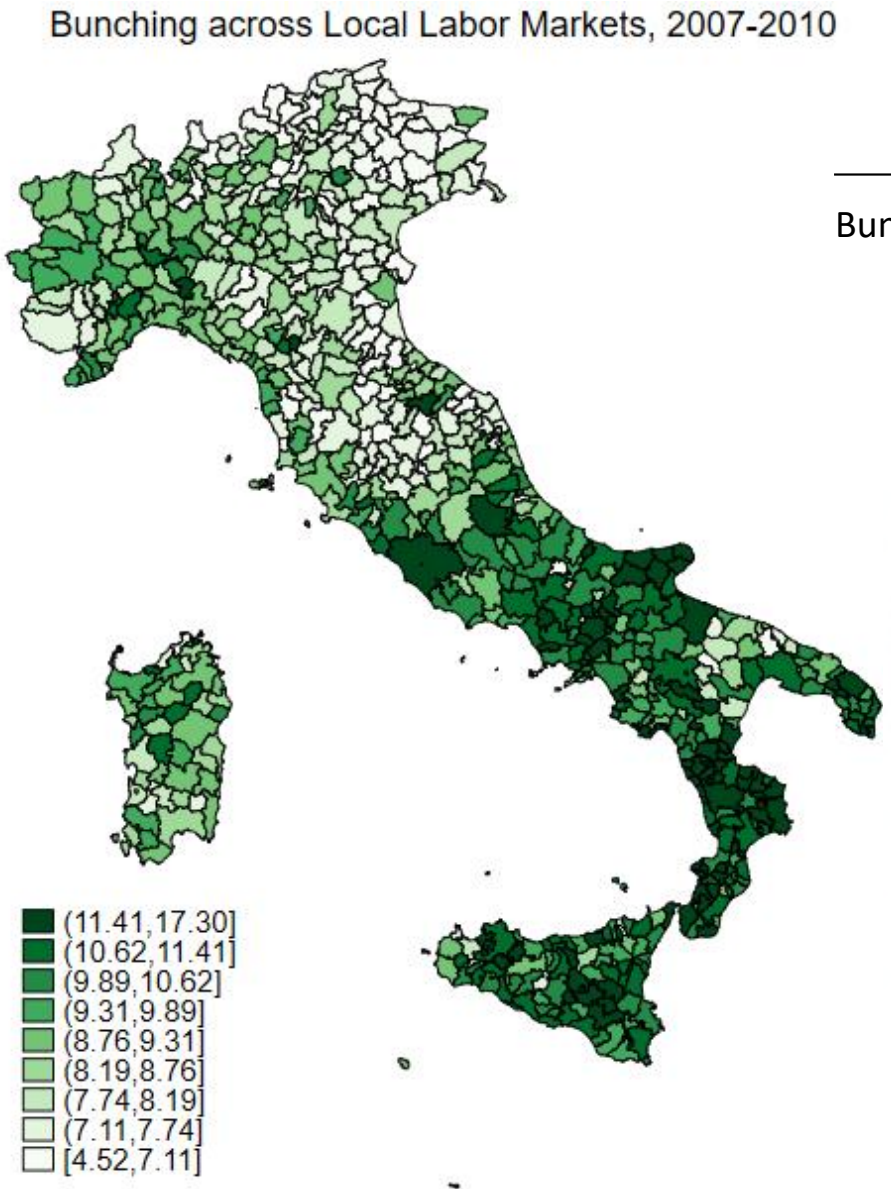


	N. Obs.	Mean	Median	SD	Min	Max
Bunching	110	9.46	9.23	1.46	6.98	12.79

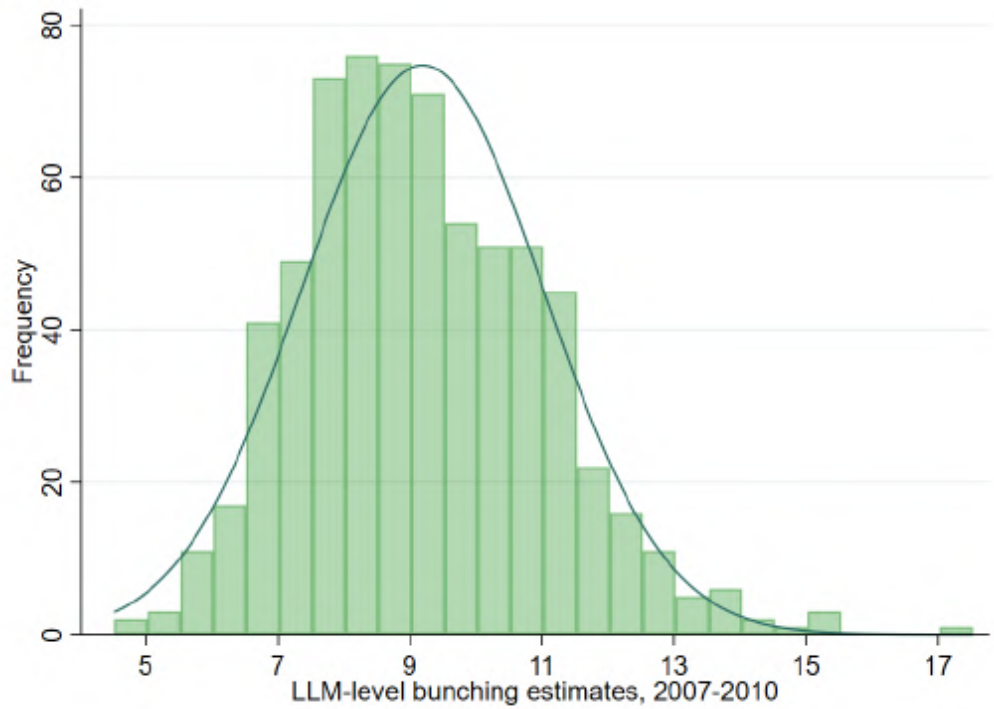


▸ Bunching ▸ Evasion proxies

SeS bunching across local labor markets, 2007-2010

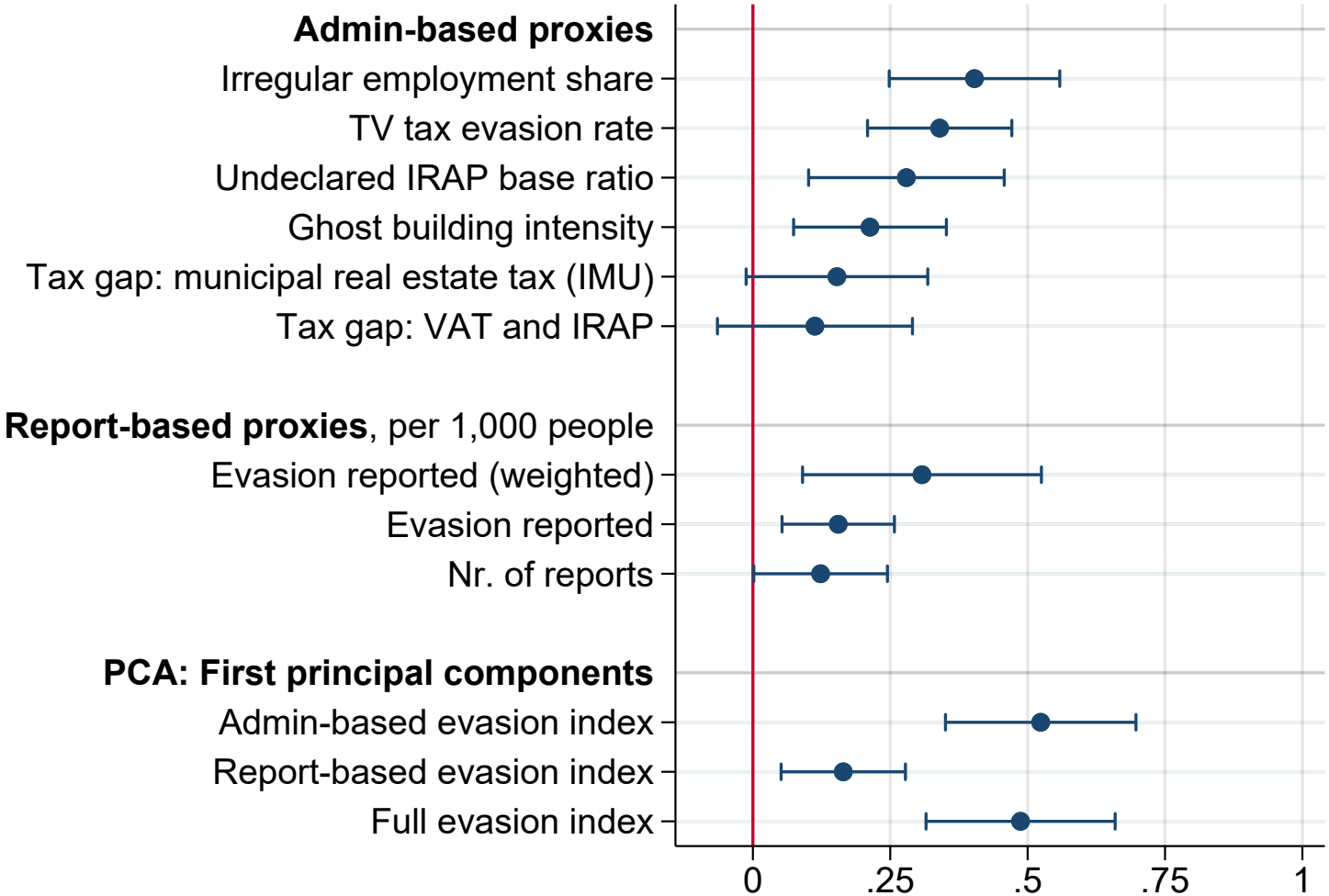


	N. Obs.	Mean	Median	SD	Min	Max
Bunching	686	9.19	8.99	1.83	4.52	17.30



▸ Bunching ▸ Evasion proxies

Across places, high evasion predicts high bunching

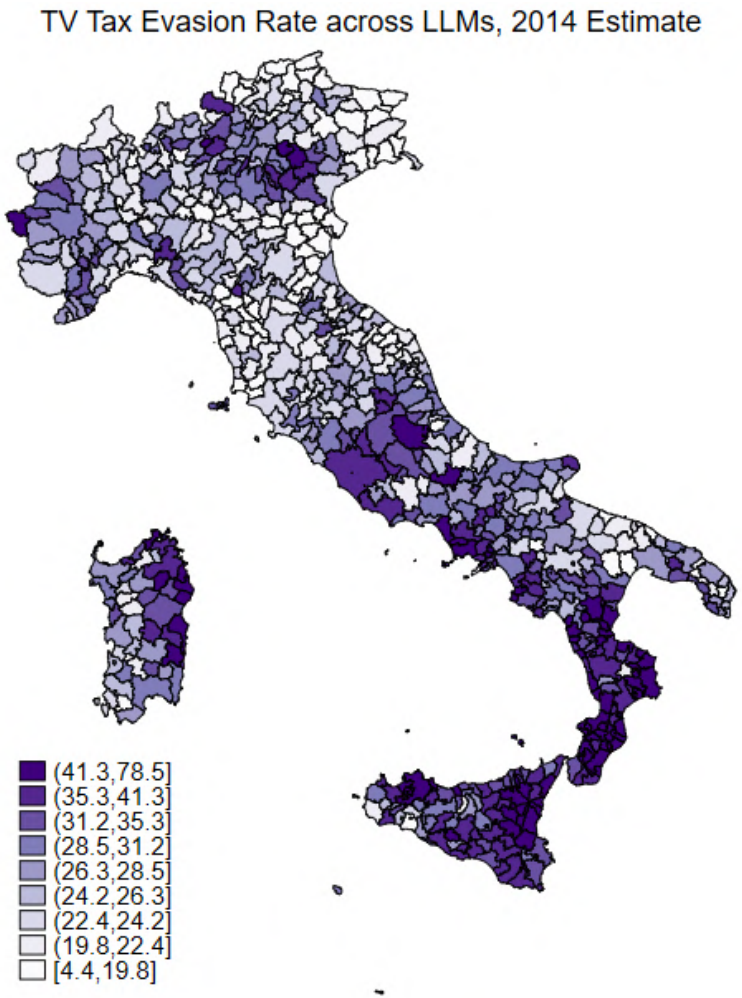


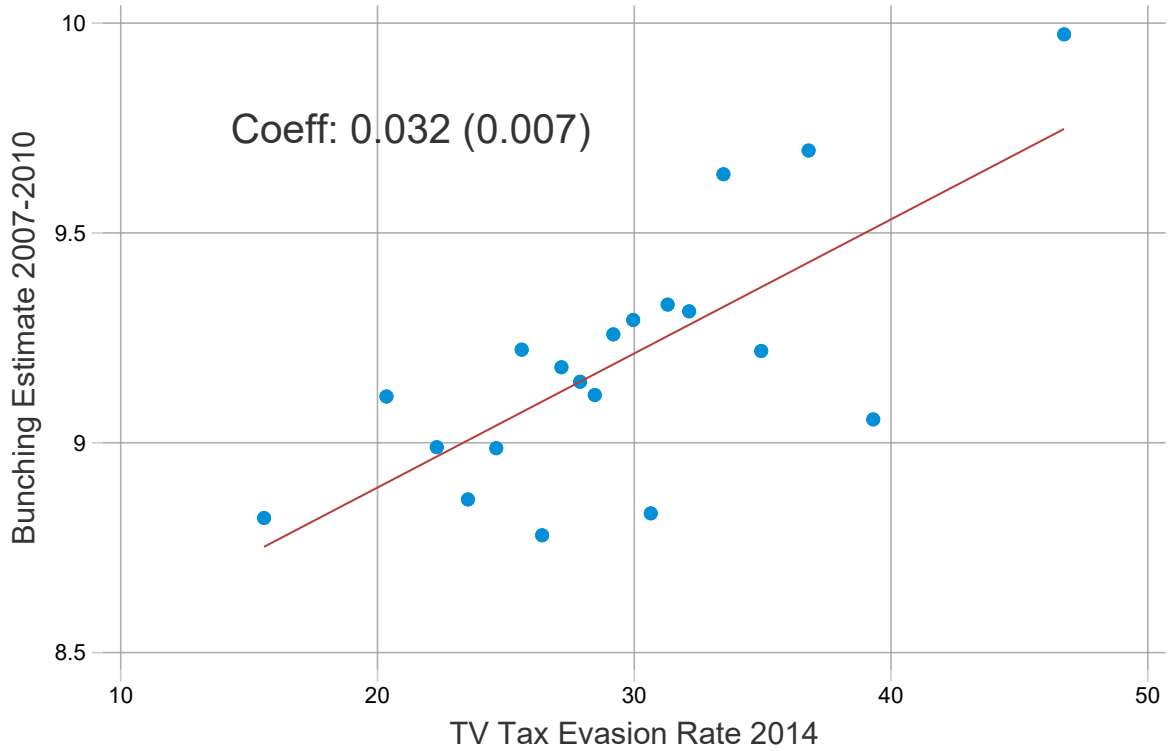
Note: evasion reports from evasori.info, 2008-2011.

Std. betas on provincial evasion proxy j ($N = 110$): ▸ Bunching ▸ Map ▸ Audit costs

$$bunching_i = \alpha + \beta Evasion_{j,i} + \gamma \log \text{VA pc}_i + \text{macro region}_i + \varepsilon_i$$

Bunching reflects evasion: TV tax

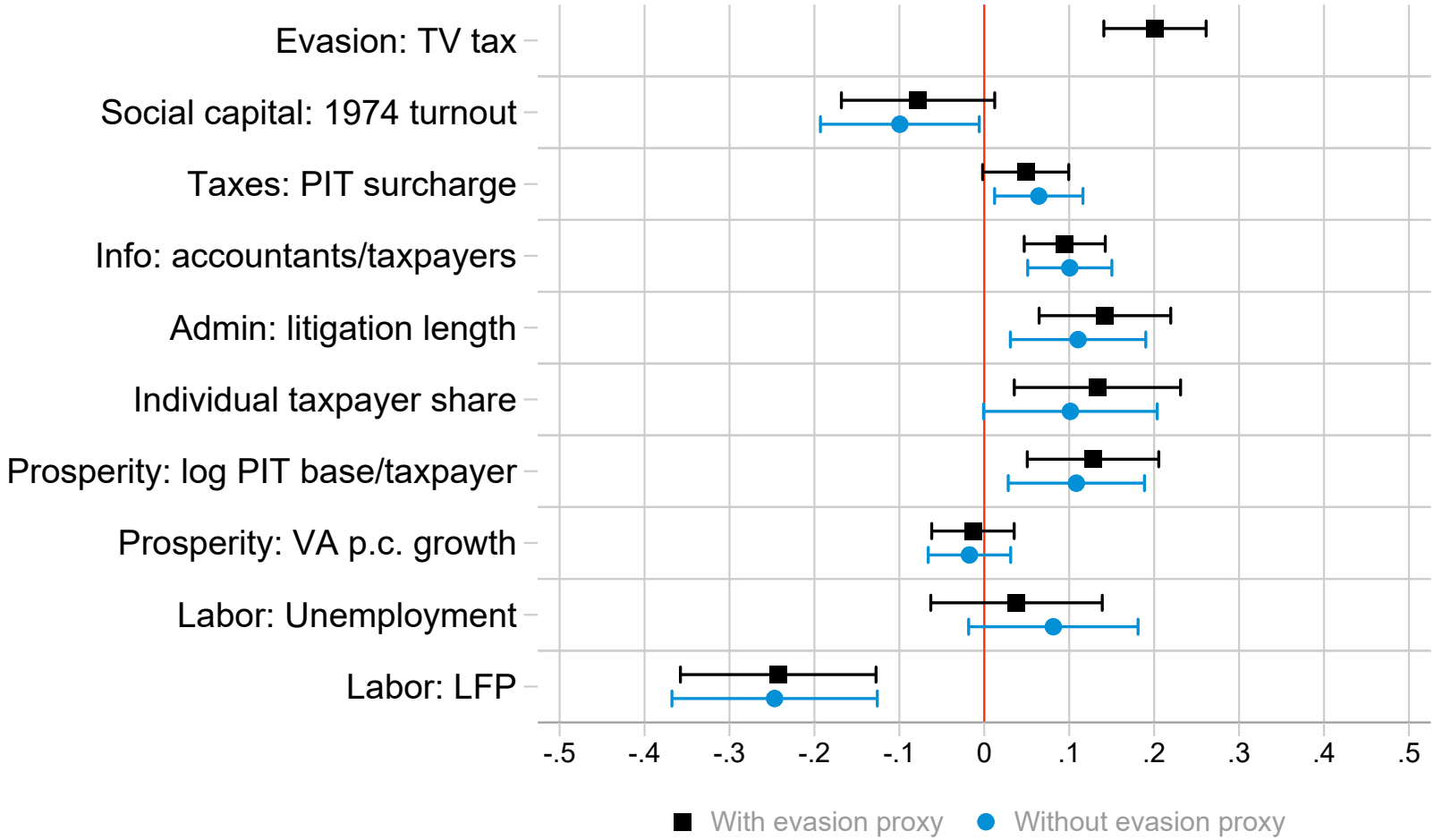




Note: 2014 data from 8,044 *comuni*, weighted by 2011 resident HHs. LLM OLS.

▸ Specification ▸ Evasion proxies ▸ Bunching

Horserace: evasion correlation robustness



Note: robust 90% CIs depicted. Regional fixed effects included. Dependent variable is PIT taxpayers bunching across 624 LLMs, over 2007-2010.

Std. coefficient on LLM covariates ($N = 686$): ▸ Bunching ▸ TV tax

$$bunching\text{PIT}_i = \alpha + \beta \underline{X}_i + \gamma \log \text{PITbase pt}_i + \text{region}_i + \varepsilon_i$$

Bunching: reporting or production responses?

In our conditional correlation analysis, bunching tracks evasion...

- **incentives**: municipal surcharges on the national PIT schedule
- **potential**: higher bunching among firms that are downstream, with lower turnover, with fewer reporting requirements, and near more accountants

Production response is unlikely...

- due to policy timeframe
- as we observe sharp bunching
- as bunching doesn't grow over time within a model's 3-year cycle

▸ Structural overview

Assessing the effects of disclosure ▸ PRE ▸ IPE

- The net effect of disclosure is positive if

$$\text{Incentive provision effect} > \text{Probability reduction effect}$$

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where ε is revenues elasticity to the expected avoided tax, $\tau - \tau\gamma p$

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- Observe LHS in the data (estimating counterfactual with p_L)
- Estimate RHS identifying ε and Δp with structural assumptions
- Interpretation:
  - IF bunching is **determined by risk jump more than elasticity**
  - THEN, disclosure improves compliance

Modeling firms: constant vs. discontinuous risk

▸ Overview

- Sketch **firms**' revenue manipulation at tax filing
  - producing revenues with heterogeneous abilities
  - underreporting revenues generates value in expectation
- **Evasion** behavior responds to incentives and costs
  - marginal benefit set by tax and perceived audit environment: $\tau - \tau\gamma p$
  - evasion potential and costs may vary by sector and size: $g(e)$
- Audit rule **disclosure** *only* affects intended evasion behavior
  - conservative assumption: audits are costless with no evasion

Model setup: constant audit risk

Overview

Risk-neutral firms maximize their value w.r.t. $\mathbf{y}^*$ and $\mathbf{e}$:

$$V(y^*, e) = y^* - (1-\tau)\cdot \underbrace{c(y^*;\theta)}_{\text{production costs}} - \tau \cdot \underbrace{(y^* - e)}_{\text{declared revenues}} - \underbrace{p_L \cdot \gamma \cdot \tau \cdot e}_{\text{expected penalty}} - \underbrace{g(e)}_{\text{manipulation cost}}$$

- $\mathbf{y}^*$: value of goods produced
- $\mathbf{e}$: extent of revenue underreporting
- θ: heterogeneous production abilities
- $\mathbf{p_L}$: constant probability of undergoing an audit
- τ: flat tax rate on reported profits
- $\gamma > 1$: penalty rate on detected evasion or cost of arrears
- $g(e) = \frac{k_e}{1+\frac{1}{\varepsilon_e}} \cdot \left(\frac{e}{k_e}\right)^{1+\frac{1}{\varepsilon_e}}$: organizational or psychological cost of e

Model: disclosure induces manipulation bunching

▸ Over ▸ Eff

- Assume iso-elastic **manipulation costs**:

$$g(e; k_e, \varepsilon_e) = \frac{k_e}{1 + \frac{1}{\varepsilon_e}} \cdot \left(\frac{e}{k_e} \right)^{1 + \frac{1}{\varepsilon_e}}$$

- With constant audit probability, **equilibrium evasion** is:

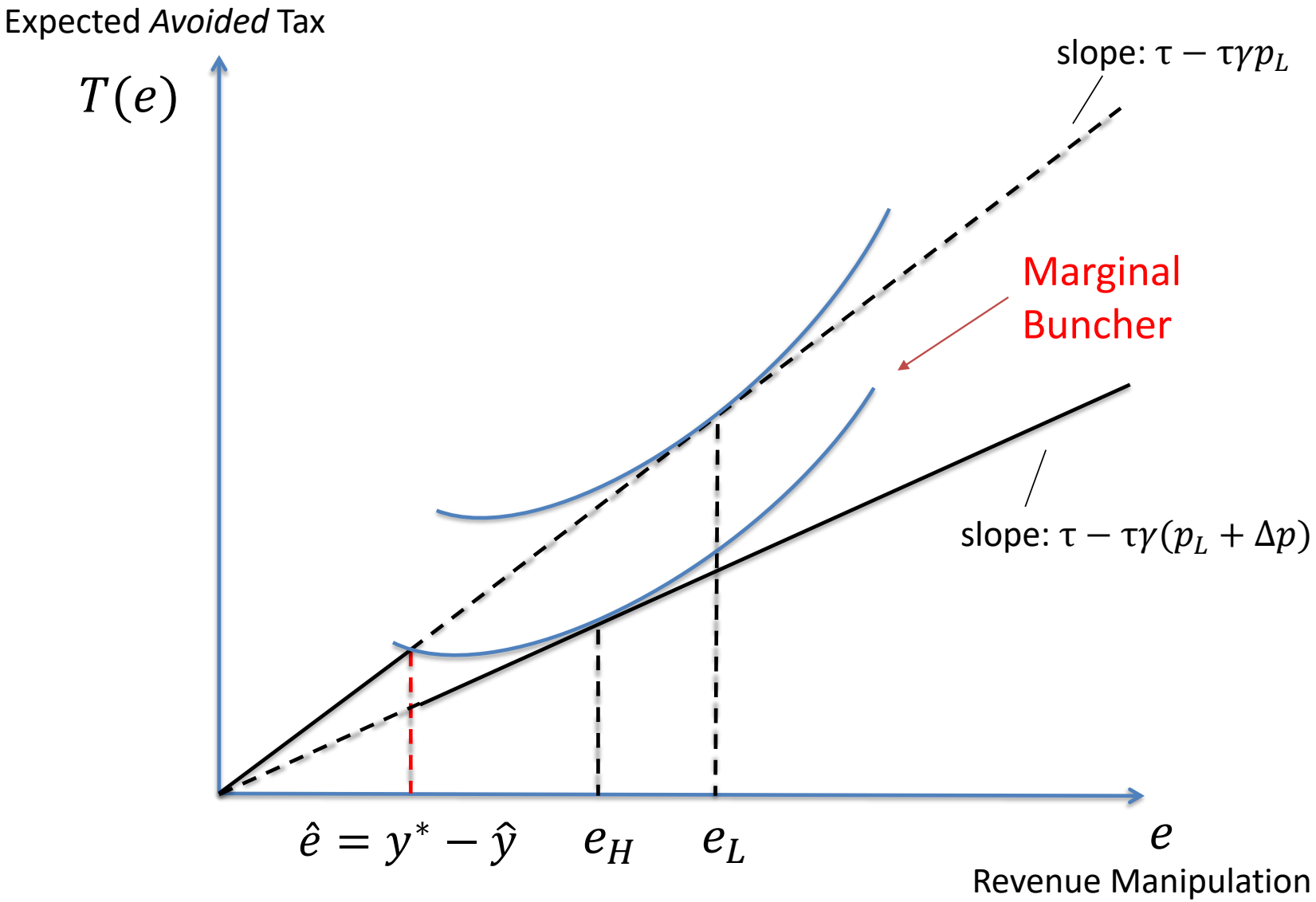
$$e^{eq} = k_e \left(\tau - p_L \cdot \gamma \cdot \tau \right)^{\varepsilon_e}$$

- Disclosure provides bunching incentives up to a **marginal buncher**:

$$\text{IC:} \quad \underbrace{V^i \left(\hat{y} - \Delta\hat{y}; p_L + \Delta p, k_e, \varepsilon_e \right)}_{\text{value at interior solution}} = \underbrace{V^n \left(\hat{y}; p_L, k_e, \varepsilon_e \right)}_{\text{value at the notch}}$$

Marginal buncher: indifference condition

▸ Structural overview



Cost or input manipulation as alternative SeS response

- 2011 reform: in the SeS, **revenue** responses seem **first order**. Why?
  1. some inputs are structural; others have $\beta < 1$
  2. "cost adjustment trap": lower costs mean higher tax base
  3. coherence and normality: other SeS thresholds limit excesses
  4. adjusting costs might raise risk, raising revenues reduces it
- In terms of our **structural** approach:
  - implicit separability: firms can misreport costs, but not due to $\hat{y}$
  - with cost manipulation: smaller revenue elasticity, thus smaller losses

▸ Structural overview ▸ Model overview ▸ Disclosure effects

Structural estimation: logic

▸ Overview

- Disclosure provides bunching incentives up to a **marginal buncher**:

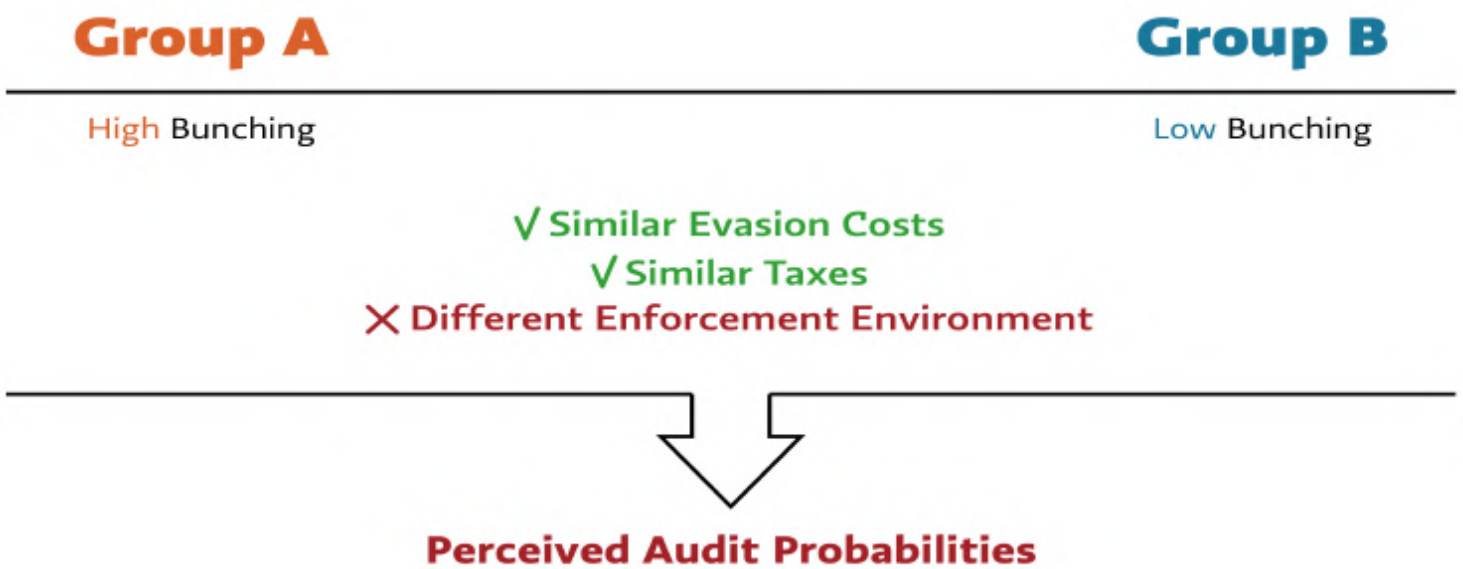
$$\text{IC: } \underbrace{V^i\left(\hat{y} - \Delta\hat{y}; p_L + \Delta p, \Theta\right)}_{\text{value at interior solution}} = \underbrace{V^n\left(\hat{y}; p_L, \Theta\right)}_{\text{value at the notch}}$$

- Use excess bunching at $\hat{y}$ to identify revenue response $\Delta\hat{y}$
- Next, to identify model primitives $(p_L, \Delta p, \Theta)$, exploit **variation** in:
  - **revenue responses** to $\hat{y}$ by region, industry, and presumed revenues
  - personal income **tax rates** (set by municipality and region)
- Add **restrictions** to model primitives to ensure degrees of freedom:
  - common audit risks by region, since auditing is set by local tax offices
  - common costs by industry and scale to get at different evasion hurdles

Structural identification: intuition for p and ε ▸ Overview

- We set up a **simulated GMM** procedure (Aghion et al., 2017)
  - bunching and tax variation with restrictions to estimate parameters

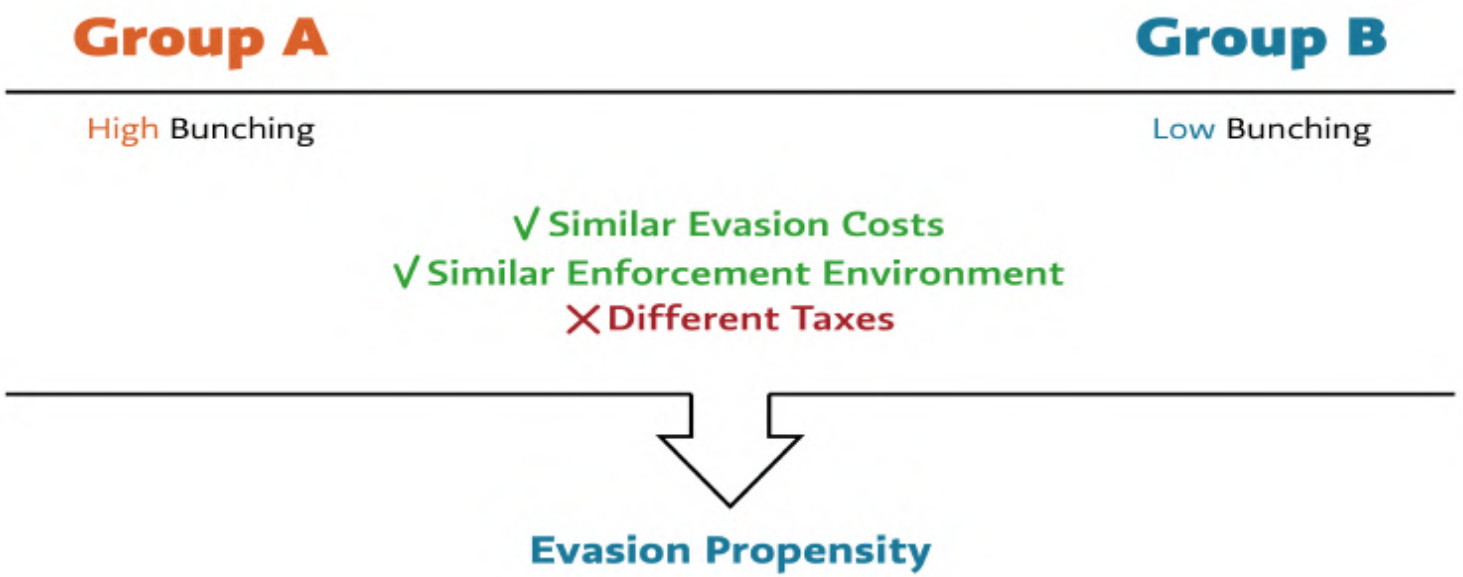
- **Case 1/2**: Consider two groups of firms...



Structural identification: intuition for p and ε ▸ Overview

- We set up a **simulated GMM** procedure (Aghion et al., 2017)
  - bunching and tax variation with restrictions to estimate parameters

- **Case 2/2**: Consider two groups of firms...



- Still, all parameters are estimated *jointly* off of functional forms

Intermediate results: equilibrium evasion with p_L

We estimate mean revenue evasion with constant audit risk p_L:

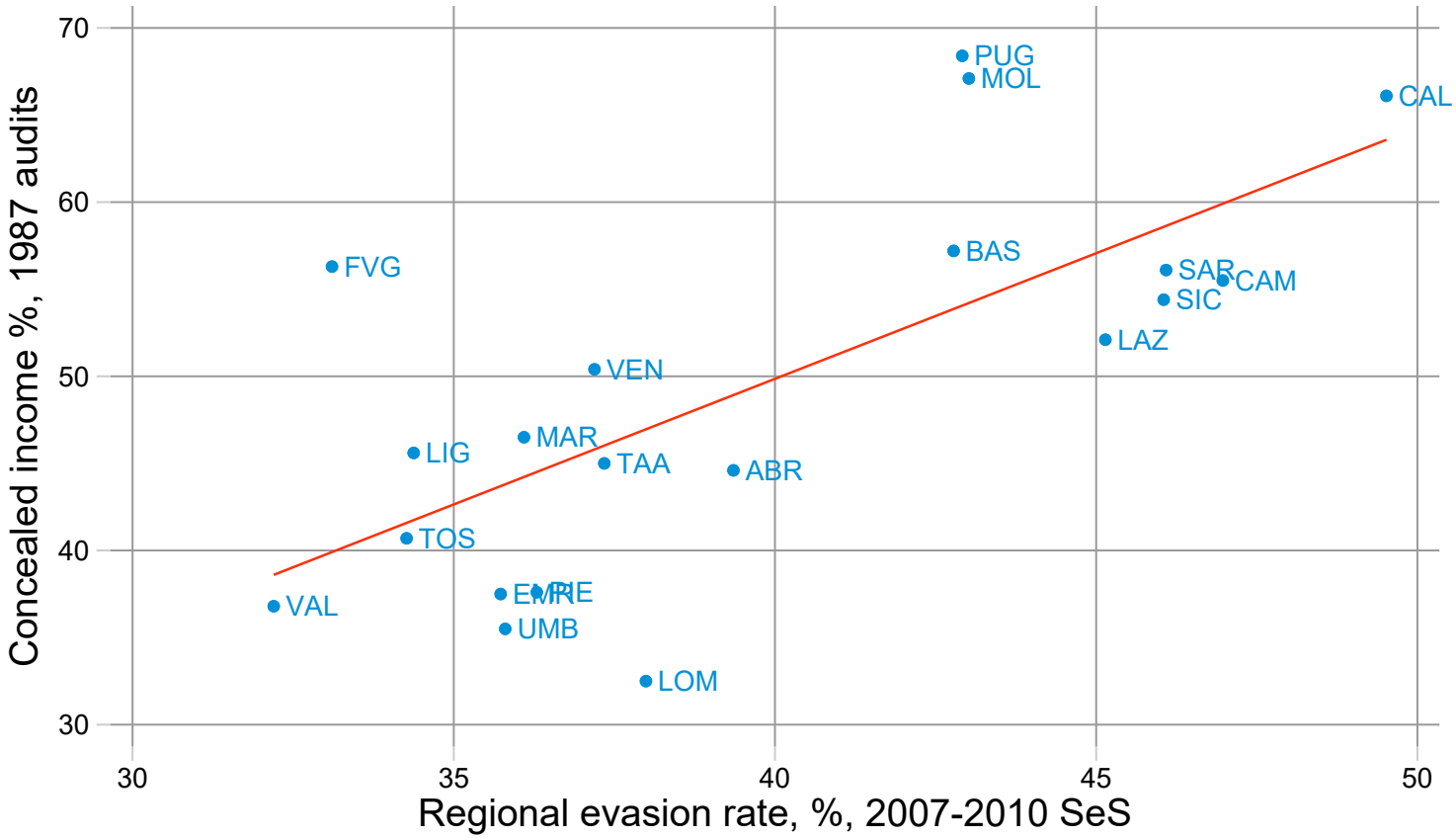
1. Across firm groups, mean evasion exceeds 1/3 **of median profits**
2. Evasion rates are higher among downstream **sectors**
3. Estimated evasion rates correlate with **regional** evasion estimates
4. Estimated **audit risks** are in the ballpark of administrative sources

▸ Audit risks ▸ Structural overview ▸ Disclosure effects

Model predicts audit-based concealed income dispersion

Out-of-sample prediction using model's equilibrium evasion as income %:

$$e^{eq}/\pi^{med} = k_e \left(\tau - p_L \cdot \gamma \cdot \tau\right)^{\varepsilon_e} / \pi^{med}$$



Note: data for 20 regions. Outcome comes from Galbiati and Zanella (2012), JPubEc, from the universe of 1987 audits by the Italian fiscal police on individual businesses. Model evasion is reported as a share of median income for Sector Studies PIT taxpayers, 2007-2010.

Probability estimates near real audit risk

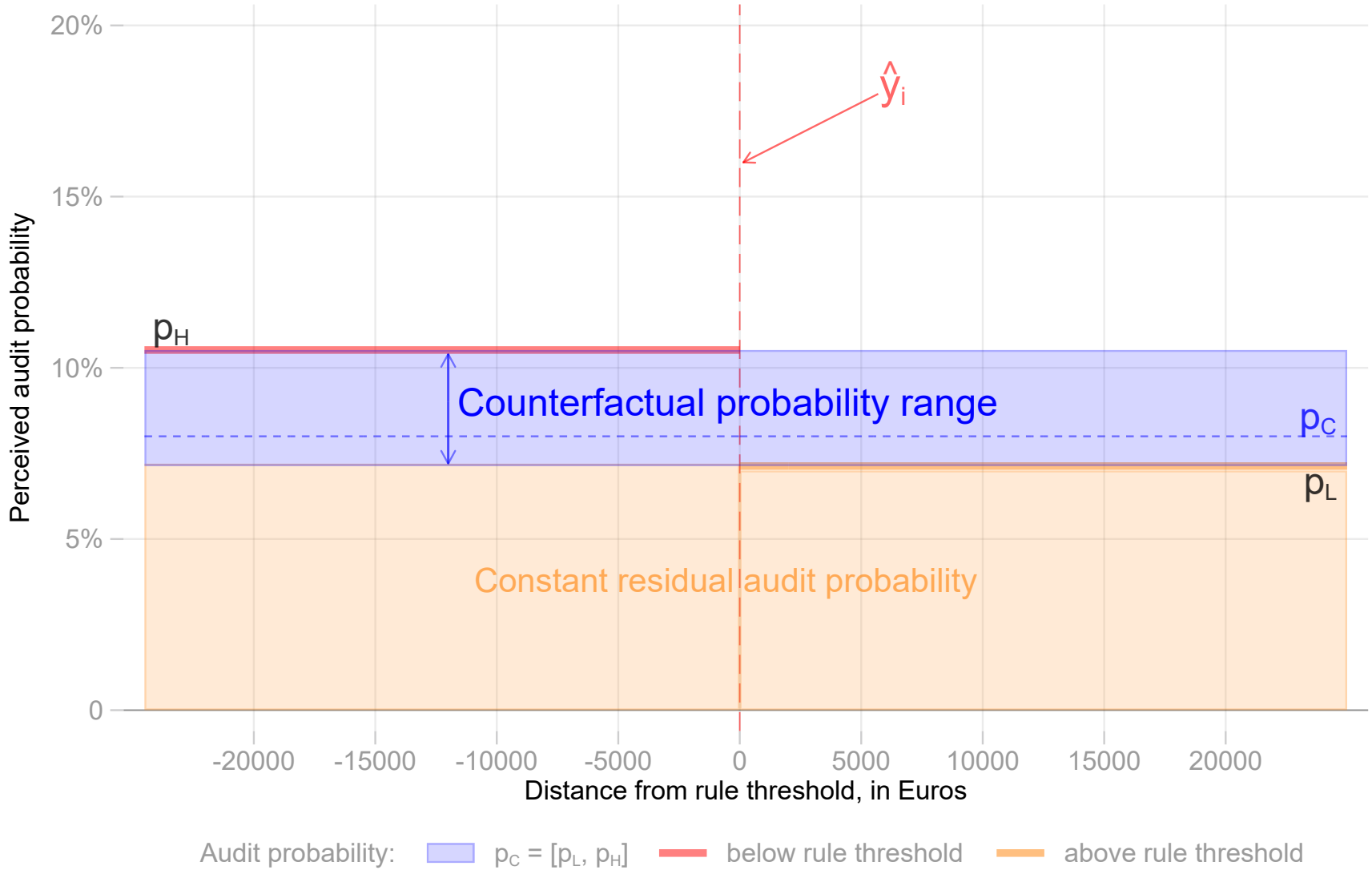
Parameter	N	mean	sd	min	max
p_L	20	10.8%	3.1%	4.6%	15.2%
p_H	20	15.6%	2.2%	10.8%	19.7%
Δp	20	4.8%	1.9%	2.7%	8.6%

D'Agosto et al. (2017), for Sector Studies PIT taxpayers, 2007-2010:

- Share of audited above $\widehat{y}$: 7.13%
- Share of audited below $\widehat{y}$: 10.52%
- Implied probability jump: 3.39%

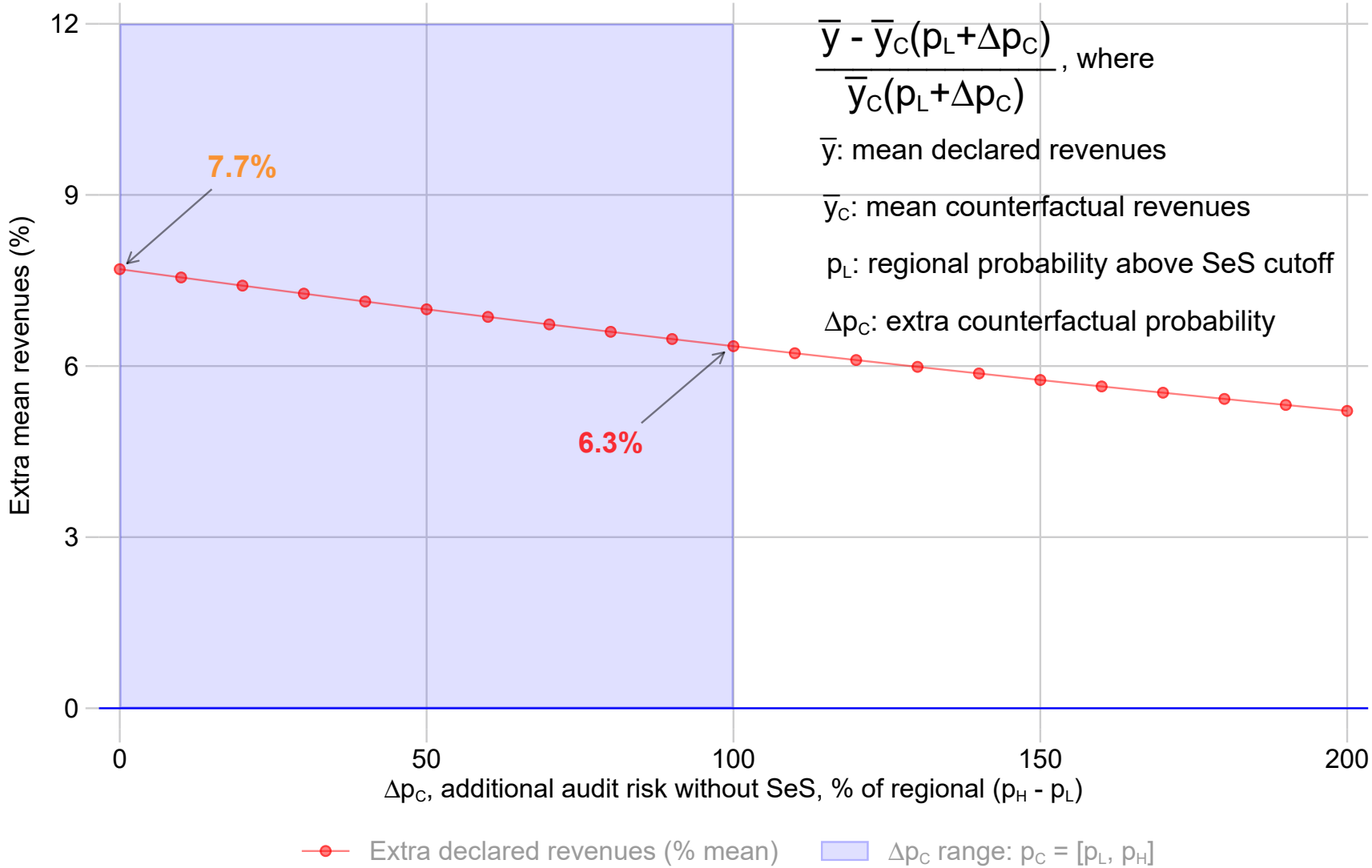
▸ WES ▸ Structural overview ▸ Results overview

Audit counterfactuals: sensible range for p_C



▸ Disclosure effects

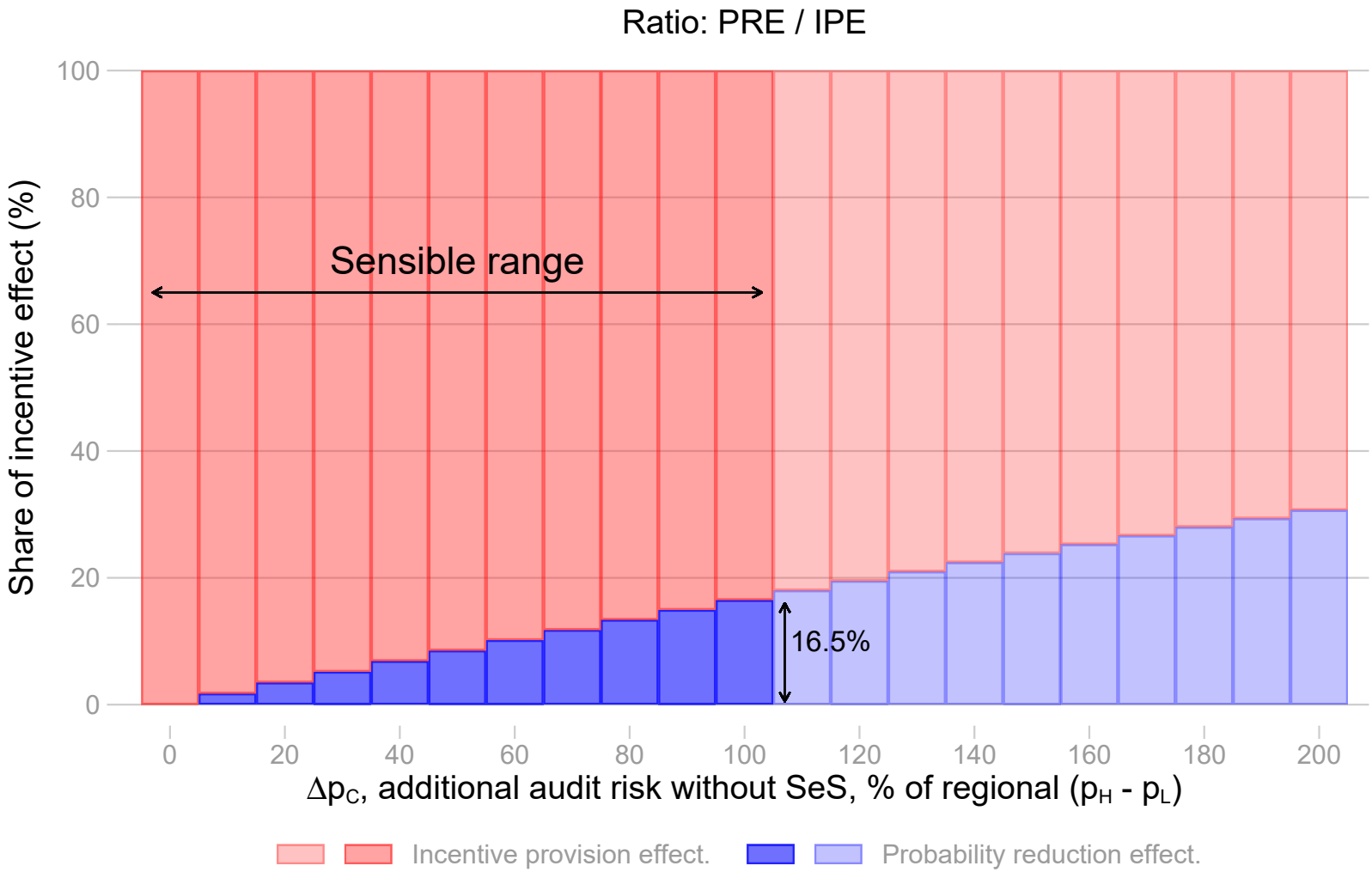
Disclosure effects across audit counterfactuals, 2007-2010



▸ Result ▸ Eq ▸ Sensible range ▸ Gains vs. losses ▸ Effectiveness ▸ Welfare ▸ Audit costs ▸ Costs

Decomposing SeS disclosure benefits

Over the sensible counterfactual range, probability reduction effects undo less than 20% of the constant positive incentive provision effects



▸ Disclosure effects

The effects of disclosure: implications

SeS disclosure raises revenues. Why?

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  - then, SeS audit risks drive bunching more than elasticity does ▸ Corr

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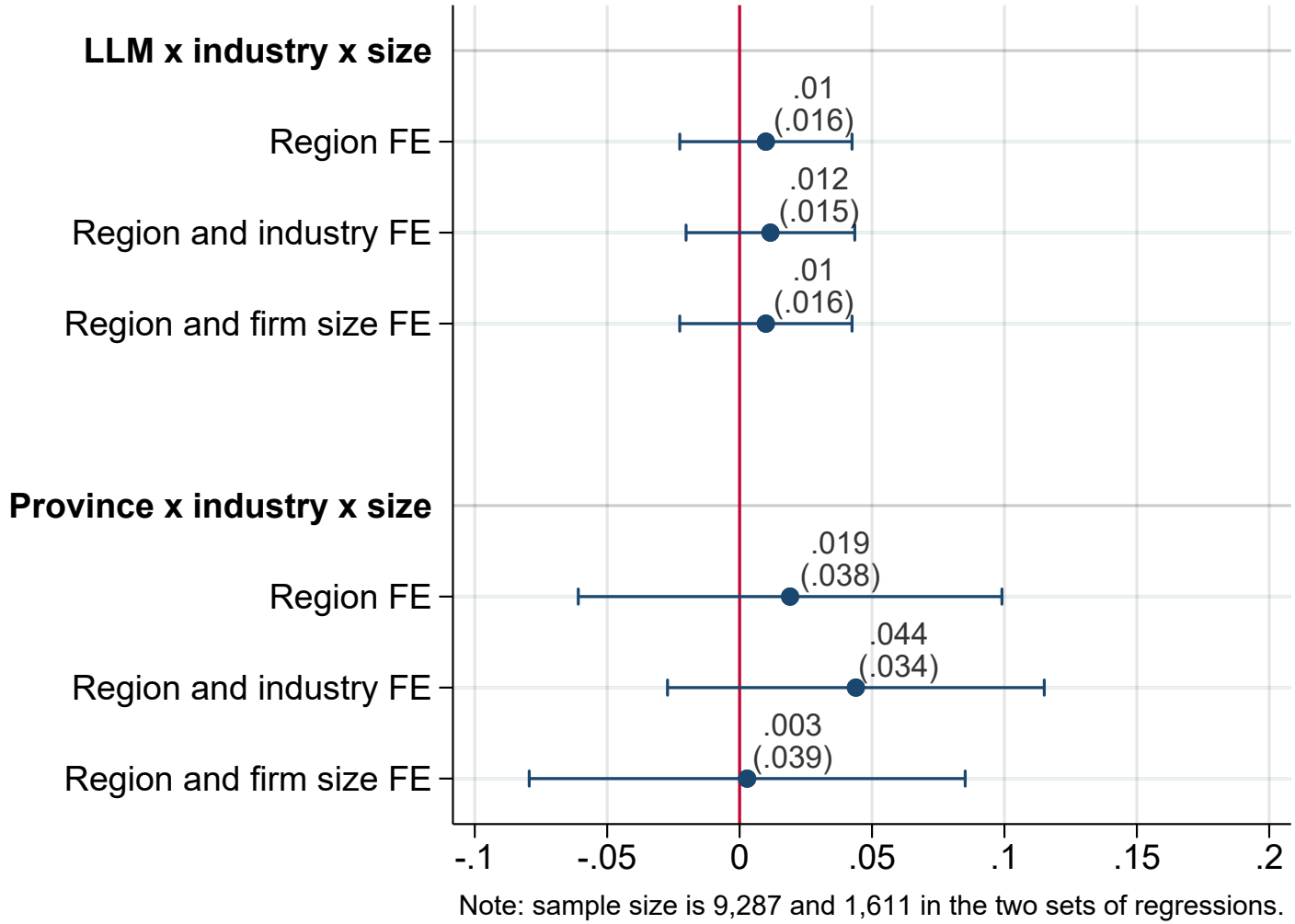
  - we might want evidence that elasticity is relatively *small*
- Fix enforcement: within regions, bunching-tax correlations are *small*
  - then, SeS audit risks drive bunching more than elasticity does ▸ Corr
- Overall, disclosure is more likely to succeed under these conditions
  - when firms are relatively *less* sensitive to tax rates than to audit risks

Within regions, the revenue response-tax correlation is low



Note: sample size is 9,287 and 1,611 in the two sets of regressions.

Six regressions for 2007-2010 responses by PIT payers, regionally clustered SEs, 1-99 percentile response trim. We display β and 95% CIs from: ▸ Implications

$$\log(\Delta\hat{y})_i = \alpha + \beta \log(\text{Mean PIT Surcharge})_i + \text{region}_i + \text{sector/size}_i + \varepsilon_i$$

Alternative models: audit administrative costs

What if tax audits are costly and disclosure helps avoidance?

1. If audit costs are **fixed** and explain all SeS bunching behavior:
   - Audit costs wouldn't influence evasion behavior
   - SeS responses wouldn't correlate with evasion proxies

2. If audit costs **depend on individual evasion** levels:
   - Then SeS responses amount, in practice, to reducing that evasion
   - We might as well model evasion directly

3. If audit costs are so strong that taxpayers **overdeclare**:
   - Overdeclaring one's true revenues within SeS should also correlate with underreporting on other margins or files
   - This seems extremely unlikely

▸ Structural overview ▸ Disclosure effects ▸ Evasion correlations

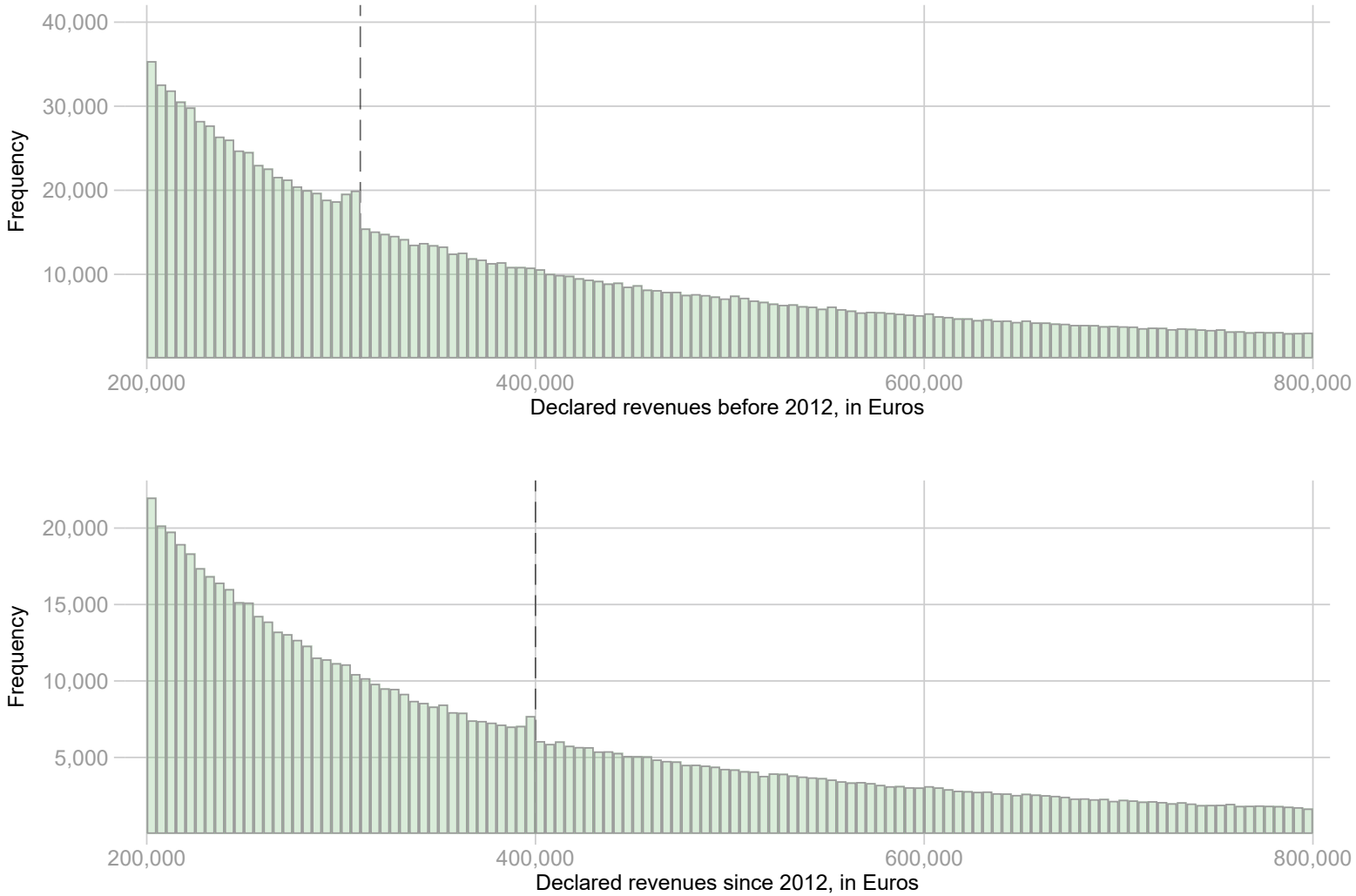
Alternative model: fixed audit administrative cost

Empirics: incentives to bunch

- We find SeS bunching correlates with tax rates
- Exploit two potential sources of variation in audit costs

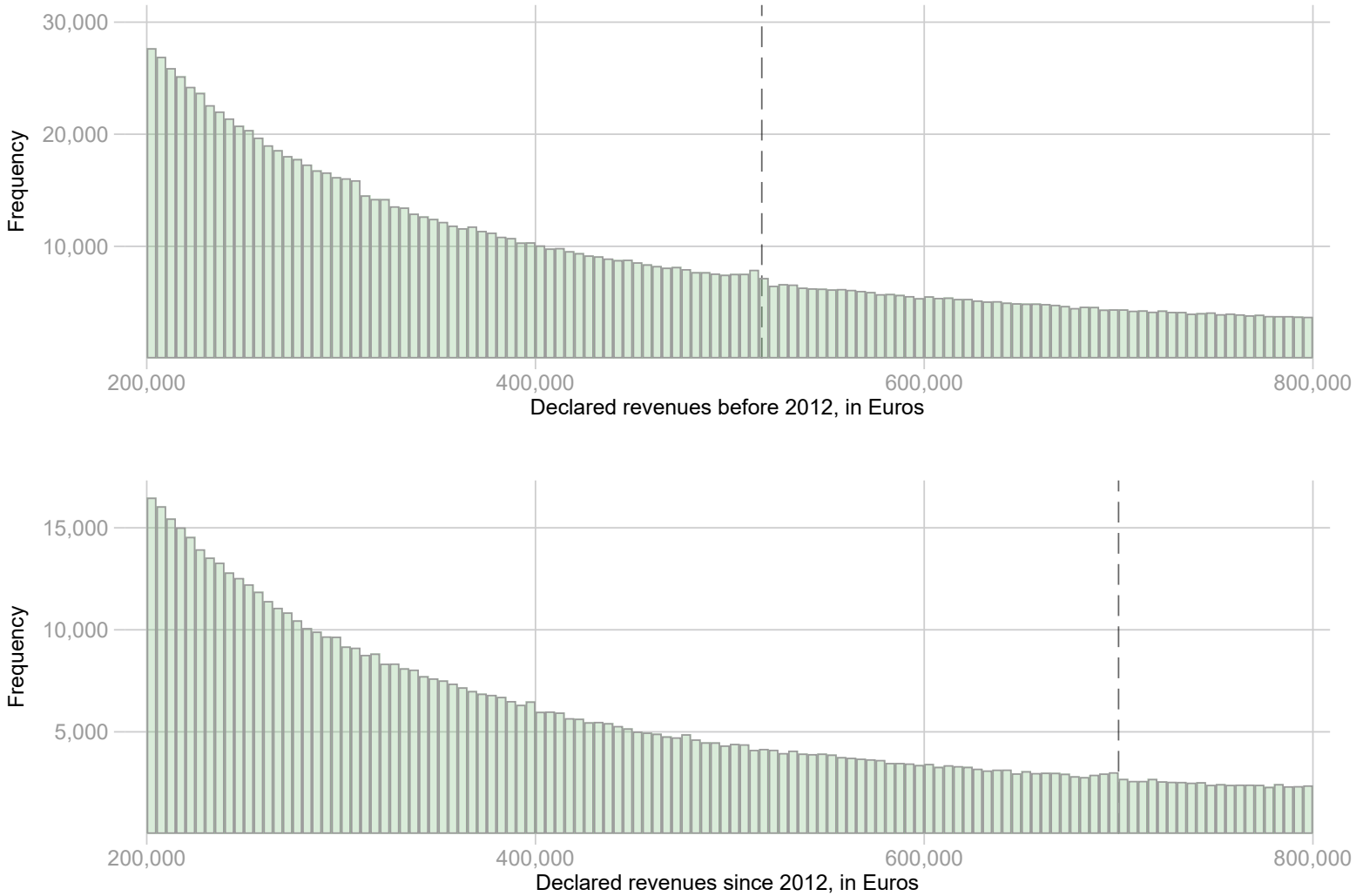
1. *Across provinces*: **tax litigation length**
   - Bunching shows comparable correlations with a small tax and a large source of admin costs
2. *Across firm size and types*:
   - **On-site audit limits**: little bunching at threshold below which audit duration is halved from 30 to 15 days
   - **Minimum taxpayer regime**: little bunching at threshold below which individuals can opt out of Sector Studies
   - **No SeS correlation**: bunching at these thresholds captures the business cost of tax audits, but doesn't predict SeS bunching

Audit limits: service sectors, before and after 2011



Dashed line: threshold for simplified accounting regime, plus 15-days limit to on-site audits since 2012.

Audit limits: non-service sectors, before and after 2011



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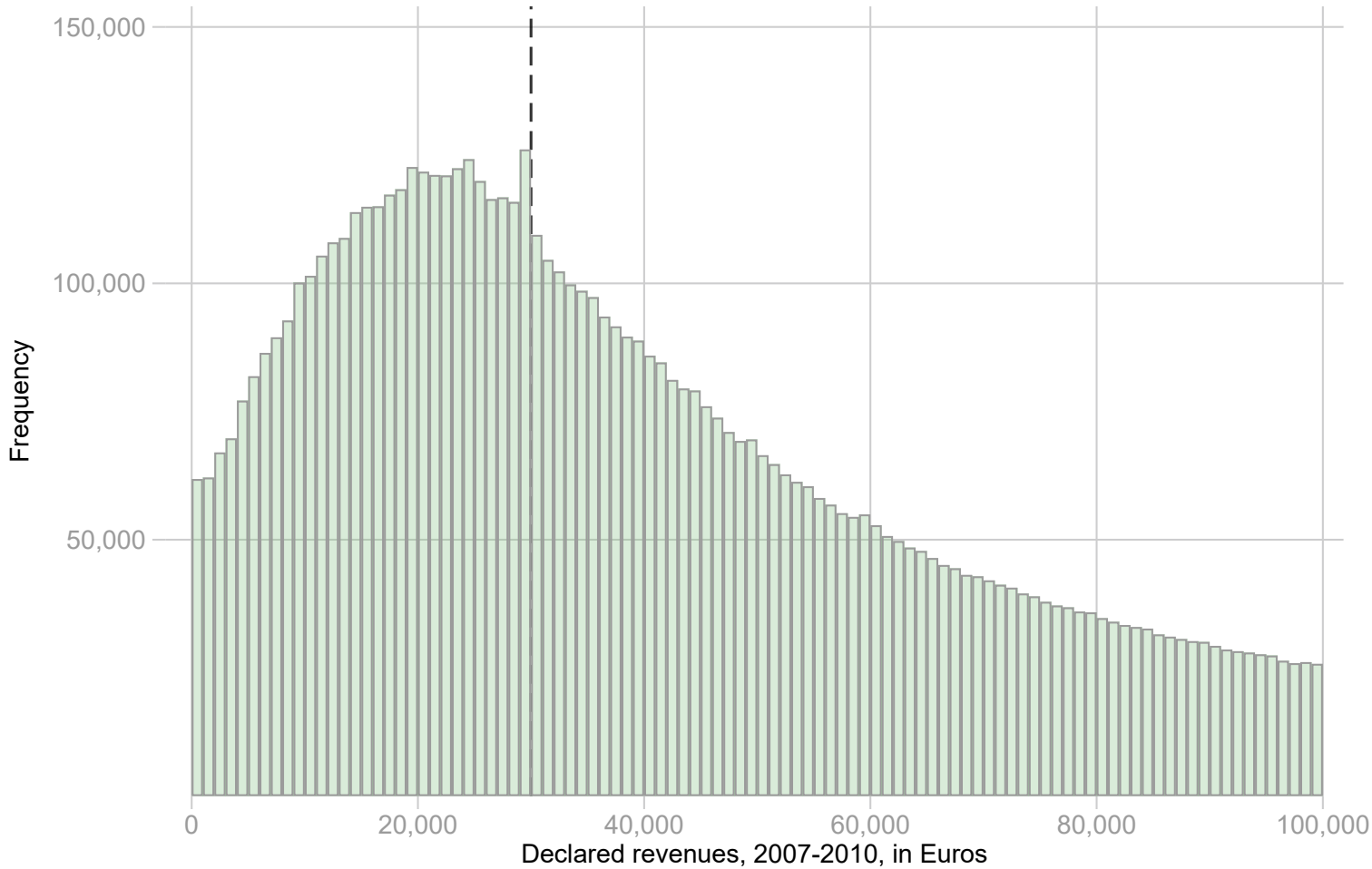
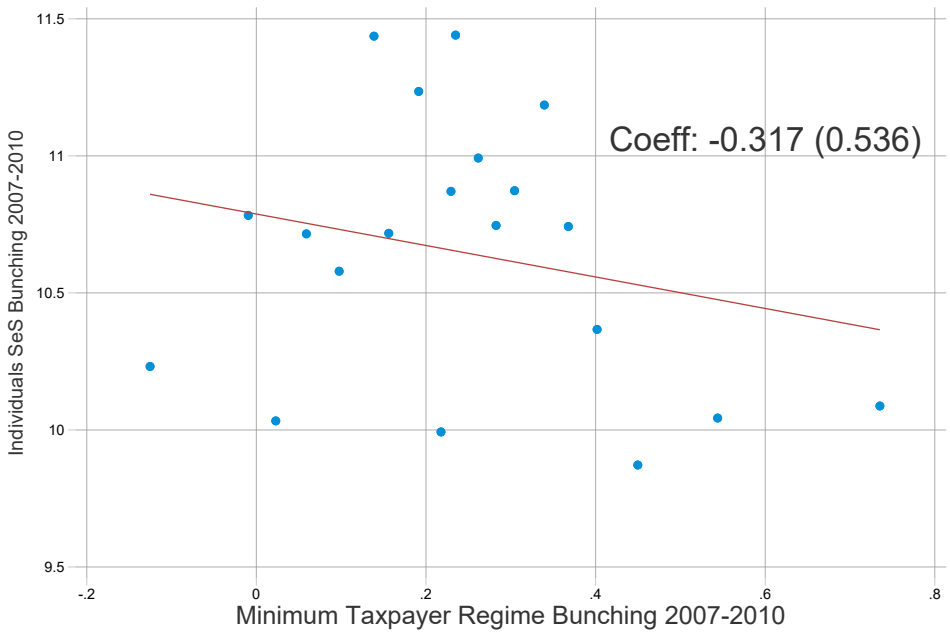
Minimum regime threshold, 2007-2010

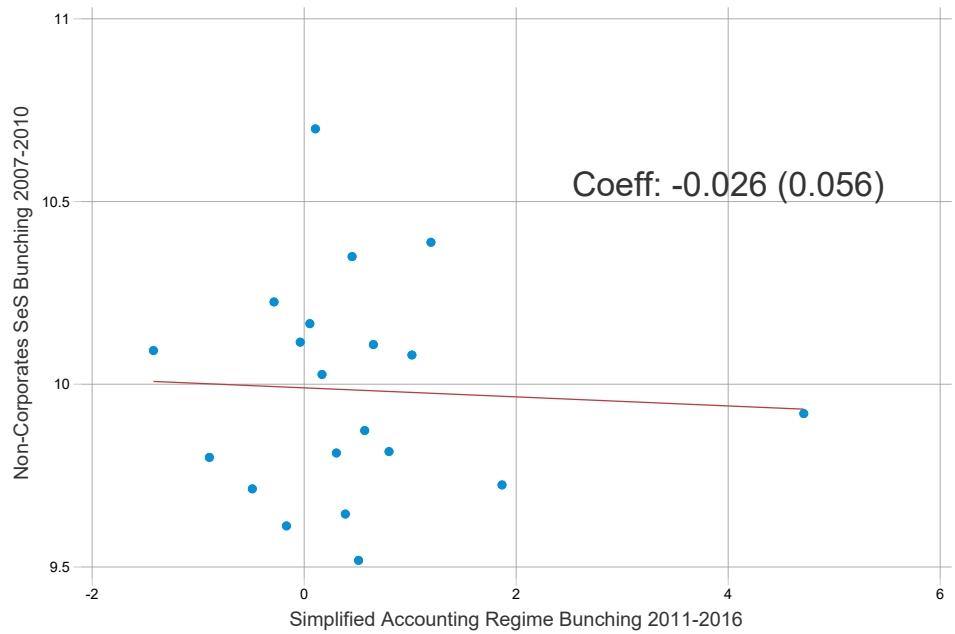


Dashed line: minimum taxpayer regime threshold at 30,000 Euros. Below, individuals can opt out of Sector Studies. Histogram features data for Sector Study individuals only.

No relationship with SeS bunching

Across provinces, estimated sensitivity to audit costs is *not* positively correlated with Sector Study bunching among comparable taxpayers:





Note: binscatters with macro-regional FEs and log VA p.c., results robust to outliers.

▸ Disclosure effects

Disclosure effects: adding a business cost of audit

- Firms might also face fixed audit costs: would the result change?

1. **Incentive provision effect** (revenue gains): unchanged
   - the effect is pinned down by the distributions observed in the data

2. **Probability reduction effect** (revenue losses): reduced
   - estimation would return a *smaller* elasticity to explain bunching
   - a fall from p_C to p_L would result in smaller revenue losses

- Thus, net gains from disclosure would be higher with audit costs
  - our MVPF section discusses the welfare implications

▸ Structural overview ▸ Disclosure effects

Tax revenue potential of SeS disclosure

▸ Effects ▸ Conclusion

Back of the envelope calculation of yearly PIT revenue effects from SeS disclosure per Euro of implementation costs, 2007-2010:

$$\text{SeS effectiveness} = \frac{\tau \cdot \left(\min\left\{\frac{\overline{y}-\overline{y}_C}{\overline{y}_C}\right\}\right) \cdot \left(\frac{\overline{\pi}}{\overline{y}}\right) \cdot \overline{y}_H \cdot N}{\text{Administrative Costs}}$$
$$= €64.21$$

- $\overline{y}$: observed mean declared revenues
- $\overline{y}_C$: counterfactual mean declared revenues
- $\min\left\{\frac{\overline{y}-\overline{y}_C}{\overline{y}_C}\right\}$: smallest reported revenue effect within the sensible counterfactual range, i.e. with $\Delta p_C = p_H - p_L$ and $y_C = y_C(p_H)$
- N: ca. 2.58 mln yearly SeS files used in structural analysis
- $\overline{\pi}$: mean gross profit across all 300 SeS structural groups
- τ: mean total PIT due across all 300 SeS structural groups
- Administrative Costs: 2010 total value of production by SOSE (€12.6 mln)

Welfare effects of disclosure: MVPF approach

▸ Effects ▸ Conclusion

- Build a **MVPF**-like ratio relying on envelope theorem and
  - Denominator: **mean net cost** to the administration from disclosure
  - Numerator: mean across **WTP of opposite sign** for two firm types
    1. Firms below $\widehat{y}$, whose audit risk rose from $p_C \in [p_L, p_H]$ to p_H:

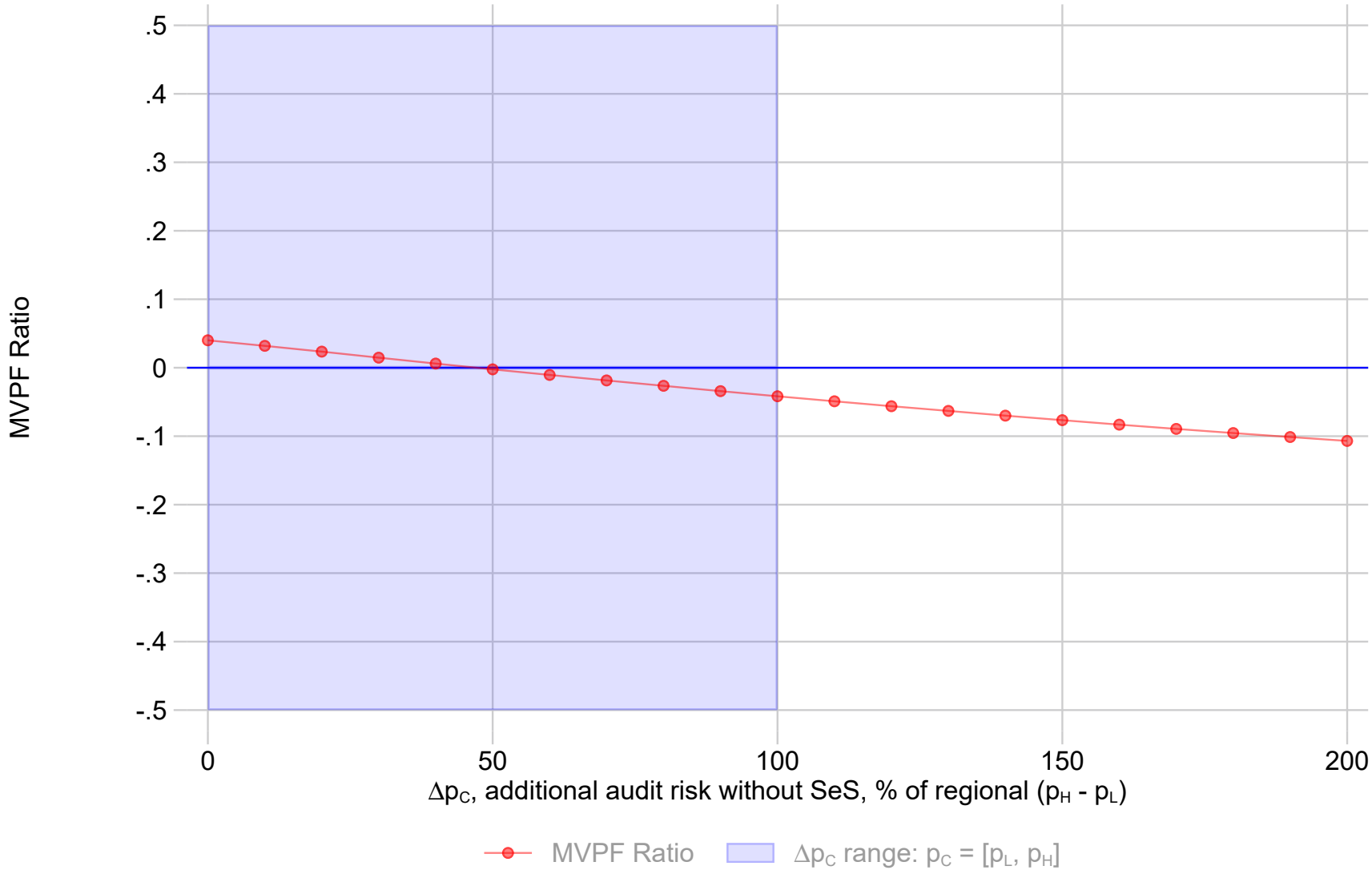
$$WTP_{\text{below}} = -(p_H - p_C) \cdot [\gamma \cdot \tau \cdot e(p_C)] \cdot \%\text{Below}(p_C) < 0$$

    2. Firms above $\widehat{y}$, whose audit risk dropped from p_C to p_L:

$$WTP_{\text{above}} = (p_C - p_L) \cdot [\gamma \cdot \tau \cdot e(p_C)] \cdot \%\text{Above}(p_C) > 0$$

- If not infinite, the resulting **ratio is bound to be small**: a viable policy
- For a large positive ratio, we'd need strong assumptions on **audit costs**

MVPF ratios across audit counterfactuals, 2007-2010



SeS compliance benefits, before and after 2011 ▸ Logic

The 2011 reward regime reinforces the benefits from SeS compliance:

SeS required condition			**Audit exemption benefits**	
Congruence	*Normality*	*Coherence*	*Before 2011*	*Since 2011*
✓			**No SeS audits** (revenues)	
	✓	✓	**No SeS audits** (costs, inputs)	
✓	✓		**No analytic-inductive audits** *up to* $e \leq 40\% \cdot y$, $e \leq €50{,}000$	
✓	✓	✓		**1. No analytic-inductive audits** *up to any amount* **2. No synthetic audits** *up to* $\pi(s)\text{-}\pi \leq 33\% \cdot \pi(s)$ **3. Shorter statute of limitation**

Note: e stands for detected underreported revenues, π is reported profits, $\pi(s)$ is profits assessed by synthetic determination. Taxpayers achieve congruence, normality, and coherence when they reach predefined SeS accounting targets.

The reward regime as a natural experiment, 2011-2016

- **Goal: estimate the effect of exposing a sector to the regime**
  - exploit regime's staggered introduction across sectors since t.y. 2011
  - inclusion depends on technical criteria and is announced at tax season
  - focus on balanced panel from 155 sectors treated by t.y. 2016
- **Strategy: sector-level event-study**

$$y_{st} = \lambda_s + \gamma_t + \sum_{q=-k}^{+k'} \beta_q \cdot I(Q_{st} = q) + \sum_{r=2007}^{2016} \delta_r \cdot X_s \cdot I(t = r) + \varepsilon_{st}$$

for every sector s and tax year t. β_q capture the reform effects.

- **Fundamental assumption: parallel path**
  - late exposure sectors provide a plausible counterfactual for early exposure sectors: parallel trajectories in absence of the reform

▸ Profits

Event-study design: specification details

▸ Profits

$$y_{st} = \lambda_s + \gamma_t + \sum_{q=-k}^{+k'} \beta_q \cdot I(Q_{st} = q) + \sum_{r=2007}^{2016} \delta_r \cdot X_s \cdot I(t = r) + \varepsilon_{st}$$

for every sector s and tax year t. In addition:

- λ_s and γ_t are **fixed effects** by sector and tax year, respectively
- β_q are **coefficients** capturing the differences before and after a sector's exposure to the regime relative to non-exposed sectors in every period
- X_s is a sector-level vector of **controls**: four macro-industry dummies; 2007-2010 averages for revenues, profits, employment cost to revenue ratio, yearly growth rates in the employment cost to revenue ratio, and in revenues. We interact each variable with tax year dummies.
- we **exclude** the dummies for the first two periods q, and for each sector's pre-reform year for reference
- standard errors are **clustered** by sector
- units are **sector-years**, while data comes from the 2007-2016 **balanced panel** of SeS filers

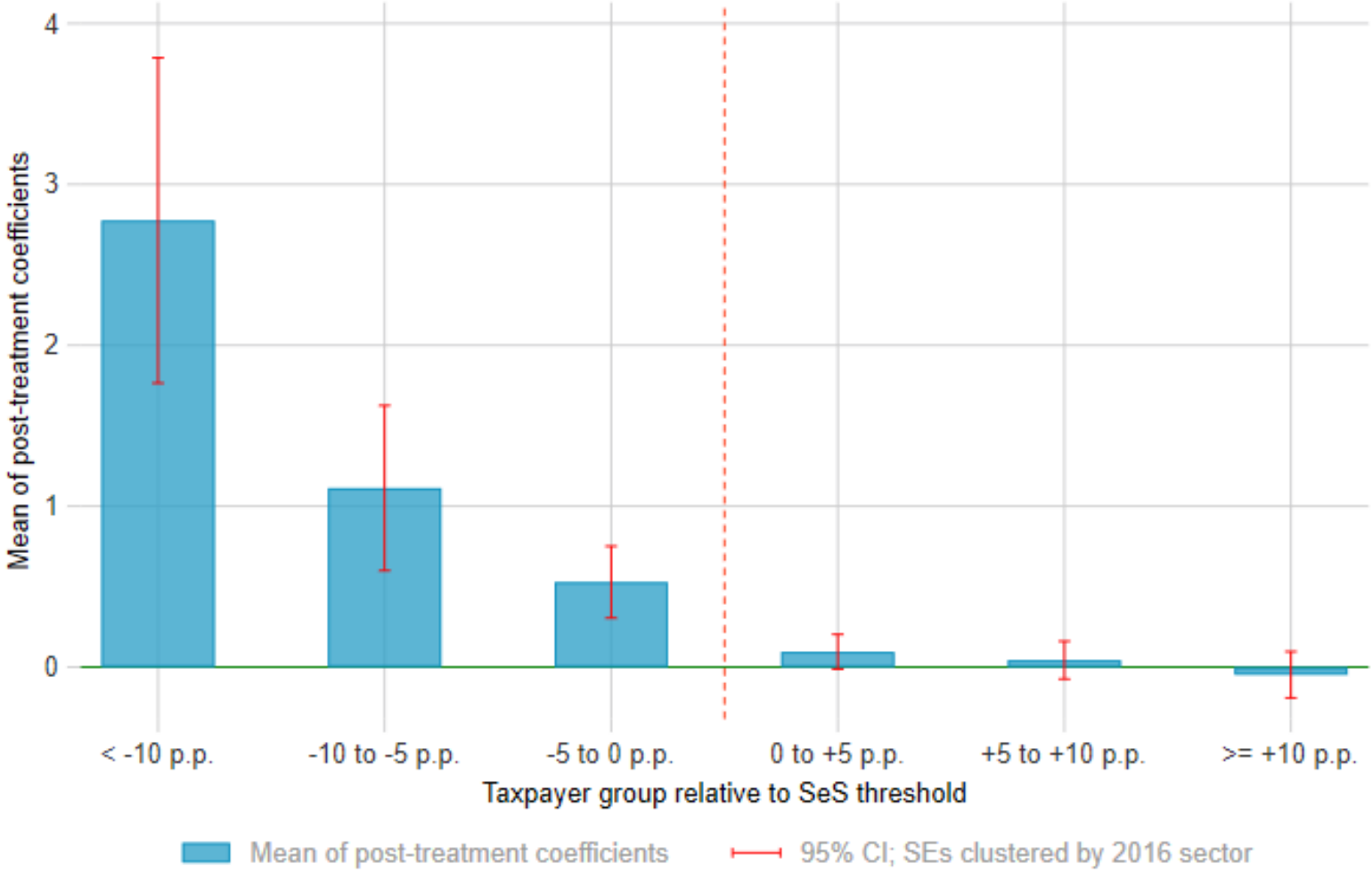
Event-study robustness

We account for recently-studied identification issues, such as negative treatment effect weights and effect heterogeneity across treatment cohorts or groups:

1. **Borusyak and Jaravel (2017)**
   - We avoid single post-treatment dummy specifications
2. **Sun and Abraham (2020)**
   - We implement their IW estimator, with baseline covariates
   - 2014 and 2015 treatment cohorts (last two) serve as control
3. **de Chaisemartin and D'Haultfoeuille (2020)**
   - We implement their DID_M estimator, with baseline covariates
   - Include as many dynamic effects as data allow to match baseline

▸ Profits

Gross profits gains are concentrated below the threshold

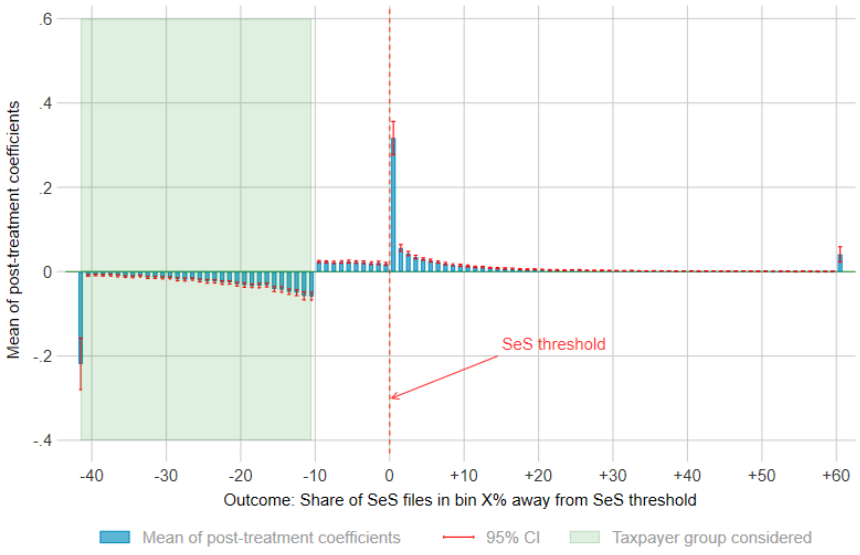


Notes: 2007-2016 balanced panel. Sample: 1550 sector-years from sectors with regime access over 2011-2016. Outcome is the log of mean gross profits. Split based on the relative threshold distance the year before one's sector reform. ▸ Profits

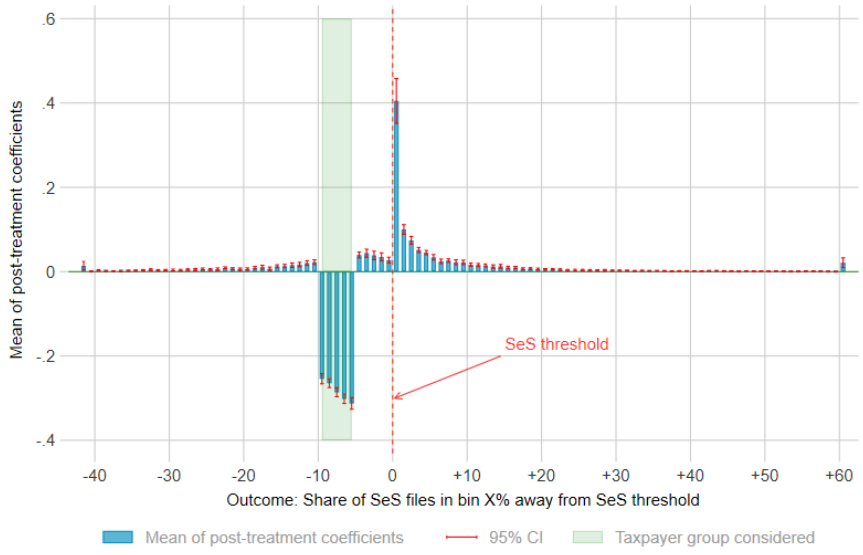
Reported revenues shift towards $\widehat{y}$: from below

▸ Profits

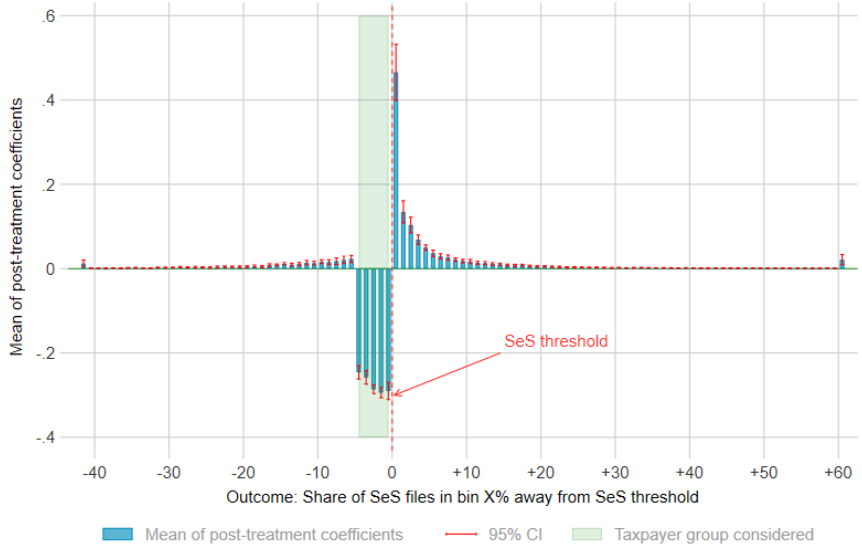
A. 10+ p.p. below $\widehat{y}$



B. Btw. −10 and −5 p.p.



C. Btw. −5 and 0 p.p.



Reported revenues shift towards $\hat{y}$: from above

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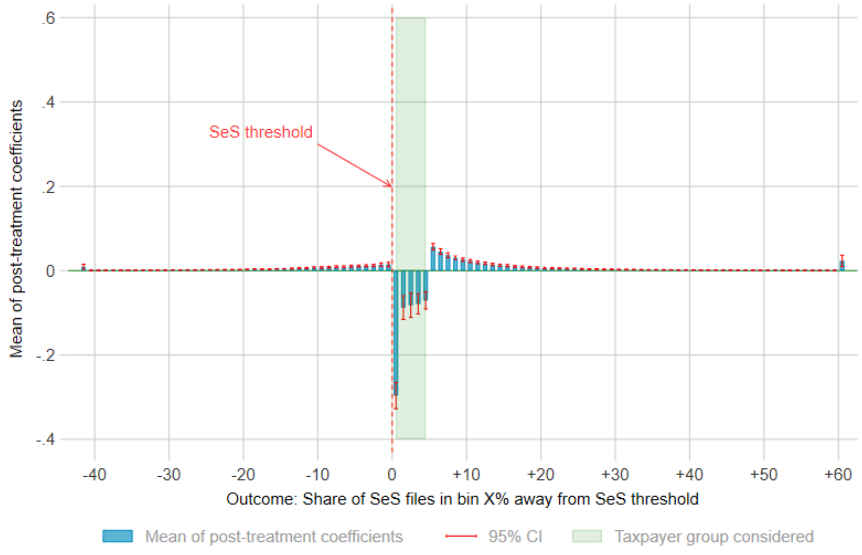
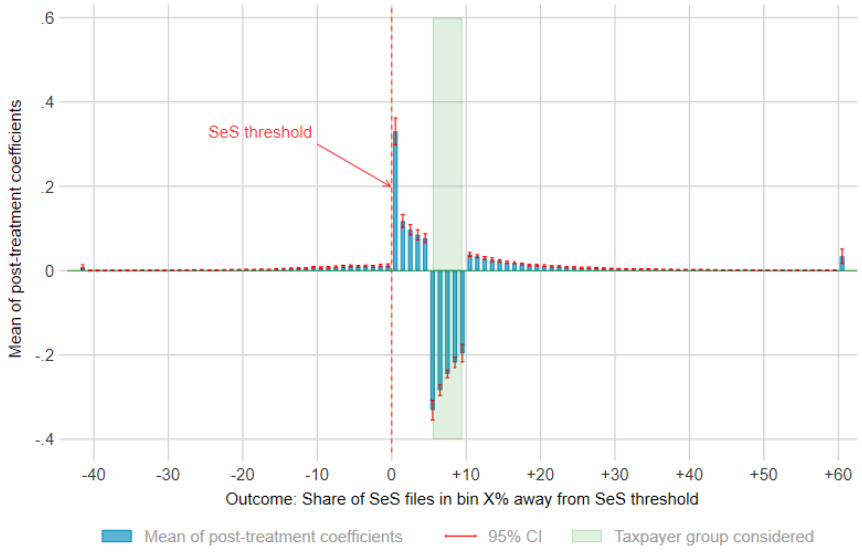
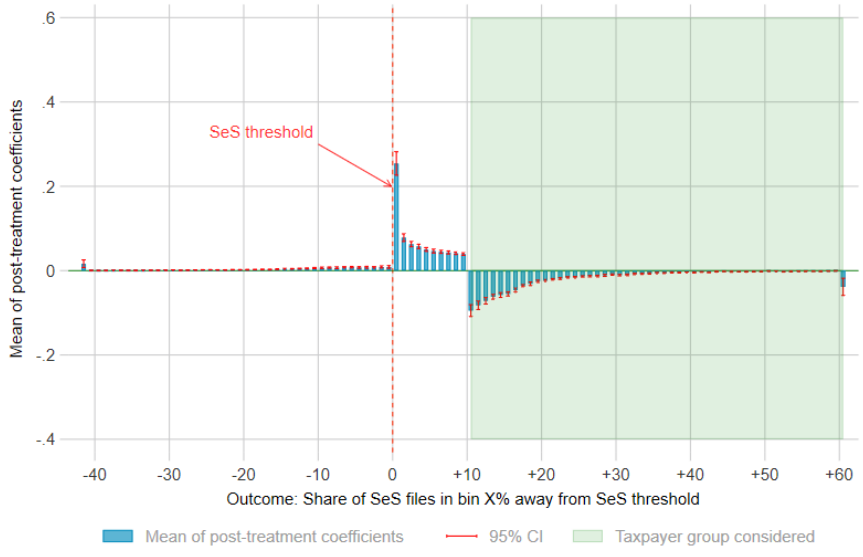
D. Btw. 0 and +5 p.p.



E. Btw. +5 and +10 p.p.



F. 10+ p.p. above $\hat{y}$



Disclosure effects: policy comparisons

▸ Conclusion

- **Sector Studies**: 1998 audit rule disclosure
  - 2007-2010 static effect: revenues +6.3-7.7%
  - 2011 reform, 6 years: revenues +12%, profits +16.2%
- **Naritomi (2019)**: 2007 tax lottery in São Paulo, Brazil
  - consumers enter lotteries when reporting transactions
  - 4 years: revenues +21%, tax revenues +9.3%
- **Almunia and Lopez-Rodriguez (2018)**: 1995 LTU in Spain
  - special audit unit for firms with revenues above €6 mln
  - LTU threshold jump: value added ∼+20%, profits ∼+16.6%
- **Choudhary and Gupta (2019)**: 2012 third-party auditors in India
  - third-party audits for small firms above revenue thresholds
  - 5 years of reform: remitted taxes +20%, taxable income +16%
- **Al-Karablieh et al. (2021)**: 2003 profit margin targets in Greece
  - one-year audit suspension for small firms that meet target
  - 4 years take-up: revenues up to −40%, taxable profits +55%-70%

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4. First estimates of audit rule **disclosure effects**
   - on the tax base: reported revenue and gross profit effects
   - on welfare: implied average welfare costs (MVPF)

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