The Local Scarring Effect of Negative Trade Shocks: Evidence from the Collapse of Finnish-Soviet Trade

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Question

- How do local labor markets shape the response to trade shocks?
  - **Hypothesis #1:** *There are more exposed workers in more exposed markets, but those exposed to negative trade shocks fare equally poorly across markets*
  - **Hypothesis #2:** *There is something systematically different about experience of exposed workers in the most negatively affected markets*

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- Hypothesis #1 versus hypothesis #2 has obvious policy implications:
  - **#1** $\Longrightarrow$ National social programs compensating workers regardless of location well suited (unemployment benefits, trade adjustment assistance)
  - **#2** $\Longrightarrow$ Scope for the same programs to inherit characteristics of place-based policies (as advocated by Austin, Glaeser, and Summers 2018)
- Better understanding of the role played by local labor market conditions may also help shed light on structural relationship between trade and inequality

To Make Progress on this Question

- **Focus on a massive trade shock**
  - Collapse of the Finnish-Soviet bilateral trade agreement in 1990
  - Newly-digitized Finnish firm exports to USSR + matched employer-employee data
  - Measure both **worker exposure** and **market exposure** to the USSR shock
    - Worker exposure (s) = USSR export share of output of a worker's plant in 1989
    - Market exposure (S) = Employment-weighted average of USSR export shares of output of a market's plants in 1989
- **Study earnings trajectories of Finnish workers from 1985 to 2004**
  - How the path of earnings varies with worker exposure to the USSR shock (s)
  - As well as how impact of worker exposure varies with market exposure ($s \times S$)

Road Map

1. **Historical Background and Data**
   - Collapse of the Finnish-Soviet trade agreement
   - Measures of worker and market exposure and other data sources

2. **Reduced-form results on trade exposures and earnings dynamics**
   - More exposed workers systematically experience lower earnings after the shock
   - Negative effect of worker exposure persistently larger in more exposed markets, **a form of local scarring**

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- Appendix/follow-up paper: an exploration of wage rigidity as a driver of earnings dynamic
  - Theory: Simple model of labor-market dynamics with wage rigidity
  - Empirics: Supporting evidence for additional predictions

Contributions

- Main empirical results = **spatial counterpart** of the **business cycle** analysis of
  Farber (2016), Davis and von Wachter (2011), Schwandt and von Wachter (2019)
  - Also contribute to the shift-share literature analyzing labor demand shocks on market-level outcomes Blanchard + Katz (92), Topalova (10), ADH (13), Kovak (13), Dix-Carniero + Kovak (17)...
  - ... to earlier work on the spillover effects of mass layoffs Gathmann, Helm and Schönberg (18)
  - ... and to the literature examining the USSR shock for Finland
    Honkapohja and Koskela (99), Jonung et al. (09), Gorodnichenko et al. (12), Gulan et al. (21), Einiö (18)...

- Theory: We emphasize **wage rigidities** Friedman (53), Akerlof et al. (96), Rodriguez-Clare et al. (20),...
  - Workhorse dynamic model of trade and labor markets: slow transition driven by idiosyncratic preference shocks Artuç et al. (10), Dix-Carneiro (14), Caliendo et al. (19), and Traiberman (19)
  - We get opposite predictions for employment and wage dynamics in short-run and long-run, for which we find support in the data

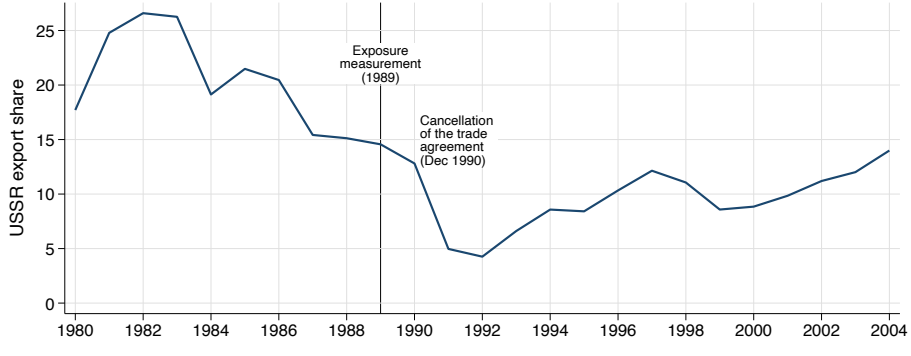
Historical Background and Data

The Curious Finnish-USSR Trade Arrangement

Trade Ministers and General Director in Moscow celebrating the signing of another Finnish-USSR 5-year trade deal in December 1982

The Finnish-USSR Trade Arrangement and its Demise

- Series of five-year, bilateral trade agreements starting in 1951
  - Trade was required to be annually balanced
  - Finland imported energy (world price) exported manufactures (negotiated high price)
- USSR unilaterally cancelled the agreement on Dec 6th, 1990



- This persistent drop is what we will refer to as the "USSR shock"

Constructing Exposure(s) to the USSR Shock

- We digitalized data on exports to the USSR at the firm-and-product level
  - $x_{fp,1989}$ = value of exports to USSR of product p by firm f in 1989

  ... and linked them with existing plant-and-product level data
  - $q_{jp,1989}$ = value of gross output of plant j product p for all j

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  - $q_{jp,1989}$ = value of gross output of plant j product p for all j
- This allows us to construct plant-level USSR export intensity:

$$s_j \equiv x_{j,1989}/q_{j,1989}$$

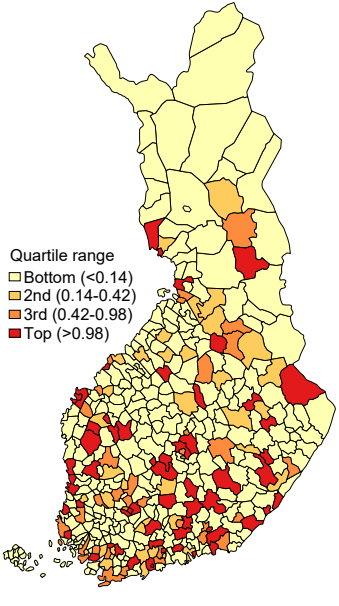
  - $x_{j,1989} \equiv \sum_p x_{fp,1989} \times (q_{jp,1989}/q_{fp,1989})$ is plant j's (inferred) USSR exports
  - $q_{j,1989} \equiv \sum_p q_{jp,1989}$ is plant j's total gross output

Market Exposure to the USSR Shock

Municipality m exposure to USSR Shock

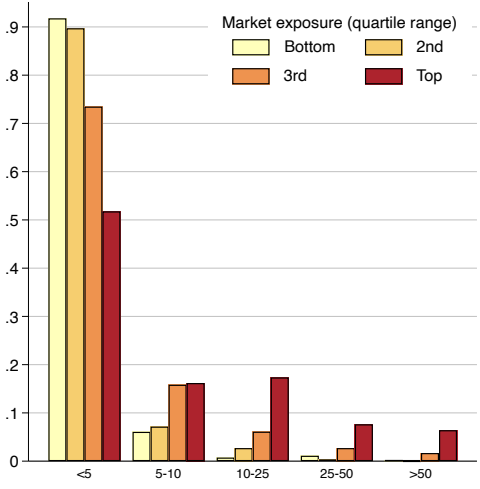
$$S_m \equiv \sum_{j \in \mathcal{J}_m} \omega_j s_j$$

with weights equal to the employment share of plant j in market m in 1989



Exposure to USSR shock was extremely skewed

Distributions of Worker Exposure (conditional on $s_i > 0$)
in by Quartiles of Market Exposure



Worker characteristics by exposure

Reduced-form Results on Trade Exposures and Earnings Dynamics

Empirical Design

- Triple-Difference: Compare differences between changes in earnings trajectories of more versus less exposed workers in more and less exposed markets

$$\Delta y_{it} = \beta_t s_i + \gamma_t (s_i \times S_m) + \text{Controls}_i' \zeta_t + \varepsilon_{it}$$

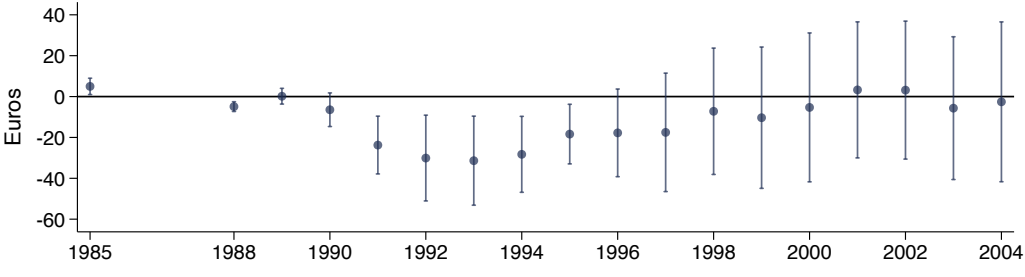
where $\Delta y_{it} \equiv y_{it} - \overline{y}_i^{pre}$ and Controls_i is a long vector of initial characteristics, including municipality fixed-effects (workers location in 1989)

Outcome, Controls and Sample

- Primary outcome: **annual earnings**
  - Finnish Tax Authority (wage and salary)
  - All earnings deflated to 2010 euros (markka-euro exchange rate and Finland's Cost-of-living index)
  - Winsorize annual income at the top 1% within each year (following ADHS 2014)
- Controls:
  - Municipality fixed-effects (where individual *i* located in 1989)
  - Characteristics of employer (plant where individual *i* worked in 1989)
    - avg pre-shock earnings, plant output, capital/labor ratio
    - manufacturing fixed-effects
  - Characteristics of the worker
    - birth year, gender, language, education level + field, pre-shock earnings
- Sample: private sector, high labor force attachment, born 1945-1967 (672,070 individuals)

Direct effect

$$\Delta y_{it} = \beta_t s_i + \gamma_t (s_i \times S_m) + \text{Controls}_i' \zeta_t + \varepsilon_{it}$$

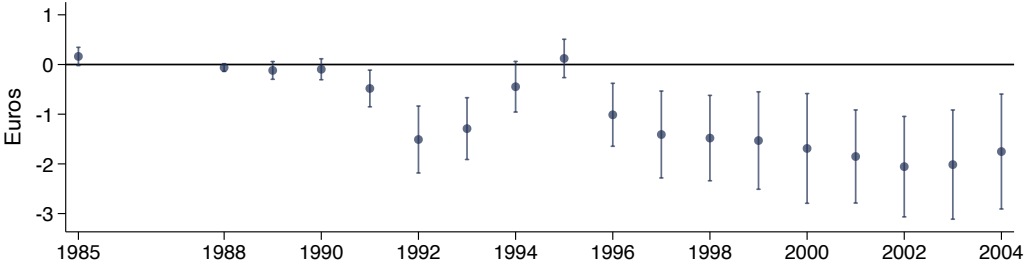


In 1992, worker at the 90th percentile of exposure experiences 607 euros ↓ compared to worker at 10th percentile (conditional on $s_i > 0$)

- for 1992: 2.4% of pre-period annual earnings
- summed over all years: 3,824 euros or 14.9% pre-period earnings.

Interaction

$$\Delta y_{it} = \beta_t s_i + \gamma_t (s_i \times S_m) + \text{Controls}_i' \zeta_t + \varepsilon_{it}$$



- Moving from 10th to 90th percentile of $s_i > 0$ distribution in 1992:
  - in 10th percentile exposure muni: 607 ↓ euros
  - in 90th percentile exposure muni: 681 ↓ euros
- Local scarring: Spatial counterpart of results in labor literature about heterogeneous impact of mass lay-offs over the business cycle

Robustness

- Additional controls
  - industry fixed effects
  - quadratic of worker exposure
  - municipality characteristics
- Relative vs. Absolute Earnings
- Alternative Worker Samples

Concluding Remarks

- How do local labor markets shape the response to trade shocks?
  - ~~Hypothesis #1: Workers exposed to negative trade shocks fair equally poorly across regions~~
  - **Hypothesis #2:** *There is something systematically different about experience of exposed workers in the most negatively affected markets*
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- Worker exposure to USSR shock lowers earnings throughout the post period, but persistently more so in more exposed markets, a form of **local scarring**
- In a follow-up paper, we also develop a model of labor-market dynamics w/ downward **wage rigidity** that rationalizes our empirical findings and make additional predictions
  - Predictions are intuitive and supported in the data, but very different than those of workhorse dynamic trade models

Appendix

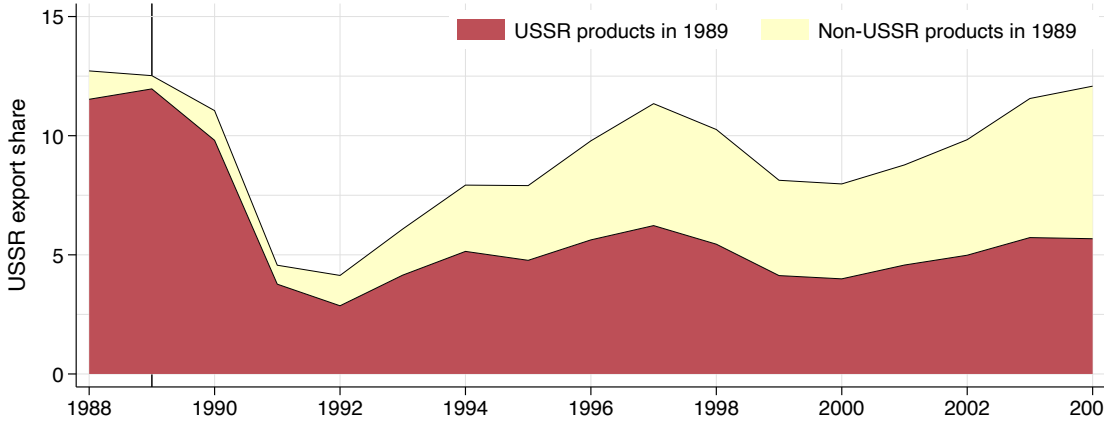

Figure A.2: Product Composition of the USSR Export Rebound

Notes: The share of Finnish exports to the USSR, or the 15 former Soviet republics, is decomposed into exports of "USSR Products in 1989" in the bottom shaded area (in red) and "Non-USSR Products in 1989" in the top shaded area (in yellow). "USSR Products in 1989" is defined as the set of 6-digit (HS88) products with USSR exports at least 5% of their total exports in 1989 whereas "Non-USSR Products in 1989" corresponds to all other products. All data are from OECD (2023a).

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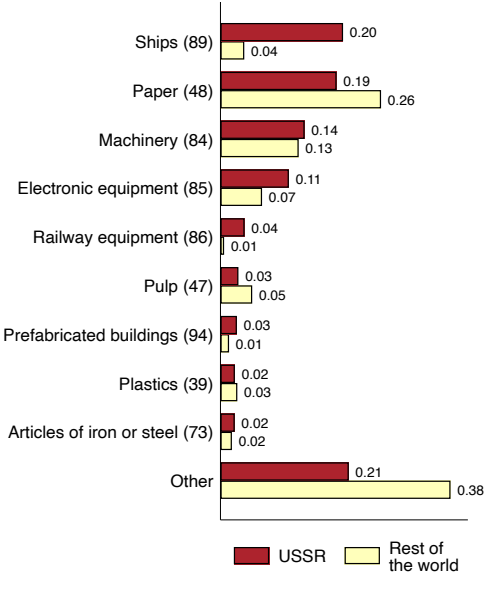
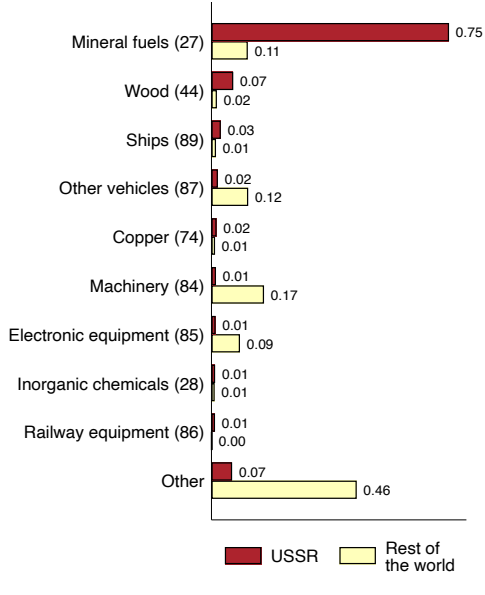


(a) Exports



(b) Imports

Figure A.1: Sectoral Composition of Finland's Exports and Imports, 1989

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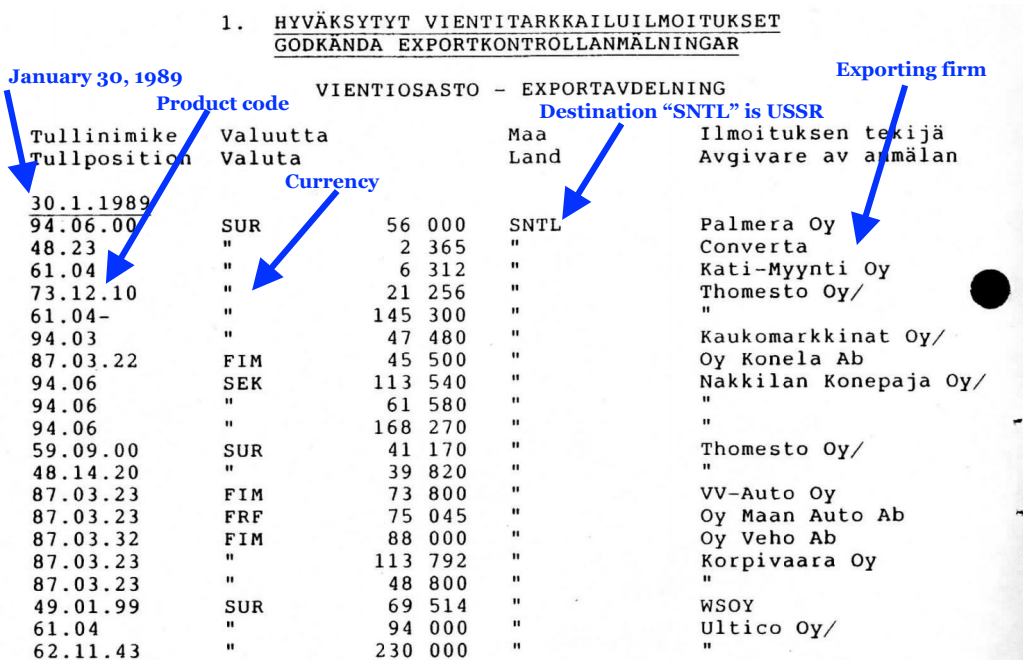
Digitizing export records

Back



1. HYVÄKSYTYT VIENTITARKKAILUILMOITUKSET
GODKÄNDA EXPORTKONTROLLANMÄLNINGAR

VIENTIOSASTO - EXPORTAVDELNING

January 30, 1989

Product code

Currency

Destination "SNTL" is USSR

Exporting firm

Tullinimike Tullposition	Valuutta Valuta		Maa Land	Ilmoituksen tekijä Avgivare av anmälan
30.1.1989				
94.06.00	SUR	56 000	SNTL	Palmera Oy
48.23	"	2 365	"	Converta
61.04	"	6 312	"	Kati-Myynti Oy
73.12.10	"	21 256	"	Thomesto Oy/
61.04-	"	145 300	"	"
94.03	"	47 480	"	Kaukomarkkinat Oy/
87.03.22	FIM	45 500	"	Oy Konela Ab
94.06	SEK	113 540	"	Nakkilan Konepaja Oy/
94.06	"	61 580	"	"
94.06	"	168 270	"	"
59.09.00	SUR	41 170	"	Thomesto Oy/
48.14.20	"	39 820	"	"
87.03.23	FIM	73 800	"	VV-Auto Oy
87.03.23	FRF	75 045	"	Oy Maan Auto Ab
87.03.32	FIM	88 000	"	Oy Veho Ab
87.03.23	"	113 792	"	Korpivaara Oy
87.03.23	"	48 800	"	"
49.01.99	SUR	69 514	"	WSOY
61.04	"	94 000	"	Ultico Oy/
62.11.43	"	230 000	"	"

How complete are recorded transactions?

- Office of Licenses:
  - Info on 3,380 transactions w/ value of 3.7 billion (in 2010 euros)
- NBER-UN:
  - Finland's exports to the USSR in 1989 were 4.2 billion

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Linking export data to LDPM

- LDPM details:
  - 1989 sampling frame of LDPM: all manufacturing plants w/ ≥ 5 employees
  - Firms legally required to answer survey
- Link firms in Office of Licenses to firms in LDPM using either
  - firm names and product codes
  - or annual reports of export cartels
- Link 71% of total value in export data to plants included in LDPM
- Missing construction, wholesale, trading companies not in LDPM

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LDPM Plants by USSR Export Intensity, 1989

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Table A.1: LDPM Plants by USSR Export Intensity, 1989

		By share of gross output exported to the USSR in 1989			
	All	0%	0–10%	10–50%	50–100%
A: Average Plant characteristics					
Gross output	9,493	5,774	39,167	44,276	18,063
Value-added	3,204	1,995	12,886	13,772	6,955
Number of workers	58.9	38.3	221.8	245.7	144.0
Value-added per worker	50.9	48.8	67.7	52.9	47.4
Capital / labor ratio	69.7	68.5	81.6	66.0	48.0
Plant age	10.5	10.2	12.9	12.6	12.5
Multi-plant firm	0.31	0.25	0.82	0.67	0.58
Share of output exported to the USSR	0.9	0.0	1.6	24.3	82.1
B: Group Size					
Share of output	1.00	0.54	0.39	0.06	0.01
Share of workers	1.00	0.58	0.36	0.05	0.01
Share of USSR exports	1.00	0.00	0.30	0.44	0.26
No. of plants	6,865	5,989	734	99	43

Notes: This table reports how characteristics of LDPM plants vary with their export intensity (in panel a) as well as the shares of output, employment, and USSR exports accounted by groups of plants with different export intensity (in panel b). All monetary values are expressed in thousands of 2010 euros.

Worker Characteristics by Worker Exposure

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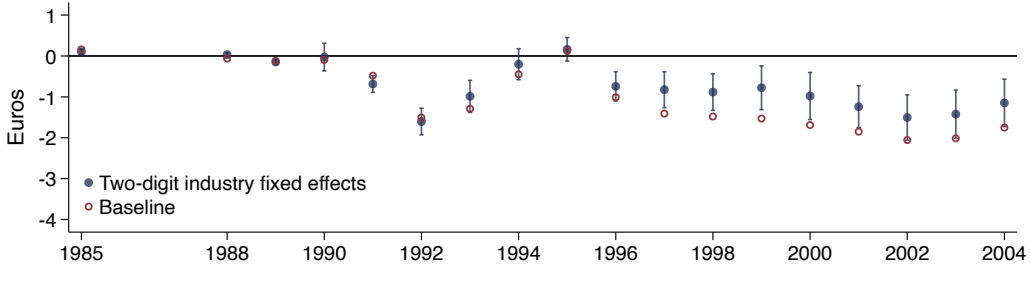
Table A.3: Worker Characteristics by Worker-Level Exposure to USSR Shock, 1989

		By worker-level exposure			
	All	0%	0–10%	10–50%	50–100%
A: Employer characteristics					
Average annual earnings	17,310	17,144	18,287	18,394	17,725
Gross output (LDPM)	77,957	39,561	132,657	113,210	70,224
Capital-labor ratio (LDPM)	73.9	71.0	79.7	70.5	53.7
B: Worker socio-demographics					
Year of birth	1953.9	1954.1	1953.2	1953.2	1953.3
Female	0.36	0.37	0.26	0.28	0.30
First language Finnish	0.95	0.94	0.97	0.96	0.97
First language Swedish	0.05	0.06	0.03	0.04	0.02
Other first language	0.003	0.003	0.002	0.001	0.003
Less than secondary/unknown degree	0.32	0.32	0.33	0.31	0.23
Lower secondary degree	0.38	0.37	0.43	0.45	0.44
Upper secondary degree	0.20	0.20	0.14	0.14	0.17
Lower tertiary degree	0.05	0.05	0.05	0.05	0.08
Higher tertiary degree	0.06	0.06	0.06	0.06	0.07
Business degree	0.16	0.17	0.08	0.08	0.08
Technical degree	0.36	0.34	0.51	0.55	0.62
Degree in other fields	0.16	0.17	0.08	0.07	0.07
Degree unknown / missing	0.32	0.32	0.33	0.31	0.23
Annual earnings	28,091	27,973	28,879	28,708	28,665
C: Sector of employment					
Manufacturing	0.36	0.27	0.98	1.00	1.00
Observations	632,269	547,134	70,841	11,369	2,925

Notes: This table reports how the characteristics of workers in our baseline sample vary with their exposure to the USSR shock. Annual earnings are expressed in 2010 euros. Gross output is in thousands of 2010 euros.

Robustness

Controlling for two-digit industry fixed effects



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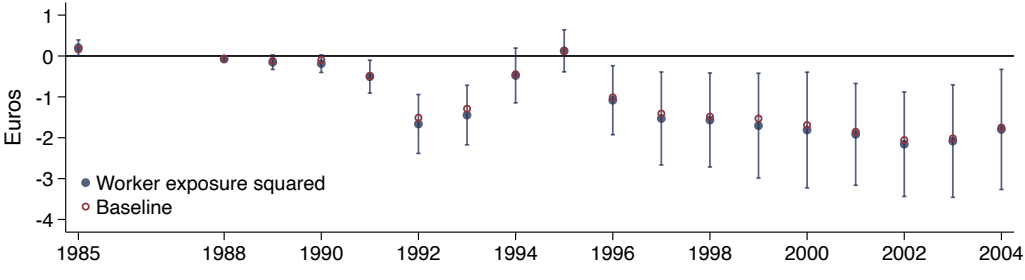
Robustness

Controlling for quadratic worker exposure



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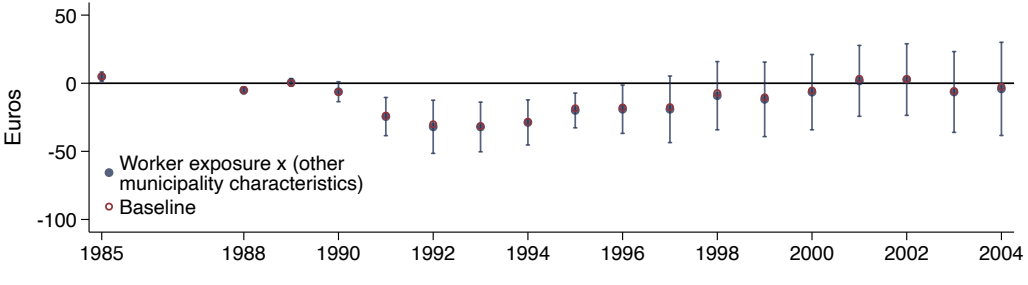
Robustness

Controlling for municipality characteristics interacted with worker exposure



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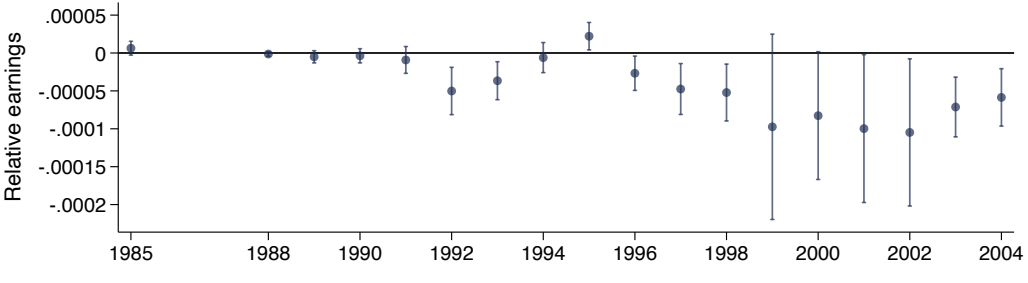
Robustness

Relative earnings



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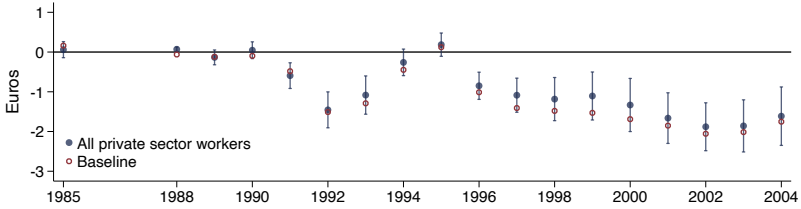
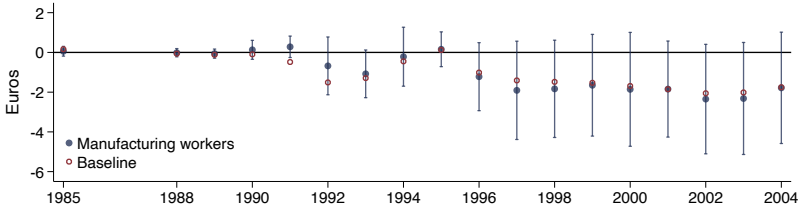
Robustness

All private sector workers



Manufacturing workers



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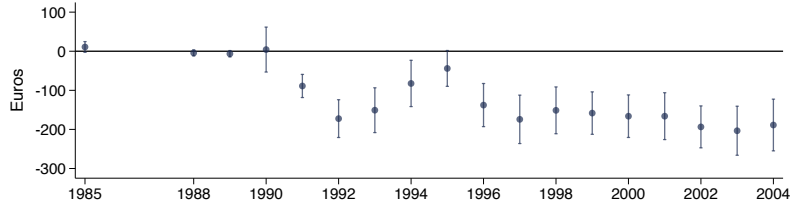
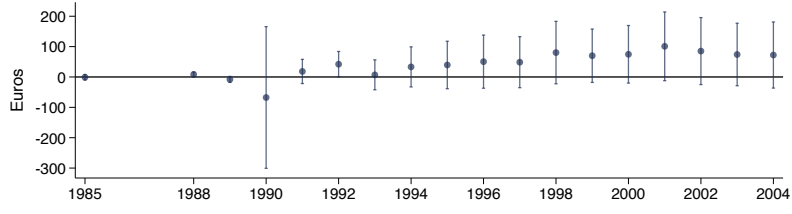


(a) Exposed workers



(b) Non-exposed workers

Figure B.1: Earnings of Exposed vs. Non-Exposed Workers

Notes: This figure reports the OLS estimates of β_t in the following worker-level regression: $\Delta y_{it} = \beta_t S_m + Controls_i' \zeta_t + \epsilon_{it}$. Figure B.1a considers the subsample of exposed workers ($s_i > 0$), whereas Figure B.1b considers the subsample of non-exposed workers ($s_i = 0$). Vertical lines indicate 95% confidence intervals on each coefficient. Robust standard errors are clustered by 1989 municipality.

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Wage Rigidity as Driver of Earnings Dynamics

A Simple Model with Wage Rigidity

Time is continuous and indexed by t

1. Labor market w/ fixed set of workers, $i \in \mathcal{I}$, and plants, $j \in \mathcal{J}$
2. Plant j employment equals labor demand at t: $E_{jt} = \phi_{jt} W_t^{-\sigma}$
3. Workers are either employed or unemployed: $E_t + U_t = N$
4. Downward wage rigidity $\dot{W}_t = \gamma(\overline{W}_t - W_t)$ if $\overline{W}_t < W_t$

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2. Plant j employment equals labor demand at t: $E_{jt} = \phi_{jt} W_t^{-\sigma}$
   - $\Rightarrow E_t = \Phi_t W_t^{-\sigma}$ where $\Phi_t \equiv \sum_{j \in \mathcal{J}} \phi_{jt}$
   - Btw t and $t + dt$, fraction λdt matches exogenously destroyed $\Rightarrow \lambda_{jt} = \max\{\lambda, -\dot{E}_{jt}/E_{jt}\}$
3. Workers are either employed or unemployed: $E_t + U_t = N$
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3. Workers are either employed or unemployed: $E_t + U_t = N$
   - If employed in j: wage W_t + endogenous probability of separation $\lambda_{jt} dt$
   - If unemployed: endogenous probability $\kappa_t dt$ of switching to employment at $t + dt$
   - Job-finding rate: $\kappa_t = \max\left\{0, \frac{\dot{E}_t + \lambda_t E_t}{U_t}\right\}$ with $\lambda_t = \sum_{j \in \mathcal{J}} \lambda_{jt} \frac{E_{jt}}{E_t}$ Derivation
4. Downward wage rigidity $\dot{W}_t = \gamma(\overline{W}_t - W_t)$ if $\overline{W}_t < W_t$

A Simple Model with Wage Rigidity

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2. Plant j employment equals labor demand at t: $E_{jt} = \phi_{jt} W_t^{-\sigma}$
3. Workers are either employed or unemployed: $E_t + U_t = N$
4. Downward wage rigidity $\dot{W}_t = \gamma(\overline{W}_t - W_t)$ if $\overline{W}_t < W_t$
   - $\overline{W}_t \equiv (N/\Phi_t)^{-1/\sigma}$ is market-clearing wage
   - $\gamma \geq 0$ determines speed of wage adjustment

Predicted Impact of USSR Shock with Wage Rigidity

Proposition 1. *In response to the USSR shock, more exposed* **workers** *experience*

1. *declines in expected earnings, with larger declines in more exposed markets if wages are sufficiently rigid*

model details

Predicted Impact of USSR Shock with Wage Rigidity

Proposition 1. *In response to the USSR shock, more exposed* **workers** *experience*

1. *declines in expected earnings, with larger declines in more exposed markets if wages are sufficiently rigid* model details
2. *declines in expected employment, with larger declines in more exposed markets* empirics

Predicted Impact of USSR Shock with Wage Rigidity

Proposition 1. *In response to the USSR shock, more exposed* **workers** *experience*

1. *declines in expected earnings, with larger declines in more exposed markets if wages are sufficiently rigid* model details
2. *declines in expected employment, with larger declines in more exposed markets* empirics

Proposition 2. *In response to the USSR shock, more exposed markets experience*

1. *declines in wages, with slow adjustment downward toward a new lower market-clearing wage* empirics

Predicted Impact of USSR Shock with Wage Rigidity

Proposition 1. *In response to the USSR shock, more exposed* **workers** *experience*

1. *declines in expected earnings, with larger declines in more exposed markets if wages are sufficiently rigid* model details
2. *declines in expected employment, with larger declines in more exposed markets* empirics

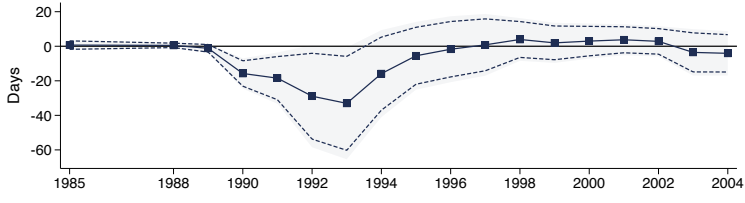
Proposition 2. *In response to the USSR shock, more exposed markets experience*

1. *declines in wages, with slow adjustment downward toward a new lower market-clearing wage* empirics
2. *declines in employment, with jump down at impact before slow adjustment upward toward full employment* empirics

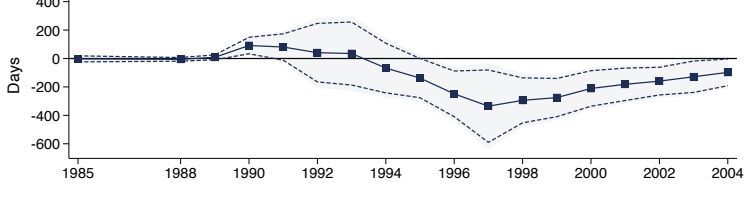
Exposure(s) to Trade and Employment Dynamics

$$\Delta n_{it} = \beta_t s_i + \gamma_t (s_i \times S_m) + \text{Controls}_i' \zeta_t + \varepsilon_{it}$$

Direct effect of worker exposure (s_i) on employment



Interaction effect of worker and market exposure ($s_i \times S_m$) on employment



- **In line with Proposition 1:** More exposed workers experience declines in employment, with larger declines in more exposed markets

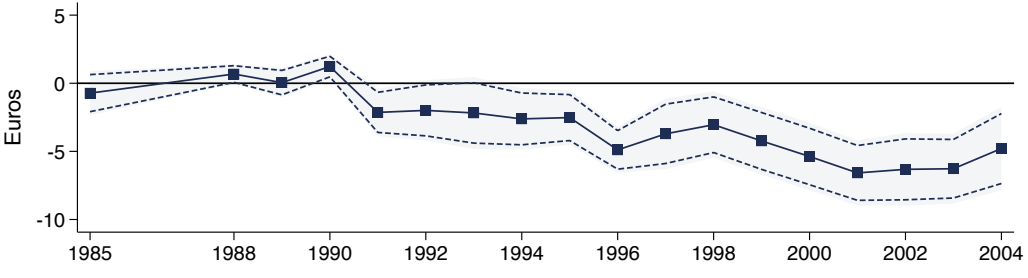
back

Direct Effect of Market Exposure

Double-Difference Specification (Drop Municipality Dummies in Controls$_i$)

$$\Delta w_{it} = \beta_t S_m + \text{Controls}_i' \zeta_t + \varepsilon_{it}$$

Direct effect of market exposure (S_m) on hourly wage



- **In line with Proposition 2:** Wages drop more in the long-run than short-run.

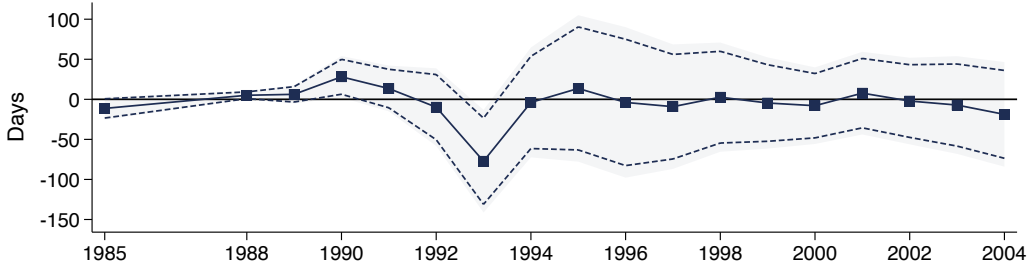
back

Direct Effect of Market Exposure

Double-Difference Specification (Drop Municipality Dummies in Controls$_i$)

$$\Delta n_{it} = \beta_t S_m + \text{Controls}_i' \zeta_t + \varepsilon_{it} \quad \text{and}$$

Direct effect of market exposure (S_m) on employment



- **In line with Proposition 2:** Employment drops more in short-run than long-run.

back