Earnings Management and Investment

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Intro: Firm Earnings, Investment and Credit

Earnings Management:

- strategic manipulation of both accounting and economic variables
- CFO Surveys: not just cosmetic "cooking the books"
- Willing to distort economic and financial choices to meet earnings benchmarks

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Zero is a special number in all 'mainstream' firm-level datasets (US, UK, EU, etc):

- **bunching** at $[0, \varepsilon\%)$ profits (compustat, orbis, fame, etc)
- not driven (just) by selective exit
- this paper: firms cut expenditures to maintain positive earnings and cheaper credit.

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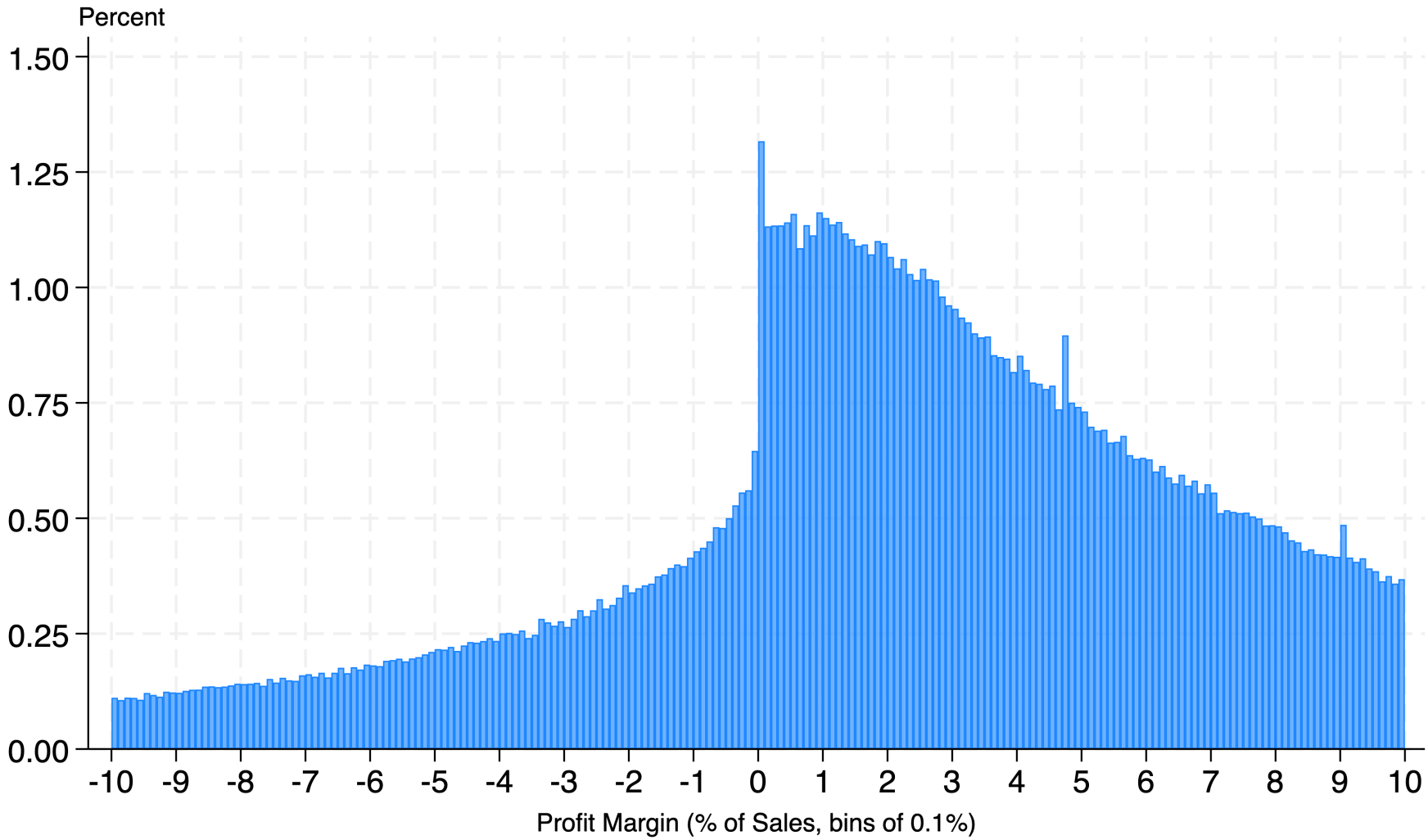
This project / plan for presentation

- empirics: study real effects of bunching at zero on investment and credit
- model (in progress): what are the macro implications of earnings management?



Source: Profits are pre-taxation. FAME database of UK firms, listed and unlisted. 2003-2023

Figure 1: Distribution of Profitability (% of Sales)

▸ Selective exits ▸ profit based on opex

What is the macro impact of this bunching?

What are the macro implications of earnings management through investment?

Micro-level:

- Looks a lot like Present-Bias
- Depresses firm capital accumulation, (mechanisms: capex and borrowing)
- firms slower to reach optimal size in DRTS world

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Macro-level:

- Distorts allocation of capital over firms (and measured agg TFP)
- Distorts set of active firms (losses make credit costly)

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GE effects could offset

- lower firm capital demand $\downarrow R$
- lower agg TFP from misallocation $\downarrow R$

Literature Review

- **earnings management** (*accrual management*) Hayn (1995); Dechow et al. (1995); Burgstahler and Dichev (1997); Healy and Wahlen (1999) (*real management*) Graham et al. (2005); Roychowdhury (2006); Gunny (2010); Cohen et al. (2008); Biddle et al. (2009); Bartov et al. (2002); Bansal (2024)

  $\Rightarrow$ managers manipulate 'paper' and real variables to achieve benchmarks (analyst target earnings per share)

- **finance and lumpy firm adjustment** Gomes (2001); Eisfeldt and Rampini (2006); Görtz et al. (2023); Tsoukalas et al. (2017)

  $\Rightarrow$ combine evidence on adjustments of **real variables, credit conditions and macro implications**

Quantifying Bunching at Zero

Estimate Counterfactual Distribution

Density is approximated by counts within narrow bins, b:

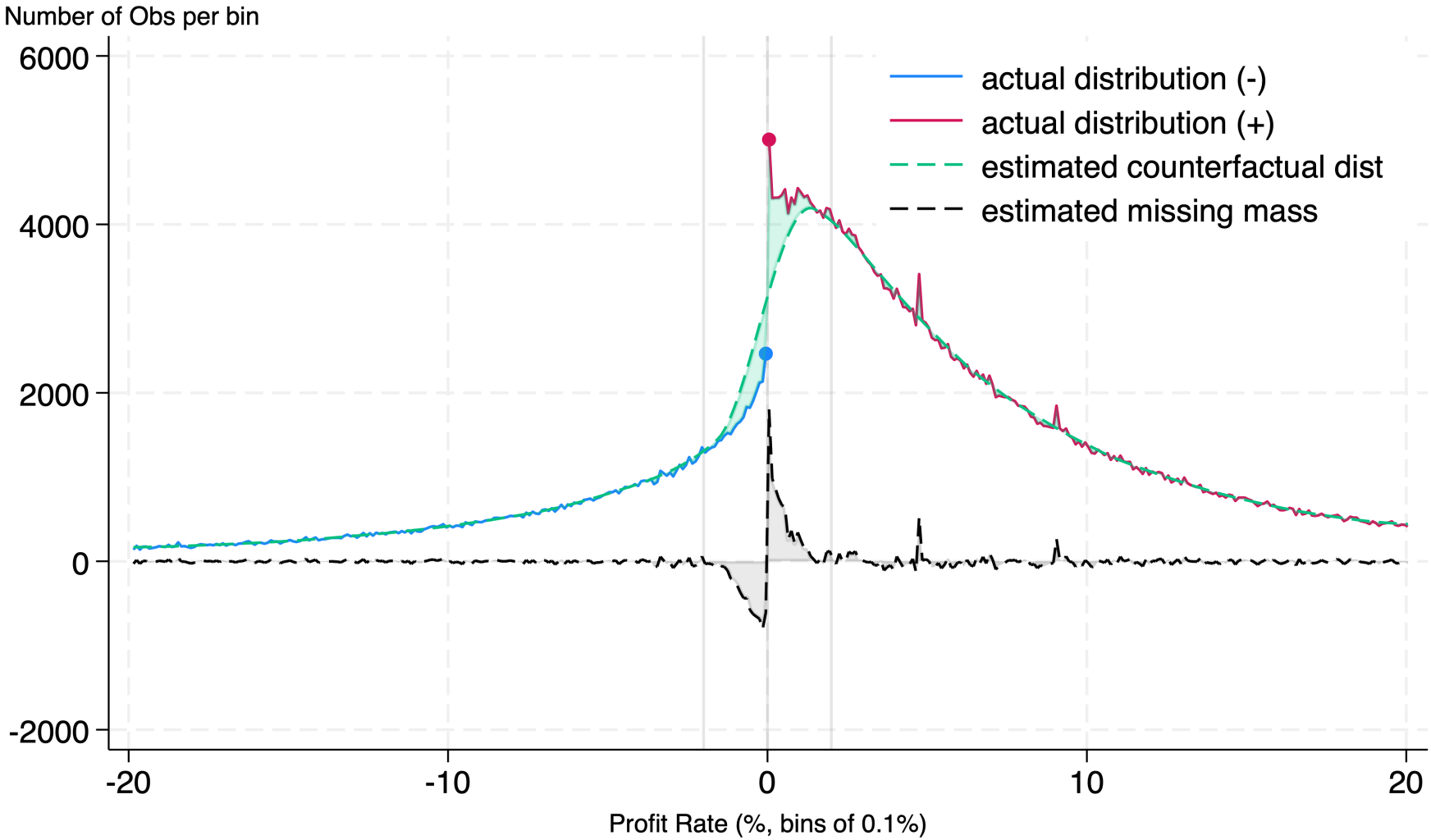
$$N_b^{data} = \sum_i 1(L_b \leq \pi_{it} < U_b) \tag{1}$$

counterfactural N_b^{cf} built from a **local polynomial regression**

$$N_b^{cf} = \hat{\mathcal{P}}(N_b^{data}, bw^*) \tag{2}$$

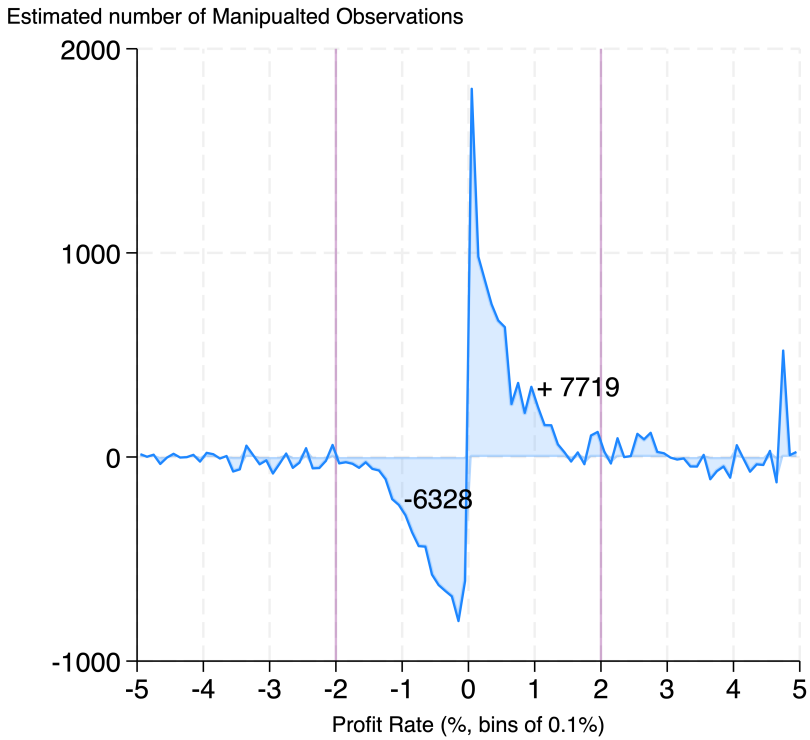
Methodology complications

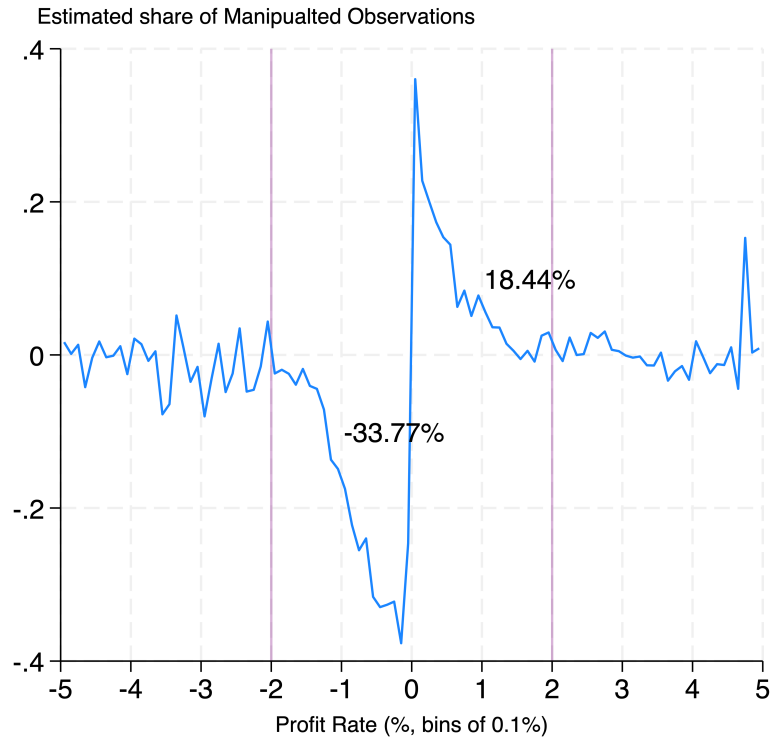
- usual fit inappropriate due to high curvature near cutoff
- uses full support to select optimal bandwidth for smoothing
- fits density away from distorted area well



Source: FAME database of UK firms, listed and unlisted. 2003-2023

Figure 2: Jump in Density at $+\varepsilon$ Profits





Source: FAME database of UK firms, listed and unlisted. 2003-2023

Figure 3: Jump in Density at $+\varepsilon$ Profits

Will adjust bw* such that two areas are approx. equal

Firm-level Investment

Dataset

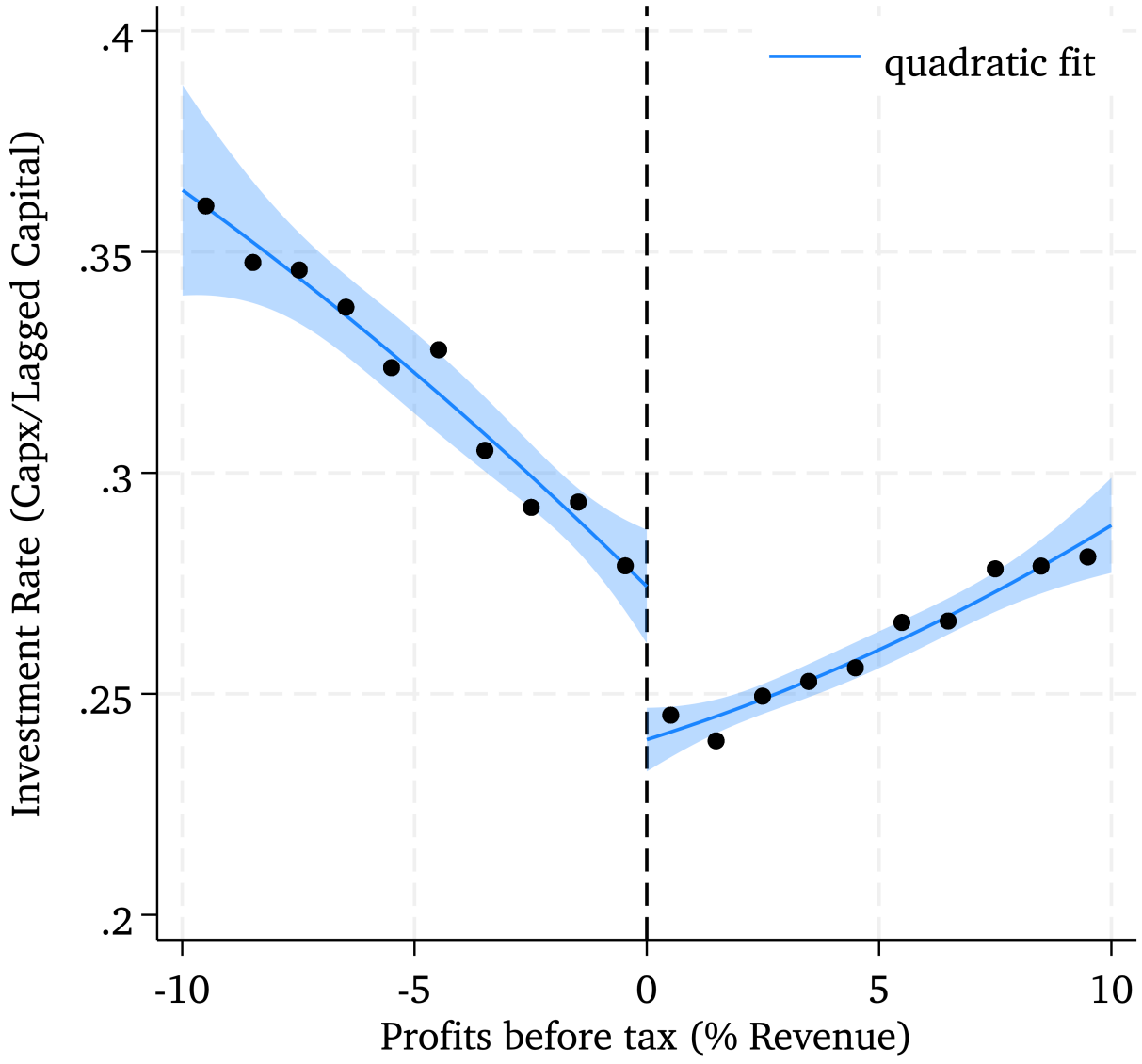
FAME database (‘Orbis+’)

- UK firms, listed and unlisted
- 2004-2019
- 200k obs
- 70+ percent coverage of private employment

qualitatively results replicate in Compustat (large US) and OrbisEU (DE, FR, ES, IT)

Capx spending rates (ppts)

CAPX Investment Rate $=$ (*Investment in Fixed Assets*$_t$ / *Fixed Assets*$_{t-1}$)



$$\text{CAPX}_{it} = \alpha + f(\pi_{it}) + \beta \cdot \mathbb{I}[\pi_{it} \geq 0] + X_{it}'\Gamma + \lambda_{s(i),t} + v_{it} \tag{3}$$

	(1)	(2)	(3)	(4)
Estimated Drop in CAPX (ppts)	-0.0310**	-0.0328**	-0.0201	-0.0321**
	(0.0137)	(0.0135)	(0.0181)	(0.0134)
Mean depvar	0.273	0.274	0.275	0.278
Scaled Effect Size (%)	-0.113	-0.120	-0.073	-0.116
Controls	No	Yes	Yes	Yes
Bandwidth	18.0	8.6	4.3	17.2
Observations	120,994	110,211	52,744	106,592

- Effect size doesn't change much adding controls for firm size, age, lagged emp and lagged profitability,
- nor changing bandwidth (though does lose precision at close range)

Macro implications?

Area measures lost investment, approximated:

- 1 in 3 firms in the (0,5] profits range.
- 12% drop at cutoff
- triangle area $=$ half the “square"
- $0.33 \times 0.12 \times 0.5$

$\approx$ 2 percent of agg investment

$\Rightarrow$ meaningful magnitudes for (potential) macro dynamics (depends on what large firms do)

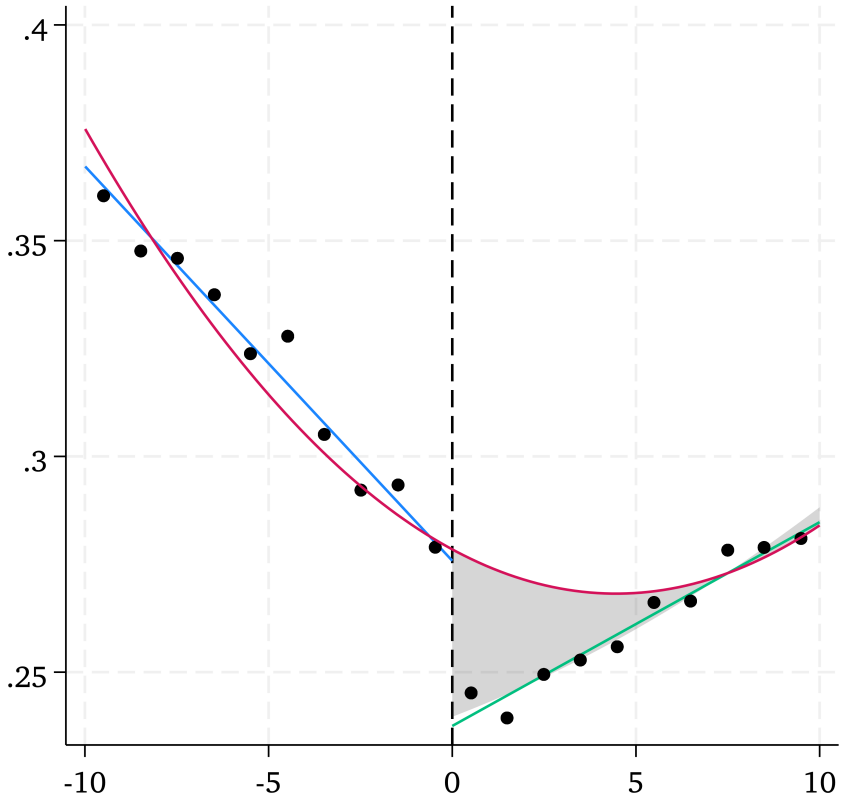
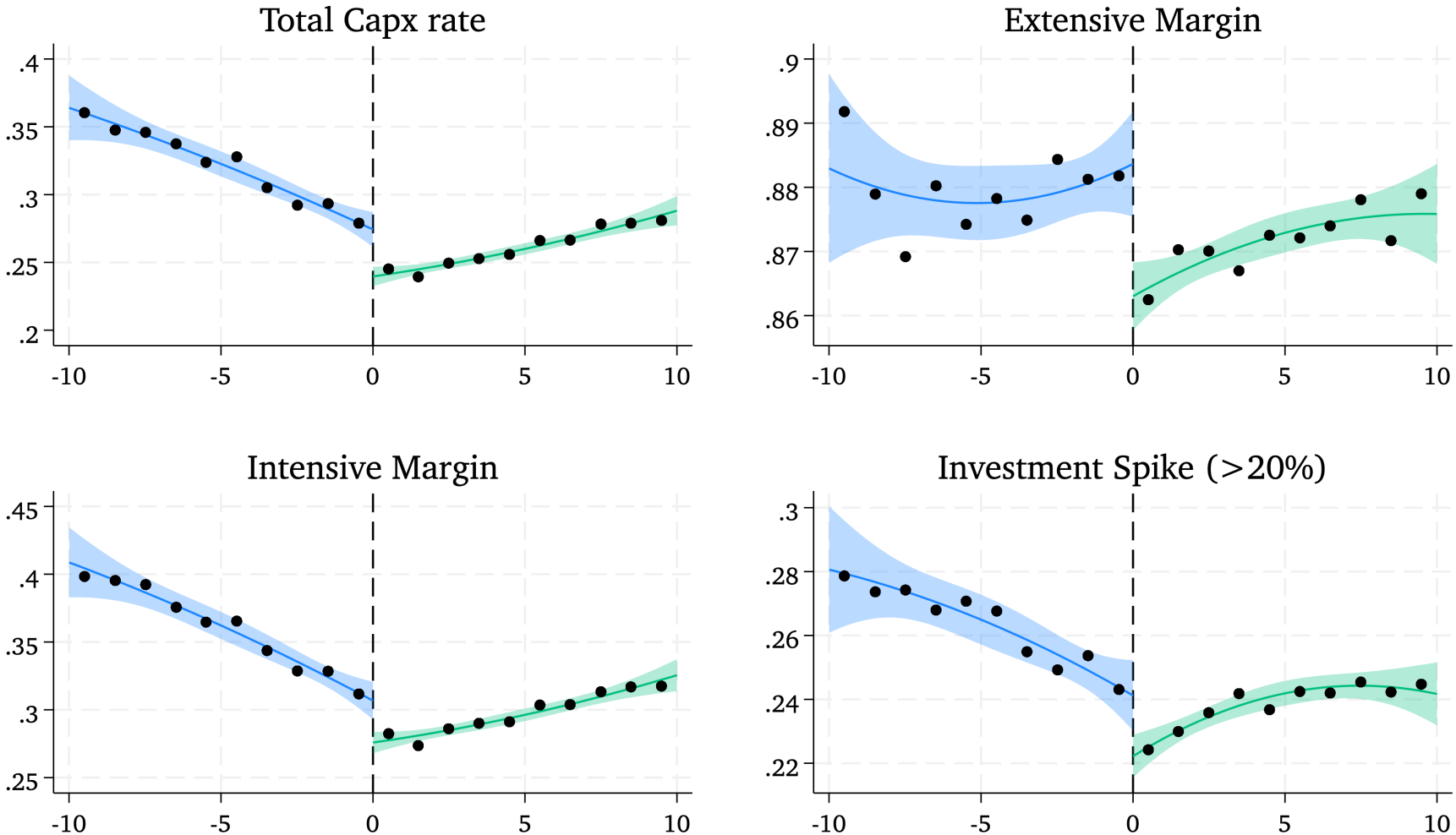


Figure 4: Missing Investment



Note: Capx rate is capx over lagged capital stock. Extensive margin is the share of firms with capx>0, intensive margin is average capx given capx>0, spike is share of firms with capx>0.2.

Figure 5: Margins of Firm-level Capital Adjustment

	(1) Total	(2) Extensive	(3) Intensive	(4) Super Extensive
Estimated disc. (ppts)	-0.0325***	-0.0284***	-0.0280***	-0.0403***
	(0.0087)	(0.0073)	(0.0094)	(0.0120)
Mean depvar	0.274	0.893	0.307	0.381
Scaled Effect Size (percent)	-0.119	-0.032	-0.091	-0.106
Controls	Yes	Yes	Yes	Yes
Bandwidth	7.5	12.4	7.8	7.1
Observations	110,230	116,330	97,860	103,829

Note: Table presents RD estimates using $p = 2$ order polynomial. Controls include lagged size, age, and profitab
Bandwidth is chosen optimally in columns (1) and (2), and set to half and twice the optimal in (3) and (4).

Table 1: Adjustment along Intensive and Extensive Margins of Investment

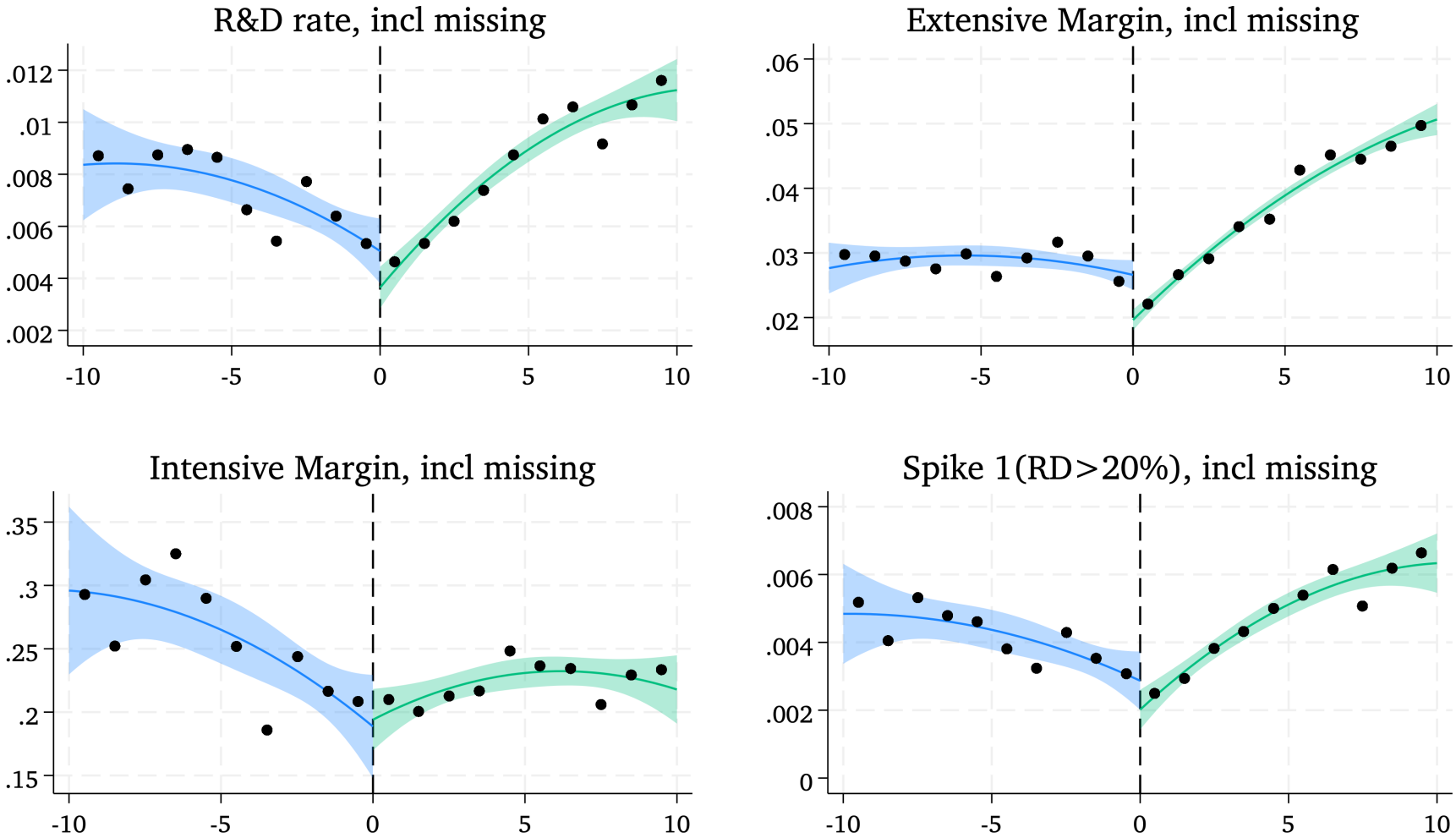


Figure 6: Firm-level XRD spending

Borrowing Costs

Interest Rates on debt

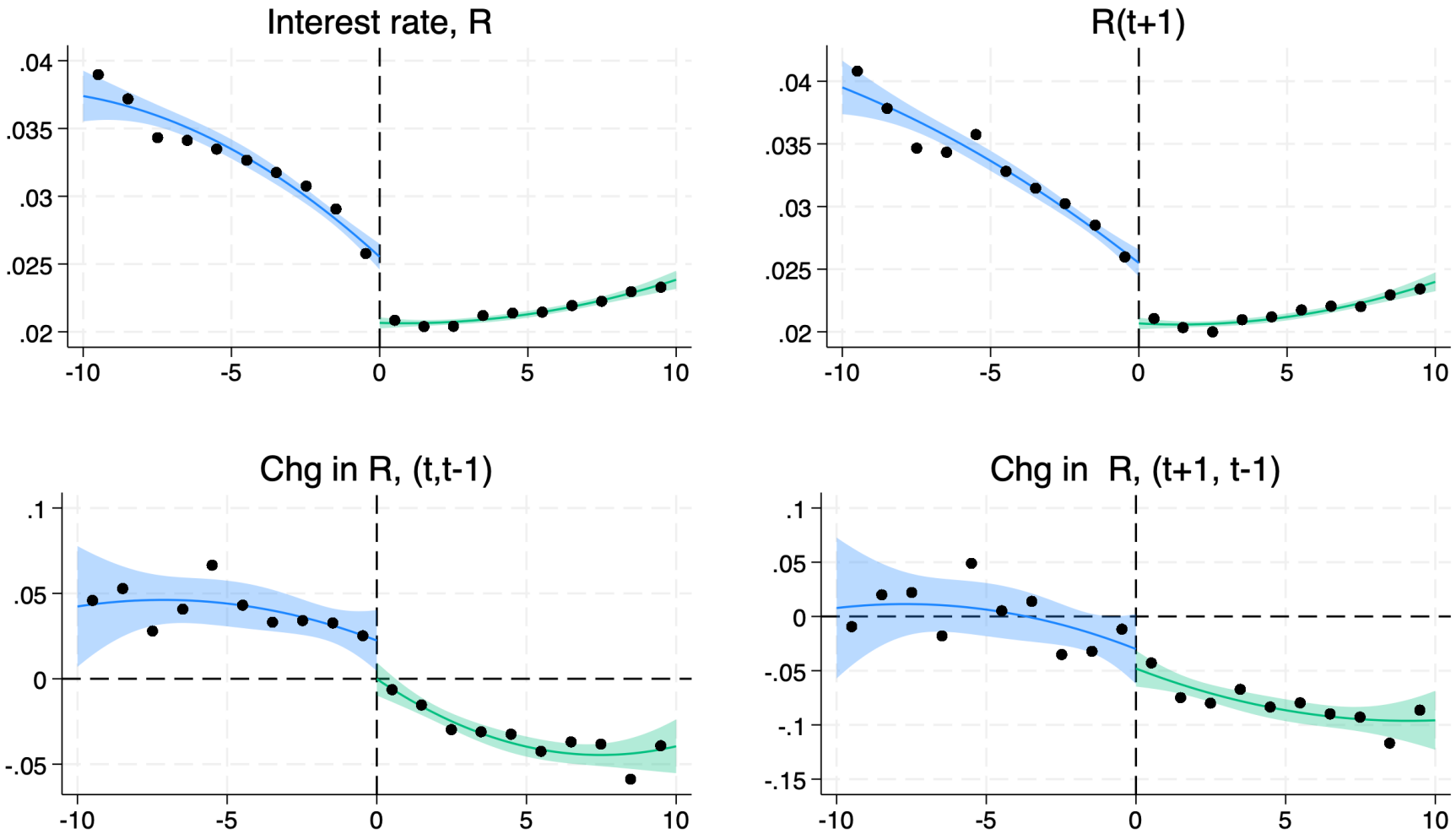


Figure 7: Interest Expenses as % current liabilities and long-term debt

	(1) Interest rate, r_t	(2) Change in Interest rate, Δr_t
Estimated disc. (ppts)	-0.4793***	-2.6775***
	(0.0520)	(0.7642)
Mean depvar	1.420	-1.439
Scaled Effect Size (%)	-33.740	186.118
Controls	Yes	Yes
Bandwidth	10.0	10.0
Observations	135,966	120,836

Note: Table presents RD estimates using $p = 2$ order polynomial. Controls include lagged size, age, and profitab
Bandwidth is chosen optimally in columns (1) and (2)

Table 2: Regression Estimates of Change in Interest Rates at cutoff

Past and Future Performance

Past Performance

Figure 8: Lagged Outcomes

Past performance doesn't determine exacly which side of the cutoff the firm will be

Future Performance

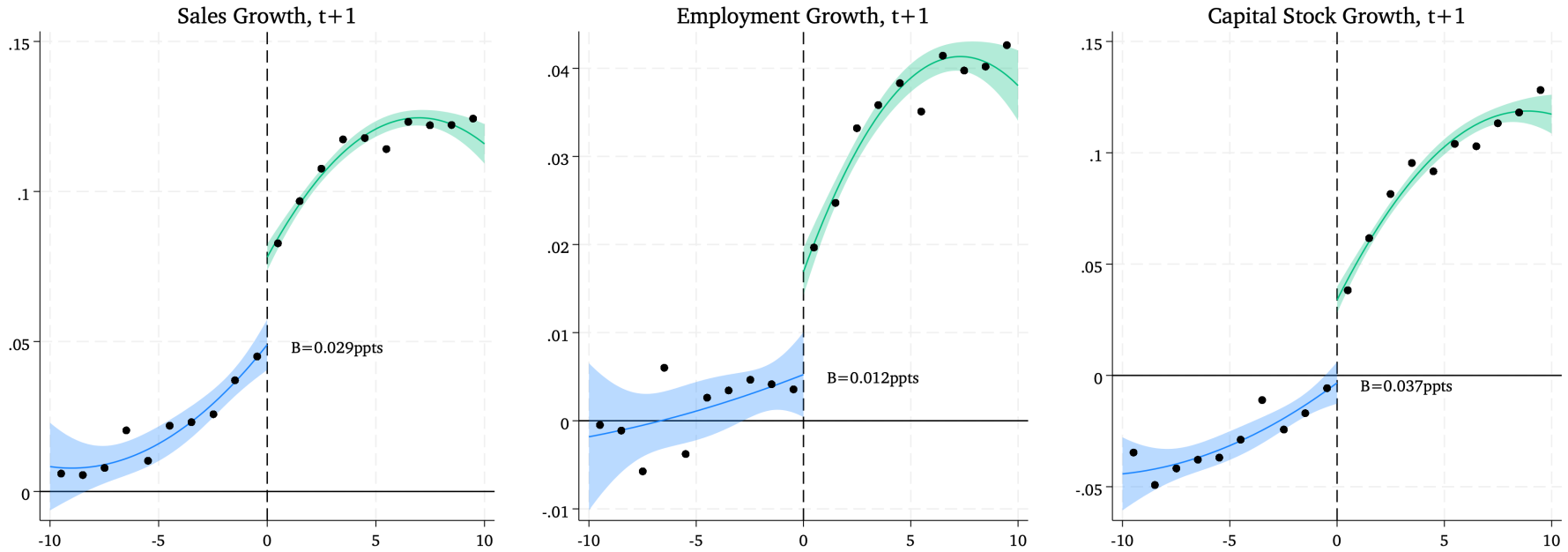


Figure 9: Lagged Outcomes vs Profit Margin today

Sharp discontinuity in future performance (intuitive after jumps in R)
NB: total effect (ie survivor in t+1 response + purging effect)

Model (in progress)

Firms: Production and Cost Structure

Production:

$$y_{it} = z_{it} f(k_{it}) = z_{it} k_{it}^{\alpha} \tag{4}$$

Firm-specific productivity follows an AR(1) with IID disturbances, $\varepsilon \sim N(0, \sigma_{\varepsilon}^2)$

$$ln\ z_{t+1} = \rho_z ln\ z_t + \varepsilon_t \tag{5}$$

standard law of motion:

$$k_{it+1} = (1 - \delta) k_{it} + x_{it} \quad s.t. \quad 0 < \delta < 1 \tag{6}$$

Adjustment of capital is costly:

$$\mathcal{AC}(x_{it}, k_{it}) = \left[\frac{\gamma}{2} \left(\frac{x_{it}}{k_{it}} \right)^2 + F \cdot 1(x_{it} \neq 0) \right] k_{it} \quad s.t. \quad \gamma > 0,\ F > 0 \tag{7}$$

Firms borrow from Rule-of-Thumb Lender

Financing decision:

- internal cash ($b > 0$)
- external financing ($b < 0$) subject to a premium.

Premium depends on operating profit, π^O

$$\pi^O = zk^\alpha - x - \mathcal{AC}(x,k) + r \cdot b \qquad (8)$$

similar premium to Gomes (2001), Goertz et al. (2023):

$$\lambda^{EXT} = \begin{cases} 0 & \text{if } \pi^O \geq 0 \\ \lambda(\pi^O) & \text{if } \pi^O < 0 \end{cases} \qquad (9)$$

For now ad-hoc, can microfound (appendix)

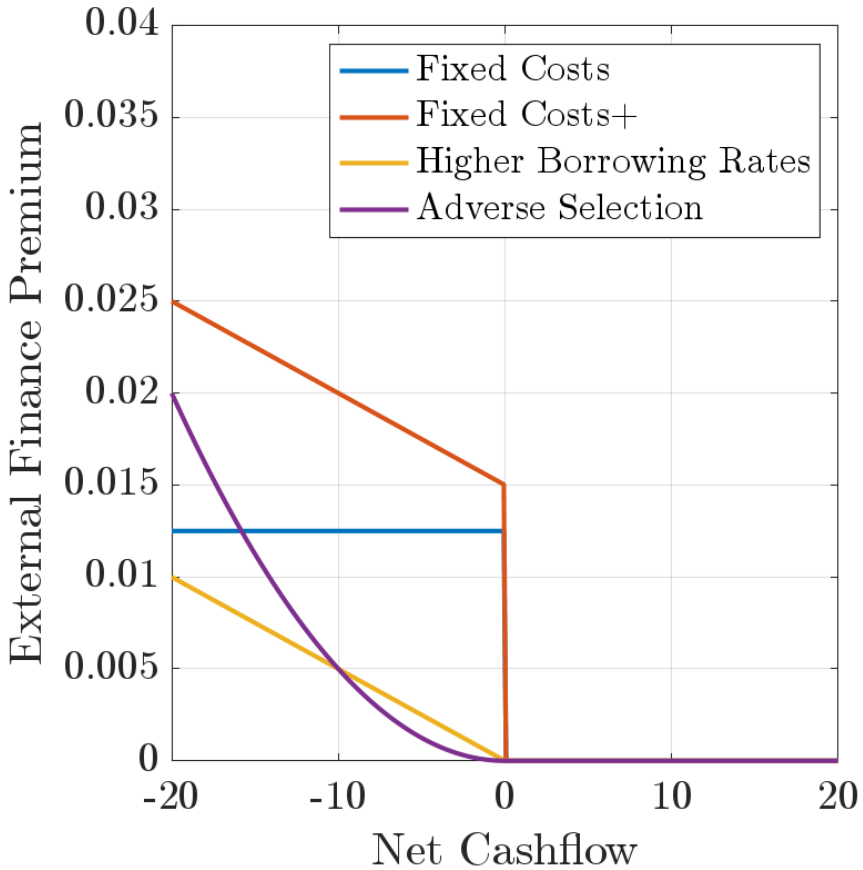


Figure 10: Example premia

Lumpy Adjustment vs Inactivity decision:

$$W(z,k,b) = \max\left\{V^I(z,k,b), V^A(z,k,b)\right\} \tag{10}$$

Inactive state, building cash balances:

$$V^I(z,k,b) = \max_{b'}\left\{zf(k) - \lambda^{EXT} + (1+r)b - b' + \beta E_{z'|z} W(z',(1-\delta)k,b')\right\} \tag{11}$$

Investment spell, increasing net borrowing

$$V^A(z,k,b) = \max_{x,b'}\left\{zf(k) - x - \mathcal{AC}(x,k) - \lambda^{EXT} + (1+r)b - b' \right. \tag{12}$$

$$\left. + \beta E_{z'|z} W(z', x+(1-\delta)k, b')\right\} \tag{13}$$

- Firms hold cash to reduce premium paid
- phases of building cash reserve and bursts of investment

Closing Comments

Firms actively manage expenditures to remain on good terms with lenders

Lender's problem is tricky in GE, but data shows strong bond repricing around zero

Next steps: solve model with rule-of-thumb lender

Note on selective exit

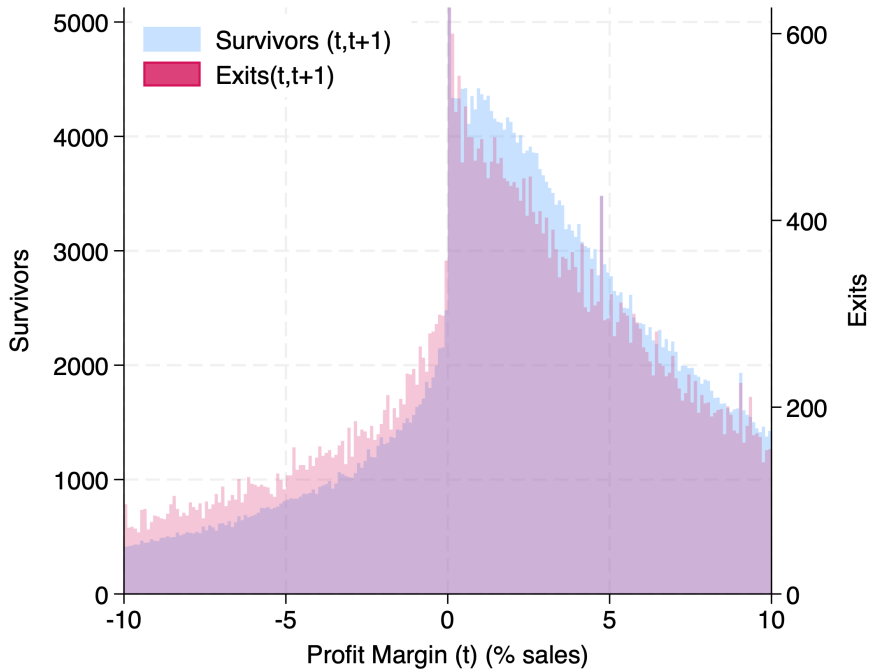


Figure 11: Exits and Survivors, t:t+1

Back to Density

Exiting firms dont behave differently around zero Compustat: large firm much more likely to survive

Lender: Microfoundation for behaviour of the Bank

Lender behaviour in the data requires a lot of updating around zero

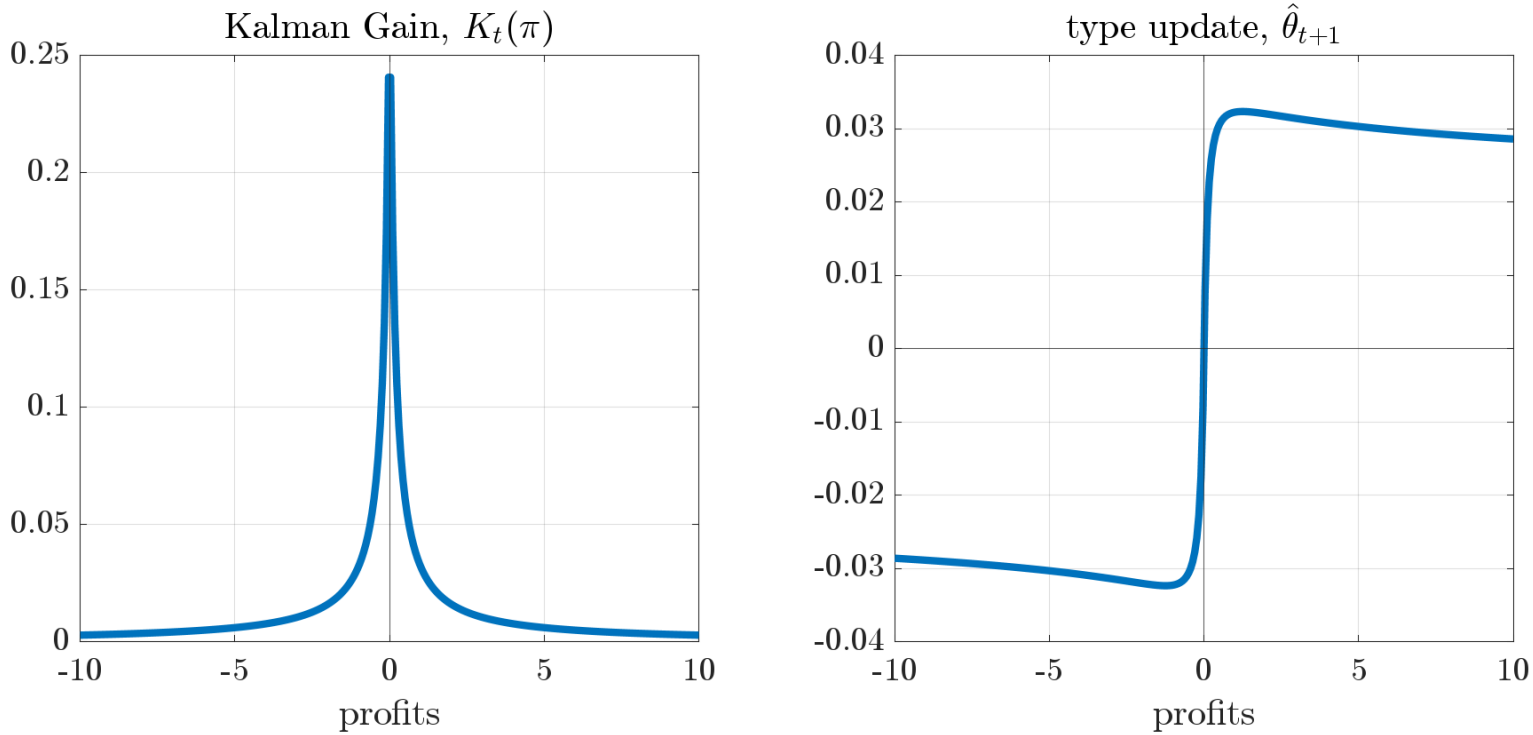


Figure 12: Attention and updating of creditworthiness

- rational inattention due to fixed costs of monitoring the firm
- No point paying attention in the tails / Much more gain around zero
- Data: positive profits x2 persistent compared to losses (.43 v .23)

Lender: Asymmetric Persistence of profits

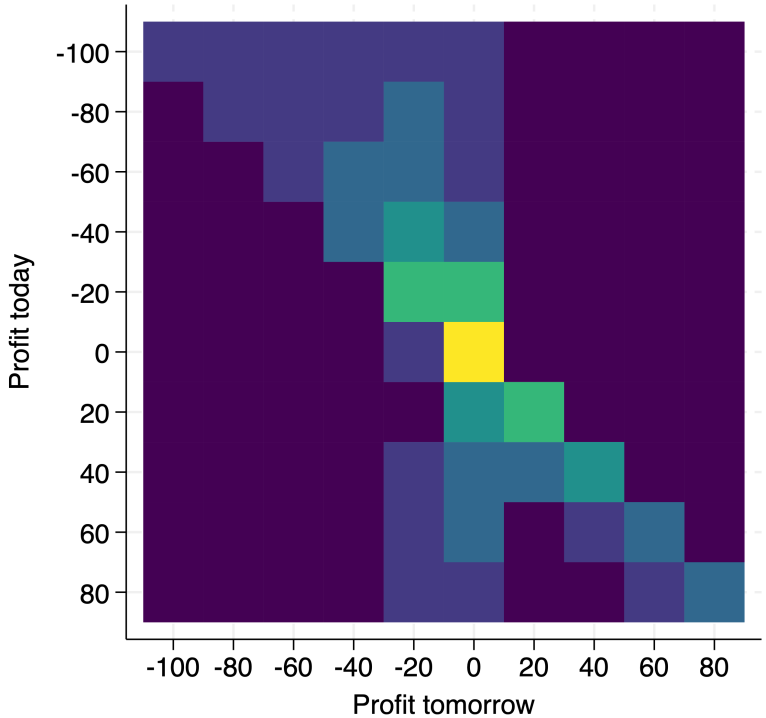
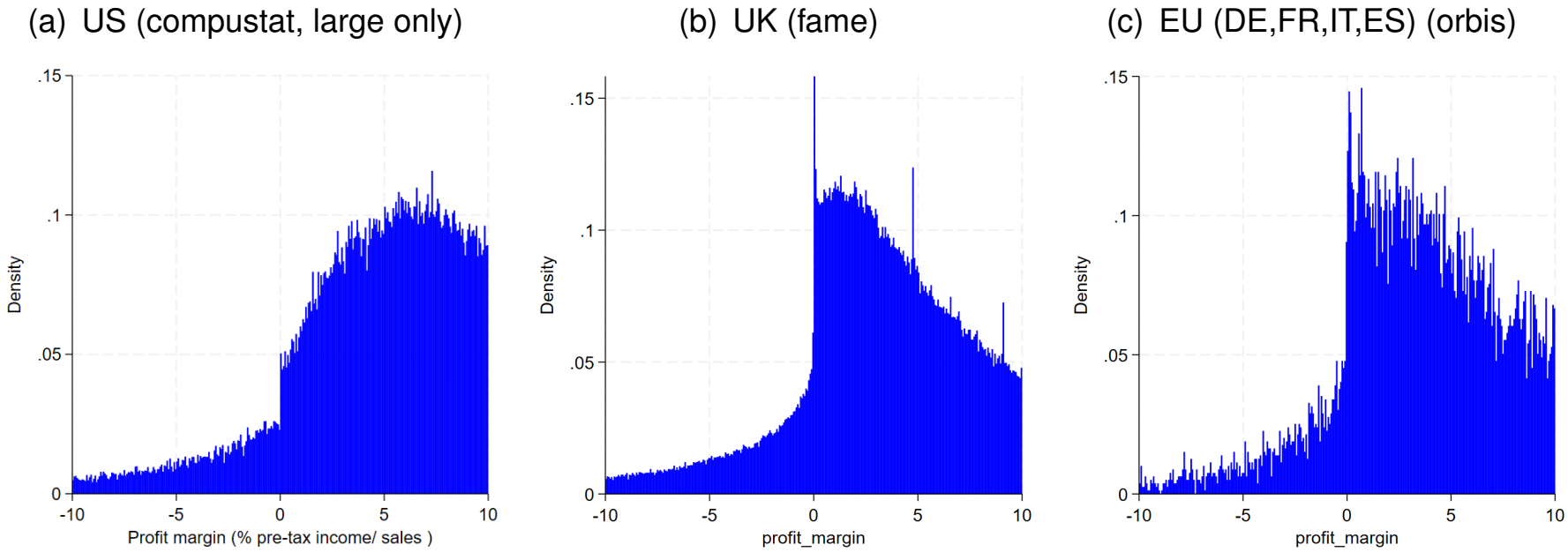


Figure 13: Profitability Transition Matrix

- Strong mean reversion (towards surplus) when making losses
- Greater uncertainty for losses

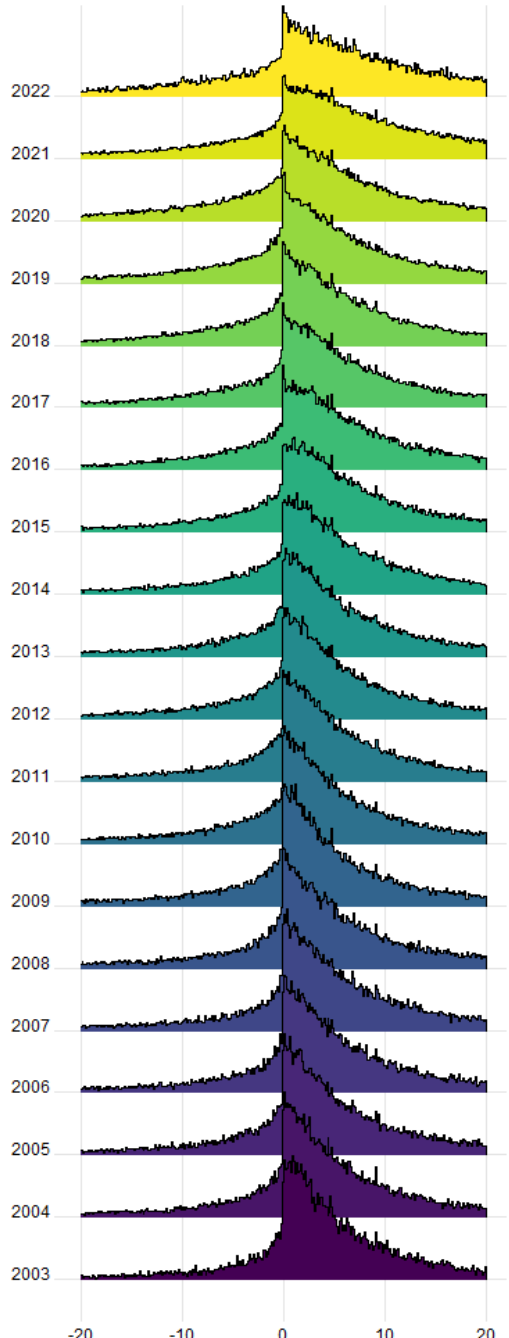
Zero the mainstream firm dynamics datasets



Note: Compustat North America database, FAME, ORBIS.

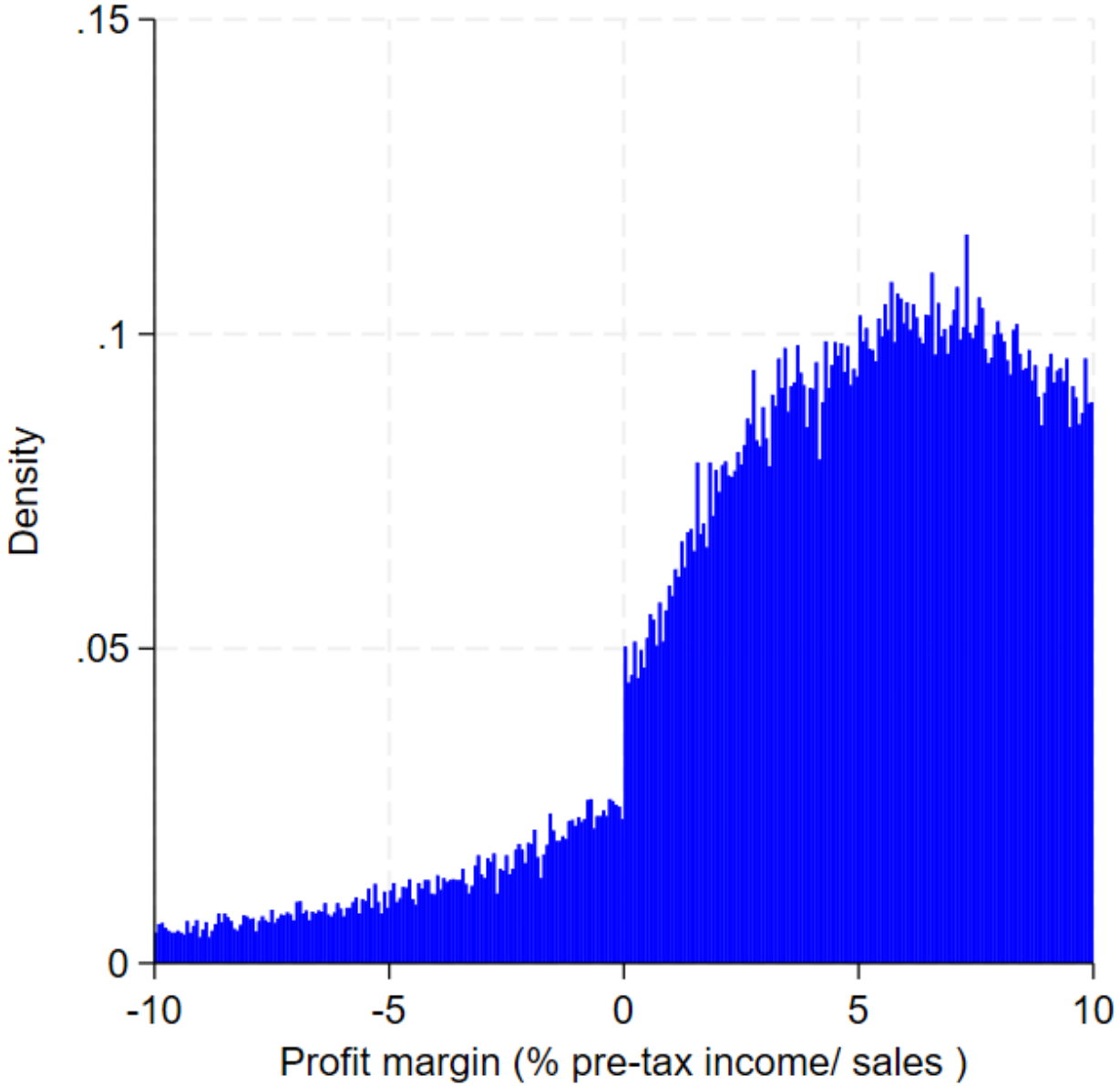
Figure 14: Density Jump at zero profits in US,UK,EU firms

Appendix: Discontinuity in Profit Margin Density by Year



Compustat (US listed firms only)

Compustat firms also seem to rearrange expenditures to achieve profitability



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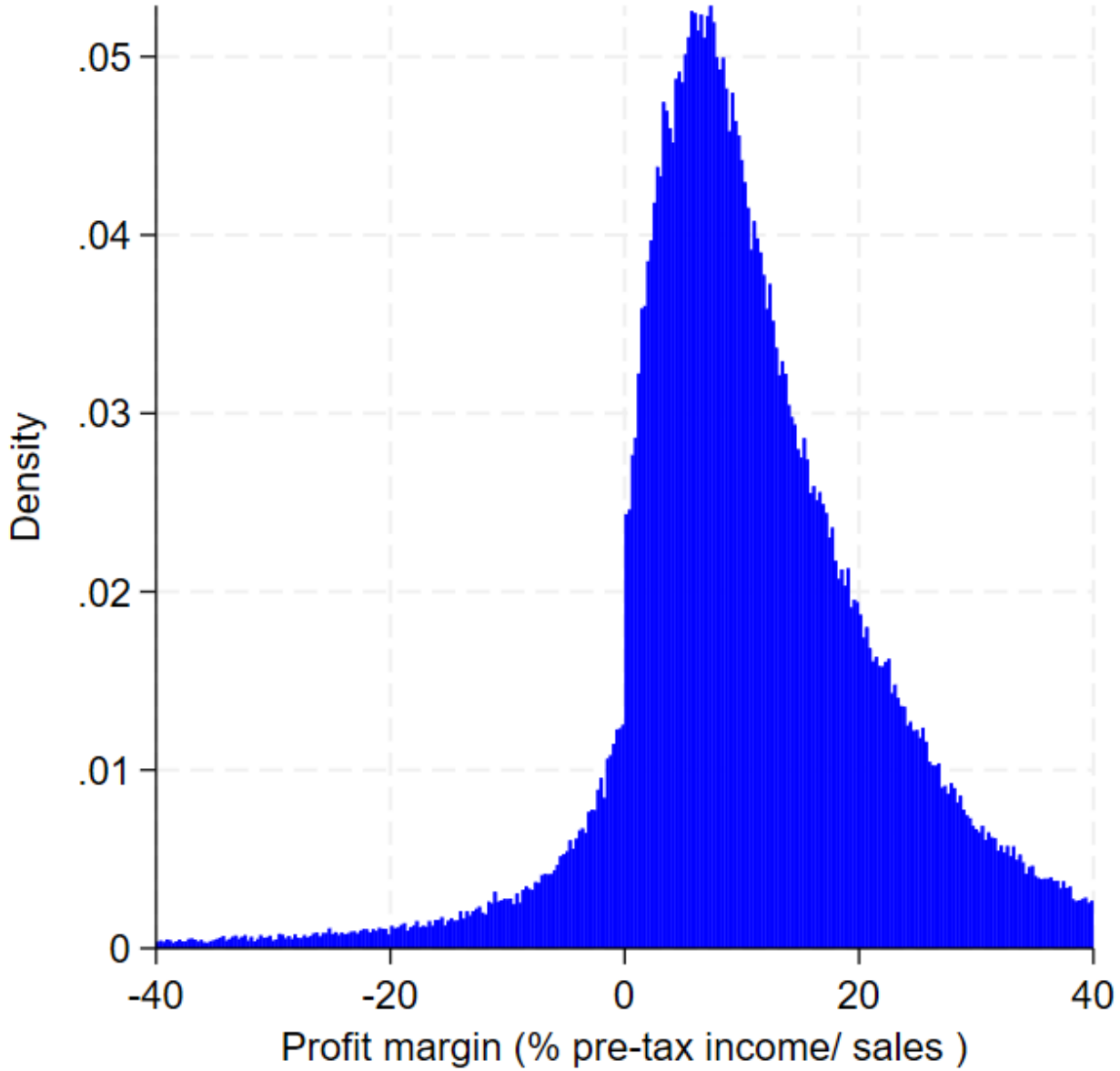

Capital Investment

Slight drop in capital investment

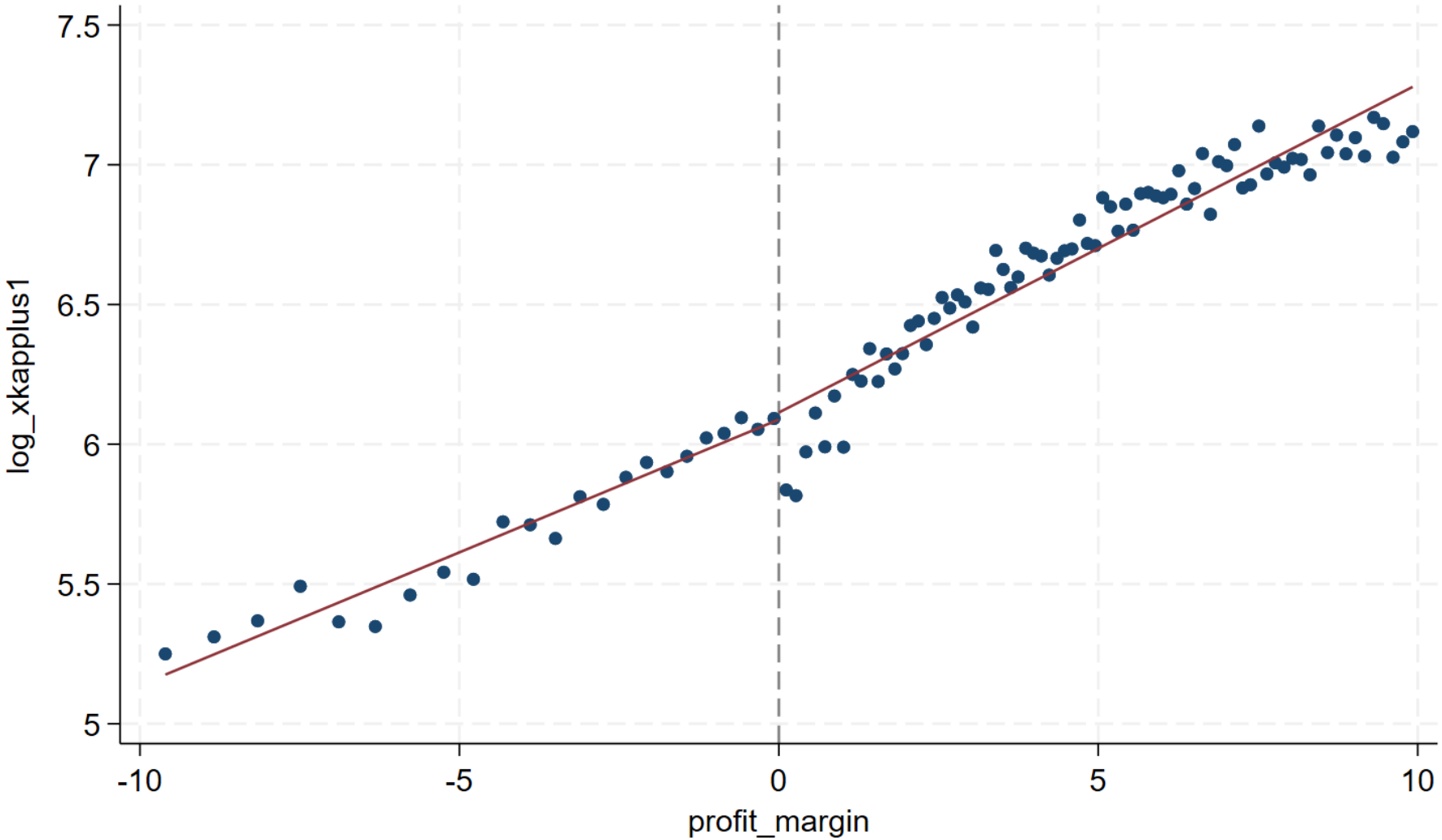

Figure 18: Manipulators boost profits but cutting CAPX slightly

Research Investment

Stronger drop in research and development

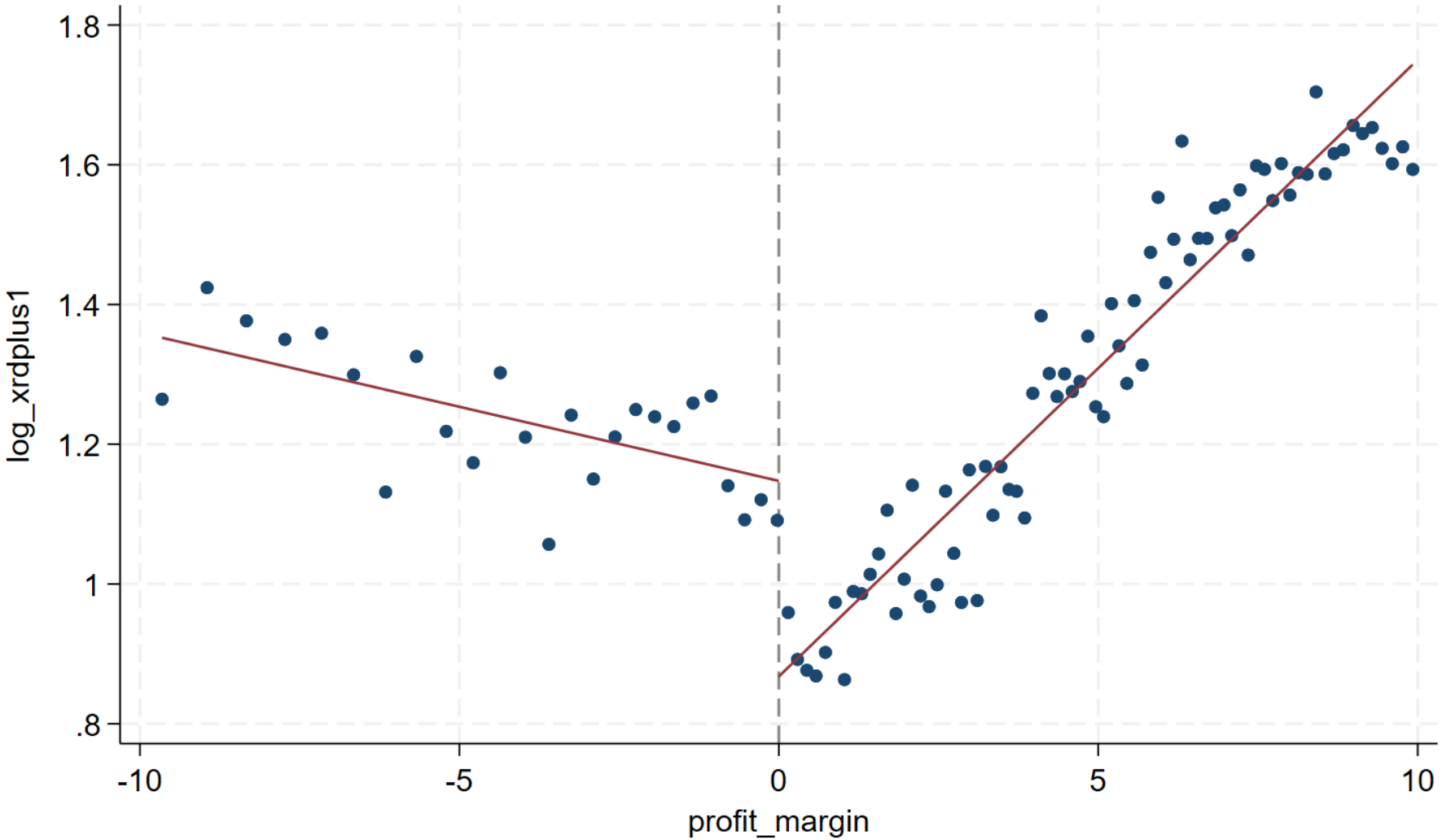

Figure 19: Manipulators boost profits but cutting Research & Development (XRD)

Interest Expenses

Interest expenses drop

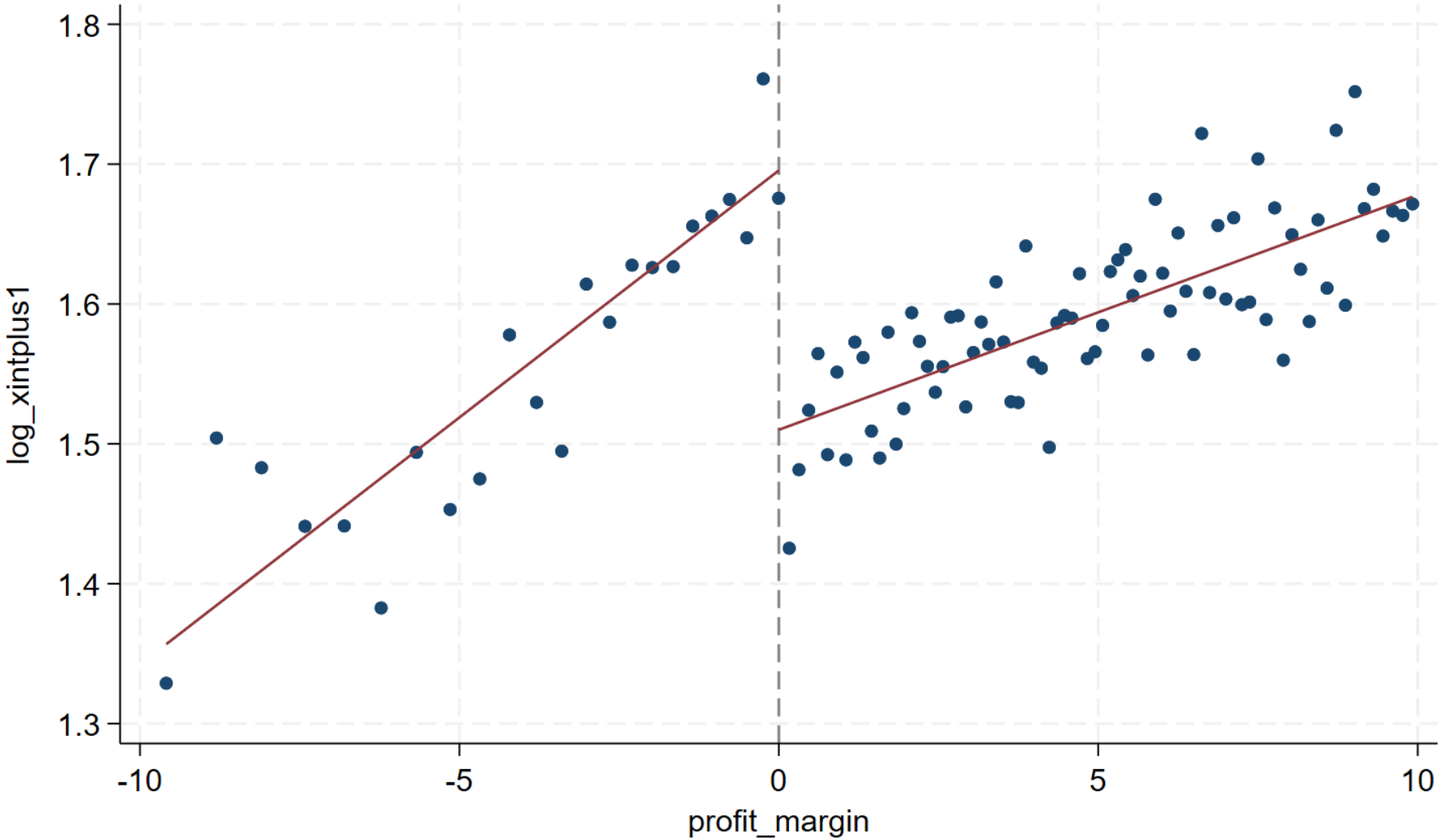

Figure 20: Interest expenses more favourable on the RHS

Employment

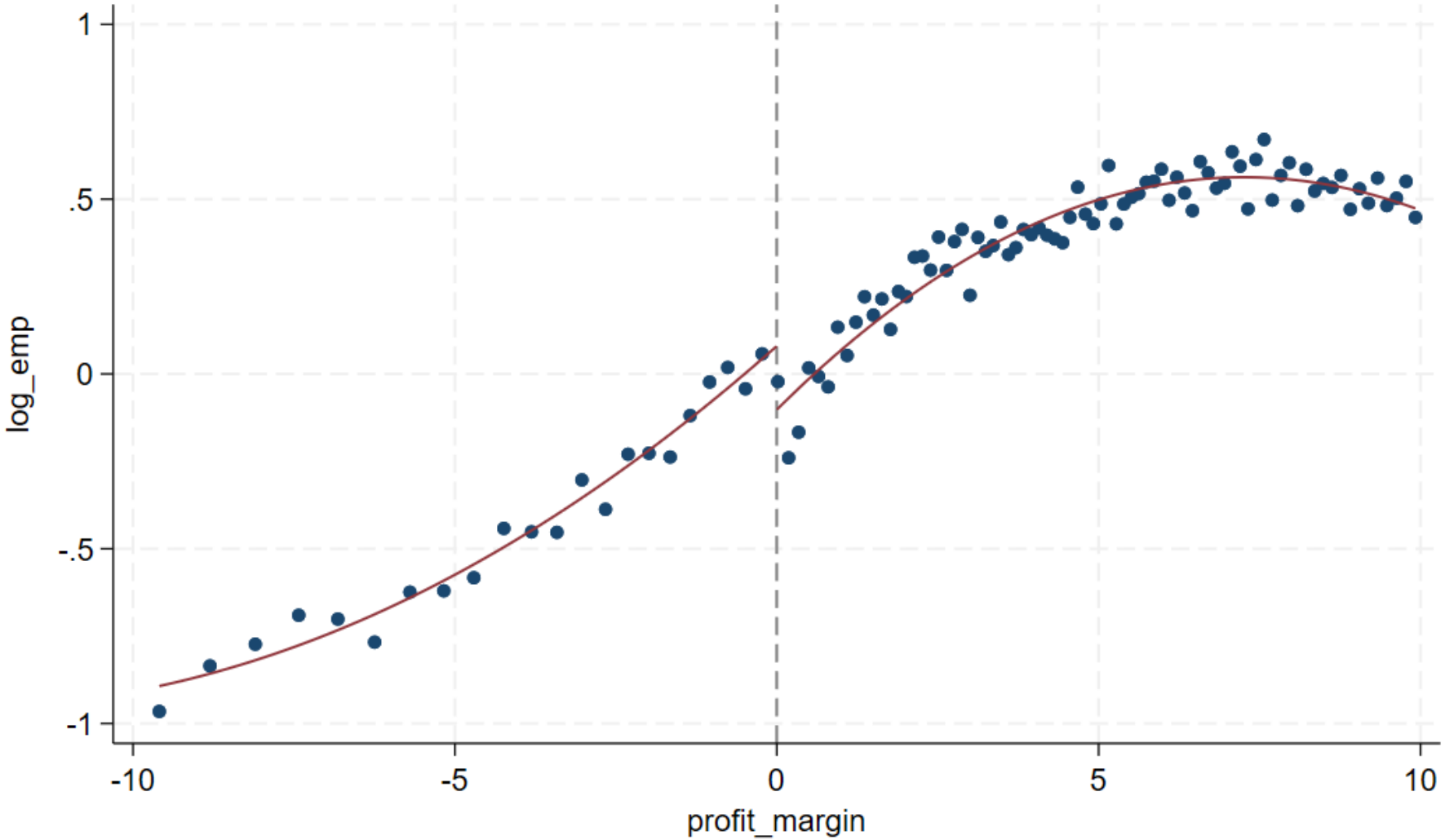

Figure 21: Employment cuts?

Inventories

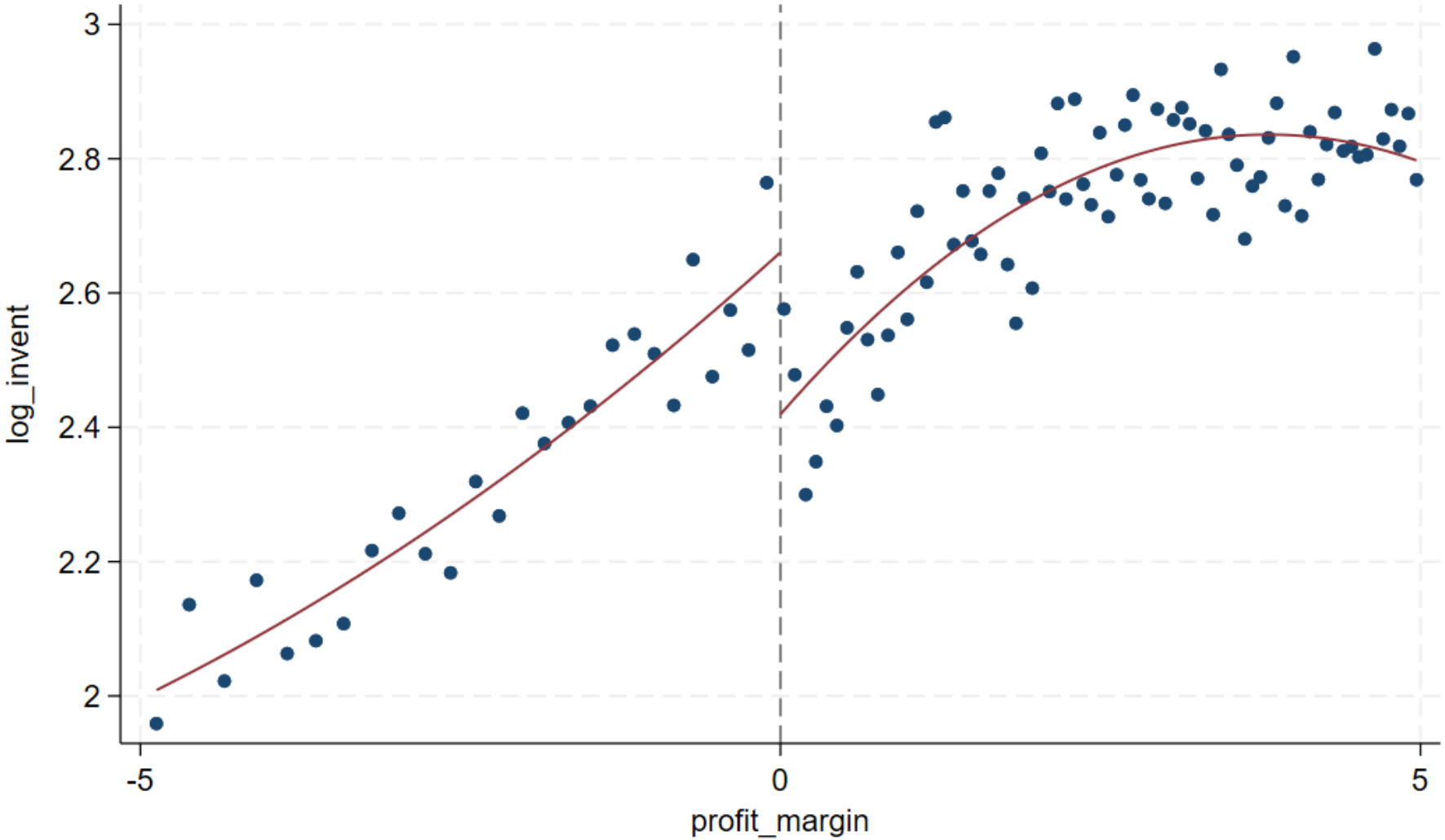

Figure 22: Lower stocks of inventories

	(1) log_real_capx	(2) log_xkapplus1	(3) log_xrdplus1	(4) log_xrd	(5) log_invent
posprofits	-0.242***	-0.246***	-0.139***	-0.322***	-0.238***
	(0.0580)	(0.0571)	(0.0405)	(0.0950)	(0.0501)
Observations	90122	91642	40476	27426	88490

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) log_cash	(2) log_emp	(3) log_xint	(4) log_xintplus1	(5) xint_share
posprofits	-0.157***	-0.122**	-0.238***	-0.135***	-0.0845
	(0.0575)	(0.0486)	(0.0501)	(0.0311)	(0.101)
Observations	80077	87038	88490	92112	84697

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: RD regression, polynomial order $p = 2$ width fixed bandwith $h = 10$. Controls: year, sector, age proxy. Robust standard errors clustered at firm and year levels.

Table 3: Simple RD regressions

Operating Profit

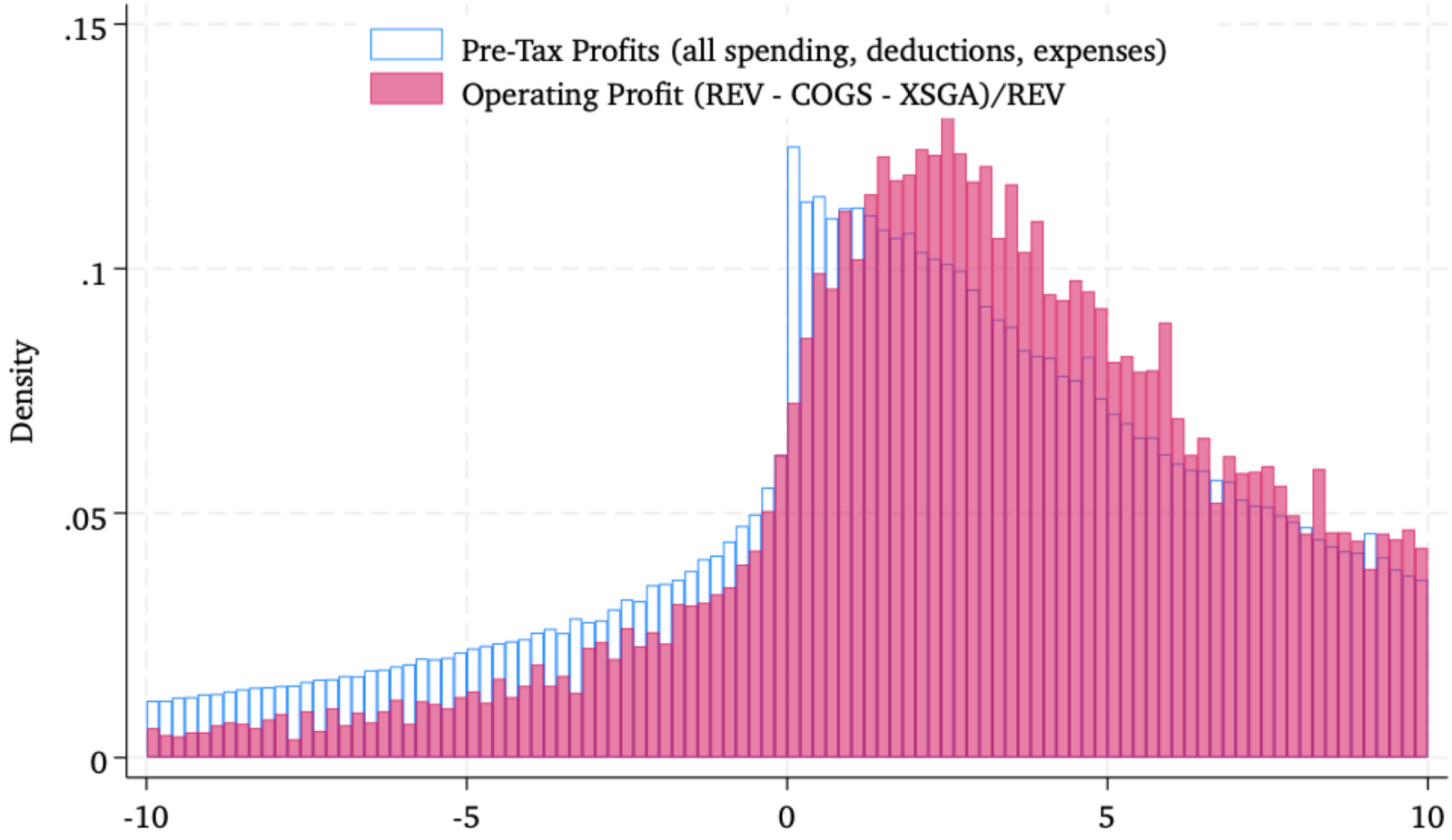

Figure 23: Net Profit and Operating Profit

No OPEX related jump: not a story about output, driven by interest, depreciation, etc

Back to Density

Persistence

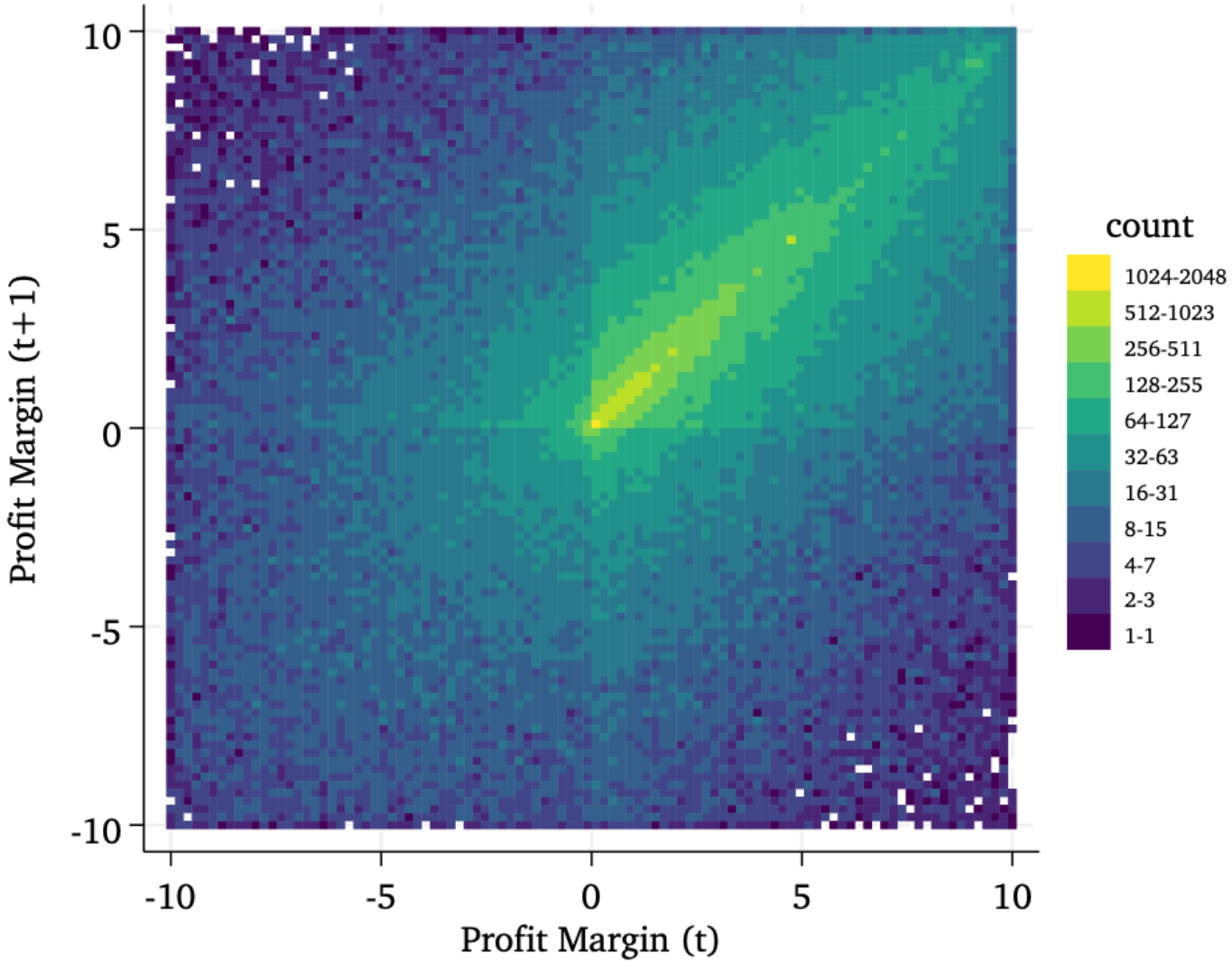

Figure 24: Joint distribution $F(\pi_t, \pi_{t+1})$

Persistence of profits

	(1)	(2)	(3)	(4)	(5)
Profitability Persistence	0.4901***	0.1197***	0.1188***	0.1056***	0.0473***
	(0.0011)	(0.0014)	(0.0014)	(0.0016)	(0.0008)
Firm-FEs		Yes	Yes	Yes	Yes
Time-FEs			Yes	Yes	Yes
Controls				Yes	Yes
Bandwidth:+/-10ppts					Yes
N	556,001	553,862	553,862	461,693	307,762

Bonus: Depreciation. More generalised distortion of choices?

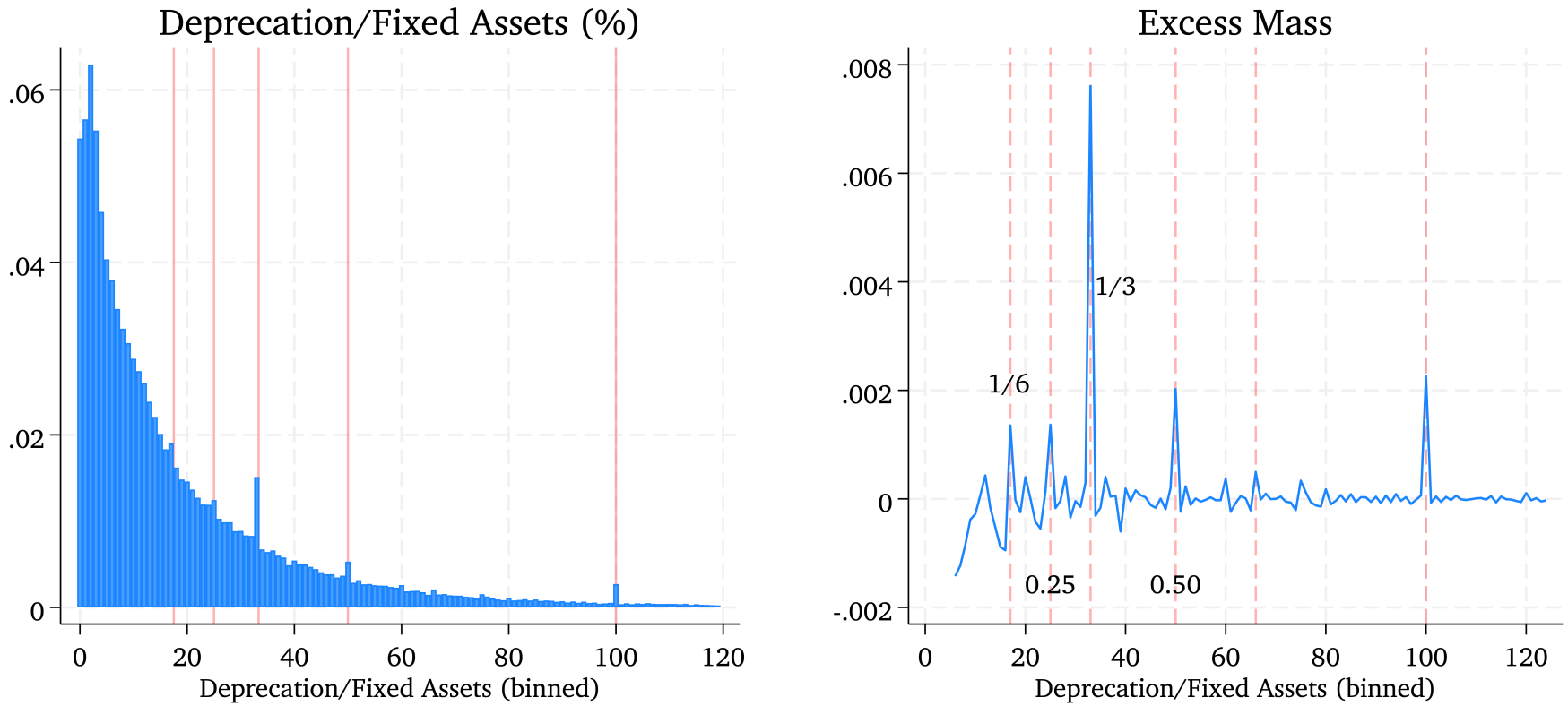

Figure 25: Depreciation Distortions relative to polynomial fit

- **Over-represented** nice fractions: $6^{-1}, 4^{-1}, 3^{-1}, 2^{-1}, 1$
- multiples of 5, 10 generally no more likely.
- don't know the true state of PPE, so guess? Impatient response?

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