

# HOW DO BUSINESS TAX RATES AFFECT REAL INVESTMENT? THE ROLE OF DEPRECIATION AND FIRM CHARACTERISTICS

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# NEW EVIDENCE ON HOW INVESTMENT RESPONDS TO LOCAL CIT

- Universe of mfg. plants and all local business tax (LBT) reforms in Germany
  - ▶ Show strong response on extensive margin, concentrated in building investment (semi-elasticity of  $\approx -3$ )
- Affirms findings from other studies with arguably messier data and identification
  - ▶ Suárez-Serrato & Zidar (2016): 40% of U.S. state-level CIT incidence falls on firm owners
  - ▶ Giroud & Rauh (2019): reallocation on extensive margin by multi-state firms to avoid CIT
  - ▶ Harju, Koivisto, Matikka (2022): zero baseline effect on investment
- **Main point here is that there is response heterogeneity depending on capital input structure at the plant level**
  - ▶ LaPoint & Sakabe (2022): responses vary by capital good for bonus depreciation scheme
  - ▶ For bonus depreciation, this is partially mechanical, for CIT, test of canonical Hall & Jorgenson (1967):  $MPK = \text{cost of capital}$

## COMMENT #1: ROLE OF INTERNAL CAPITAL MARKETS

- Firms can reshuffle resources across plants in response to local demand shocks
  - ▶ Giroud & Mueller (2015 JF + 2019 AER) show this for financially constrained firms
  - ▶ Same is likely true for supply shocks like LBT rate changes
  - ▶ Older draft: limited evidence of firms spatially reallocating capital here (why?)
- **But in this setting, the internal resource shifting is likely on the employment side!**
  - ▶ Sample covers mfg. firms for which phys. capital is more immobile and operations are more geographically concentrated (e.g. Mian & Sufi 2014)
  - ▶ Table 8: inv. responses driven by largest plants which are more likely to be important production sites within parent firm
- Other reason: German tax code encourages shifting labor to low tax areas through apportionment formula and rate hikes amplify these incentives

Table 8: Robustness tests: Reallocation of capital inputs

	Total	Total	2-3 estab.	2-3 estab.	4+ estab.	4+ estab.
	<i>Prob.</i>	<i>Level</i>	<i>Prob.</i>	<i>Level</i>	<i>Prob.</i>	<i>Level</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<b><i>LBT rate differential</i></b>	-0.108 (0.135)	-1.282* (0.736)	-0.118 (0.170)	-1.855** (0.882)	-0.187 (0.275)	0.000801 (1.605)
Establishment controls	✓	✓	✓	✓	✓	✓
Regional controls	✓	✓	✓	✓	✓	✓
Establishment FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Observations	170,012	145,940	101,186	87,674	68,826	58,266
Adjusted R-squared	0.403	0.752	0.442	0.723	0.373	0.785

*Notes:* The dependent variables are the logarithm of price-adjusted net investment probability of establishment  $i$  in year  $t$  in columns (1), (3) and (5) and the price-adjusted net investment level of establishment  $i$  in year  $t$  in columns (2), (4) and (6). Establishment controls comprise the logarithm of price-adjusted capital stock and the logarithm of price-adjusted turnover. Regional controls comprise the logarithm of price-adjusted GDP per capita, the unemployment rate, and the logarithm of population. Estimations are performed by ordinary least squares (OLS). We cluster standard errors (in parentheses) at the municipality level. \*\*\*, \*\*, and \* indicate significance levels of 0.01, 0.05, and 0.1, respectively.

- Check whether reallocation of employment occurs for multi-plant firms too

# SUTVA VIOLATION AND THE APPORTIONMENT FORMULA

- At the firm  $f$  level, the LBT rate  $\tilde{\tau}_{f,j,t}$  is a weighted avg. of LBT rates where weights are the wage bill share for plant  $i$ :

$$\tilde{\tau}_{f,j,t} = \sum_{i=1}^{N_f} \tau_{j,t} \times \left( \frac{W_{i,j,t}}{W_{f,j,t}} \right)$$

- Multi-plant firms can lower their overall tax bill by moving labor to municipalities  $j$  with lower tax rates  $\tau_{j,t} \implies$  tax base spillover implications of LBT changes
- Then there is a potential **SUTVA violation** to the extent that...
  - (I) Workers either relocate to or jobs are created at “untreated”  $(j, t)$  where  $\Delta\tau_{j,t} = 0$
  - (II) Phys. capital and labor are complementary (Curtis et al. 2021)

## COMMENT #2: HOW TO MEASURE INVESTMENT?

- Paper argues that their CAPX measure improves upon the literature
  - ▶ *“Further, we observe investments directly compared to accounting data-based studies, that have to infer investments from changes in the capital stock.”*
  - ▶ Could be, but there is a high bar to be cleared to justify this statement
  - ▶ “Standard” definition:  $I_{t+1} = \Delta NPPE_{t+1} + \text{accounting depreciation}$
  - ▶ Here,  $I_{t+1} \approx \Delta K_{t+1} + \text{economic depreciation}$  ( $K_{t+1}$  nets out leases)
- Bai et al. (2022 NBER WP): literature has 40 different ways of measuring  $I_t$  in Compustat with wild variation in implied  $I_t/K_{t-1}$
- **How does the Wagner (2010) method used here to get  $K$  compare to the more standard perpetual inventory approach? (Hayashi & Inoue 1991)**
  - ▶ Capital stock  $\neq$  net/gross book values that we get from databases like Compustat/Orbis
  - ▶ Sanity check using subsample of German firms in Orbis?

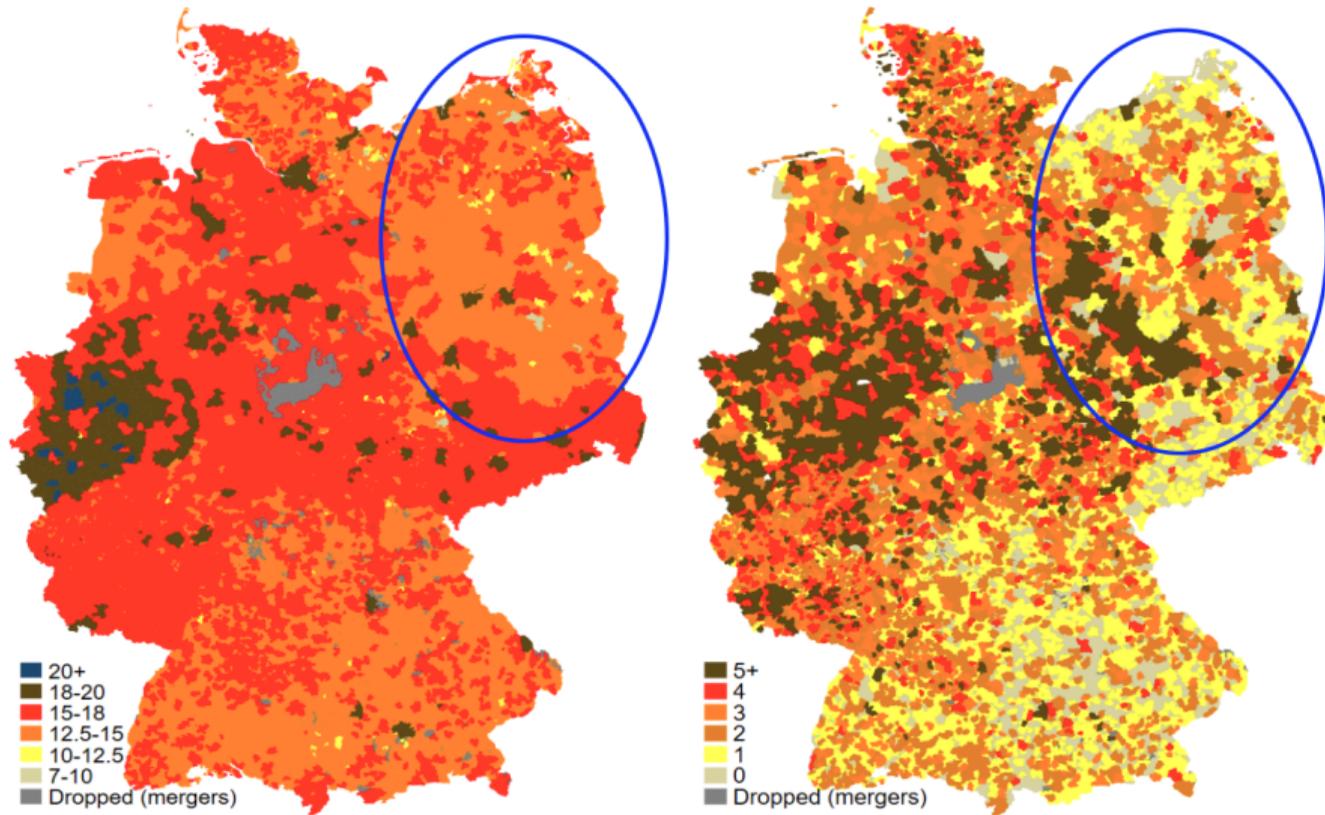
## COMMENT #3: WHAT IS THE MARGINAL CONTRIBUTION?

- Large literature on how investment responds to local tax policy
  - ▶ Sources of heterogeneous responses due to depreciation and size/age already documented
  - ▶ Other paper in this session (Hines & Kindsgrub 2022) also looking at German LBT policy, complementary results on new business entry
  - ▶ Fuest, Peichl, Siegloch (2018) on the labor market incidence of German LBT
- **More emphasis on what is new in this paper**
  1. Can separate investment outcomes by capital good type
    - ★ Response concentrated in extensive margin real estate investment
    - ★  $\implies$  LBT policy has potentially long-lived effects on local capital retention, CRE stock
  2. Heterogeneity by corporate form: C-corp vs. pass-through entities
    - ★ Table 6 DDD: no differential response before vs. after 2008 reform (why??)
    - ★ Can these results help distinguish financing constraints vs. lumpy investment?

# MISCELLANEOUS LOOSE ENDS

- **Bonus depreciation** scheme targeting East Germany during sample period
  - ▶ Evidence in papers by Eichfelder & Schneider that this generated large building inv.
  - ▶ **Region  $\times$  year FEs** to take out other place-based policy variation
- **Separate analysis for West vs. East Germany**
  - ▶ Most variation in tax rate changes is on the intensive margin
  - ▶ Series of rate hikes in West Germany which might feature **non-linear responses**
  - ▶ Compared to East Germany where municipalities more likely to have a a single hike or cut
- **Bad control problem in the event study specification**
  - ▶ Reverse causality between the outcome and the RHS control variable (e.g. GDP)
  - ▶ Cleaner to use lagged macro variables and/or **region  $\times$  year FEs** (Figure B.2 helps)

Figure 1: Variation in LBT rates among German municipalities



(a) LBT rates in 2016

(b) Local multiplier changes per municipality, 1995–2016

# OVERALL ASSESSMENT

- **Impressive dataset and clean institutional setting with common federal tax base**
  - ▶ We need more papers showing how CAPX responds to local policy!
  - ▶ Other papers use plant-level mfg. Census data, but this one also has CAPX broken down by asset type (land, buildings, equipment)
  - ▶ Another advantage: can also distinguish between C-corps vs. pass-throughs
- **My suggestion: move framing away from measurement towards PBP literature**
  - ▶ Not clear that investment is correctly measured in the data, especially given recent accounting critiques
  - ▶ Results have important implications for policymakers who are looking to spur long-lasting investment in struggling economies → recent U.S. experience with Opportunity Zones
  - ▶ Other outcomes to consider: since response is driven by buildings/construction, long-run impact on prices/amenities



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THANKS!

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