Policy Thresholds as Growth Barriers: Theory and Evidence from a Payroll Tax Notch

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NBER Public Economics Program Meeting, Spring 2026

April 16, 2026

Introduction: Motivation

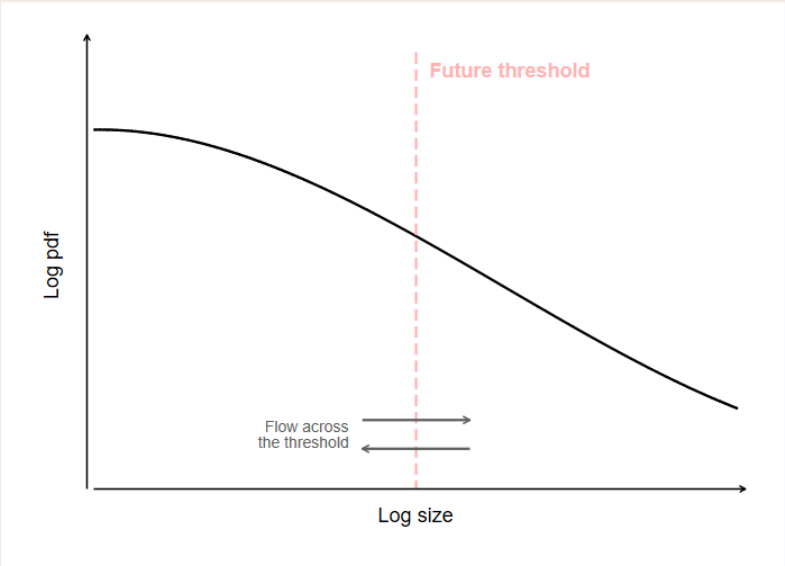
- Discrete policy thresholds are pervasive in tax and regulatory systems.
  - Tax notches, welfare cliffs, size-based regulation, reporting requirements...
- Bunching literature: leverages local responses to identify structural parameters such as elasticities.
- **Separate questions:** How do thresholds distort the *overall distribution*? And what does this mean for the outcomes of units?
  - Static theory: intensive/extensive margin responses can shift mass.
  - Further dynamic channel: **Growth barrier** thresholds persistently discourage crossing → effects compound distorting the whole distribution.
- Structural models show dynamic effects and growth barriers matter (e.g. Garicano et al. 2016, Gourio & Roys 2014, Aghion et al. 2025), but require detailed parametric assumptions.

→ We lack a **reduced-form, portable framework** for studying the impacts of growth barriers.

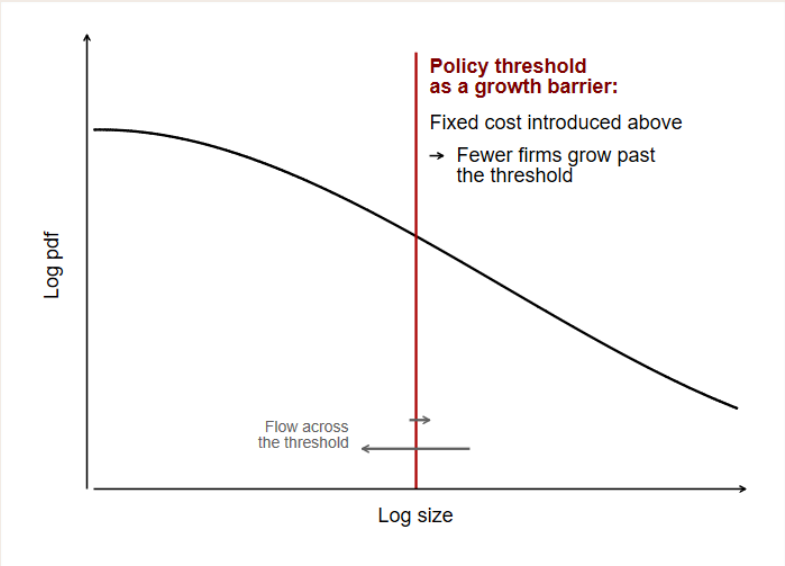
This Paper

1. **Theory:** Portable framework for how growth barriers reshape the full distribution.
   - Counterfactual characterized by a single sufficient statistic p, identifiable while the notch is active.
   - Holds for a large class of stochastic processes without making strong structural assumptions about. e.g. production functions.
2. **Empirical methodology:** *Switcher difference-in-differences* estimator for $ATET$.
   - Standard bunching estimators target different parameters and miss the wider impacts.
   - Standard DiD is biased: units that refrain from crossing are treated but classified as untreated.
3. **Empirics:** Abolition of a firm-level payroll tax notch in Finland.
   - $\sim$18% fewer firms above threshold; effects extend far into the distribution.
     - These responses seem to be driven by real behavior.
   - Theory: Theoretical counterfactual closely matches post-reform distribution.
   - Switcher DiD: Repeal increased firm scale by $\sim$10% (employment, capital, value added).

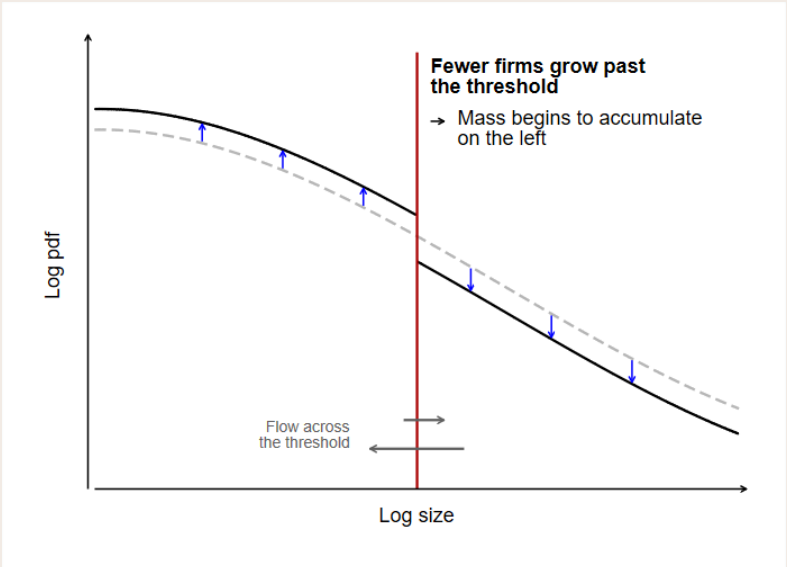
Growth Barrier: Undistorted Distribution



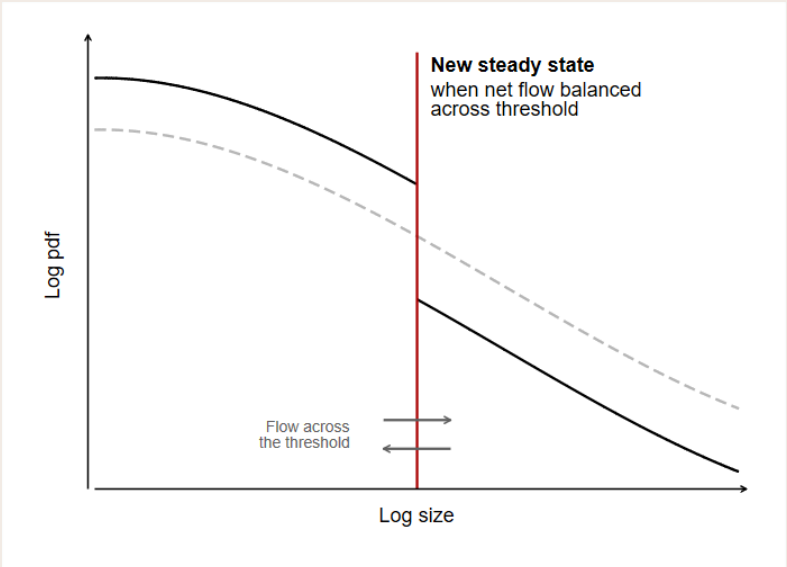
Growth Barrier: Notch Introduction



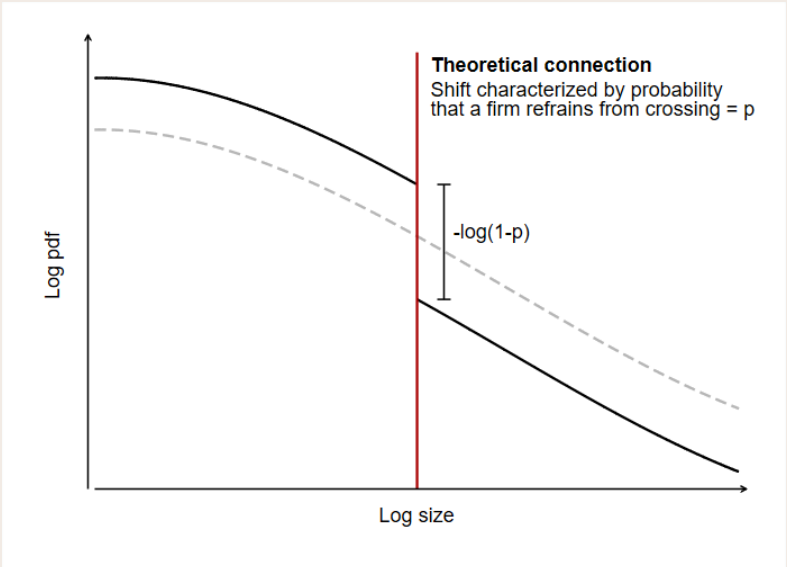
Growth Barrier: Transition



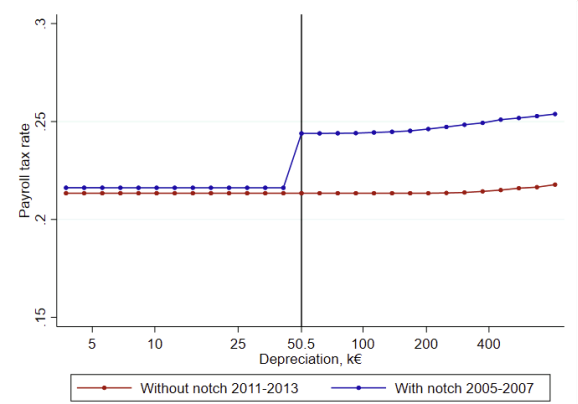
Growth Barrier: Steady State with Notch

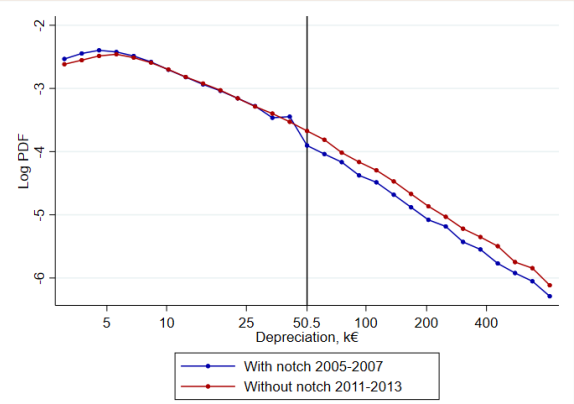


Growth Barrier: Sufficient statistic



Testing the theory: Payroll Tax Notch in Finland





Average payroll tax rates before and after repeal: ∼2.8 pp. notch

Log firm distribution before repeal

Testing the Theory: Dynamic Bunching

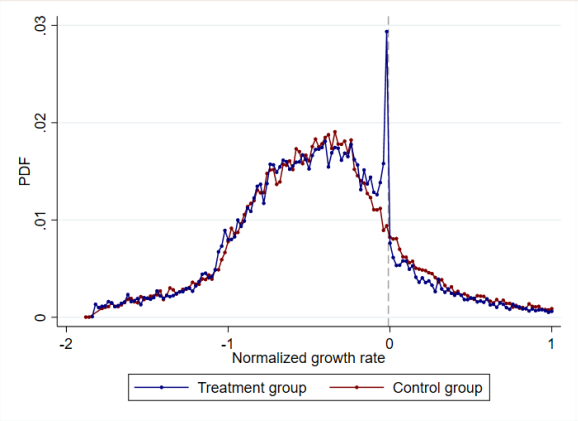
Goal: Estimate a counterfactual distribution with pre-repeal data, and compare to the observed post-repeal distribution.

- We use dynamic bunching to estimate $\hat{p}$ (Garbinti et al. (2024))
- Normalized growth rates:

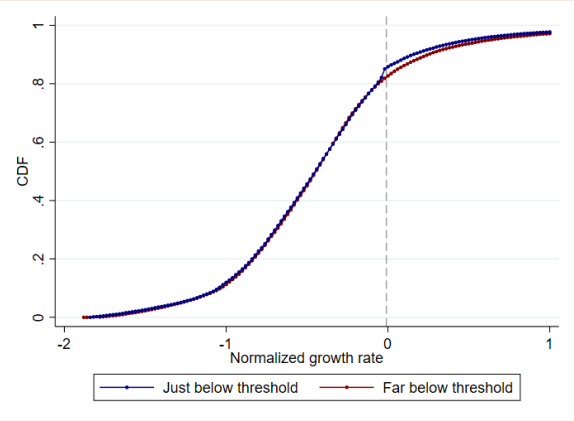
$$\bar{g}^1_{i,t} = \frac{d_{i,t+1} - 50{,}500}{d_{i,t}}$$

- Treatment group: 3 bins just below threshold (€22,715 – €50,499).
- Control group: 3 bins further below (€15,210 – €22,714), with threshold scaled by $\hat{\alpha} = 0.535$.

Dynamic Bunching: Normalized Growth Rate Distributions



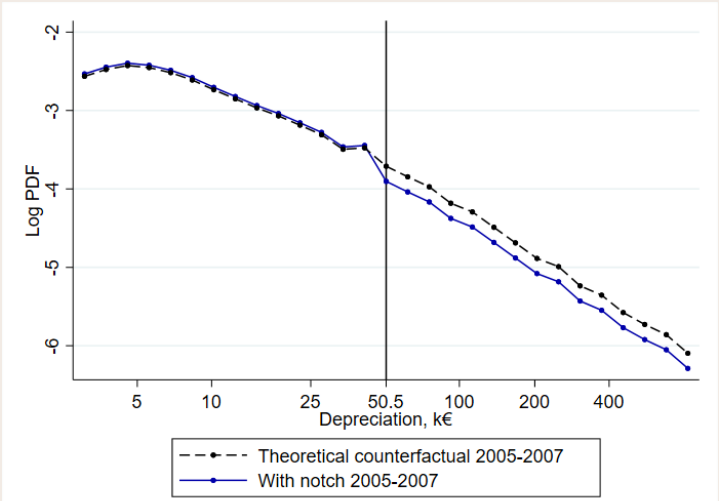
PDF



CDF: $\hat{p} = 0.182\ (0.001)$

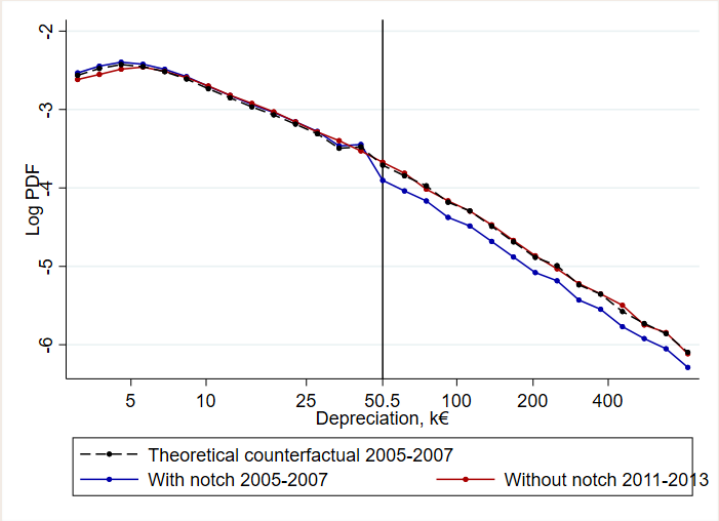
Counterfactual vs Observed Distributions

Using $\hat{p}$ and the pre-reform distribution from **pre-reform data only**, we estimate a theoretical counterfactual.



Counterfactual vs. Observed Distributions

The theoretical counterfactual closely matches the post-reform distribution.



Is This Real?

- Accounting depreciation (3rd-party audited): same pattern. ▸ Figure
- No evidence of firm splitting by owners. ▸ Figure
- Owner-level depreciation distribution. ▸ Figure
- No discontinuity in outsourcing at the threshold. ▸ Figure

→ **Responses seem to reflect genuine changes in firm scale.**

Empirical Methodology: Identification Issue

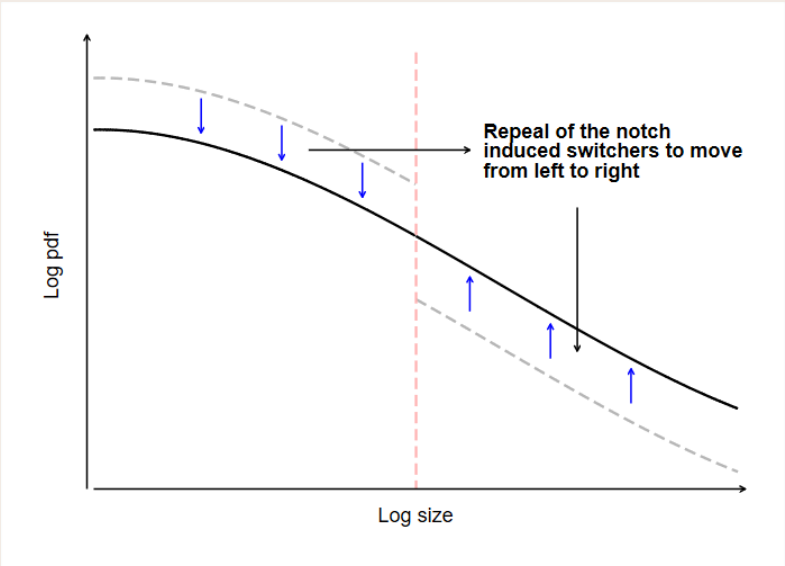
Goal: Estimate ATET of notch repeal when standard DiD fails.

- Standard DiD assumes treatment status is observed and fixed.
- With growth barriers, this fails: some units *refrained from crossing* due to the notch.

$\rightarrow$ These "switcher" units were **treated**, but standard DiD classifies them as untreated when the notch is in place.

$\rightarrow$ **Control group is contaminated** $\rightarrow$ Standard DiD is biased.

Empirical Methodology: Identification Issue



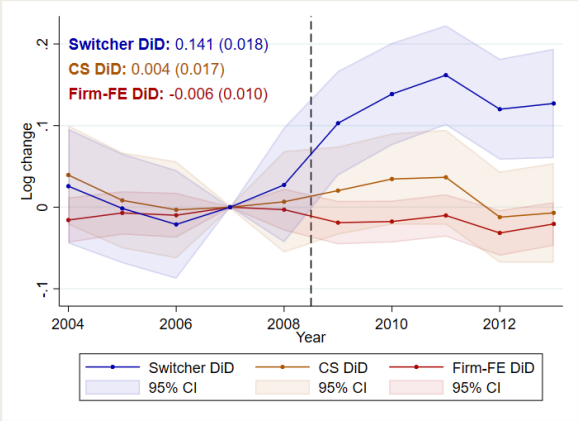
Result: Standard DiD is biased. The bias depends on switchers. Identifiable.

- Under parallel trends (in log counts and outcome means), monotonicity and SUTVA for below-stayers:

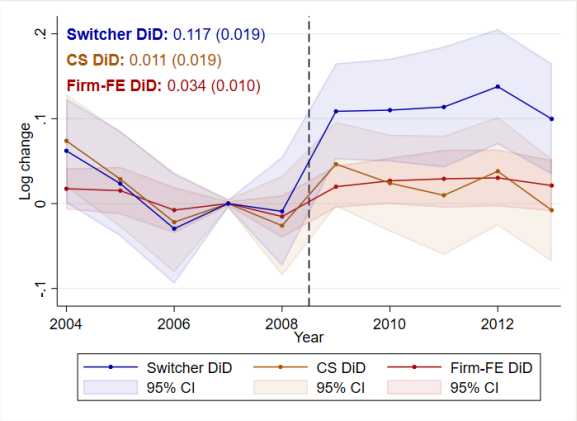
$$ATET = \underbrace{\tau^{DID}}_{\text{Cross-sectional DiD}} + \underbrace{w\left(E[y|\text{ above, pre }] - E[y|\text{ below, pre }]\right)}_{\text{Switcher term (bias)}},$$

where w is the share of switchers among treated units.

Results: Labor Costs and Employment

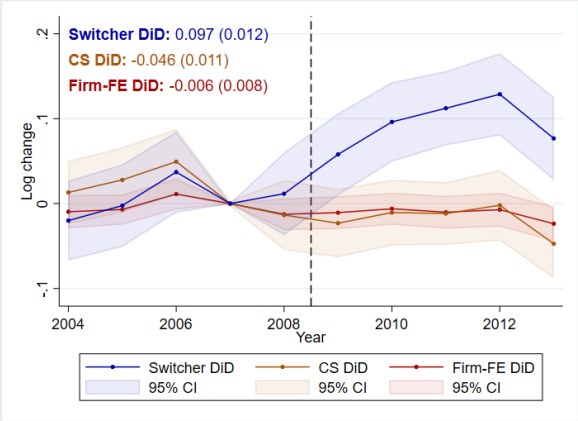


Δ Labor costs

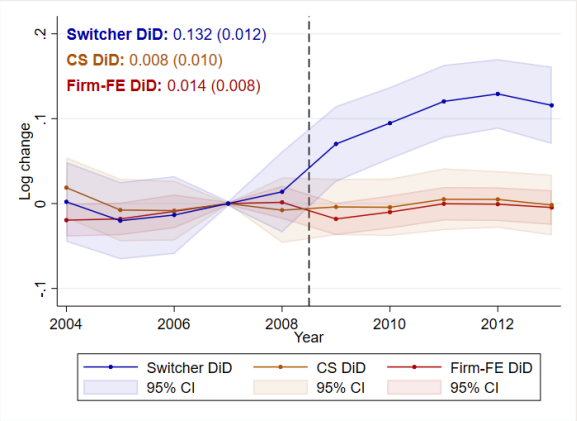


Δ Employees

Results: Capital Stock and Value Added



△ Capital stock



△ Value added

Summary

1. **Theory:** Policy thresholds may act as growth barriers, distorting the *entire* distribution.
   - Counterfactual distribution characterized by a single sufficient statistic p.
   - Validated out-of-sample: pre-reform $\hat{p}$ predicts the post-reform distribution.
2. **Methodology:** Standard DiD is biased when thresholds induce movement across cutoffs.
   - Switcher DiD can deal with this.
3. **Empirics:** Abolition of a Finnish payroll tax notch.
   - $\sim$18% fewer firms above the threshold; effects extend far into the distribution.
   - After repeal: $\sim$10% increases in employment, capital, and value added.
   - Fiscal externality $\approx$ 1/3 of the mechanical effect of payroll taxes (ongoing: other tax bases).

$\rightarrow$ Even modest tax notches can meaningfully distort the size distribution and reduce economic activity.

Thank you!

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Theory: Setup

Setup: Continuous time Itô diffusion with a reflective lower bound.

- Consider unit size S over continuous time t with some minimum size S_{min}
  - Size e.g. income/wealth of individual, no. employees/revenue of firm
- We assume a stochastic growth process for the size dS_t in the:

$$dS_t = g_0(S_t)dt + \sigma(S_t)dW_t, \tag{1}$$

  - $g_0(S_t)$ is the drift parameter, W_t is Brownian motion, $\sigma(S_t)$ determines variance.
- E.g. standard geometric Brownian motion (GBM) is a special case $g_0(S_t) = gS_t$ and $\sigma(S_t) = \sigma S_t$.

Theory: Growth Barrier

<u>Growth barrier:</u> A policy notch is assumed to reduce growth just below the policy threshold.

- A policymaker introduces policy notch at $\bar{S}$ above which costs increase.

$\rightarrow$ Units have an incentive to refrain from crossing the threshold.

- Assumption: growth rate is reduced in a small interval below the threshold $[\bar{S} - \delta, \bar{S}]$.

$$g_1(S_t) = \begin{cases} g_0(S_t), & \text{if } S_t \notin [\bar{S} - \delta, \bar{S}] \\ g_0(S_t) - \gamma, & \text{if } S_t \in [\bar{S} - \delta, \bar{S}] \end{cases} \tag{2}$$

- (An approximation of a general growth reduction, when δ is small.)

Theory: Counterfactual Distribution

Result: A simple testable sufficient statistics representation of the counterfactual distribution.

- Using (1) and (2), we can derive a *counterfactual* pdf distribution $f_0(S)$ in logs:

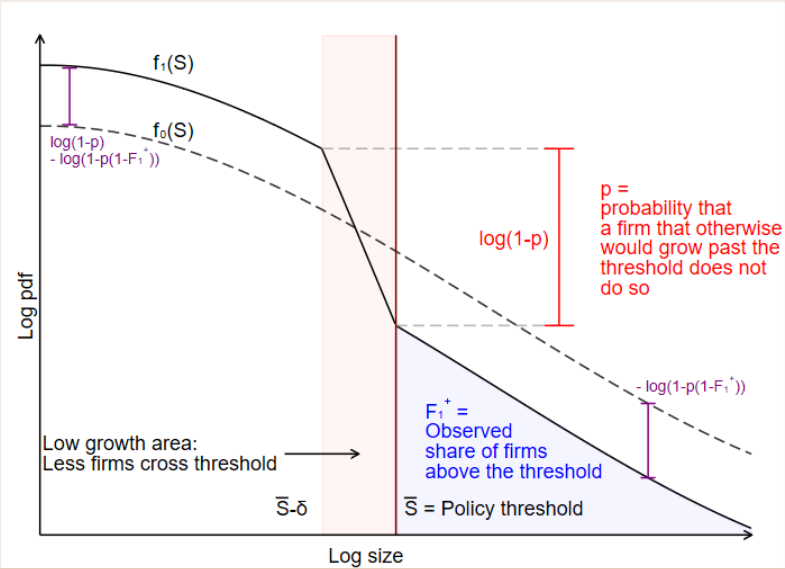
$$\log f_0(S) = \begin{cases} \log(1-p) + \psi + \log f_1(S), & \text{if } S < \bar{S} \\ \psi + \log f_1(S), & \text{if } S \geq \bar{S}. \end{cases}.$$

  where $\psi \equiv -\log\left(1 - p(1 - F_1^+)\right)$, $f_1(s)$ is the observed pdf, and $F_1^+ = \int_{\bar{s}}^{\infty} f_1(s)ds$ is the observed share of units above the threshold.

- p is the probability that a unit refrains from crossing the threshold due to the notch.

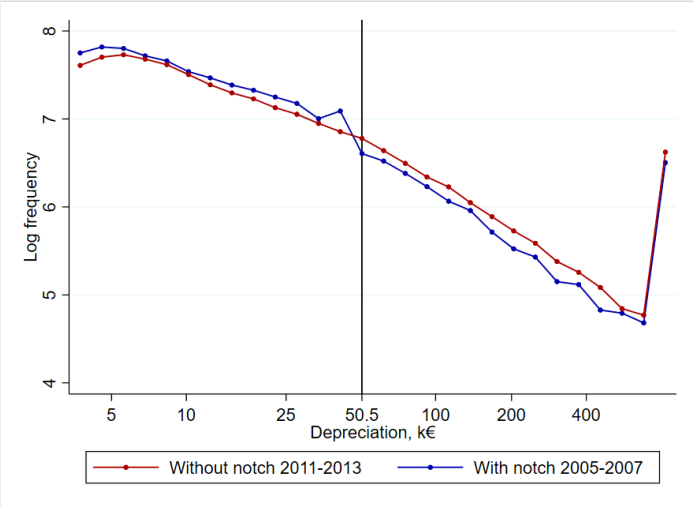
$\rightarrow$ p **can be identified using the dynamic bunching approach of Garbinti et al. (2024)**

Theory: Illustration



Firm distribution: Balanced panel distribution

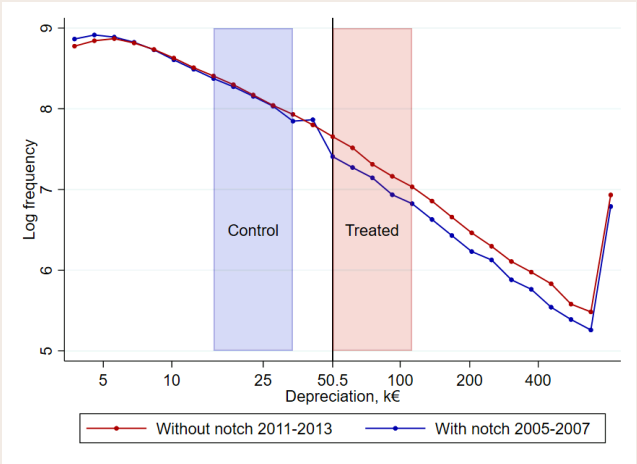
Go back



Firm Distribution: Treatment and control groups

▸ Go back

Treatment: 5 bins above. Control: 5 bins bins below (excluding ”buncher” bin below).



Is this real? Audited accounting capital depreciation

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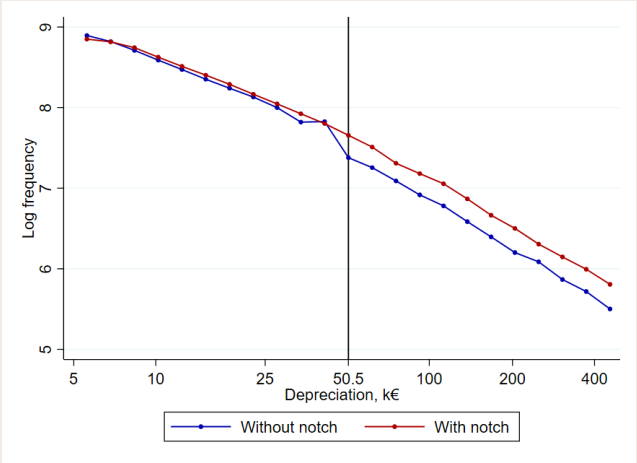
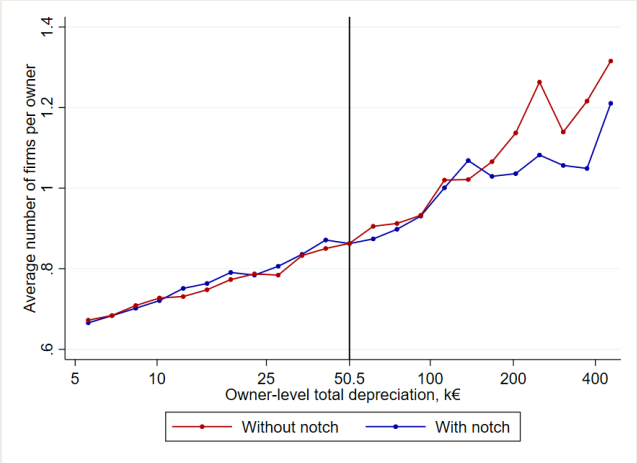


Is this real? Firm splits

Go back



Is this real? Owner-level depreciation

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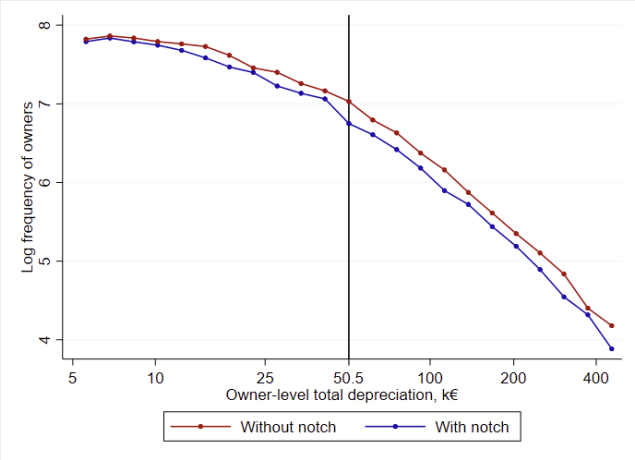

Is this real? Outsourced services

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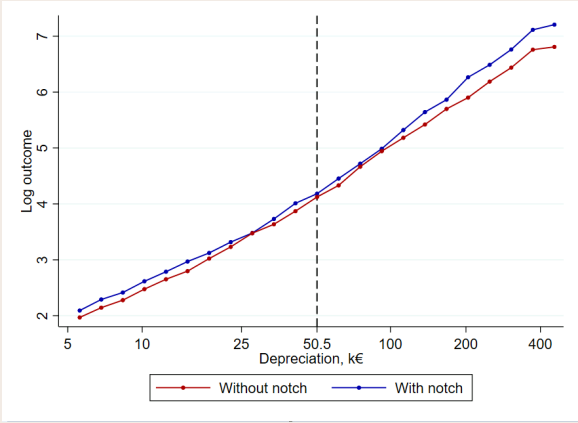
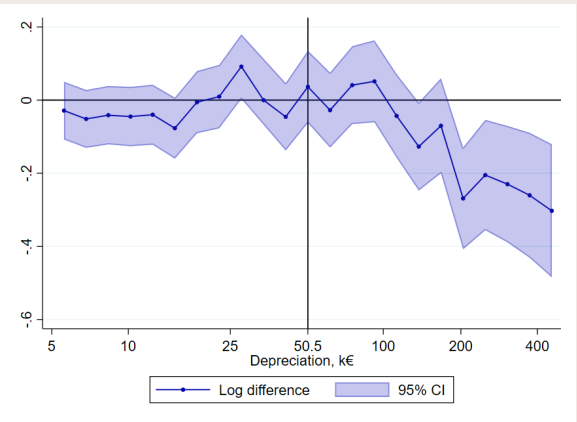


Outsourcing



Difference

Is this real? Rental capital

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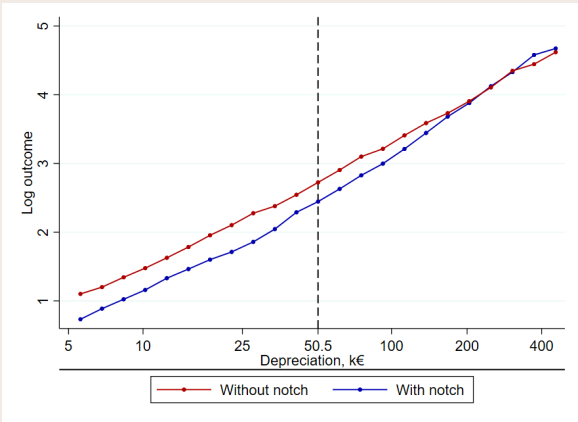
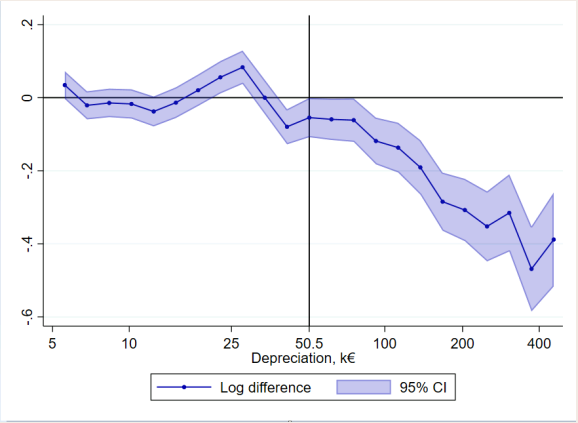


Rental capital



Difference