Labor Market Conflict and the Decline of the Rust Belt

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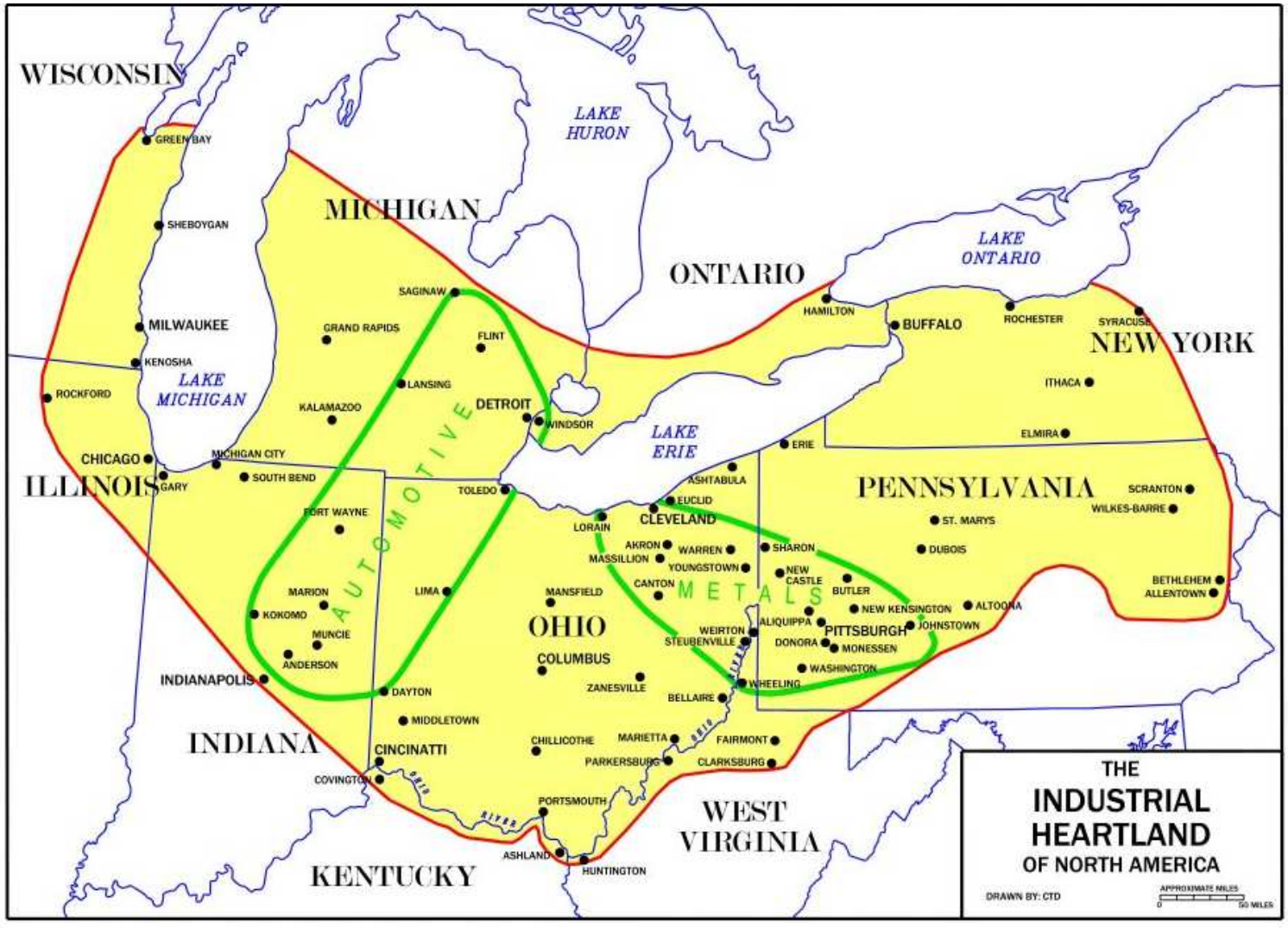
The Rust Belt



Four Facts About Rust Belt Since WW II

1. Rust Belt share of economic activity declined slowly & persistently
2. Rust Belt wages substantially higher than average after end of WW II
3. Labor-management relations were prone to conflict
4. Weak productivity growth in Rust Belt industries

Five Facts About Rust Belt Since WW II

1. Rust Belt share of economic activity declined slowly & persistently
2. Rust Belt wages substantially higher than average after end of WW II
3. Labor-management relations were prone to conflict
4. Weak productivity growth in Rust Belt industries
5. Starting 1980s,
   - Rust Belt decline slowed
   - wage premia declined
   - labor market conflict decreased
   - productivity growth increased

Our Theory

- Theory explores two channels of Rust Belt's decline:
  1. lack of competition and inefficient rent sharing in labor markets (where unions have ability to hold up firms)
  2. effect of foreign competition in product markets on aggregate innovation
- Competition in labor and output markets affects firms' incentive to innovate
- Economic activity shifts to region with faster productivity growth

Related Literature

- **Competition and productivity**: Acemoglu & Akcigit (2011), Aghion et al (2005), Atkeson & Burstein (2010), Bloom, Draca and Van Reenan (2016), Cole & Ohanian (2004), Herrendorf & Texeira (2011), Holmes (1998), Holmes & Schmitz (2010), Parente & Prescott (1999), Pavcnik (2002), Schmitz (2005), ...
- **Unions and economic performance**: Holmes (1998), Taschereau-Dumouchel (2012), Bridgman (2011), Dinlersoz and Greenwood (2012), Acikgoz and Kaymak (2012)
- **Rust Belt**: Blanchard & Katz (1992), Feyrer, Sacerdote and Stern (2007), Glaeser and Ponzetto (2007), Yoon (2012)

This Talk

1. Four Facts
2. Model
3. Quantitative Analysis

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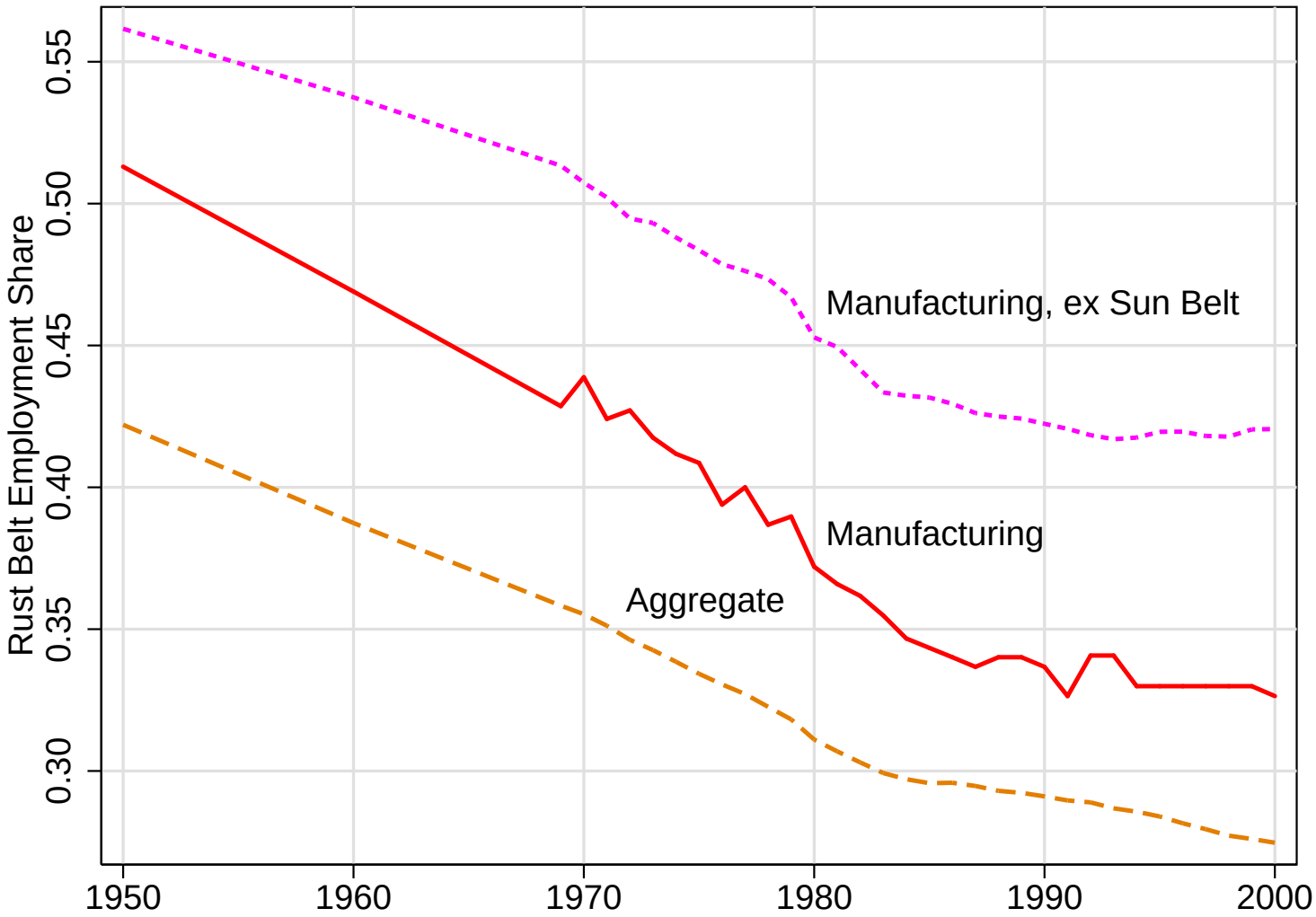
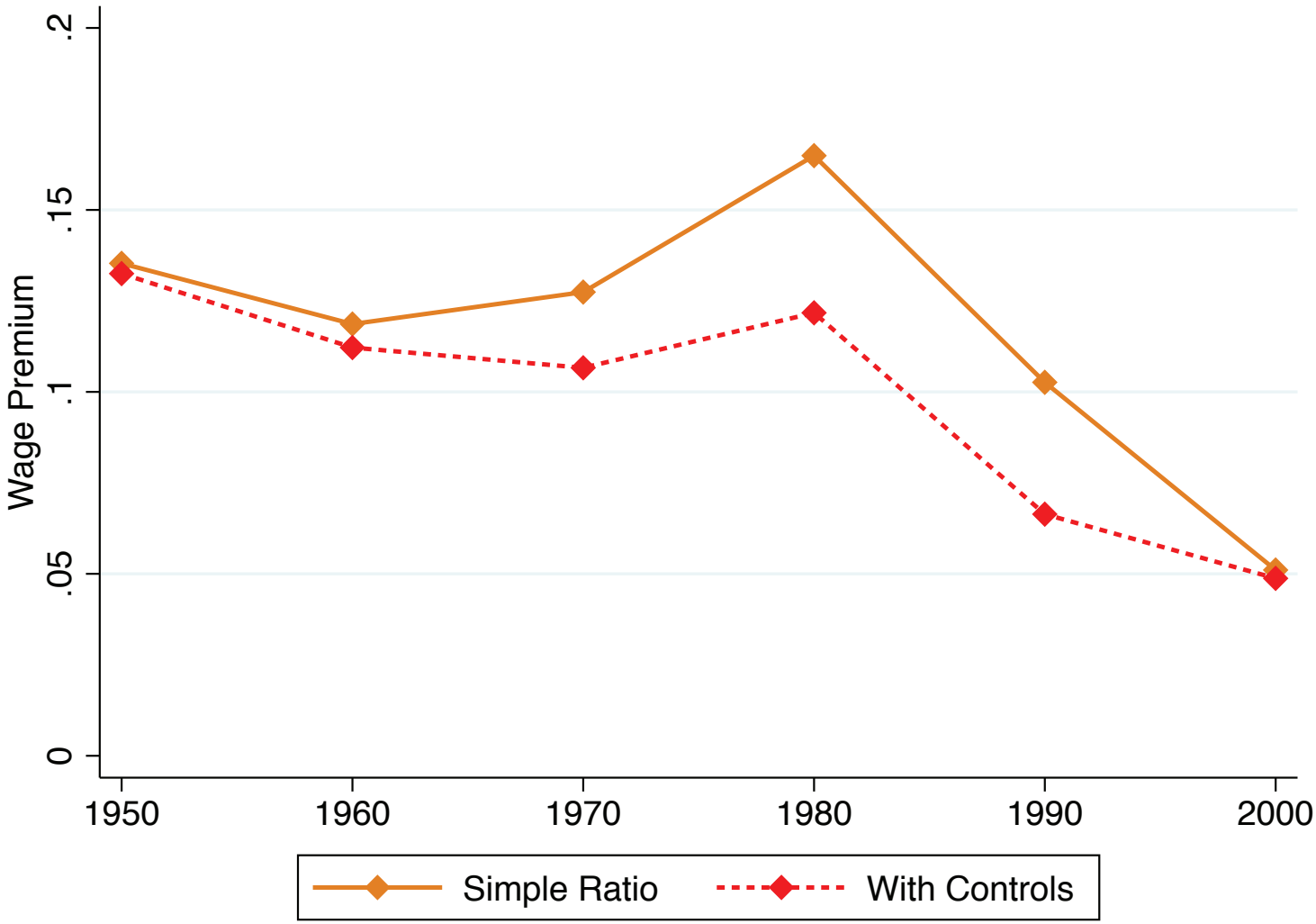
Rust Belt Employment Share Declined



Rust Belt Wages High



Labor Market Conflict

Unionization and Stoppages pre-1980s

Panel A: Unionization Rates (1973 to 1980)

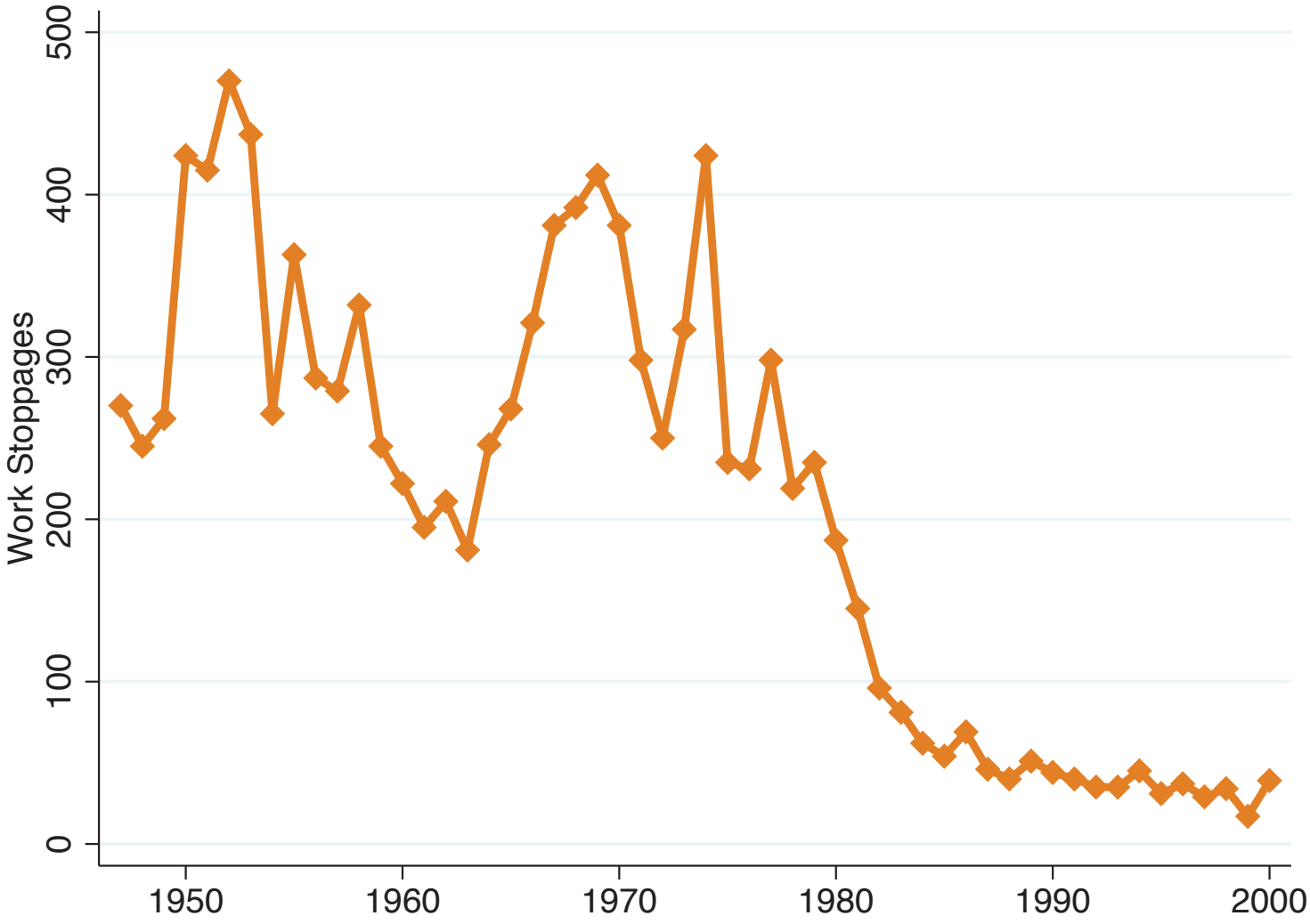
	Manufacturing	Services	Overall
Rust Belt	48.1	22.5	30.9
Rest of Country	28.4	14.4	18.1

Panel B: Major Work Stoppages Rates (1958 to 1977)

	Manufacturing	Services	Overall
Rust Belt	19.2	3.2	9.7
Rest of Country	2.7	0.9	1.6

Labor Market Conflict

Stoppages pre- vs. post-1980s



Rust Belt Productivity Growth Low

Labor Productivity Growth in Rust Belt Industries

	Annualized Growth Rate, %		
	1958-1985	1985-1997	1958-1997
Blast furnaces, steelworks, mills	0.9	7.6	2.8
Engines turbines	2.3	2.9	2.5
Iron and steel foundries	1.5	2.3	1.7
Metal forgings/stampings	1.5	2.8	1.9
Metalworking machinery	0.9	3.5	1.6
Motor vehicles/equipment	2.5	3.8	2.9
Photographic equipment/supplies	4.7	5.1	4.9
Railroad locomotives/equipment	1.6	3.1	2.0
Screw machine products	1.2	1.1	1.2
Rust Belt weighted average	2.0	4.2	2.6
Manufacturing weighted average	2.6	3.2	2.8

Rust Belt was Technological Laggard

- Autos, steel, rubber did *not* adopt latest technologies:
  - National Academy of Sciences: *producers did not adopt long-available technologies* *(e.g. basic oxygen furnace, continuous caster, electric arc furnace, . . .)*
  - McKinsey productivity study on autos: *slow adoption of "lean production" in autos*
  - Literature comparing productivity to other countries: *US producers were slow to roll out new products* *(e.g. radial tires, fuel-efficient engines, . . .)*
- Mechanism:
  labor market conflict $\Rightarrow$ inefficient rent sharing $\Rightarrow$ low innovation rates $\Rightarrow$ low employment growth

Non-Structural Evidence (I): Work Stoppages (1957-78)

Unit of Observation: state-industry (2-digit)

	Log Employment Growth 1950-2000	
Independent Variables	(1)	(2)
Work Stoppages / Year	-0.30***	-0.27***
	(0.063)	(0.056)
State Manufacturing	-1.90***	
Employment Share, 1950	(0.13)	
State Employment	-2.10***	
Herfindahl Index, 1950	(0.38)	
Constant	-0.87***	-1.40***
	(0.10)	(0.13)
Observations	5,128	5,128
R^2	0.617	0.735
Industry Fixed Effects	Y	Y
State Fixed Effects	N	Y

Non-Structural Evidence (II): Unionization Rate (1973-77)

Unit of Observation: state-industry (2-digit)

	Log Employment Growth 1950-2000	
Independent Variables	(1)	(2)
Unionization Rate	-0.56***	-0.30***
	(0.077)	(0.072)
State Manufacturing	-1.83***	
Employment Share, 1950	(0.12)	
State Employment	-2.41***	
Herfindahl Index, 1950	(0.37)	
Constant	-0.83***	-1.45***
	(0.10)	(0.13)
Observations	4,691	4,691
R^2	0.637	0.747
Industry Fixed Effects	Y	Y
State Fixed Effects	N	Y

Non-Structural Evidence (III): Strikes / Year (1927-34)

Unit of Observation: state-industry (2-digit)

	Log Employment Growth 1950-2000	
Independent Variables	(1)	(2)
Strikes 1927-34	-0.019***	-0.012***
	(0.0040)	(0.0039)
State Manufacturing	-2.68***	
Employment Share, 1950	(0.14)	
State Employment	3.85***	
Herfindahl Index, 1950	(0.68)	
Constant	-0.70***	-1.33***
	(0.18)	(0.19)
Observations	2,834	2,834
R^2	0.712	0.745
Industry Fixed Effects	Y	Y
State Fixed Effects	N	Y

1. Four Facts
2. Model
3. Quantitative Analysis

Key Ingredients

- Risk-neutral households, inelastic labor supply
- Two regions: Rust Belt (R), Rest of Country(S)
- Two sectors: manufactures (m), non-tradables (n)
- Two countries: U.S., Rest of the World ($*$)
- Technologies linear in labor in all sectors / regions / countries

Static Problem

- For *given* productivities in all sectors / regions / countries, the model has standard features:
  - Trade à la Armington in manufactured goods
  - Manufactured goods and non-tradeables (services) are gross complements in CES production technology of final good
- Labor market in Rust Belt manufacturing is non-competitive but does not affect static allocation of labor across sectors / regions

Final Good

- Final good in each region produced from manufactured goods and local services:

$$Y_t^i = \left(\mu m_t^{\frac{\theta-1}{\theta}} + (1-\mu)(n_t^i)^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}$$

- Manufactured good is composite of differentiated varieties (indexed by j) in a continuum of sectors (indexed by i), produced at home and abroad:

$$m_t = \left(\int_0^1 m_t(i)^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$$

$$m_t(i) = \left(\int_0^1 m_t(i,j)^{\frac{\rho-1}{\rho}} dj + \int_0^1 m_t^*(i,\tilde{\jmath})^{\frac{\rho-1}{\rho}} d\tilde{\jmath} \right)^{\frac{\rho}{\rho-1}},$$

where * denotes varieties produced abroad

Final Good

- Final output consumed or used for investment
- Manufactures and services are gross complements, i.e. $\theta \in [0, 1)$
- Intermediates are gross substitutes , i.e. $\rho > \sigma > 1$

Intermediate Goods

- Industries $i \in [0, \lambda)$ located in Rust Belt (R)
- Industries $i \in [\lambda, 1]$ located in Rest-of-Country (S)
- Competition in labor markets varies by region (captured by time-varying union bargaining power β_t)

Intermediate Goods

Each intermediate firm (producing variety j in industry i) has access to production and innovation technologies.

1. Production is linear in labor:

$$y_t = z_t \cdot n_t$$

2. By investing $C\big(x, z, Z\big)$ units of the final good, firm can enhance idiosyncratic productivity by $100 \cdot x$ percent next period:

$$z_{t+1} = z_t(1 + x_t)$$

Union

- Union bargains with (individual) Rust Belt producers over profits
- Protocol is atemporal Nash with time-varying bargaining weight β_t
- Results robust to alternative protocols (e.g. take-it-or-leave-it bargaining embedded in optimal rent extraction problem)

▸ TIOLI

Intermediate Firms' Dynamic Problem (Innovation)

In the Rest-of-Country:

$$
\begin{aligned}
V^S(Z,U,z_S;\beta,\tau) = \quad & \max_{x_S>0} \quad \Big\{\Pi^S(Z,U,z_S;\beta,\tau) \\
& -P(Z,U;\beta,\tau)\cdot C(x_S,z_S,Z) \\
& +\delta E\Big[V^S(Z',U',z'_S;\beta',\tau')\Big]\Big\},
\end{aligned}
$$

In the Rust Belt:

$$
\begin{aligned}
V^R(Z,U,z_R;\beta,\tau) = \quad & \max_{x_R>0} \quad \{(1-\beta)\Pi^R(Z,U,z_R;\beta,\tau) \\
& -P(Z,U;\beta,\tau)\cdot C(x_R,z_R,Z) \\
& +\delta E\Big[V^R(Z',U',z'_R;\beta',\tau')\Big]\Big\},
\end{aligned}
$$

Worker's Problem

- Rust Belt manufacturing jobs pay premium over competitive wage
- "Closed Shop" in Rust Belt manufacturing implies rationing of jobs
- Each period fixed fraction of the labor force retires and non-union workers decide whether to apply for lifetime union card

▸ Quantitative Analysis

Worker's Problem

$$W(Z,U,M,\upsilon;\beta,\tau) = \max\left\{W^R(Z,U,M,\upsilon;\beta,\tau), W^S(Z,U,\upsilon;\beta,\tau)\right\}$$

Value of non-union worker in Rust Belt:

$$\begin{aligned} W^R(Z,U,M,0;\beta,\tau) \quad = \quad & F(Z,U,M;\beta,\tau)\Big\{w + R(Z,U;\beta,\tau) \\ & \quad +\delta\Big((1-\zeta)E\big[W(Z',U',M',1;\beta',\tau')\big]\Big\} \\ & +\big(1-F(Z,U,M;\beta,\tau)\big) \\ & \quad \times\Big\{w-\bar{u}+\delta E\big[W(Z',U',M',0;\beta',\tau')\big]\Big\}, \end{aligned}$$

where $\bar{u} \geq 0$.

Worker's Problem

Value of union worker in Rust Belt:

$$\begin{aligned} W^R(Z,U,\cdot,1;\beta,\tau) &= w + R(Z,U;\beta,\tau) \\ &\quad +\delta(1-\zeta)E\big[W(Z',U',M',1;\beta',\tau')\big] \end{aligned}$$

Value of any worker in the Sun Belt:

$$W^S(Z,U,\upsilon;\beta,\tau) = w + \delta(1-\zeta)E\big[W(Z',U',\upsilon;\beta',\tau')\big]$$

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Quantitative Analysis

- How big is model's decline in Rust Belt employment share?

Quantitative Analysis

- How big is model's decline in Rust Belt employment share?
- Discipline quantitative exercise by extent of competition:
  1. from foreign producers (regional trade shares, 1950-2000)
     import shares are low in 1950 and rising gradually
  2. in labor markets (estimated wage premiums, 1950-2000)
     wage premia high 1950 to early 1980s, followed by sharp drop

Calibration

Parameters and Target Moments

- τ – iceberg trade costs
- (β_H, β_L) – union's bargaining weight
- λ – share of varieties produced by Rust Belt
- α – linear (scale) parameter of cost function
- γ – curvature parameter of cost function
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- (β_H, β_L) – union's bargaining weight
- λ – share of varieties produced by Rust Belt
- α – linear (scale) parameter of cost function
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Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- λ – share of varieties produced by Rust Belt
- α – linear (scale) parameter of cost function
- γ – curvature parameter of cost function
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- Initial Rust Belt employment share of 51.3%
- α – linear (scale) parameter of cost function
- γ – curvature parameter of cost function
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- Initial Rust Belt employment share of 51.3%
- 1.8% TFP growth (1950-2000)
- γ – curvature parameter of cost function
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- Initial Rust Belt employment share of 51.3%
- 1.8% TFP growth (1950-2000)
- 8.5% Investment-to-GDP ratio (1950-2000)
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- Initial Rust Belt employment share of 51.3%
- 1.8% TFP growth (1950-2000)
- 8.5% Investment-to-GDP ratio (1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- χ^n – exogenous productivity growth in service sector
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Wage premium: 12% (pre-1985), 4% (post-1985)
- Initial Rust Belt employment share of 51.3%
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- 8.5% Investment-to-GDP ratio (1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- 12.9% employment share of manufacturing (national, 1950)
- χ^* – exogenous productivity growth in foreign manufacturing

Calibration

Parameters and Target Moments

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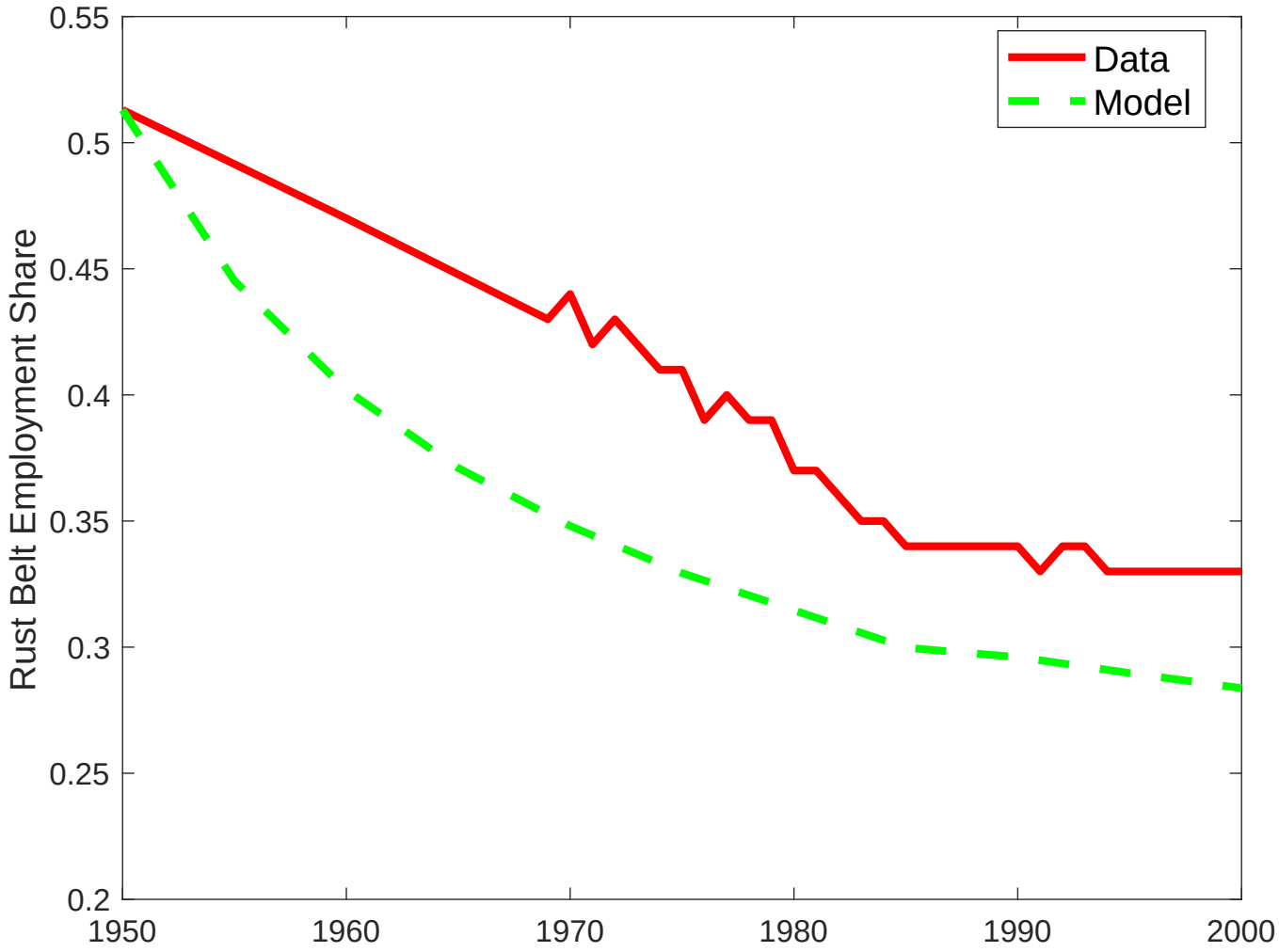
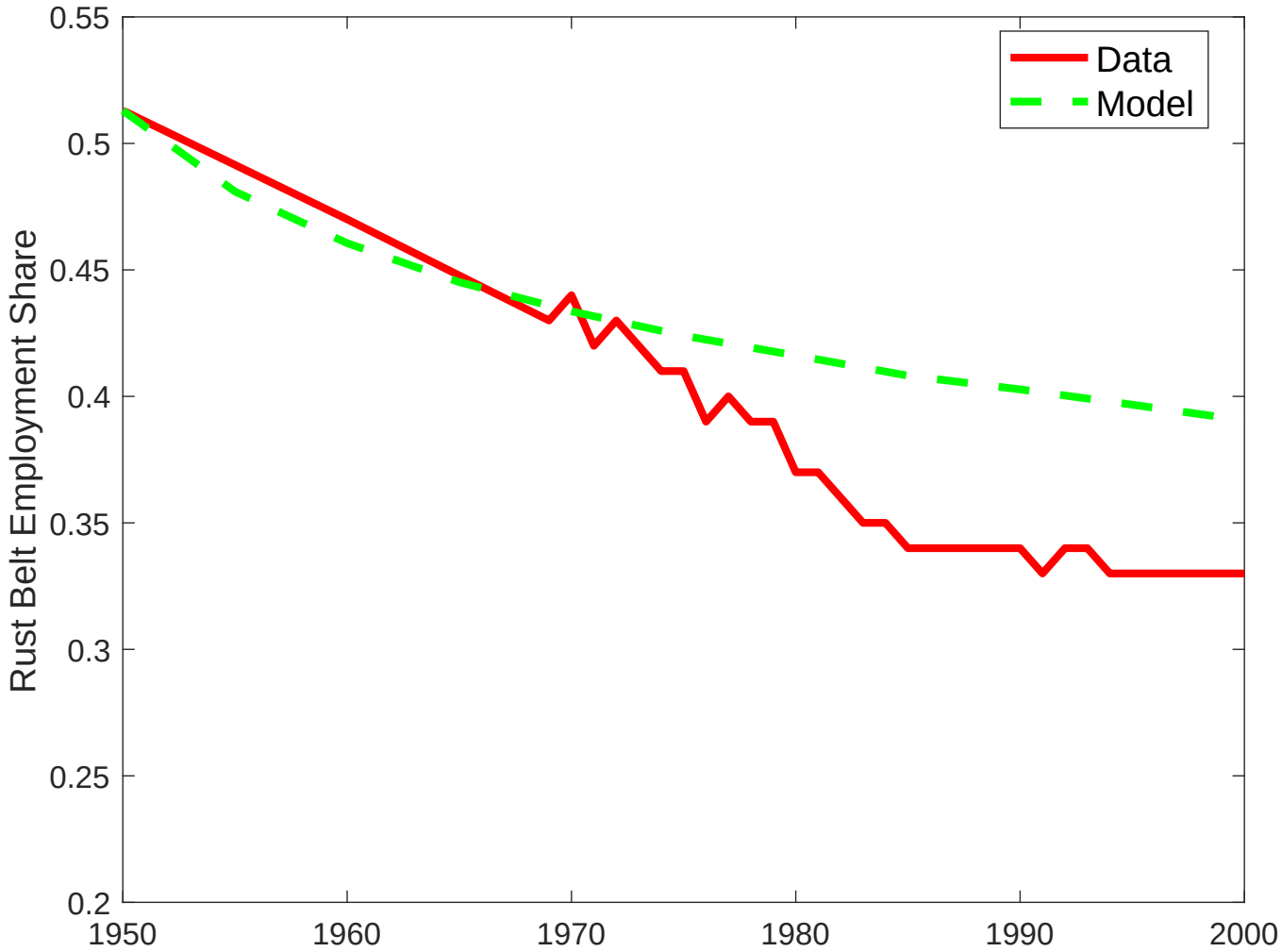
- Initial Rust Belt employment share of 51.3%
- 1.8% TFP growth (1950-2000)
- 8.5% Investment-to-GDP ratio (1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- 12.9% employment share of manufacturing (national, 1950)
- Aggregate import share: 12.3% (2000)

Rust Belt Employment Share in Model and Data

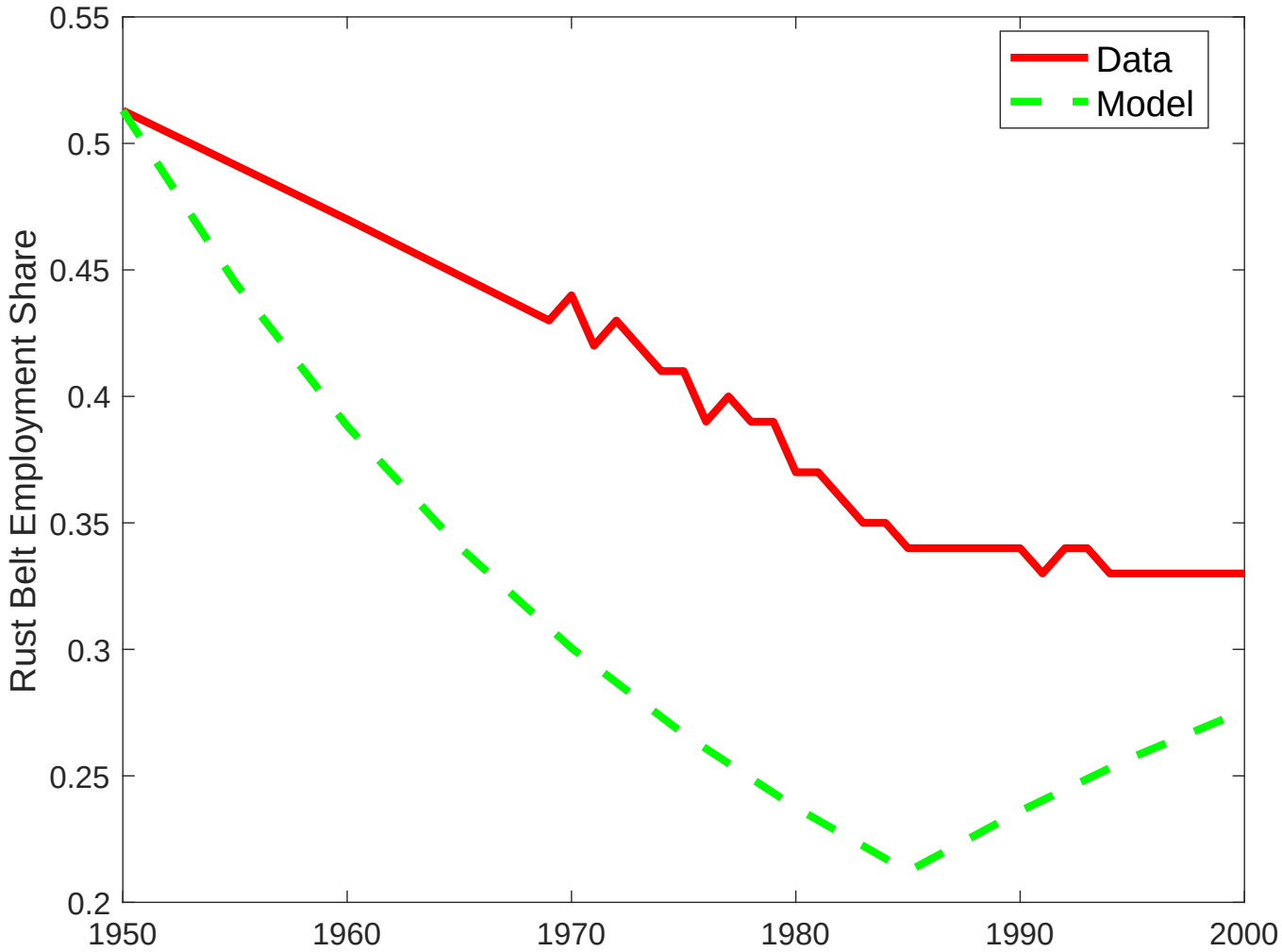


▸ Conclusion

Counterfactual: Weak Unions



Counterfactual: No Structural Change & Autarky



Conclusion

- Relative to the rest of the US, Rust Belt declined in economic terms (employment, value added) from 1950 to 2000
- Theory emphasizes lack of competition as force of Rust Belt's decline
- Quantitative model can generate sizeable share of employment loss

Union with TIOLI Offers

- Union makes take-it-or-leave-it offer $b \in [0, 1]$
- If firm accepts, unionized workers receive w plus *per capita* share of $b \cdot \Pi^R$
- If firm rejects, union calls a strike and
  - succeeds with probability β
    (i.e. production is halted for one period and $\Pi^R = 0$)
  - fails with probability $1 - \beta$
    (i.e. production resumes, workers get w, firm receives Π^R)
- Union offers $b \in [0, \beta]$ since firm rejects any $b > \beta$
- Optimal β depends on sensitivity of firm's innovation decision
- Quantitatively, $\beta = b$ for empirically relevant parameterizations of this version of model

◂ Return to Nash bargaining