The Socio-Economic Impact of the Energy Crisis: Evidence from Germany

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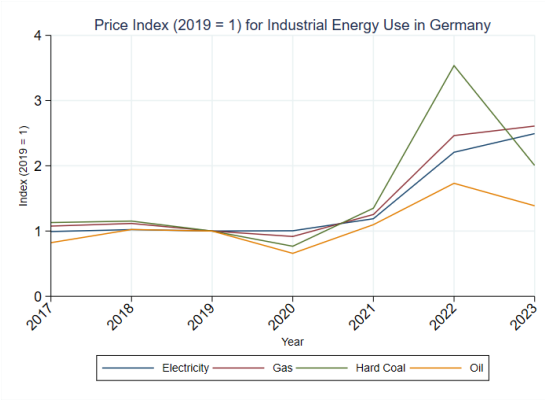
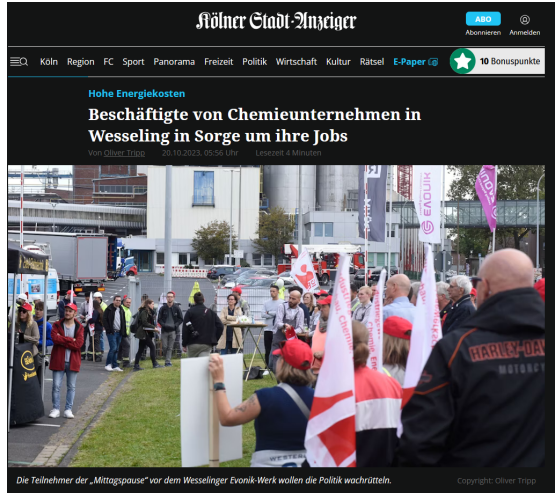
Motivation: High energy prices (RUS aggression against UKR) and job security





Motivation: Consequences Subject of Controversial Debate

- German Chancellor Olaf Scholz feared that an embargo on Russian gas could place "**hundreds of thousands of jobs at risk**" and push "**entire industries to the brink**" (Politico, 2022).

- But: Bachmann et al. (2024) deemed the consequences of a gas embargo "manageable".

Research Question

How did the price-shock affect **sectoral**, **regional**, and **establishments** (labor market) outcomes? Such as:

- **Employment and wages**
- *Voting and attitudes*

- **Data:** Administrative data AFiD, IEB (BHP, sectoral aggregates)

- **Variation:** Exploit differential exposure to the energy price shock by leveraging variation in energy intensity and fuel mix.

Related literature and contribution

- **Consequences of the recent energy crisis**: We analyze sectoral, regional, and establishment-level responses in the manufacturing sector for Germany (e.g., Arquié & Thie, 2023; Auclert, Monnery, Rognlie, & Straub, 2023; Bachmann et al., 2024; Fetzer, Gazze, & Bishop, 2024; Fetzer, Palmou, & Schneebacher, 2024; Hutter & Weber, 2023; Lafrogne-Joussier, Martin, & Mejean, 2023).

- **Energy costs in manufacturing**: we look at output, employment, and wages (Abeberese, 2017; André, Costa, Demmou, & Franco, 2023; Cox, Peichl, Pestel, & Siegloch, 2014; Fontagné, Martin, & Orefice, 2024; Ganapati, Shapiro, & Walker, 2020; Gerster & Lamp, 2024; Marin & Vona, 2019, 2021; Mertens, Müller, & Neuschäffer, 2022).

- **Structural Change & Green Transition:** We study labor market and political consequences of energy shocks (D. Autor, Dorn, Hanson, & Majlesi, 2020; D. H. Autor, Dorn, & Hanson, 2013; D. H. Autor, Dorn, Hanson, & Song, 2014; Dauth, Findeisen, & Suedekum, 2014; Dippel, Gold, Heblich, & Pinto, 2021; Hanson, 2023).

Data

German Census of the Manufacturing Industry - AFiD (*"Amtliche Firmen in Deutschland"*)

- Plant-level data, covering the universe of plants that belong to a manufacturing firm with at least 20 employees.
- Information about plant level fuel use in physical units and by fuel type, and number of employees.

German Statistical Office

- Industrial fuel prices, and production index

IEB & BHP

- Data on employment and wages and the individual and establishment-level.
- Aggregates at the sectoral and regional levels.

Measure of Exposure to the Shock at the 4-digit sector-level

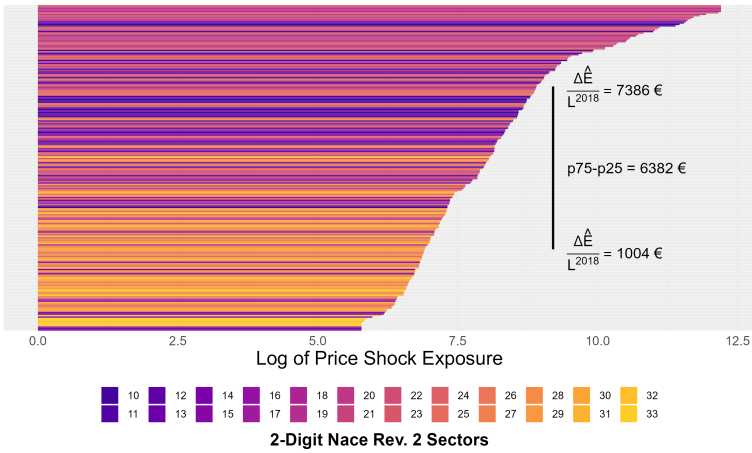
- Exposure of sector s to energy price changes
  - Calculate "excess energy costs" of sector s from plant level data:

$$ExcessCosts_s = \sum_{i \in S} \sum_{f \in F} Fuel_{f,i,s}^{2018} * \Delta P_f$$

- ΔP_f is the change in the price for fuel f between 2022 and 2018
- Define the exposure as excess costs per employee in 2018

$$Exposure_s = \frac{ExcessCosts_s}{\sum_{i \in S} L_i^{2018}}$$

Log sectoral exposure



Empirical approach

- **Intensity treatment:** relate changes in *lny* between some month(year) t and a baseline month(year) to sectoral exposure

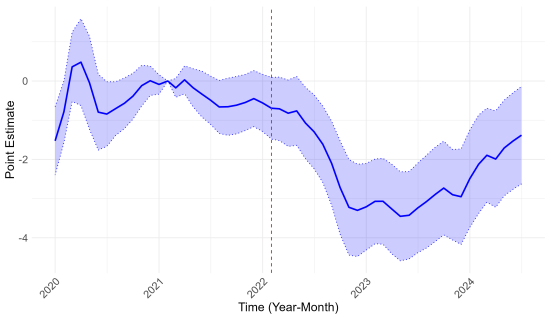
$$\Delta y_{i,t} = y_{i,t} - y_{i,2021} = \beta_0 + \sum_{\tau=2018,\, \tau \neq 2021}^{2023} \beta^{\tau} \ln(Exposure_s) \mathbb{1}\{t = \tau\} + \gamma_t + \varepsilon_{i,t}$$

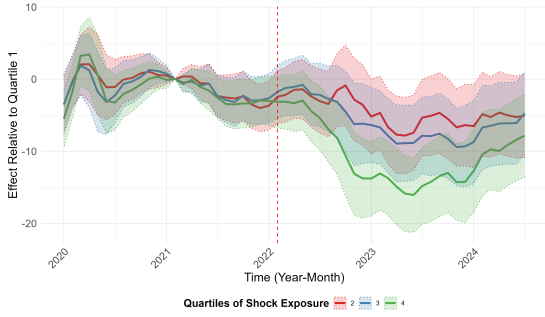
- $\Delta y_{i,t}$: change in the logarithm of unit i's outcome between year t and 2021
- β^{τ}: coefficients of interest
- γ_t: year (*2-digit industry) FE

Results

- Motivational: Production-Index (Destatis)
- Labor Market Effects
- IEB regional aggregates

Exposure and monthly production: cont. effect and exposure quartiles





- Motivational: Production-Index (Destatis)
- Labor Market Effects
- IEB regional aggregates

Sector-Level Results: Response to a 100% Increase in Shock Exposure

	Log Employment		Log Wages	
	(1)	(2)	(3)	(4)
Delta 2018	-0.381	0.222	-0.174	0.166
	(0.465)	(0.542)	(0.116)	(0.129)
Delta 2019	-0.366	0.390	-0.274***	0.099
	(0.412)	(0.464)	(0.102)	(0.113)
Delta 2020	0.101	0.472	0.066	-0.055
	(0.291)	(0.323)	(0.085)	(0.105)
Delta 2022	0.232	-0.002	0.035	-0.226*
	(0.264)	(0.255)	(0.141)	(0.122)
Delta 2023	0.162	0.327	-0.250	-0.434***
	(0.352)	(0.330)	(0.158)	(0.146)
# of Observations	1,100	1,100	1,100	1,100
# of Sectors	220	220	220	220
Year-FE	Yes		Yes	
Year-Sector-FE		Yes		Yes

Notes: Significance levels are indicated as * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

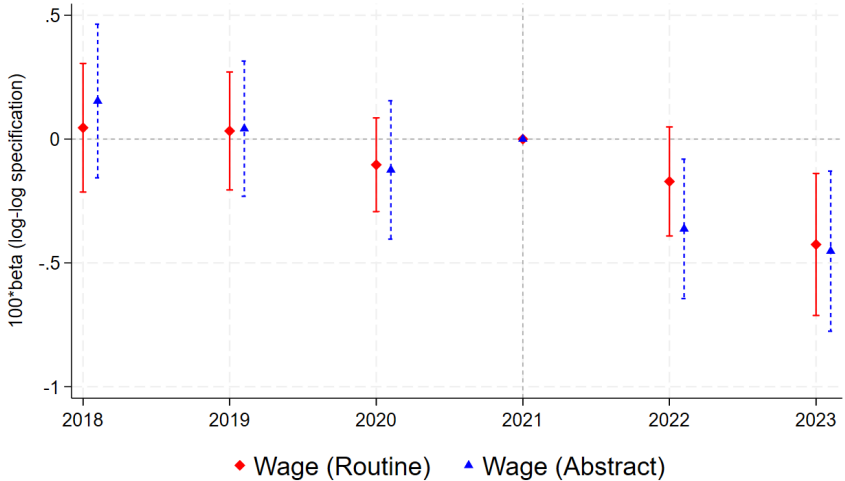
Establishment-Level Results: Response to a 100% Increase in Exposure

	Log Employment		Log Wages	
	(1)	(2)	(3)	(4)
Delta 2018	0.285	0.451	-0.175	0.081
	(0.318)	(0.349)	(0.114)	(0.094)
Delta 2019	0.137	0.356	-0.245***	-0.081
	(0.265)	(0.288)	(0.073)	(0.054)
Delta 2020	0.034	0.182	0.047	-0.013
	(0.122)	(0.114)	(0.042)	(0.051)
Delta 2022	0.106	0.215*	-0.063	-0.210***
	(0.099)	(0.112)	(0.053)	(0.049)
Delta 2023	-0.118	0.308	-0.217**	-0.369***
	(0.174)	(0.189)	(0.085)	(0.089)
# of Observations	105,715	105,715	105,715	105,715
Year-FE	Yes		Yes	
Year-Sector-FE		Yes		Yes

Notes: Significance levels are indicated as * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Establishment Level: Effects for Along the Wage Distribution

Sector Level: Effects on Wages by Task-Group



Sector Level: Effects on Wages by Subgroups (Tenure)

Additional Results

- Heterogeneity by plant characteristics ▸ Size/Age
- Establishment transitions ▸ Transitions
- Discretized exposure measure ▸ Wages ▸ Employment

- Motivational: Production-Index (Destatis)
- Labor Market Effects
- IEB regional aggregates

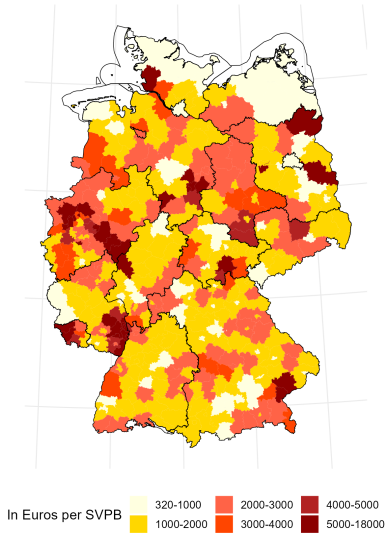
Regional Exposure

- Map sectoral exposure to 400 districts using IEB Employment data
- Recall: Exposure of sector s is defined as excess costs per worker.
- $\Rightarrow$ Multiply # of workers in sector s in district d with exposure measure and sum across S.

$$ExcessCosts_d = \sum_{s \in d} L_s \times Exposure_s$$

- Scale $ExcessCosts_d$ with the number of workers subject to social security contributions in district d

Exposure of Districts (Maps)



Regional results:

- No employment effects — ▸ Employment
- Negative wage effects only in the manufacturing sector — ▸ Wages
- No negative effects on wages in other sectors — ▸ Wages
- Null effects on voting outcomes — ▸ Voting

Summary and to-dos

- Overall null employment effects
- Consistent negative wage effects $\Rightarrow$ partly explained by new hires
- Sector-level investment decline and sharp price increase
- Null effects on voting (last elections)

To-Dos

- Use individual level survey data to study attitudes (SOEP)

Thank you!

Questions? Comments? Remarks?
Write me: katia.gallegos-torres@iab.de

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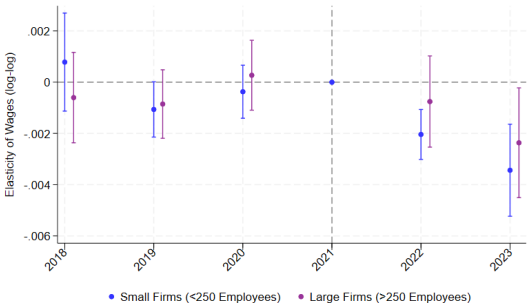
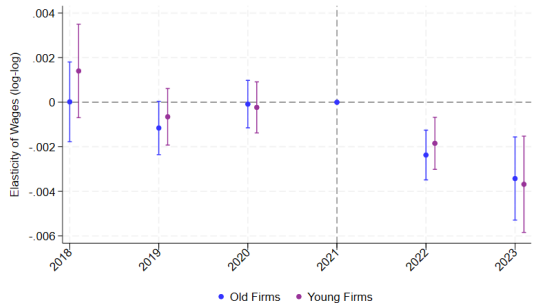
Establishments' wages: by Size and Age





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Wages for Workers Transitioning

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Discretized Shock Exposure: Employment

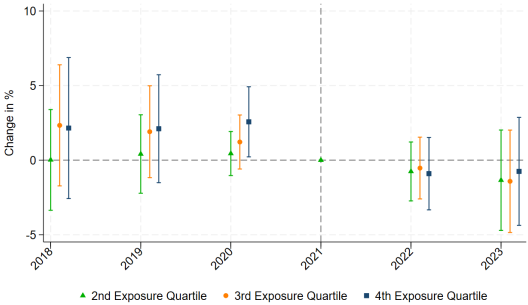

Figure: Sector Level

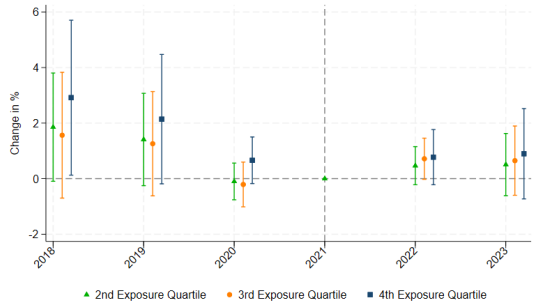

Figure: Establishment Level

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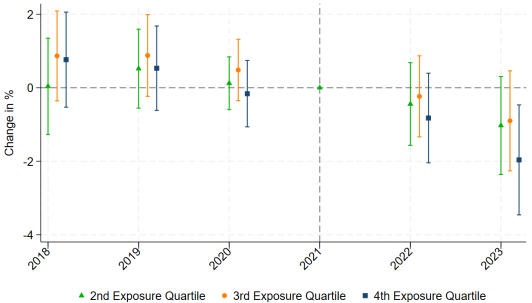
Discretized Shock Exposure: Wages



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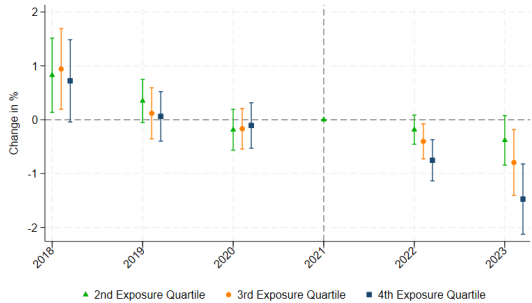

Figure: Establishment Level

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Regional employment: again null effects

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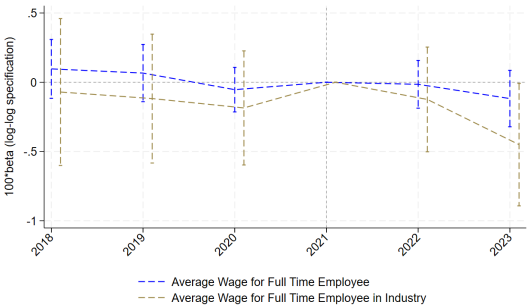
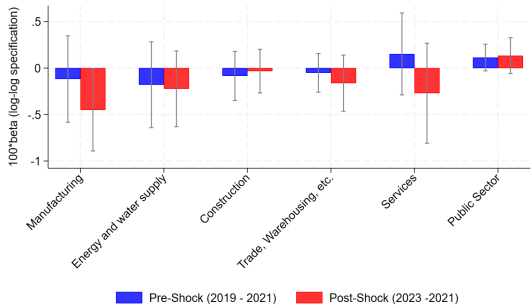
Regional wages: again negative effects but no spillovers





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Voting outcomes

	Δ CDU Share			Δ SPD Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ 2021 - 2017	0.003	0.006*	0.006	0.002	0.001	0.000
	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Δ 2025 - 2021	-0.002	-0.002	-0.002	-0.008***	-0.003	-0.001
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)

	Δ Green Share			Δ FDP Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ 2021 - 2017	-0.013***	-0.004	-0.000	0.003*	-0.000	-0.001
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Δ 2025 - 2021	0.006***	0.004*	0.003*	-0.000	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)

	Δ AfD Share			Δ Left Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ 2021 - 2017	0.002	-0.003**	-0.003**	0.001	-0.001	-0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ 2025 - 2021	0.012***	0.002	-0.000	-0.007***	-0.003	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
# of Observations	400	400	400	400	400	400
Region-FE	Yes	Yes	Yes	Yes	Yes	Yes
Industrial employment share		Yes	Yes		Yes	Yes
Sociodemographic characteristics			Yes			Yes

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

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