

# Do Higher Corporate Taxes Reduce Wages? Micro Evidence from Germany

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# Who bears the burden of corporate taxation (CT)?

- Companies (legal constructs) pay taxes but cannot bear tax burden
- Burden of CT is passed on to individuals:
  - ▶ Capitalists/shareholders through interests/dividends
  - ▶ Consumers through prices
  - ▶ Owners through profits
  - ▶ **Employees through wages**
- Incidence important for design of (redistributive) tax policy
- But: only a handful of recent studies providing **empirical evidence** because identification is extremely challenging 

## This paper ...

... focuses on German Local Business Tax (*Gewerbesteuer*) and makes the following contributions:

### 1 Identifying variation:

- ▶ **Multiple quasi-experiments:** each year, on average, 8% of the 11,441 municipalities change tax rate
- ▶ Within one country: (macro)economic environment is kept constant

### 2 Administrative linked employer-employee panel data

- ▶ Firm: liable?, corporate vs. non-corporate, wage setting regime (CBA)
- ▶ Control for observed and unobserved worker and firm heterogeneity

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## 1 Local Business Tax (LBT, “Gewerbesteuer”)

- ▶ Most important tax instrument for municipalities
- ▶ Applies to corporate and non-corporate firms, certain exemptions
- ▶ Tax base: operating profits (federal level), same as for CT
- ▶ Basic tax rate set at the federal level (3.5; 5.0%)
- ▶ City councils decide every year (only) on specific collection rate ( $cr$ ; multiplier to basic tax rate, 200-500%) for next year

## 2 Corporate Tax (CT): Additional tax for corporate firms

## 3 Personal Income Tax (PIT): Additional tax for non-corporate firms

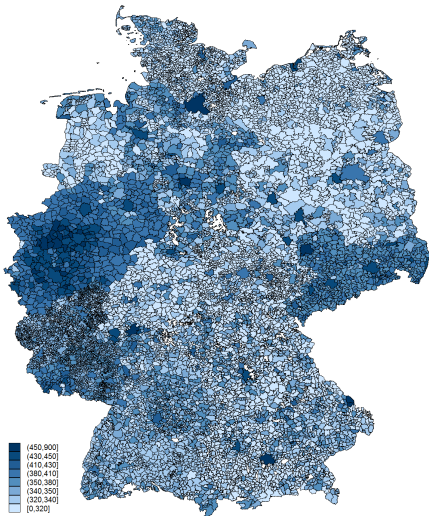
### ▶ Tax revenue

#### • Examples:

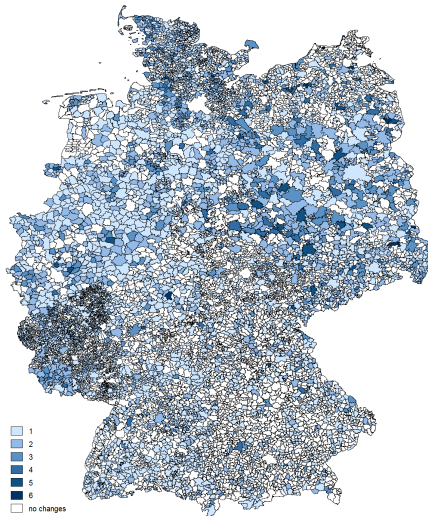
$cr = 250\%$  equals EMTR for corporate firm of 38%

$cr = 400\%$  equals EMTR for corporate firm of 43% 

collection rates in 2008



number of tax changes per community, 1998-2008



Source: Statistical Offices of the Länder

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- General model of profit maximizing firm
- Assumptions matter:
  - ▶ Wage setting institutions
  - ▶ Mobility: Closed economy (Harberger model) vs. small open economy
  - ▶ Location specific rents vs. firm specific rents
  - ▶ Complementarity/substitutability btw capital and (heterogeneous) labor
  - ▶ Income shifting possibilities between profits and wages

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  - ▶ Income shifting possibilities between profits and wages

→ empirical questions!

Key issue: identification

Our solution: variation in local CT and detailed firm information

Theories generate several testable predictions:


1. **Profit sharing:** If employees participate in firm's profits, negative impact of higher CT on wages (for given output) (“direct effect”, Arulampalam et al., 2013).
  - ▶ **Search models:** Matching surplus to be shared
  - ▶ **Union wage bargaining:**
    - ★ If unionized and competitive sector (without CBA) coexist, we expect an effect of changes in local taxes on wages only in **unionized firms**.
    - ★ Smaller effect for bargaining at sector level (rather than firm level) effect, but not sector CBAs are binding at the firm level
    - ★ Effect increasing with bargaining power
  - ▶ **Fair wage models:** if fairness perceptions depend on firm profits

2. **Capital mobility:** higher local CT reduce investment → labor productivity and wages fall (“indirect effect”, Arulampalam et al., 2013).
3. **Labor mobility:** Mitigates effect of local CT on wages.  
Yet, higher local expenditures may compensate for lower wages
4. **Income shifting:** higher CT lead to higher wages if employees and owners overlap → small, family owned firms.

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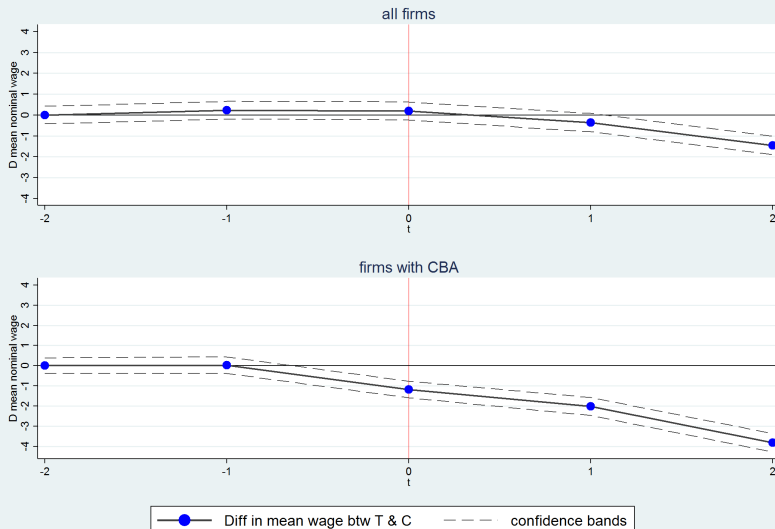
## Linked employer-employee panel data LIAB

- Municipality: administrative statistics
  - ▶ Universe of the municipalities
  - ▶ Variables: **LBT collection rate**, population, fiscal and budgetary information
- Firm data: IAB Establishment panel
  - ▶ Stratified random sample from the population of all establishments
  - ▶ Variables: value added, investment, labor union contract, industry
  - ▶ Important: legal form (EMTR) and info **whether firms are liable to LBT**
- Administrative employee data: Employment register
  - ▶ 2% sample of all employees paying social security contributions
  - ▶ Variables: qualification, age, tenure, nationality, gender, ...
  - ▶ Wages (right-censored)

- Years 1998–2008
- Baseline:
  - ▶ Companies liable to LBT
  - ▶ Only manufacturing
  - ▶ Corporate firms (non-corporate separately)
  - ▶ Full-time employees (90% of workers in manufacturing)
  - ▶ Exclude workers with censored wages (approx 10%)
- 4 million worker-year observations 

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Source: LIAB. Note: Tax reform occurred for treatment group in year  $t=0$ . No other tax changes in any other period, neither for control nor treatment group. Wages are normalized to 100 in pre-reform year  $t = -2$ .

## Mincer-type wage-equation:

$$\ln w_{ifm,t} = \alpha_t \ln cr_{m,t} + \beta \mathbf{X}'_{i,t} + \gamma \mathbf{Y}'_{f,t} + \lambda \mathbf{Z}'_{m,t} + \delta \mathbf{T}'_{ifm,t} + \mu_i + \mu_f + \mu_m + \mu_t + \varepsilon_{ifm,t},$$

- $\ln w_{ifm,t}$ : log earnings of individual  $i$ , in firm  $f$  & muni.  $m$  at time  $t$
- $cr_{m,t}$ : collection rate
- worker controls  $\mathbf{X}_{i,t}$ : age, migrant, skill, occupation, tenure
- firm controls  $\mathbf{Y}_{f,t}$ : size, output, investment, export share, industry
- municipal controls  $\mathbf{Z}_{m,t}$ : UR rate, property taxes, size, (state)
- $\mu_i, \mu_f, \mu_m, \mu_t$ : individual, firm, municipal and time FE
- $\mathbf{T}_{ifm,t}$ : wage trends for skill, CBA, state, firmsize, industry
- Standard errors clustered at county (labor market) level

Model	(1)	(2)	(3)	(4)	(5)
Firm type	All	With CBA	Without CBA	With CBA	
log collection rate <sub>t</sub>	-0.076** (0.036)	-0.093** (0.045)	0.024 (0.031)		-0.098** (0.048)
log collection rate <sub>t</sub> : sector level				-0.092** (0.045)	
log collection rate <sub>t</sub> : firm level				-0.094* (0.055)	
log collection rate <sub>t-1</sub>					-0.019 (0.034)
Adjusted R <sup>2</sup>	0.186	0.198	0.142	0.198	0.181
Observations	4016476	3512491	503985	3512491	3204780
Groups	1240030	1085873	210230	1085873	1014992
Clusters	405	395	351	395	395
Long run effect					-0.118**
Wage elasticity	-0.31	-0.38	0.09		-0.46
Wage elasticity: sector level				-0.39	
Wage elasticity: firm level				-0.35	
Euro incidence	-0.44	-0.53	0.12		-0.67
Euro incidence: sector level				-0.49	
Euro incidence: firm level				-0.62	





Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*)

Model	(1)	(2)	(3)	(4)
Sample	Baseline			Placebo
log collection rate	-0.093** (0.045)	-0.080* (0.047)	-0.081* (0.043)	-0.033 (0.030)
labor market region trends	No	Yes	No	No
job-year FE	No	No	Yes	No
Adjusted $R^2$	0.198	0.226	0.210	0.397
Observations	3512491	3512491	3512491	287206
Groups	1085873	1085873	1085873	113810
Clusters	395	395	395	368
Elasticity	-0.38	-0.33	-0.33	
Incidence	-0.53	-0.46	-0.46	

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*)

Model	(1)	(2)	(3)	(4)	(5)
log collection rate <sub>t</sub>	-0.098** (0.048)	-0.097** (0.047)	-0.098** (0.048)	-0.103** (0.048)	-0.100** (0.047)
log collection rate <sub>t-1</sub>	-0.019 (0.034)	-0.027 (0.035)	-0.019 (0.034)	-0.024 (0.034)	-0.035 (0.036)
log value added	0.004** (0.002)		0.004** (0.002)	0.005*** (0.001)	
log investment	-0.000 (0.001)	0.000 (0.001)		0.000 (0.001)	
log employees	0.033*** (0.010)	0.036*** (0.009)	0.033*** (0.009)		
log full-time hours	0.035 (0.040)	0.055 (0.036)	0.034 (0.039)		
Adjusted R <sup>2</sup>	0.181	0.180	0.181	0.177	0.176
Observations	3204780	3204780	3204780	3204780	3204780
Groups	1014992	1014992	1014992	1014992	1014992
Clusters	395	395	395	395	395
Elasticity	-0.46	-0.49	-0.46	-0.50	-0.53
Incidence	-0.67	-0.71	-0.67	-0.72	-0.77

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*)

- Wage elasticity increasing in skill 
- Censored wages: results sensitive for high-skilled 
- Similar estimates for non-corporate firms (not significant), no effect for service sector 
- Wage effect zero for firm movers 
- Negative employment effects (Siegloch, 2013)

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## How much of the corporate tax burden is borne by workers?

- Overall: For 1€ higher tax bill, companies reduce wage bill by 0.40€
- But: incidence depends on wage setting institution and firm characteristics
  - ▶ Strong effect for firms with CBA, increasing in skills: profit sharing
  - ▶ Negative effect also present for firms with sector CBA but only if CBA not binding
  - ▶ Rather small estimates for the indirect effect, suggests that competitive wages are sticky
  - ▶ Small and positive wage effects for small firms: income shifting



Thank you for your attention!

Comments? Questions?

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- Harberger (1962): Closed economy with corporate and non-corporate sectors: introduction of CT borne by capital owners in both sectors
- Mobile capital reduces returns to labor (assuming complementarity; Bradford, 1978, Kotlikoff & Summers, 1987)
- Small open economy: returns to capital are unaffected and labor bears the total burden of CT (Diamond & Mirrlees, 1971)
- Harberger (1995): labor could even bear an excess burden
- Recent studies using CGE models: labor bears 40-60% of CT burden (Mutti & Grubert, 2004, Randolph, 2006, Gravelle & Smetters, 2006, Harberger, 2008, Gravelle, 2010)

- Few (recent) empirical studies: Labor bears 20–80% of CT burden
- 2 clusters of studies in terms of identifying variation:
  - 1 Cross-country data: Hassett & Mahur (2006), Felix (2007), Desai et al. (2007)
  - 2 Firms/industry data: Felix & Hines (2009), Dwenger et al. (2011), Liu & Altshuler (2013, NTJ), Arulampalam et al. (2012, EER)
- Bauer et al. (2012) use set-up very close to FPS (2011): face data limitations, no municipal information and no firm data

## Non-corporate firms:

$$\tau_{EMTR}^{non-corp} = \frac{\tau_{PIT}^{top} \cdot (1 + soli) + \tau_{fed} \cdot cr}{1 + \tau_{fed} \cdot 1.8}$$

- $\tau_{PIT}$ : (top) marginal tax of PIT, decreased over period, now 45%
- *soli*: “solidarity surcharge” “to finance reunification”: 5.5%
- **cr**: collection rate, set by municipality, varies btw. 200–500%

## EMTR corporate firms:

$$\tau^{corp} = \frac{\tau_{CT} \cdot (1 + soli) + \tau_{fed} \cdot cr}{1 + \tau_{fed} \cdot cr}$$

- $\tau_{CT}$ : corporate tax rate - 25% (2001-2007), now 15%
- *soli*: “solidarity surcharge” “to finance reunification”: 5.5%
- $\tau_{fed}$ : LBT federal rate 5% (1998-2007), now 3.5%
- **cr**: collection rate, set by municipality, varies btw. 200–500%
- example:  $\tau^{corp} = \frac{0.25 \cdot (1.055) + 0.05 \cdot 4}{1 + 0.05 \cdot 4} = 0.386$



Table : Number of tax changes per community, 1998-2008

# changes	any change		big change	
	# municipalities	in %	# municipalities	in %
0	4977	43.50	7575	66.21
1	4376	38.25	3376	29.51
2	1552	13.57	430	3.76
3	402	3.51	57	0.50
4	96	0.84	2	0.02
5	32	0.28	1	0.01
6	6	0.05	0	0.00

*Source:* Statistical Offices of the Länder. *Note:* The average increase is 21 points (6%). A big change is defined as an increase of more than 21 points. The average big change is 31 points (8.9%).

Table : Share of communities with changing collection rates (in %)

	$\Delta cr \neq 0$	$\Delta cr > 0$	$\Delta cr < 0$
Total	8.1	7.2	0.9
by Year			
1999	5.4	4.3	1.1
2000	8.4	7.4	1.0
2001	12.7	11.5	1.3
2002	8.6	7.9	0.7
2003	9.8	9.1	0.8
2004	8.8	8.2	0.6
2005	11.0	10.4	0.7
2006	7.8	7.0	0.8
2007	4.4	3.7	0.8
2008	4.0	3.2	0.8

Source: Statistical Offices of the Lnder. Note: The average increase is 21 points (6%). N=11,441 per year

Nash bargaining over wages and employment:

$$w_i^{k*}, L_i^{k*} = \arg \max_{w_i^k, L_i^k} \Omega_i^k, \quad \text{where}$$

$$\begin{aligned} \Omega_i^k &= \beta^k \ln(L_i^k [w_i^k - \bar{w}^k]) + \\ & (1 - \beta^k) \ln([F_i(K_i, L_i^1, L_i^2) - \sum_{k=1}^2 w_i^k L_i^k] (1 - \tau_i) - (1 - \alpha \tau_i) r K_i). \end{aligned}$$

This yields the following first-order conditions:

$$\begin{aligned} w_i^{k*} &= \bar{w}^k + \frac{\beta^k}{(1 - \beta^k)} \frac{P_i}{L_i^k (1 - \tau_i)} \\ \frac{\partial F(K_i, L_i^1, L_i^2)}{\partial L_i^k} &= \bar{w}^k \quad k = 1, 2 \end{aligned}$$



The full wage effect can be expressed as the sum of a direct and an indirect effect:

$$\frac{\partial w_i^{k*}}{\partial \tau_i} = \text{direct effect} + \text{indirect effect},$$

where

$$\text{direct effect} \equiv - \frac{(1 - \beta^j) \beta^k K_i}{(1 - \beta^k \beta^j) L_i^k} \frac{\partial R_i}{\partial \tau_i} < 0;$$

$$\text{indirect effect} \equiv - \left( \frac{(w_i^{k*} - \bar{w}^k)}{L_i^k} \frac{\partial L_i^k}{\partial R_i} + \frac{\bar{w}_i^j (1 - \beta^j) \beta^k}{(1 - \beta^k \beta^j) L_i^k} \frac{\partial L_i^j}{\partial R_i} \right) \frac{\partial R_i}{\partial \tau_i} \geq 0,$$

with

$$\frac{\partial R_i}{\partial \tau_i} = r \frac{(1 - \alpha)}{(1 - \tau_i)^2} > 0.$$

	mean	sd	min	max	N
monthly wage	3171	813	421	5510	4016476
high-skilled wage	3736	867	441	5509	143565
medium-skilled wage	3213	820	421	5509	3062917
low-skilled wage	2913	685	466	5510	809994
age	41	10	16	64	4016476
tenure	11	8	0	34	4016476
share: male	0.81	0.39	0	1	4016476
share: blue collar	0.83	0.37	0	1	4016476
employees (fulltime)	341	1637	1	48826	14379
annual value added (in 1000)	38845	230549	9	10570000	14379
annual investments (in 1000)	4336	31867	0	1755000	14379
share: sector union contract	0.46	0.50	0	1	14379
share: firm union contract	0.11	0.31	0	1	14379
share: no union contract	0.44	0.50	0	1	14379
share: stand alone plant	0.71	0.45	0	1	14379
share: part of multi-plant firm	0.29	0.45	0	1	14379
collection rate (in %)	348	42	150	520	6753
population (in 1000)	27.19	115.49	0	3426	6753
local unemp. rate	0.12	0.06	0	0	6753
municipal revenues (in millions)	48.24	199.97	4	4416	6753
municipal expenses (in millions)	43.42	194.82	4	5971	6753

Model	(1)	(2)
log collection rate <sub>t</sub> × high skilled	-0.099 (0.073)	-0.081 (0.058)
log collection rate <sub>t</sub> × medium skilled	-0.097** (0.045)	-0.096** (0.046)
log collection rate <sub>t</sub> × low skilled	-0.061 (0.056)	-0.121 (0.075)
log collection rate <sub>t-1</sub> × high skilled		-0.062 (0.042)
log collection rate <sub>t-1</sub> × medium skilled		-0.027 (0.033)
log collection rate <sub>t-1</sub> × low skilled		0.041 (0.059)
Adjusted R <sup>2</sup>	0.198	0.181
Observations	3512491	3204780
Groups	1085873	1014992
Clusters	395	395
Long run effect: high skilled	-0.099	-0.142*
Long run effect: medium skilled	-0.097**	-0.123**
Long run effect: low skilled	-0.061	-0.080
Wage elasticity: high skilled	-0.39	-0.54
Wage elasticity: medium skilled	-0.40	-0.48
Wage elasticity: low skilled	-0.26	-0.33
Euro incidence: high skilled	-0.12	-0.17
Euro incidence: medium skilled	-0.43	-0.56
Euro incidence: low skilled	-0.06	-0.08

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*)

Model Group	(1) firm tenure	(2) age	(3) collar type	(4) mobility
log collection rate	-0.091* (0.047)	-0.094** (0.046)	-0.089* (0.046)	-0.103** (0.046)
log collection rate * medium	-0.004 (0.016)			
log collection rate * high	0.007 (0.022)			
log collection rate * medium		0.003 (0.010)		
log collection rate * old		0.003 (0.019)		
log collection rate * white collar			-0.027 (0.025)	
log collection rate * mobile workers				0.214*** (0.070)
Adjusted $R^2$	0.199	0.199	0.198	0.199
Observations	3512491	3512491	3512491	3512491
Groups	1085873	1085873	1085873	1085873
Clusters	395	395	395	395

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*).

Model Sample	(1)	(2)	(3)	(4)	(5)
	Legal type		Industry		
	corporate	non-corporate	manufacturing	traffic	services
log collection rate	-0.093** (0.045)	-0.102 (0.064)	-0.093** (0.045)	-0.061 (0.045)	-0.023 (0.066)
Adjusted $R^2$	0.198	0.203	0.198	0.145	0.113
Observations	3512491	201603	3512491	339154	467551
Groups	1085873	92557	1085873	98385	212523
Clusters	395	316	395	167	323
Elasticity	-0.38	-0.39	-0.38	-0.25	-0.09
Incidence	-0.53	-0.30	-0.53	-0.44	-0.02

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*)



Model Group	(1) establishment type	(2) firm size	(3) profitability	(4) work council	(5) tax salience
log collection rate	-0.115** (0.056)	-0.139** (0.066)	-0.097** (0.047)	-0.080* (0.048)	-0.071 (0.072)
log collection rate * stand alone	0.025 (0.030)				
log collection rate * 50-250 employees		0.117** (0.051)			
log collection rate * 250-1000 employees		0.035 (0.062)			
log collection rate * >1000 employees		0.027 (0.078)			
log collection rate * poor			0.014 (0.015)		
log collection rate * work council				-0.013 (0.022)	
log collection rate * local tax relevant.					-0.047 (0.089)
Adjusted $R^2$	0.199	0.199	0.199	0.198	0.213
Observations	3495591	3512491	3512491	3512491	2551316
Groups	1080893	1085873	1085873	1085873	647658
Clusters	394	395	395	395	364

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*).

Model	(1)	(2)	(3)	(4)
Wage treatment	person never censored	not censored in t	ceiling	imputed
log collection rate x high skilled	-0.099 (0.073)	-0.045 (0.074)	0.019 (0.049)	-0.017 (0.057)
log collection rate x medium skilled	-0.097** (0.045)	-0.105** (0.045)	-0.107*** (0.039)	-0.124*** (0.044)
log collection rate x low skilled	-0.061 (0.056)	-0.068 (0.056)	-0.072 (0.049)	-0.091 (0.058)
Adjusted $R^2$	0.198	0.208	0.221	0.140
Observations	3512491	3820751	4592096	4592096
Groups	1085873	1197097	1373324	1373324
Clusters	395	395	395	395
Wage elasticity: high skilled	-0.39	-0.18	0.08	-0.07
Wage elasticity: medium skilled	-0.40	-0.43	-0.43	-0.51
Wage elasticity: low skilled	-0.26	-0.29	-0.31	-0.39
Euro incidence: high skilled	-0.12	-0.06	0.02	-0.02
Euro incidence: medium skilled	-0.43	-0.46	-0.46	-0.53
Euro incidence: low skilled	-0.06	-0.07	-0.07	-0.09

Note: All specifications include person, firm, municipal and year fixed effects as well as: skill-year, occupation-year, firm size-year, CBA type-year, state-year fixed effects. Standard errors (in parentheses) clustered at county level. Significance levels are 0.1 (\*), 0.05 (\*\*), and 0.01 (\*\*\*).