Shocking Capital: Firm-level Responses to a Large Local Business Tax Reform in France

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Motivation I

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- **Not all variation in the cost of capital leads to the same responses**
  - Tax policies *directly and immediately* reducing the cost of investment might be more effective than policies that more broadly affect the cost of capital and pay off gradually over time.
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- *Research question*: How did firms respond to the **permanent** abolition of a business tax that was **directly raised on equipment capital**?

Motivation II

- **Taxes on production** are particularly high in France
  - 3% of GDP in France versus 1.6% in Euro zone, less than 0.5% in Germany (DG trésor, 2018).
  - encompasses taxes on sales, value-added, real-estate, wage bill ...
- Recurrent governmental projects to reform such taxes.
- These taxes are claimed to be **very detrimental to competitiveness** by a wide rang of observers (e.g. Conseil National de l'Industrie, 2018 and OFCE, 2018)
  - **Theoretical** or **indirect** academic foundations to these claims:
    - Taxing intermediate goods is widely considered as inefficient (Diamond & Mirlees 1971)
    - Taxes on sales for BtB transactions generate cascading distortions and encourages inefficient vertical integration (Hansen et al., 2017).
- **Little ex-post evaluation** of such taxes, in particular on firm-level outcomes.
  - Data hardly available
  - No policy-induced variation in tax rates, except for real estate taxes but variation is small ...

This paper

1. We analyze the abolition of the "taxe professionnelle" a large reform of local business taxation in France in 2010.
   - 1.1 percentage point of GDP before and 0.8 after (-5bn€) (DG Tresor)
   - Prior to 2010:
     sTax base = historical cost of equipment; Tax rate = locally set
   - Reform: Tax base is shifted to value-added, rates set nationally
2. We use **newly available data** from TP returns to precisely measure **ex-ante exposure** to the reform.
   - Data on equipment capital and real estate capital at the plant-level
   - Measure of exposure = weighted average of tax rates where weights are determined by the size and K intensity of plants owned by a given firm.
3. Implement **DiD estimation** in order assess the impact on:
   i. tax burden
   ii. capital
   iii. sales and value-added
   iv. wage bill and employment
   So far...

Main results

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Descriptive findings

1. Prior to the reform we see
   i. robust negative (resp. positive) **correlation** between plant-level capital (resp. labor) intensity and local taxes
   ii. this holds within-industry and within-firm (multi-plant firm).
2. Most firms are ex-ante winners from the reform. The magnitude of the gains varies a lot, even within sector.

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   $\Rightarrow$ labor born a very small share of the incidence (simple computation suggests less than 5%).
5. Results robust to a variety of checks:
   i. Inclusion of rich set of sectoral and size fixed-effects
   ii. Varying definition measure of ex-ante exposure (year of reference)
   iii. Graphical evidence (mostly) supports causal interpretation of the findings.

Relation to Previous Literature

- **Previous analysis of TP and its reform**
  - Rathelot & Sillard (EJ 2008): little if any impact of variation in local rates on firm location (1990s)
  - Simula & Trannoy (REP, 2009): tax augmented q-theory of investment (Summers, BPEA, 1981) applied to the reform (ex-ante evaluation)
  - Ly and Paty, forthcoming RSUE: effect of the reform on tax setting behavior by local governments
- **Empirical Studies of Business Tax**
  - CIT: investment and employment (Bond and Van Reenen, 2007), wage incidence (Suárez Serrato & Zidar, AER, '16; Fuest et al., AER ,'18)
  - Tax on dividends: Yagan, AER, '15; Boissel & Matray '19
  - Investment bonus: House and Shapiro, 2008; Zwick and Mahon, 2017
  - Payroll taxes: Saez et al., AER ,'18; Ku et al., 2019
- **Related to literature on misallocation of factors of production**
  - Dispersion in tax rates is likely to amplify dispersion in marginal productivity of capital and misallocation (Fagjelbaum et al. Restud 2018)
  - Aggregate TFP growth would have been 30% higher in mfg sector between of 1990-2015 if factors had been optimally allocated: Libert, 2017; Restuccia Rogerson RED 2008; Hsieh & Klenow QJE 2009

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Local business taxation before 2010

The *taxe professionnelle*

- Declare at $t-1$ value of real-estate and equipment owned at $t-2$ (base at t)
- Local authorities vote at $t-1$ the tax rate for year t
- Taxation floor at 1.5% of VA (if sales>7.5M€) and ceiling at 3.5% of VA

Formalization

- Firm i owning $n(i,t)$ establishments in cities $\mathcal{C}_i$.
- Baseline tax burden:
  - Tax base of i in city c: $KB_{c,i,t-2} + KE_{c,i,t-2}$.
  - Sum of tax $\times$ base across plants:

$$\text{TP}_{i,t} \equiv \sum_{c \in \mathcal{C}_{i,t-2}} \tau_{c,t} \times (KB_{c,i,t-2} + KE_{c,i,t-2})$$

  - $z_{i,t-2} = 1$ if sales $S_{i,t-2} > 7.5$M€
- Actual tax burden writes as:

$$\mathcal{T}_{i,t} = \min\left[\max\left\{0.015 z_{i,t-2} VA_{i,t-2}, \text{TP}_{i,t}\right\}, 0.035 VA_{i,t-2}\right]$$

Local business taxation after 2010

CET = CFE + CVAE

- In February 2009, Nicolas Sarkozy, announced the removal of productive investments from the business tax base to sustain the competitiveness of industrial companies.

  "*The business tax will be abolished in 2010 because we want to keep factories in France.*" N. Sarkozy, February 5, 2009 on TF1

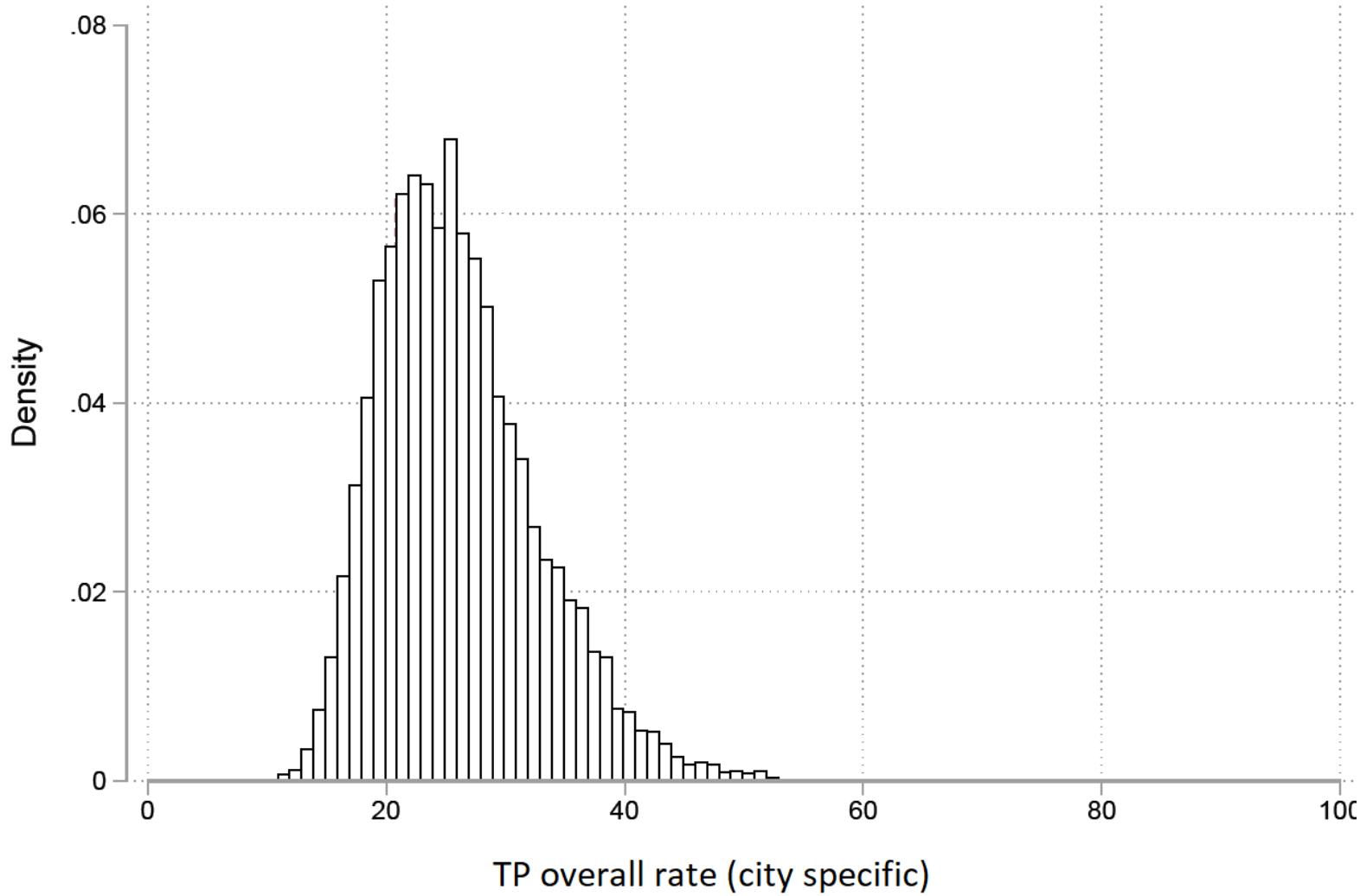
- Replacement consists of two parts:
  - CFE: TP part on real estate
  - CVAE: tax on value added (national rate depending on sales)

$$\mathcal{T}_{i,t} = \max \left\{ \left(\underbrace{\tau_t^n(S_{i,t-2}) VA_{i,t-2}}_{\text{CVAE}} + \underbrace{\sum_{c \in \mathcal{C}_{i,t-2}} \tau_t^c KB_{c,i,t-2}}_{\text{CFE}} \right), 0.03 VA_{i,t-2} \right\}$$

where : $S_{i,t-2}$ refers to sales of firm i at $t-2$

▸ Details on CVAE rate

Distribution of overall tax rate in 2008



▸ Map

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Administrative databases

BIC-BRN database

- Standard balance sheet based on firm's tax returns
- Restriction to manufacturing and service sectors (NFCs)
- Allows to measure precisely the firm-level total TP and then CET burden net of deductions (as opposed to FICUS-FARE). Denoted $\mathcal{T}_{it}$

TP tax returns

- **Establishment** data on KB and KE (and L but we use the DADS)

International trade database (Douane)

- value and volume and value per firm*product*destination
- Used to study pass-through of taxes into export prices

Social contribution database (DADS)

- Work hours and gross wage at employee-level
- Possible to match at the establishment level

Descriptive statistics from our estimation sample

Estimation sample:

- Balanced sample 2005-2015 present in BRN, DADS and TP returns over the period 2004-2010 and BRN, DADS past 2011-2015. (Preliminary results suggests no effect of the policy on survival.)
- Additional restriction: drop firms below 0.5 and above 99.5 percentile in terms several accounting ratios: VA/L, T/VA and S/K.

	Workforce (full time equiv.)	Value Added (in M euros)	KE/VA (in %)	KB/VA (in %)	T/VA (in %)
2005	26.67	1.34	9.80	1.96	2.52
2006	27.46	1.44	9.62	1.94	2.51
2007	28.14	1.55	9.42	1.92	2.34
2008	28.60	1.61	9.61	1.96	2.33
2009	28.42	1.55	10.60	2.18	2.46
2010	28.47	1.59	10.97	2.25	1.76
2011	28.86	1.66			1.69
2012	29.07	1.68			1.79
2013	29.11	1.70			1.81
2014	29.18	1.71			1.84
2015	29.27	1.72			1.85
Number firms	110987	Share manuf	21.3%		

▸ Aggregate time-series

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Capital intensity at the plant level

- For each plant, we have: KB_j, KE_j, WB_j.
- We compute cost share at the plant level.

$$s_{j,v} = \frac{v_j}{KB_j + KE_j + WB_j} \text{ for } v = KB, KE, WB$$

$$s_{j,K} = s_{j,KB} + s_{j,KE} \text{ (overall K intensity)}$$

- How does $s_{j,v}$ vary with local tax rates? We regress s_K on local tax rate $\ln(1+\tau_j)$.
- $b_v = \frac{\widehat{\text{Cov}}(s_{v,j}, \tau_{c(j)})}{\widehat{\text{Var}}(\tau_j)}$ with $b_{KB} + b_{KE} + b_{WB} = 0$
- We can identify this covariance from within sector variation and for multi-plant firms, within firm.

Cross-sectional correlation between K share and $\tau_{c(j)}$

Table: L, KB and KE intensity at the plant level

	(1)	(2)	(3)
	s_{KB}	s_{KE}	s_{WB}
within-industry			
$\ln(1+\tau)$	0.014	-0.102***	0.089***
	(0.006)	(0.018)	(0.018)
Adj R-sq	0.104	.18	.18
N	501709	501709	501709
within-firm			
$\ln(1+\tau)$	0.006	-0.057***	0.051***
	(0.004)	(0.018)	(0.016)
Adj R-sq	0.39	0.568	0.583
N	180834	180834	180834
Sample average $\bar{s}$	0.04	0.135	0.82

- Cannot evaluate effect the reform on this outcome (no taxation implies no information), so we focus on **firm-level outcomes**

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Conceptual framework

Static model

- Multi-plant firm i with CES across plants j (ES=σ, weight = α_j) and CES within plants between K and L (ε, weight on L β_j)
- Monopolistic competitive with constant elasticity of demand γ

Taxation

- National corporate tax τ_c (we ignore it today, no changes over the period)
- Tax on K (τ_K)
- Tax on production (τ_Y)

Objective of the firm: max after tax profits with respect to inputs and price

$$\max \Pi_i = p_i Y_i - \sum_{j \in i} (w_j L_j + r K_j (1 + \tau_{K,j})) - Y_i \tau_Y$$
$$- \tau_c (p_i Y_i - \sum_{j \in i} (\theta_L w_j L_j + \theta_K r K_j (1 + \tau_j)) - \theta_Y Y_i \tau_Y)$$

Unit cost and sales

- u_i unit cost of production by firm i.
- We denote $\tilde{u}_j$ unit cost of production by plant j:

$$\tilde{u}_j = (\beta^{\varepsilon} w_j^{1-\varepsilon} + (1-\beta)^{\varepsilon} (r(1+\tau_{K,j}))^{1-\varepsilon})^{\frac{1}{1-\varepsilon}}$$

- Unit cost at the firm level is:

$$u_i = \frac{1}{1-\tau_Y} \left[\sum_{j \in i} \alpha_j^{\sigma} \tilde{u}_j^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$$

- MC+Cst elasticity of demand $\Rightarrow$ cst markup $p_i = \frac{\gamma}{\gamma-1} u_i$
- Sales:

$$p_i Y_i = \text{cst.} \times u_i^{1-\gamma}$$

Stylized tax reform

Impact on unit cost, sales and factor demand

- Stylized reform:
  - Introduction of national tax on VA: $\Delta\tau_Y = \tau_Y$ (national)
  - Delete tax on KE: $\Delta\tau_{K,j} = -\tau_{K,j}$ (decrease larger for places for higher rates)
- Denote s_j^Y: cost share of plant j in total cost of firm i, s_j^K KE intensity of j

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$$\Delta \ln Sales_i = (1-\gamma)\Delta \ln u_i$$

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$$\Delta \ln u_i \approx_{\text{f.o.}} -\ln(1-\tau_Y) - \sum_{j \in i} s_j^Y \times s_j^K \times \ln(1+\tau_j)$$

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We build the empirical counterpart of $\textbf{shock}_i$.

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- Impact on plant-level **employment** can be studied:

$$\Delta \ln L_j \approx_{fo} (\gamma - \sigma) \ln(1-\tau_Y) + (\gamma - \sigma) \left(\sum_{j \in i} s_j^Y \times s_j^K \times \ln(1+\tau_j) \right)$$
$$+ (\gamma - \varepsilon) s_j^K \times \ln(1+\tau_j)$$

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$$+ (\gamma-\varepsilon)\underbrace{s_j^K \times \ln(1+\tau_j)}_{\textbf{shock}_j}$$

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Empirical strategy

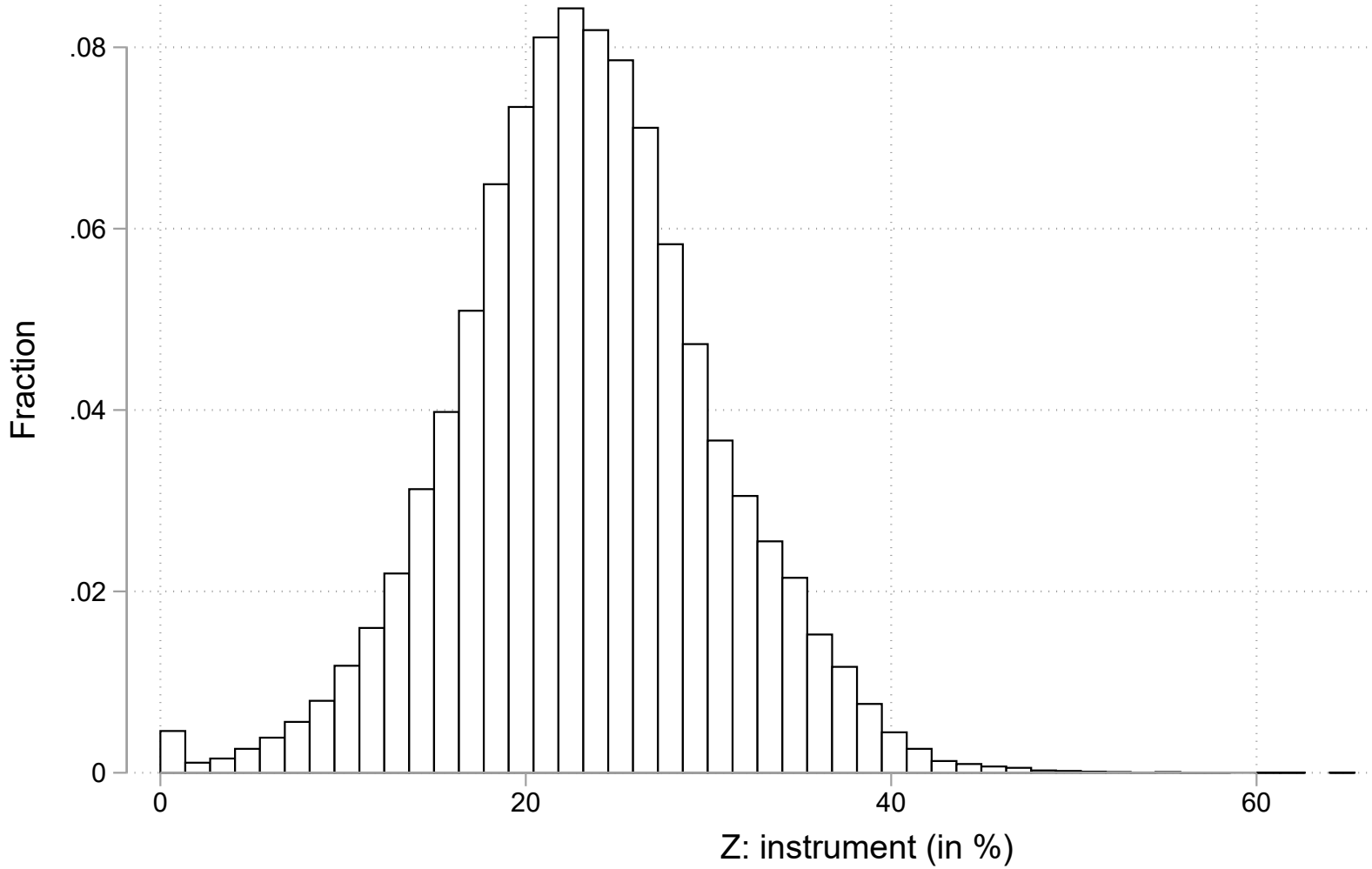
How is a Y_{it} outcome affected by a variation in the tax burden $\left(\frac{\mathcal{T}}{VA}\right)_{it}$?

- **Standard issue of simultaneity:** Outcome Y might affect the average tax rate, especially when tax rate depends on size.
- **Instrumentation following principle of Auten & Carroll (REStat 1999)**
  - Compute theoretical tax change applying the rule change to firm-level data prior to the reform (2008)
- **Definition of the instrument:** Z_i predicted reduction in tax burden as a percentage of the initial tax base. Baseline year: 2008.

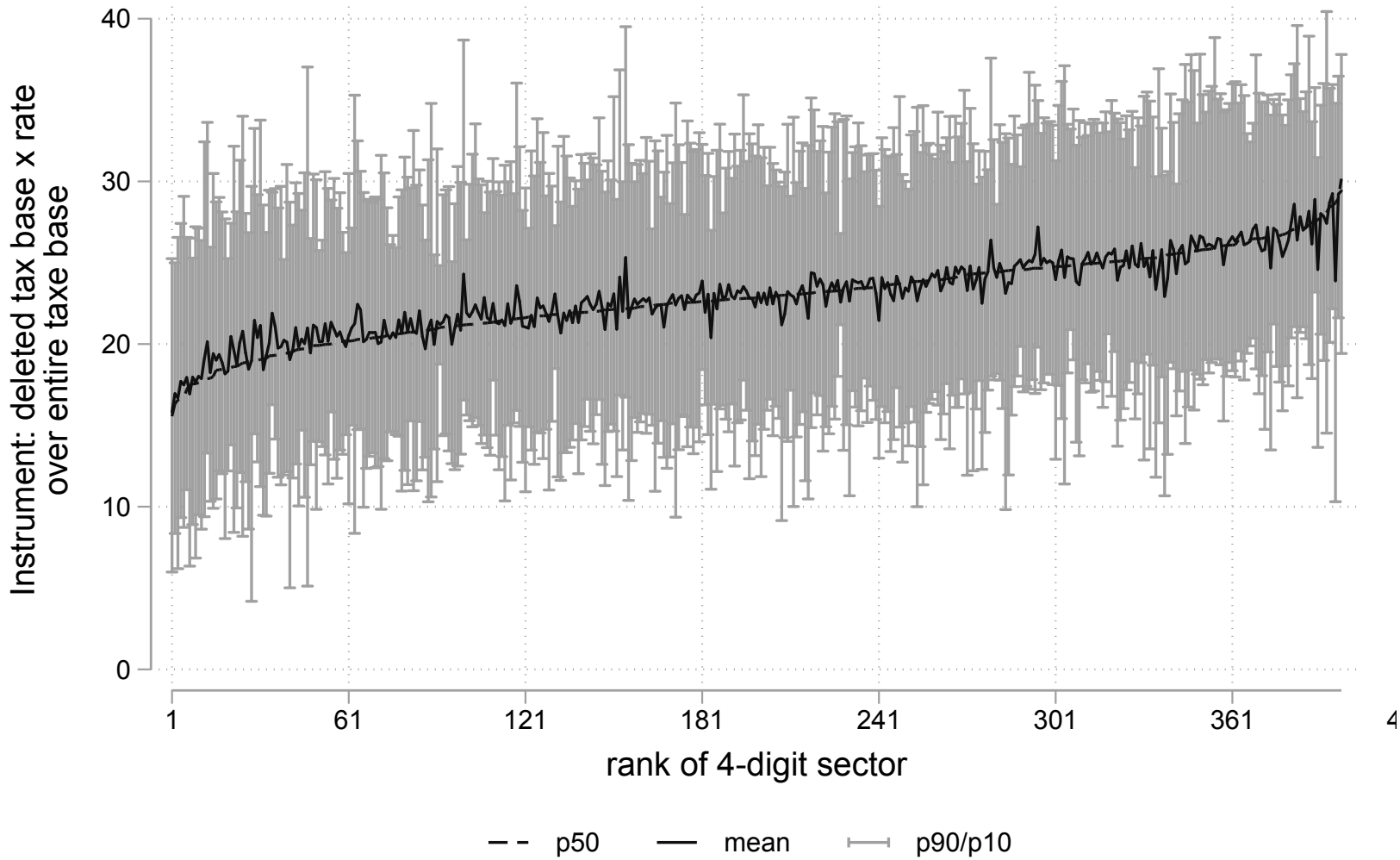
$$Z_i = \left(\sum_{j \in i} KE_j + KB_j\right)^{-1} \times \sum_{j \in i} \tau_{c(j)} \times KE_j$$

$$= \sum_{j \in i} \tau_{c(j)} \times \underbrace{\frac{KE_j}{KE_j + KB_j}}_{\text{plant } j \text{ KE intensity}} \times \underbrace{\frac{KE_j + KB_j}{\sum_{j \in i} KE_j + KB_j}}_{\text{plant } j \text{ in firm i tax base}}$$

Distribution of the instrument



Substantial variation within sector



▸ Details on distribution of ex-ante gains

DiD Specification

- **DiD specification**:

  Reduced-form

$$Y_{it} = \beta_Y Z_i \times \mathbb{1}\{t > 2008\} + \psi^{RF}_{s(i),t} + \alpha^{RF}_i + \varepsilon^{RF}_{i,t}$$

  First-stage

$$\ln\left(\frac{T_{i,t}}{VA_{i,t}}\right) = \beta_{FS} Z_i \times \mathbb{1}\{t > 2008\} + \psi^{RF}_{s(i),t} + \alpha^{RF}_i + \varepsilon^{RF}_{i,t}$$

  where **(i)** Z_i is the instrument for firm i, **(ii)** $\psi_{s(i),t}$ 2-digit sector $\times$ year FE, **(iii)** α_i is a firm FE.

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  where **(i)** Z_i is the instrument for firm i, **(ii)** $\psi_{s(i),t}$ 2-digit sector $\times$ year FE, **(iii)** α_i is a firm FE.

- **Identification**: we assess the *common trend assumption* by estimating a dynamic DiD comparing firms above T3 to firms below T1:

$$\ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = l\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$$

  – We additionally group firm within a given sector into 3 tertiles of treatment intensity and trace-out first stage and outcomes before and after the reform T3 versus T1.

  – Note: the reform is announced in February 2009 and decided upon by summer 2009 $\Rightarrow$ Firms were likely to know that they were not going to pay taxes on future investment. $\Rightarrow$ We take 2008 as our reference year.

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First stage: ln(T/VA)

$\diamond \ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = d\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$

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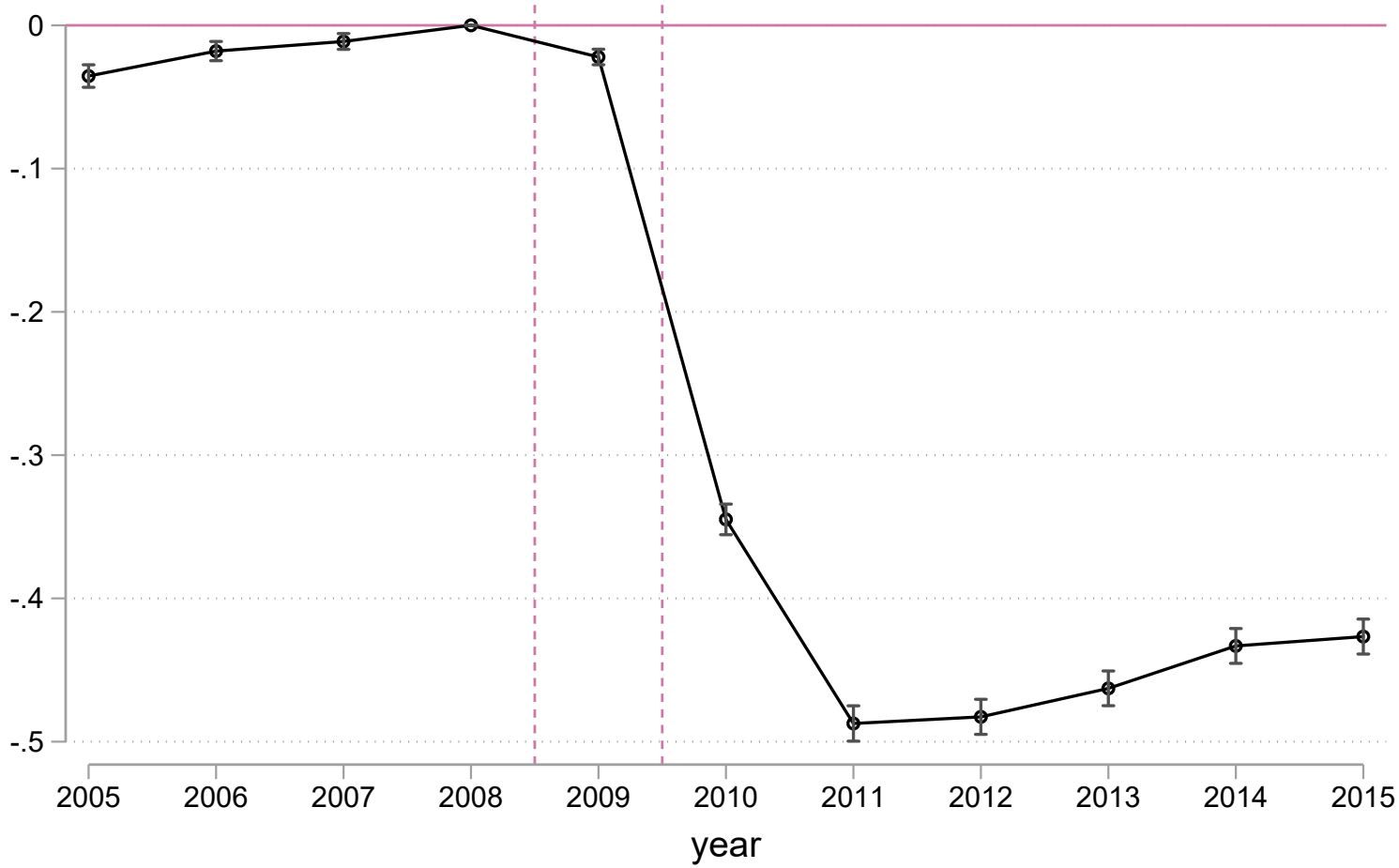
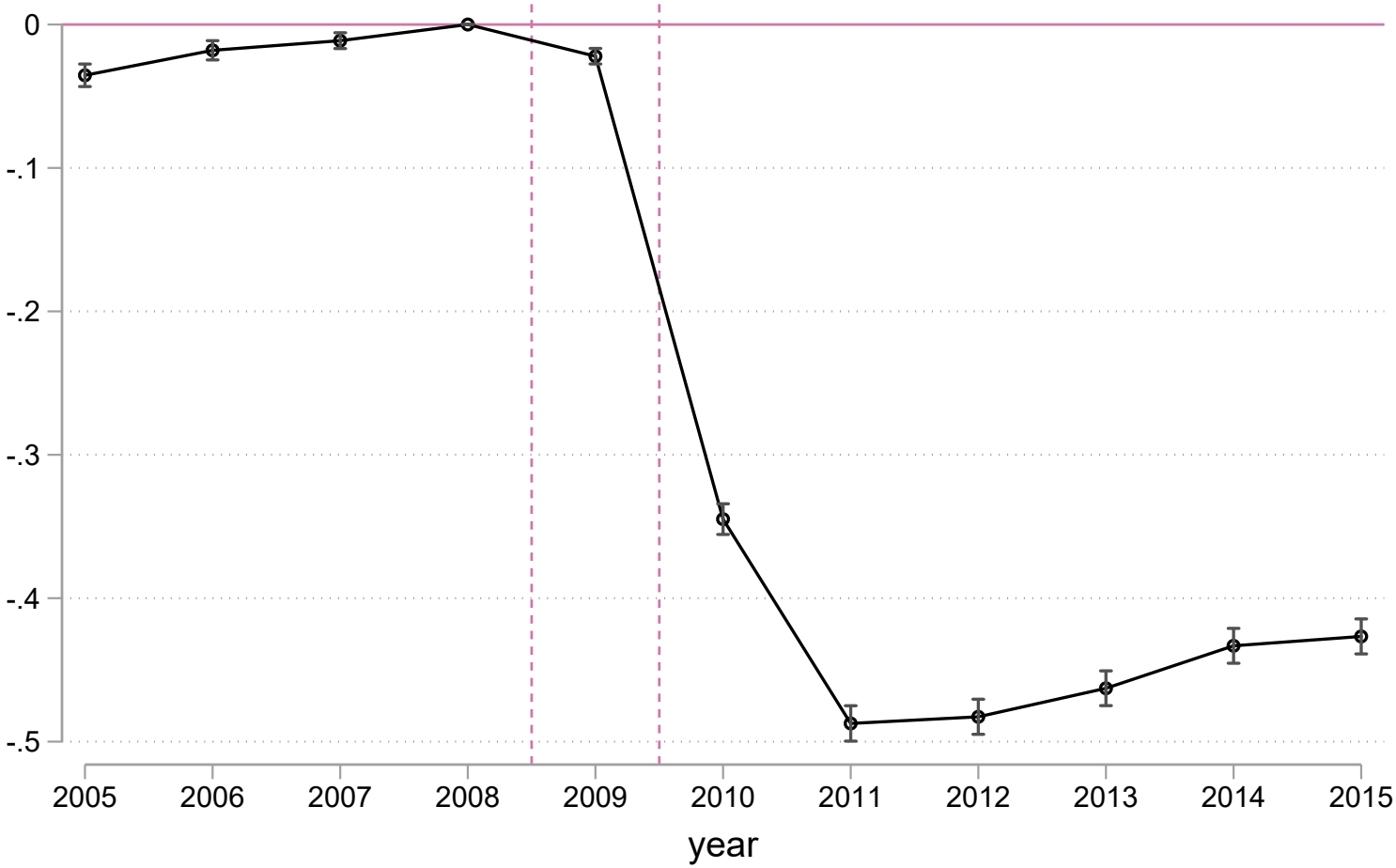


◇ Decline in tax rate $T3 - T1 \approx -0.50$; Average T/VA $\approx 2.5\%$

First stage: ln(T/VA)

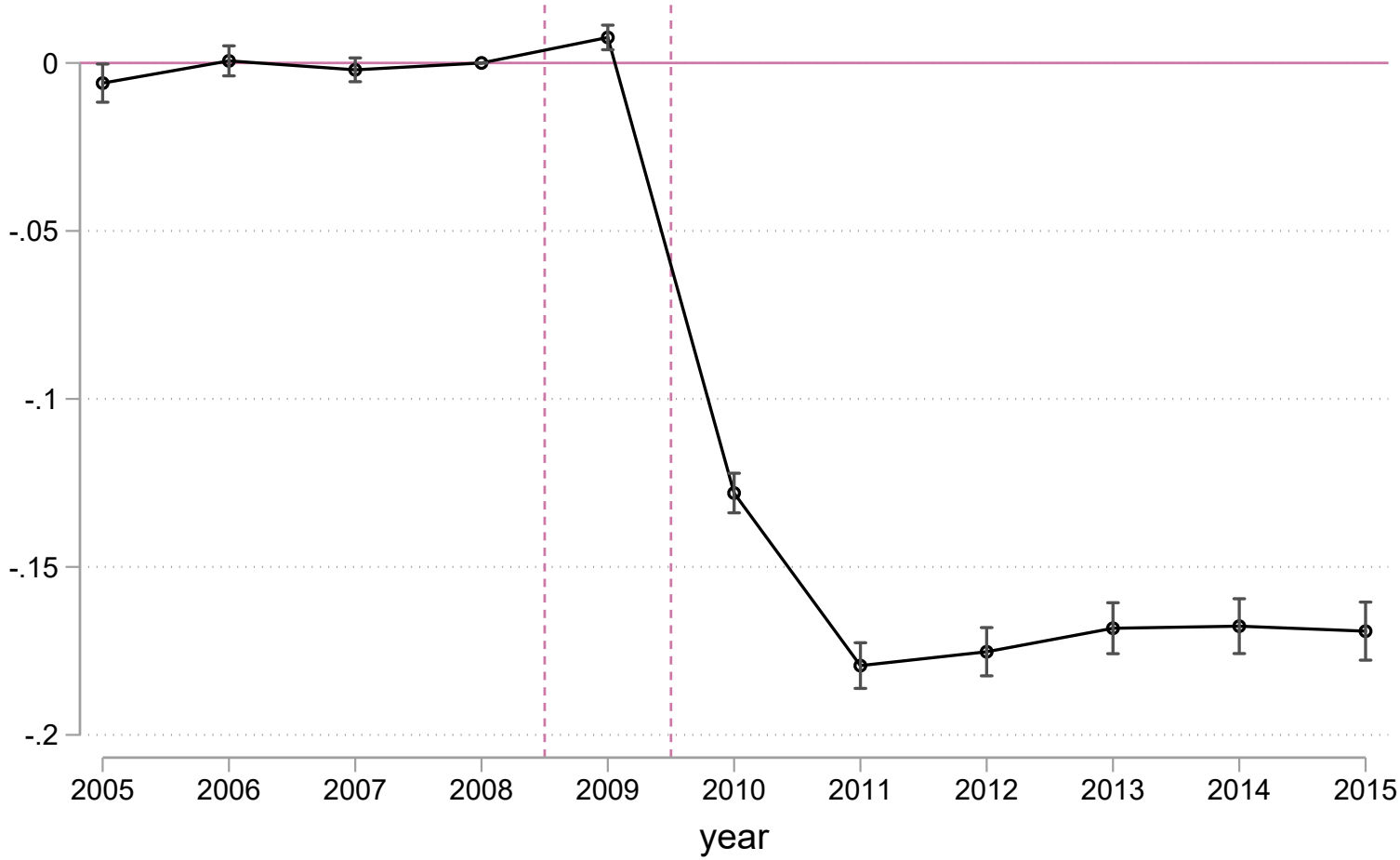
◇ $\ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = d\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$



◇ Decline in tax rate $T3 - T1 \approx -0.50$; Average T/VA $\approx 2.5\%$
$\Rightarrow$ -1.25 pp decline in tax rate. As a comparison: Corporate taxe on profits = 3.7 % of VA over the period 2005-2015 (National accounts)

First stage: ln(all taxes on production/VA)

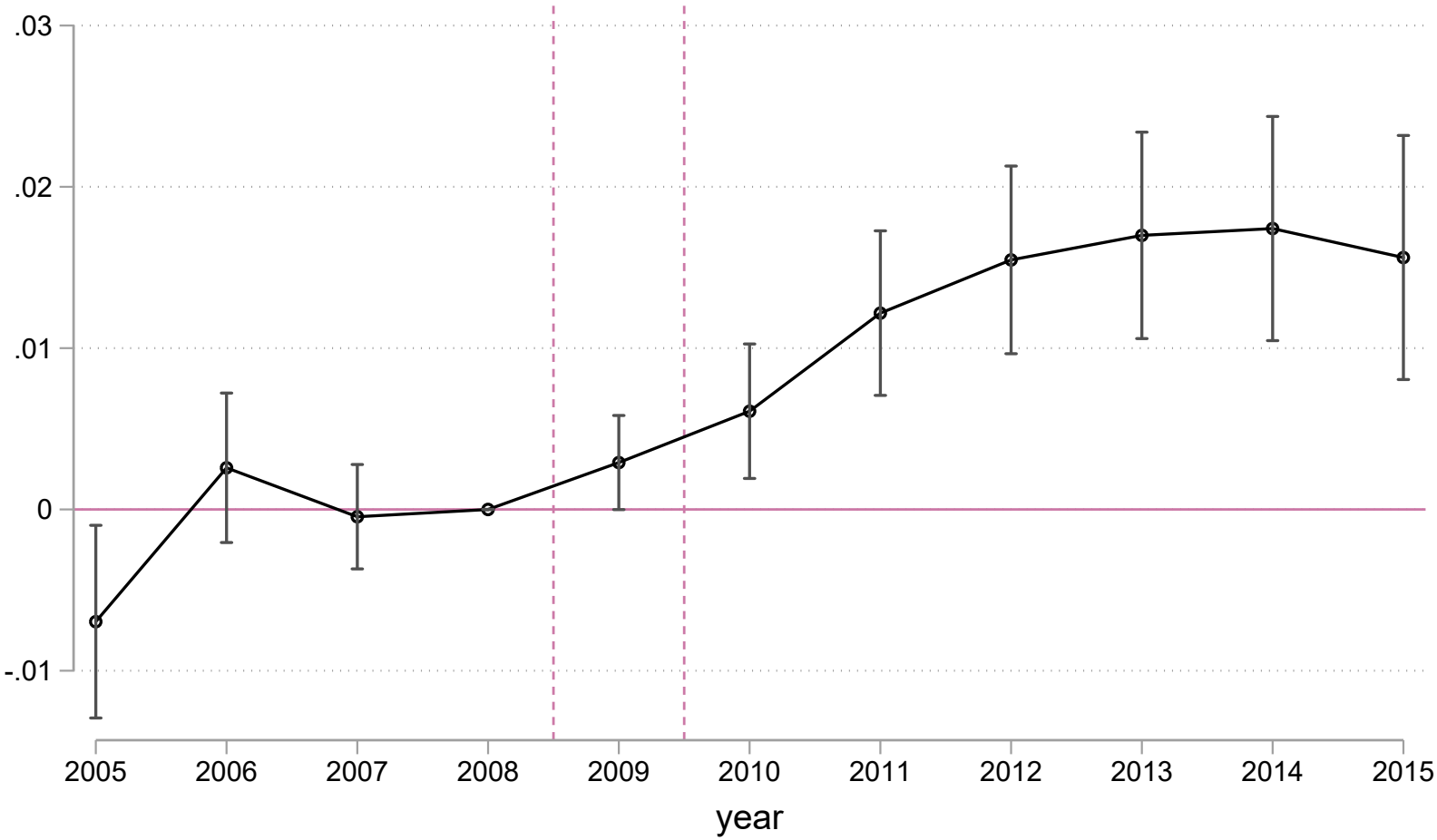
◇ $\ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = d\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$



◇ Decline in tax payment from TP to CET is not offset by rise in other taxes on production.

Assets

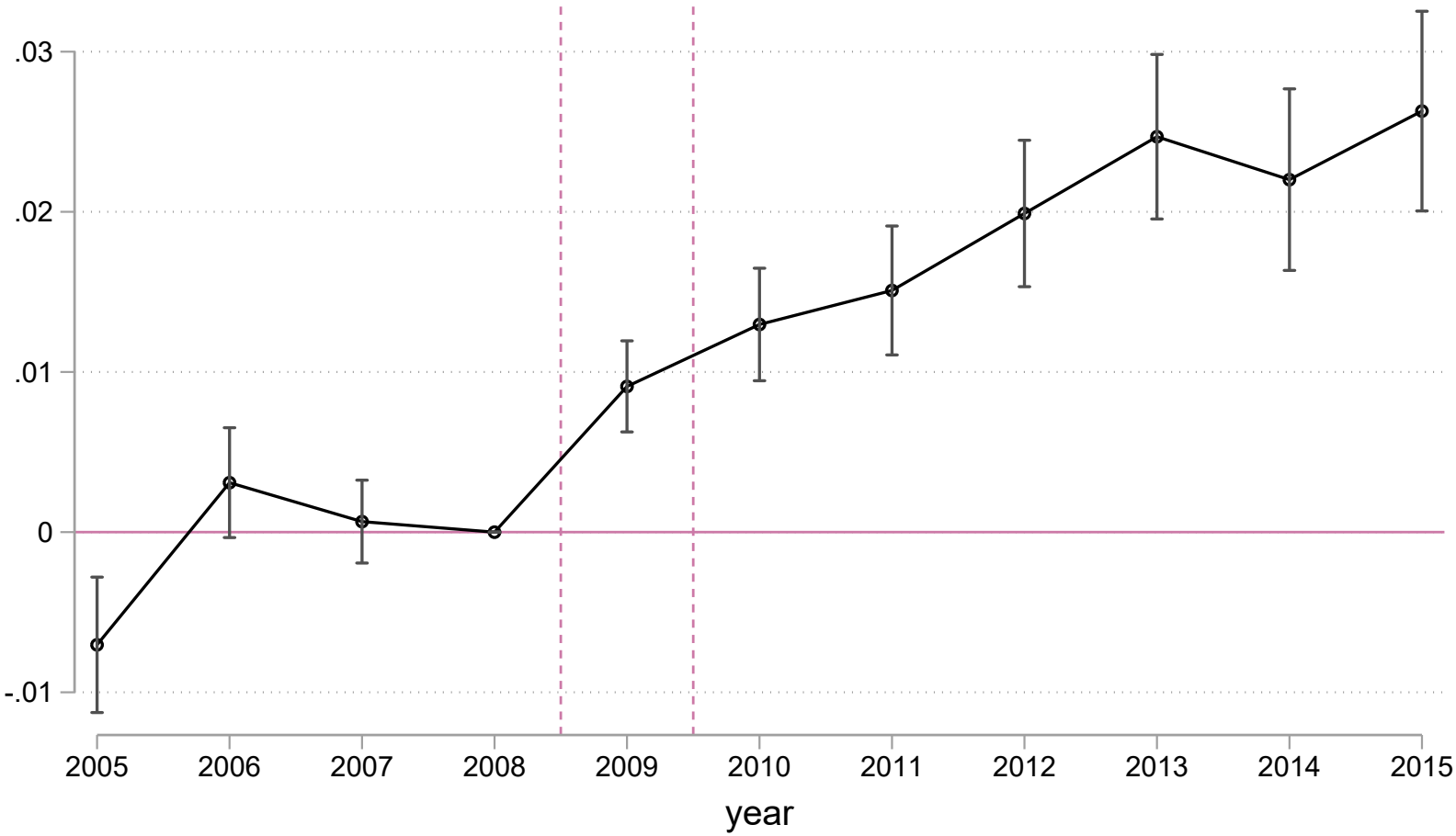
◇ $\ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = d\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$



◇ Positive effect on assets (effects driven by tangible assets).

Sales

◇ $\ln Y_{it} = \sum_{l \neq 2008} \beta_l T_{3,i} Z_i \times \mathbb{1}\{t = d\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$



◇ Positive impact on sales, same magnitude as on asset.

◇ Divergence between T3 and T1 occurs in 2009: anticipation effect or differential effect of the crisis?

◇ Attentive firms which trusted the government knew that they were not going to pay taxes on investment undertaken in 2009.

High exposure versus low exposure

Sales

We computes 3 quantiles of Z per 2d-sector and trace the evolution of average sales relative to 2008 (not just the gap between T1 and T3).

High exposure versus low exposure

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– ◇ 2009 is a bad year for all firms. But perhaps less so for firms in T3.

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The first and second vertical lines correspond to the announcement and the implementation of the reform respectively

– ◇ 2009 is a bad year for all firms. But perhaps less so for firms in T3.

– ◇ T2 are in an intermediate position.

High exposure versus low exposure

Value-added

The first and second vertical lines correspond to the announcement and the implementation of the reform respectively

– ◇ Same pattern for VA.

Note: Value-added exclusive of tax on production (va brute prix de marché)

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Outline

Introduction

Institutional background

Data

Some descriptive findings

Empirical approach

- Motivating conceptual framework
- Empirical strategy

Results

- Graphical results
- Static specification

Conclusion

Baseline results

$\diamond \ln Y_{it} = \beta Z_i \times \mathbb{1}\{t > 2008\} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$

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Outcomes	**(1)** 2-digit	**(2)** 4 digit	**(3)** 2 digit × size	**(4)** 4 digit × size
Sales	0.148***	0.141***	0.096***	0.091***
	(0.016)	(0.016)	(0.016)	(0.016)
Value Added	0.187***	0.183***	0.117***	0.116***
	(0.016)	(0.016)	(0.016)	(0.016)
Capital	0.123***	0.111***	0.101***	0.091***
	(0.021)	(0.021)	(0.022)	(0.022)
Wagebill	0.169***	0.165***	0.120***	0.113***
	(0.015)	(0.015)	(0.016)	(0.016)
Total hours	0.150***	0.146***	0.102***	0.100***
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Wage per hour	0.019***	0.019***	0.018***	0.019***
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Observations	1,260,544	1,260,544	1,260,390	1,260,390
Firm Fixed Effect	√	√	√	√
Sector × Year	2-digit	4 digit	2 digit × size	4 digit × size

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◇ Average value $\bar{Z} \approx 0.22$

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◇ Average value $\bar{Z} \approx 0.22 \Rightarrow$ Average effect: Sales + 3.26%

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◇ Average value $\bar{Z} \approx 0.22 \Rightarrow$ Average effect: Value added + 4.11%

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Expansion of wage bill and VA are of the same magnitude ⇒ Stable share of compensation over VA.

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90% of increase in wage bill is driven by increase in hours, 10% hourly wage.

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Results fairly robust to controlling for tighter sectoral specification. Including size (5 categories based on sales in 2008).

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Results suggest that the reform led to an expansion of business but do not see an increase in capital intensity. Compatible with a low ES between KE and other inputs.

2SLS: Overall tax burden $\ln(T)$ instrumented by Z

$\diamond$ $\ln Y_{it} = \beta \ln T_{it} + \psi_{s(i),t} + \alpha_i + \varepsilon_{i,t}$

Outcomes	**(1)** 2-digit	**(2)** 4 digit	**(3)** 2 digit × size	**(4)** 4 digit × size
Sales	-0.057***	-0.053***	0.041***	-0.039***
	(0.006)	(0.006)	(0.007)	(0.007)
Value Added	-0.070***	-0.067***	-0.048***	-0.048***
	(0.006)	(0.006)	(0.007)	(0.007)
Capital	-0.045***	-0.040***	-0.041***	-0.037***
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Total hours	-0.057***	-0.053***	-0.042***	-0.041***
	(0.006)	(0.006)	(0.006)	(0.006)
Wage per hour	-0.007***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
First Stage: dependent variable: log(T)				
Z	-0.309***	-0.321***	-0.282***	-0.288***
	(0.005)	(0.004)	(0.005)	(0.005)
Observations	1,260,544	1,260,544	1,260,390	1,260,390
KP Wald F-stat.	5130	6043	4166	4720

$\diamond$ Given an average ratio of T/VA = 2.5% and worker compensation over VA = 0.7.
Exogenous decline of €1 in tax burden $\Rightarrow$

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◇ Given an average ratio of T/VA = 2.5% and worker compensation over VA = 0.7.
Exogenous decline of €1 in tax burden ⇒ +€2.8 in value-added in the long-run;

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$\diamond$ Given an average ratio of T/VA = 2.5% and worker compensation over VA = 0.7.
Exogenous decline of €1 in tax burden $\Rightarrow$ +€1.76 spent on wagebill;

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◇ Given an average ratio of T/VA = 2.5% and worker compensation over VA = 0.7.
Exogenous decline of €1 in tax burden ⇒
+€1.60 goes to increasing hours and +€0.16 goes to increasing hourly wages.

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Positive but small incidence on labor. Simple computations based estimates suggest that incidence share $\approx 5\%$ ▸ Incidence

Robustness test

- Using ln(all prod taxes / VA) as endogenous variable
- Different baseline years to define the instrument: average 2005-2008 or 2006

Dep. Var.	Sales	Va	K	W	H	W/H
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Endog var: ln(Impot/VA)	-0.121***	-0.152***	-0.100***	-0.137***	-0.122***	-0.015***
	(0.013)	(0.013)	(0.017)	(0.012)	(0.012)	(0.004)
Instrument w/ baseline year 2006	-0.028***	-0.020***	-0.006	-0.032***	-0.028***	-0.004***
	(0.006)	(0.006)	(0.007)	(0.005)	(0.005)	(0.002)
Instrument w/ year 05-08	-0.044***	-0.036***	-0.025***	-0.047***	-0.042***	-0.005***
	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.002)
Observations	1,260,544	1,260,544	1,260,390	1,260,390	1,260,544	1,260,544
Sector × Year	2-digit	2-digit	2 digit	2-digit	2-digit	2-digit

Notes: Each coefficient corresponds to a separate 2SLS estimation. Column corresponds to different dependent variables and row to different definition of the instrument or of the endogenous variable. Heteroskedasticity robust standard errors, clustered at the firm level are reported under parenthesis. ***, ** and * indicate p-value below 0.01, 0.05 and 0.1 respectively.

Plan

Introduction

Institutional background

Data

Some descriptive findings

Empirical approach
- Motivating conceptual framework
- Empirical strategy

Results
- Graphical results
- Static specification

Conclusion

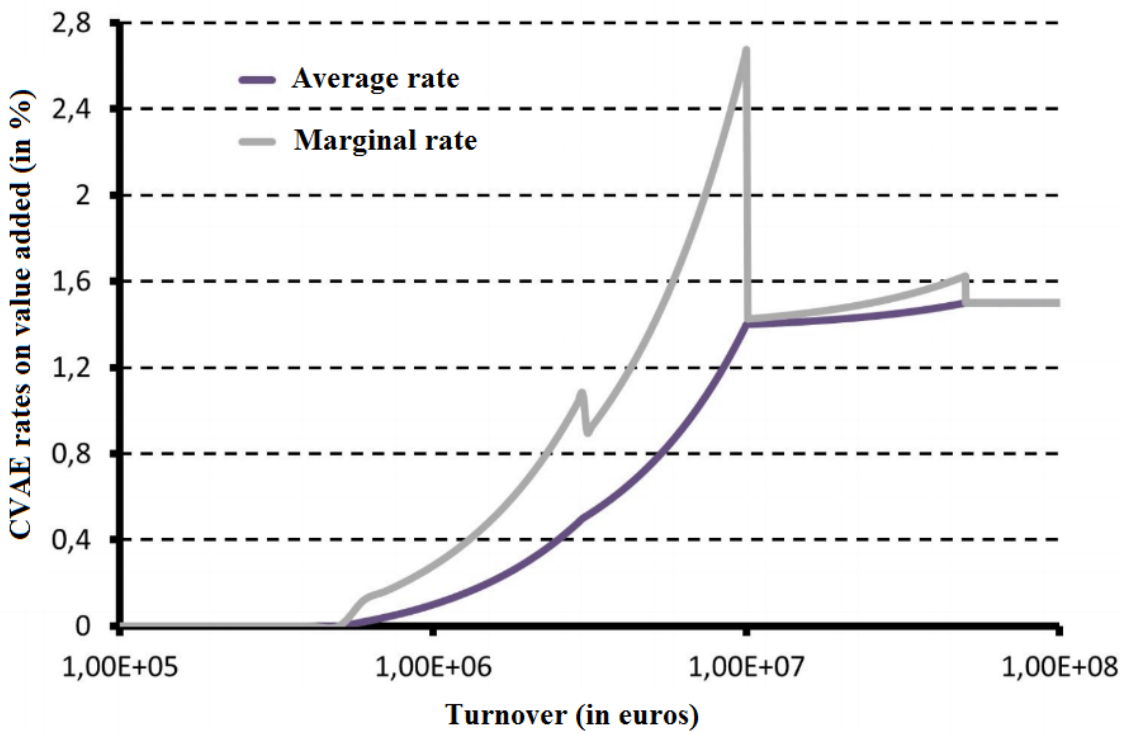
Conclusion

- **Assessing tax on capital factor: *taxe professionnelle* reform in 2010**
  - Generates substantial tax burden decrease heterogeneously distributed
  - Measurement thanks to rich set of administrative databases
  - Implement difference-in-differences setting on instrument of tax reform
- **Substantial impact on firms decisions/output**
  - Increase in capital, sales and value-added
  - Increase in wage bill, mostly driven by hours
  - Labor born a small share of the burden of the tax.
- **Empirical work remaining**
  - Robustness tests (more precise matching)
  - *Douane database*: export volumes and unit values (pass-through)
  - *DADS*: (1) employment reallocation across establishments (2) wage and employment per socioprofessionnal categories
- **Other on-going work**
  - model-based aggregation of the relative effect of the reform estimated in DiD with I-0 linkages (start with sector specific effects)
  - pre-reform event-study around large changes in local rate to study the capital and labor reallocation across plants, across and within-firms

Back up slides

Details on CVAE

$$\tau_t^n(S) = \begin{cases} 0 & \text{if } S < 0.5 \\ 0.005\,\frac{S-0.5}{2.5} & \text{if } 0.5 \leq S < 3 \\ 0.005 + 0.009\,\frac{S-3}{7} & \text{if } 3 \leq S < 10 \\ 0.014 + 0.001\,\frac{S-10}{40} & \text{if } 10 \leq S < 50 \\ 0.015 & \text{if } S \geq 50 \end{cases}$$



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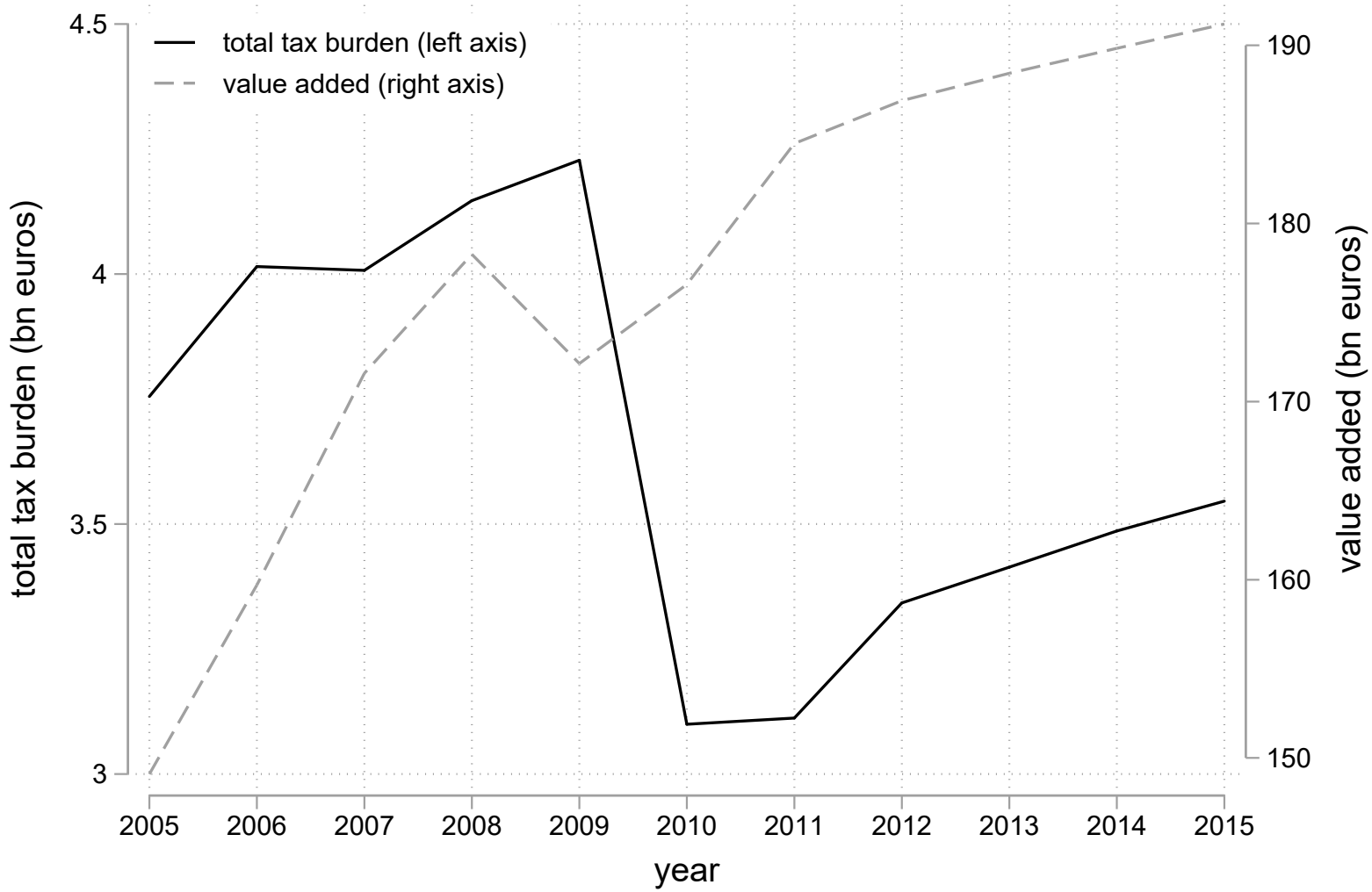
Evolution of aggregates

Based on the estimation sample



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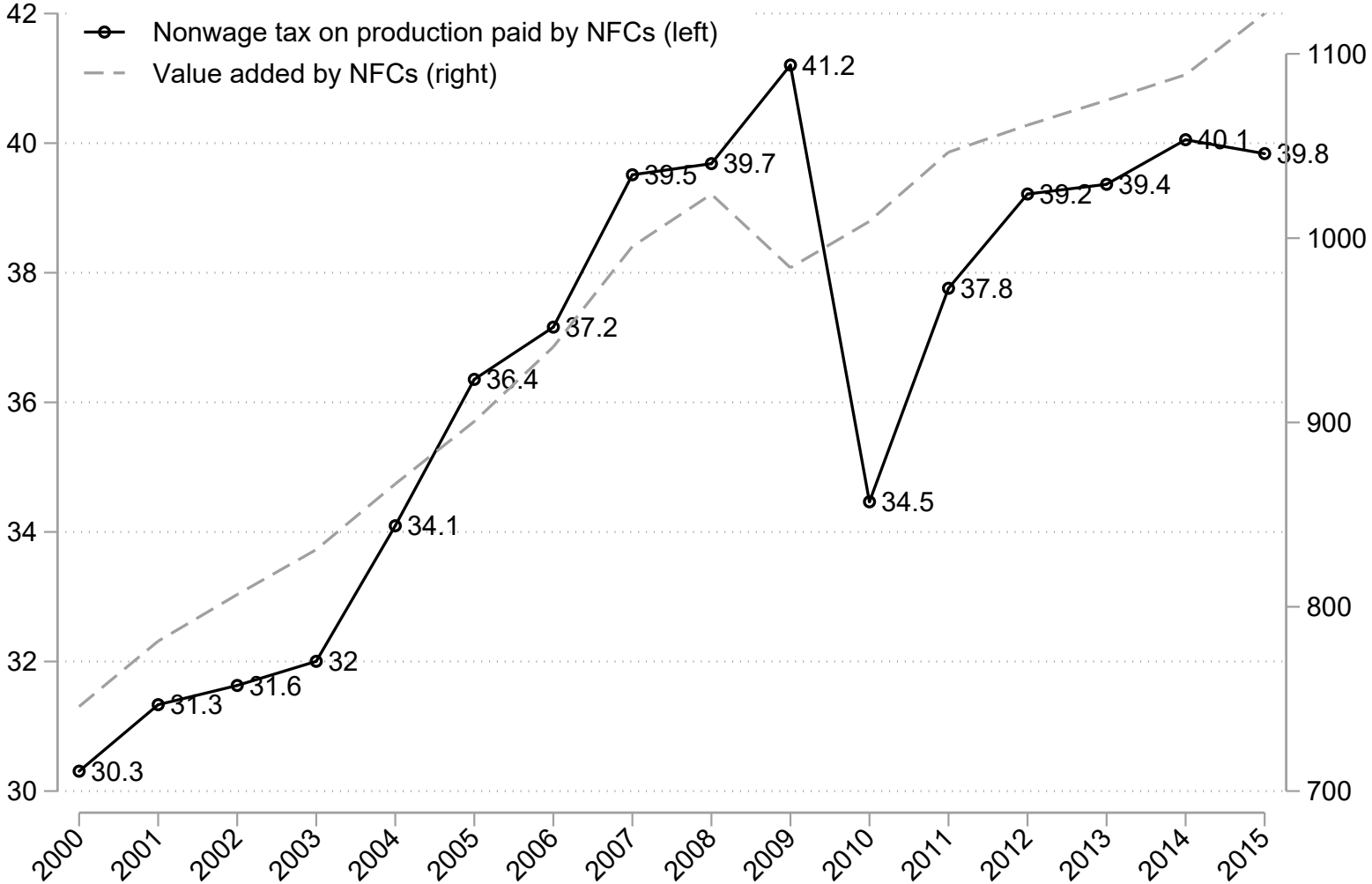
Evolution of aggregates

National accounts



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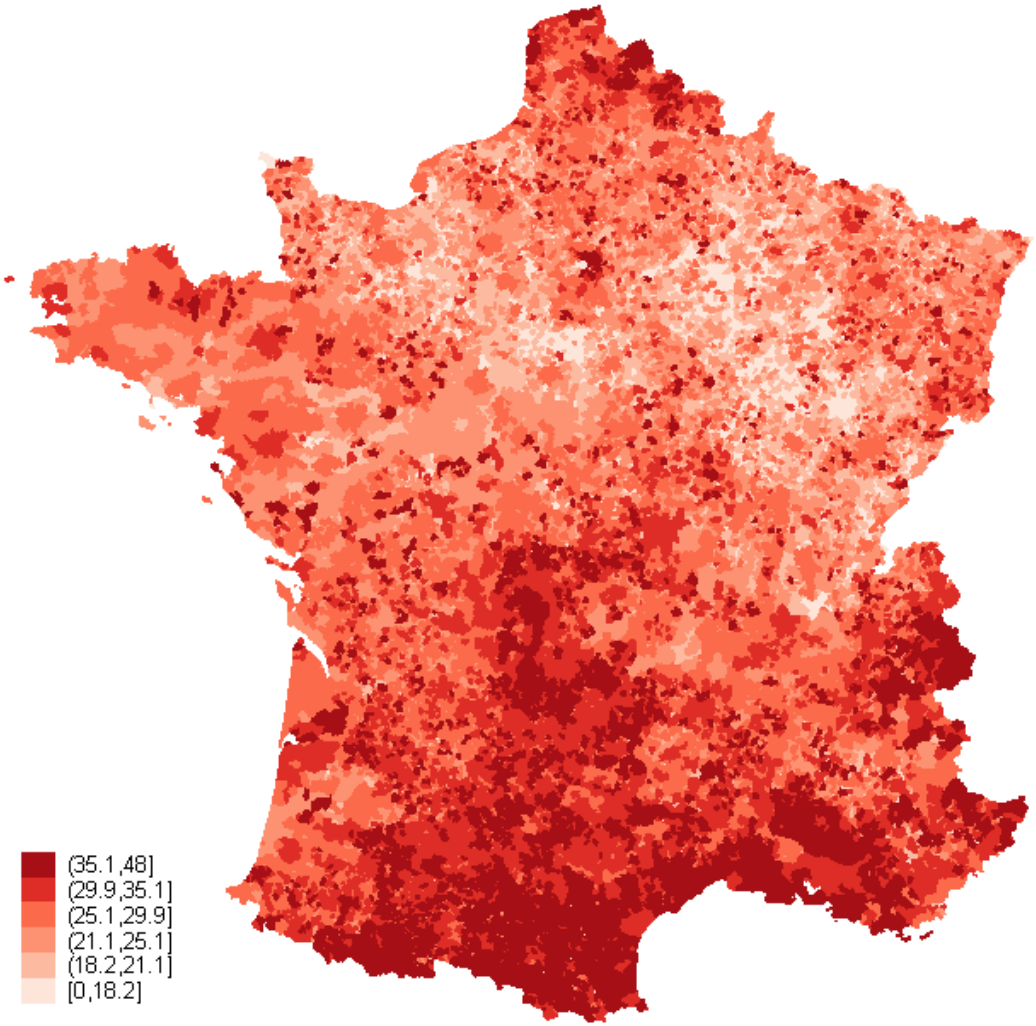
Overall tax rate in 2008, by municipality



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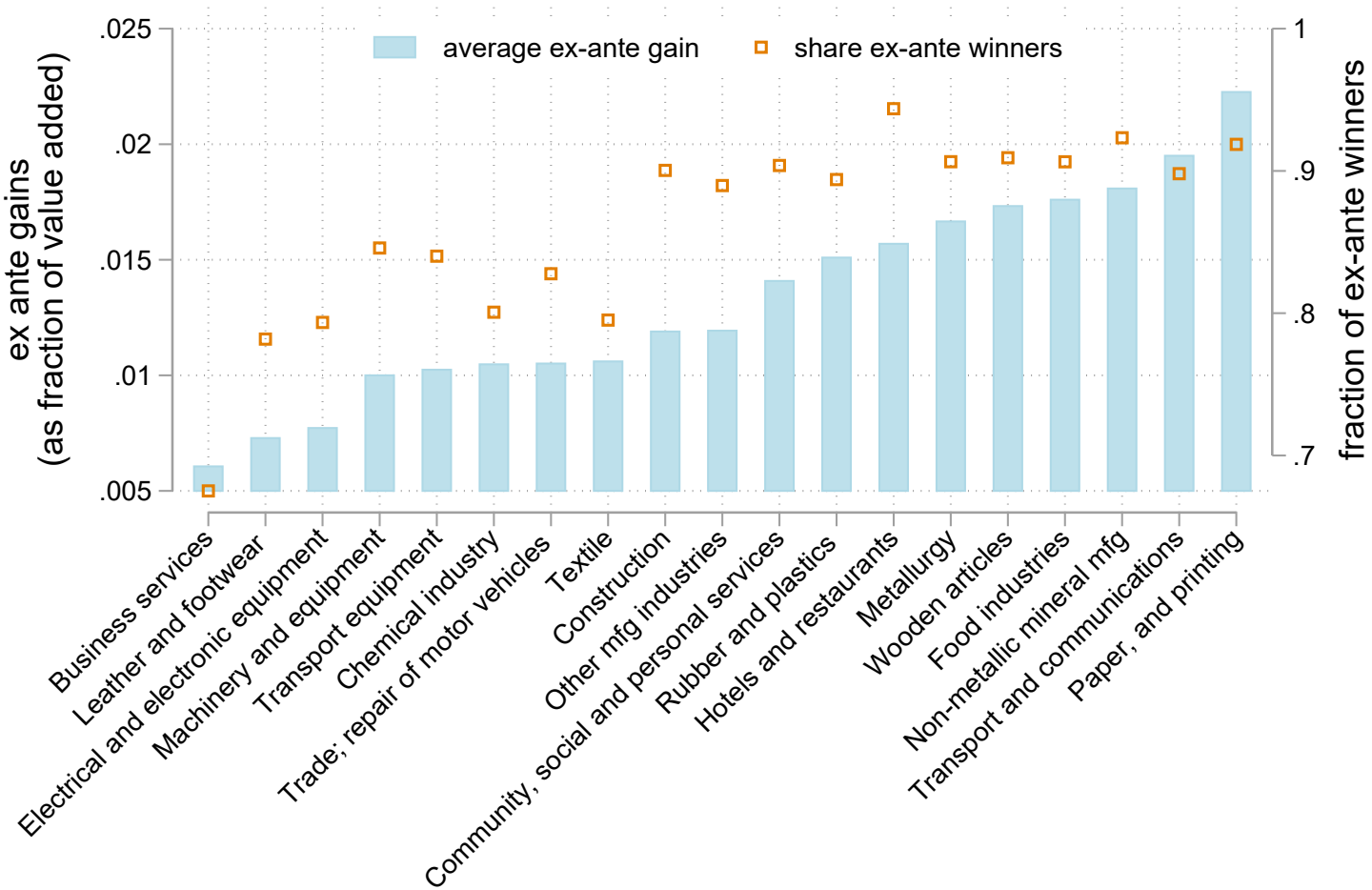
Ex-ante gains by aggregated sector

Ex-ante gains $= (TP_{08} - (\widehat{CVAE}_{08} + \widehat{CFE}_{08}))/VA_{08}$ (estimation sample)

He were substract the CET = CVAE + CFE based on 2008 tax base from the actual 2008 tax burden divided by VA 2008.



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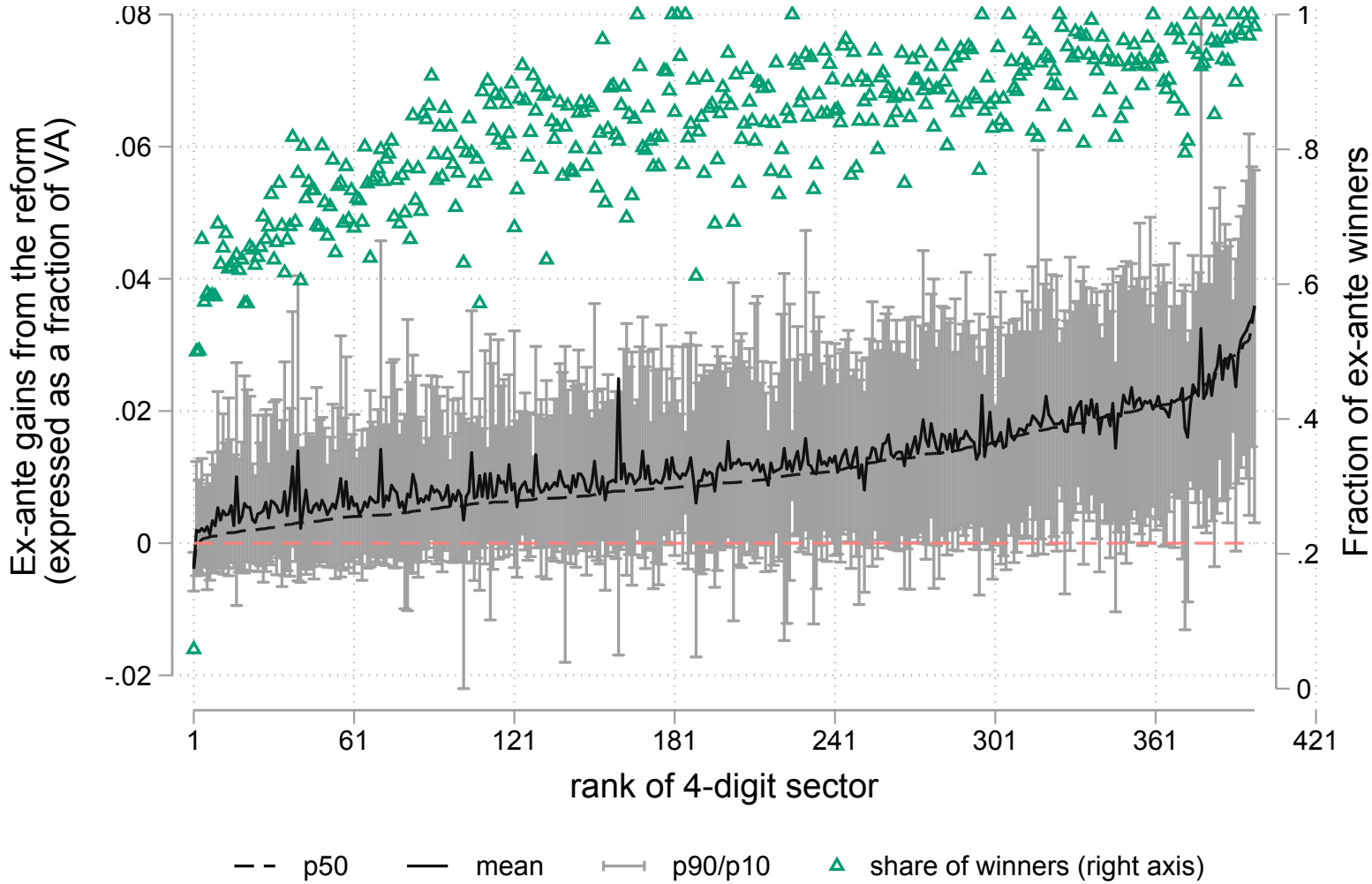
Ex-ante gains within sector



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2SLS: ln(T/VA)

	(1)	(2)	(3)	(4)
Sales	-0.054***	-0.050***	-0.040***	-0.038***
	(0.006)	(0.005)	(0.006)	(0.006)
Value Added	-0.067***	-0.064***	-0.047***	-0.047***
	(0.006)	(0.006)	(0.007)	(0.006)
Capital	-0.043***	-0.039***	-0.039***	-0.036***
	(0.008)	(0.007)	(0.009)	(0.009)
Wagebill	-0.060***	-0.057***	-0.048***	-0.047***
	(0.005)	(0.005)	(0.006)	(0.006)
Total hours	-0.054***	-0.051***	-0.041***	-0.040***
	(0.005)	(0.005)	(0.006)	(0.006)
Wage per hour	-0.006***	-0.006***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	1,260,544	1,260,544	1,260,390	1,260,390
First stage	log of average tax rate $\ln(T/VA)$			
KP Wald F-stat.	6654	7848	5210	5951
1st stage coef.	-2.847***	-2.924***	-2.552***	-2.582***
	(0.035)	(0.033)	(0.035)	(0.033)
Firm Fixed Effect	√	√	√	√
Sector × Year	2-digit	4 digit	2 digit × size	4 digit × size

Robustness checks: 2SLS

Dep. Var.	Sales	Va	K	W	H	W/H
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Endog var: ln(Impot/VA)	-0.121***	-0.152***	-0.100***	-0.137***	-0.122***	-0.015***
	(0.013)	(0.013)	(0.017)	(0.012)	(0.012)	(0.004)
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Share of the burden born by labor

- Workers have QL preference with indirect utility $V(w)$.
- Firms have the same profit function as before:

$$\Pi = pY - wL - rK(1+\tau_K) - Y\tau_Y$$

- Overall changes in welfare following a marginal change in the instrument dZ: $dW = LdV + d\Pi$
- Envelop theorem implies:

$$dV = L\frac{dw}{dZ}dZ \text{ and } d\Pi = -\frac{dw}{dZ}dZL - rK\frac{d\tau_K}{dZ}dZ$$

We assume that $\frac{d\tau_Y}{dZ} = 0$.

Overall change in welfare writes as: $dW = -rK\frac{d\tau_K}{dZ}dZ$

- Labor share:

$$\begin{aligned} I_L \equiv \frac{dV}{dV + d\Pi} &= \frac{dw/w}{dZ} \times \frac{wL}{rK} \Big/ \left(\frac{d\tau_K}{dZ}\right) \\ &= \widehat{\beta}^w_{RF}\frac{\alpha_L}{1-\alpha_L} \Big/ \left(\frac{d\tau_K}{dZ}\right) = 4.43\% \Big/ \left(\frac{d\tau_K}{dZ}\right) = 4.43\% \end{aligned}$$

Assuming our instrument maps one-to-one with changes in marginal rate and calibrating the labor share $\alpha_L = 0.7$ and choosing $\widehat{\beta}^w_{RF} = 1.9\%$.

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