Labor Market Conflict and the Decline of the Rust Belt

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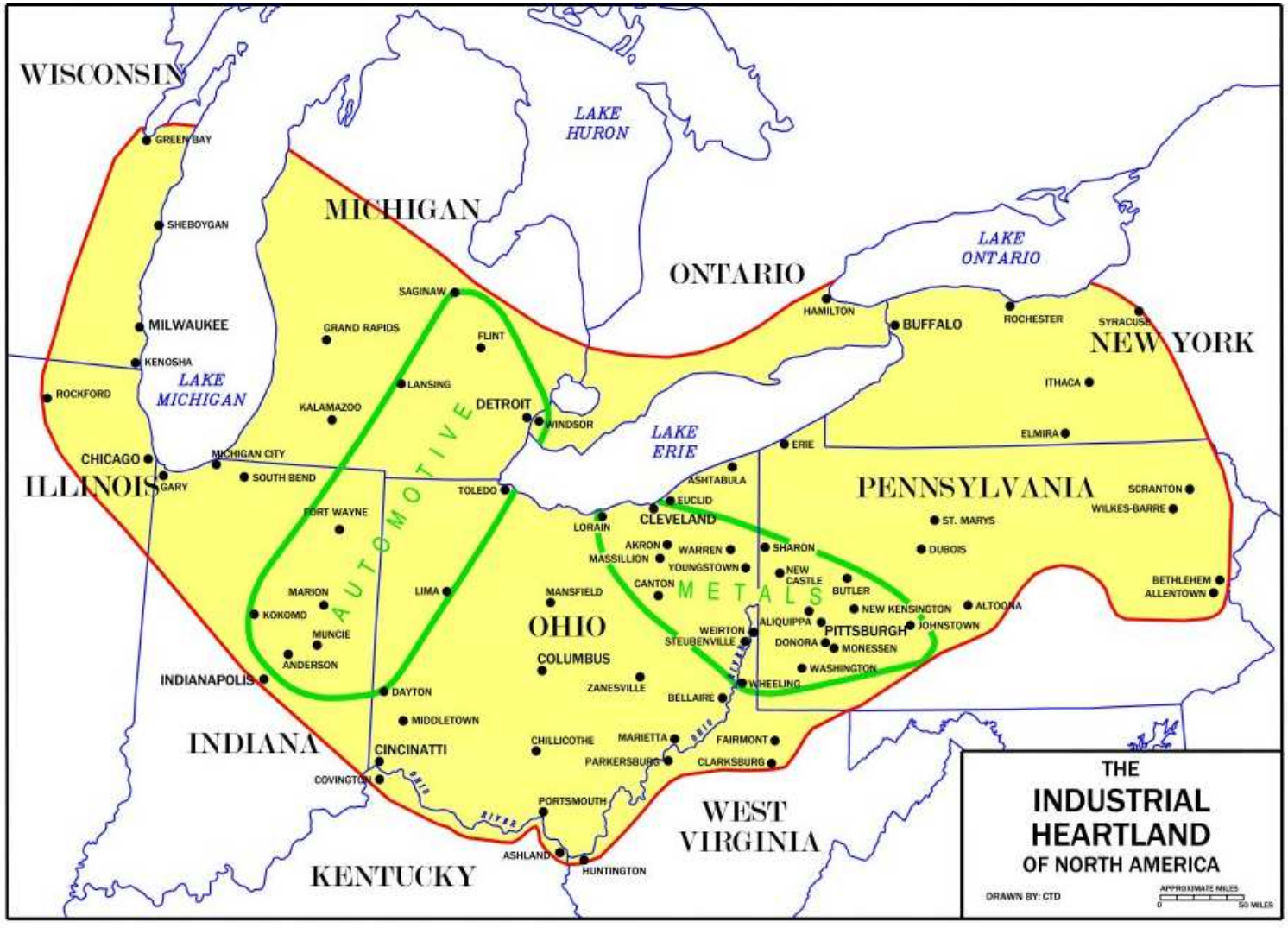
The Rust Belt



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

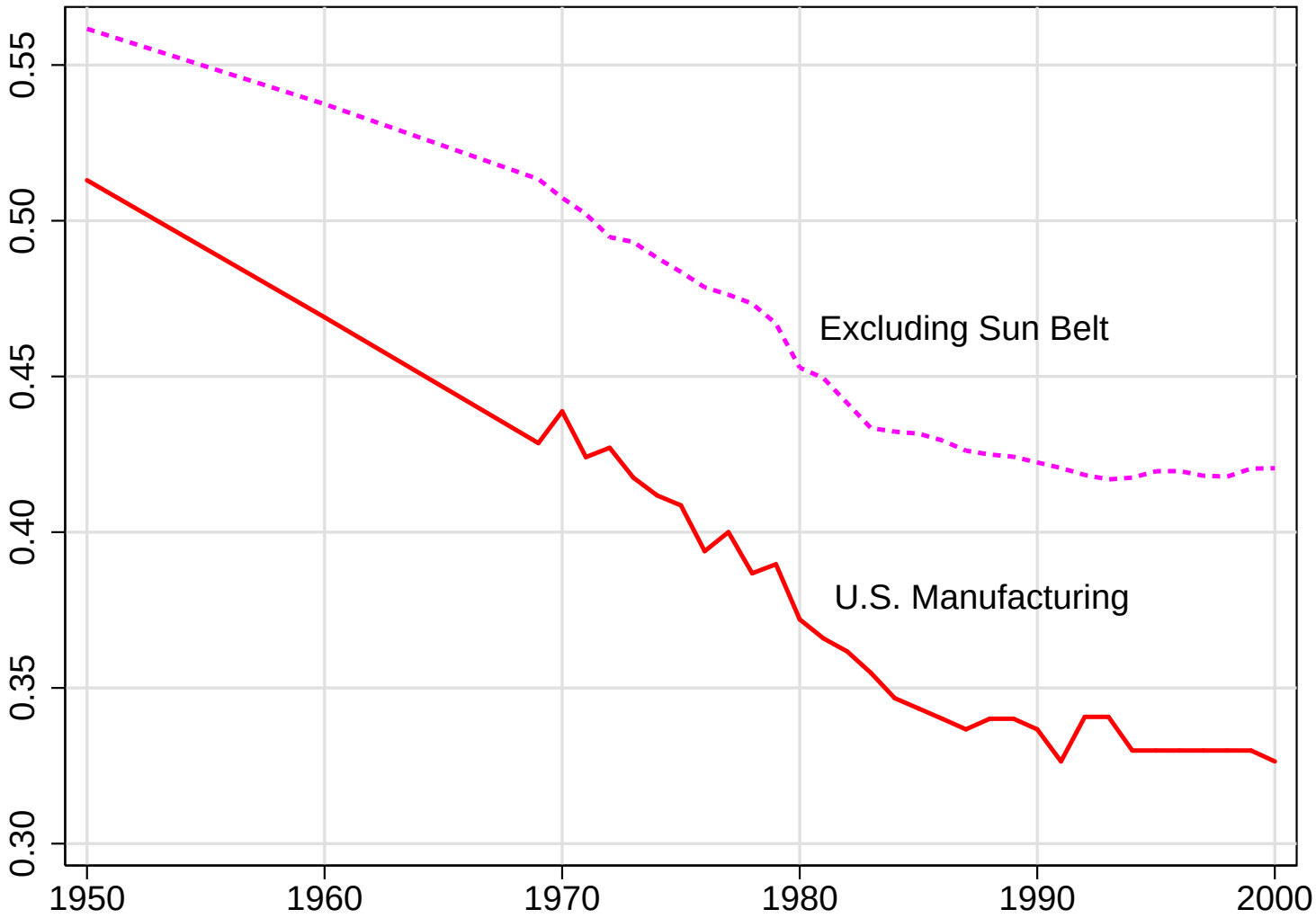
1. Rust Belt share of economic activity declined slowly & persistently
2. Rust Belt wages substantially higher than average after end of WW II
3. Labor-management relations were prone to conflict
4. Weak productivity growth in Rust Belt industries
5. Starting in early 1980s,
   - Rust Belt decline slowed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

Our Theory

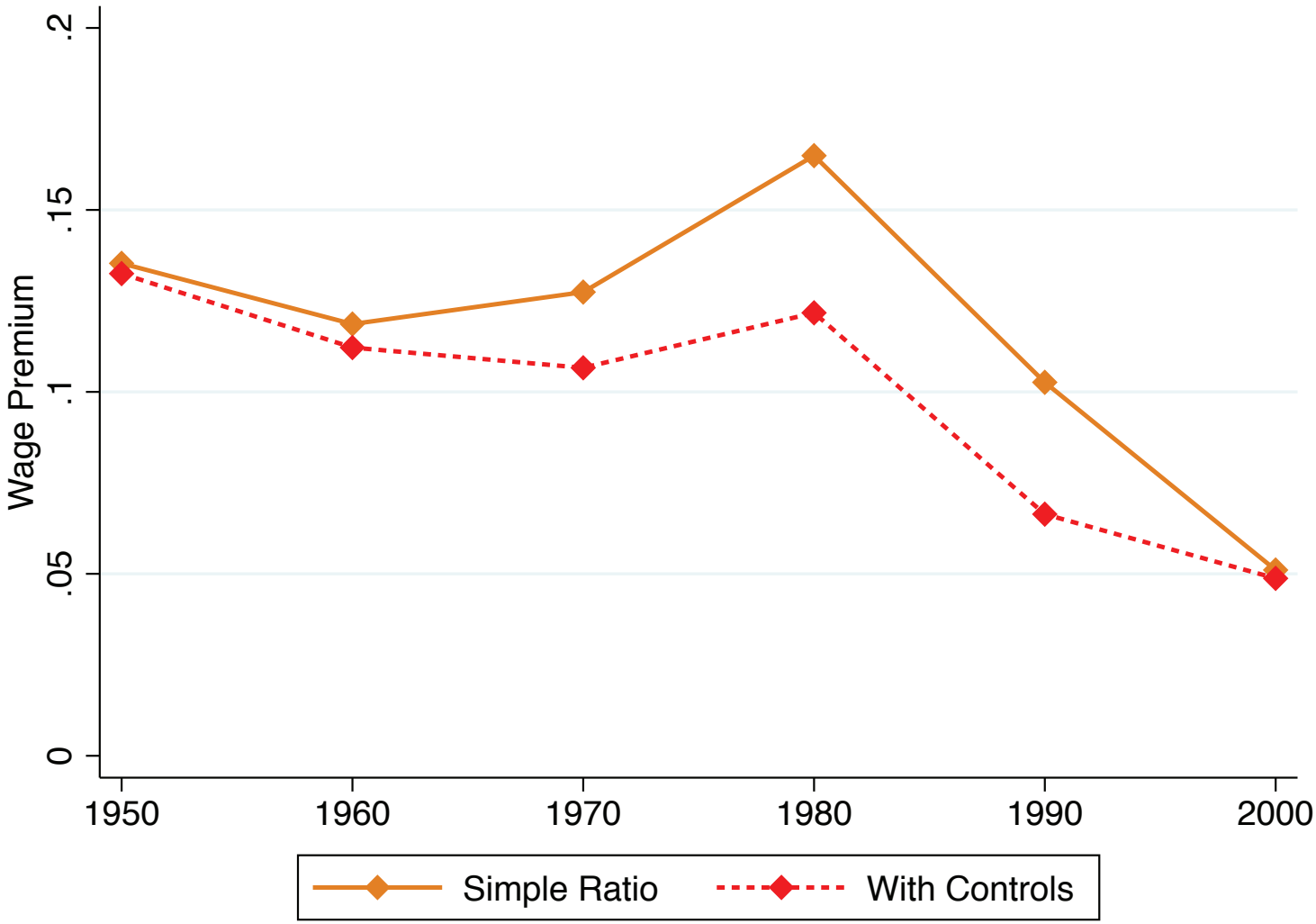
- Theory explores three channels of Rust Belt's decline:
  1. lack of competition and inefficient rent sharing in labor markets (where unions have ability to hold up firms)
  2. rise of foreign competition:
     - effect of shift in absolute advantage on aggregate growth
     - effect of shift in comparative advantage on regional growth
  3. structural change (secular shift of economic activity from manufacturing to non-manufacturing)
- Competition in labor and output markets affects firms' incentive to innovate
- Economic activity shifts to region with faster productivity growth

1. Four Facts
2. Model
3. Quantitative Analysis

Rust Belt Employment Share Declined



Rust Belt Wages High



Labor Market Conflict

Unionization and Stoppages pre-1980s

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

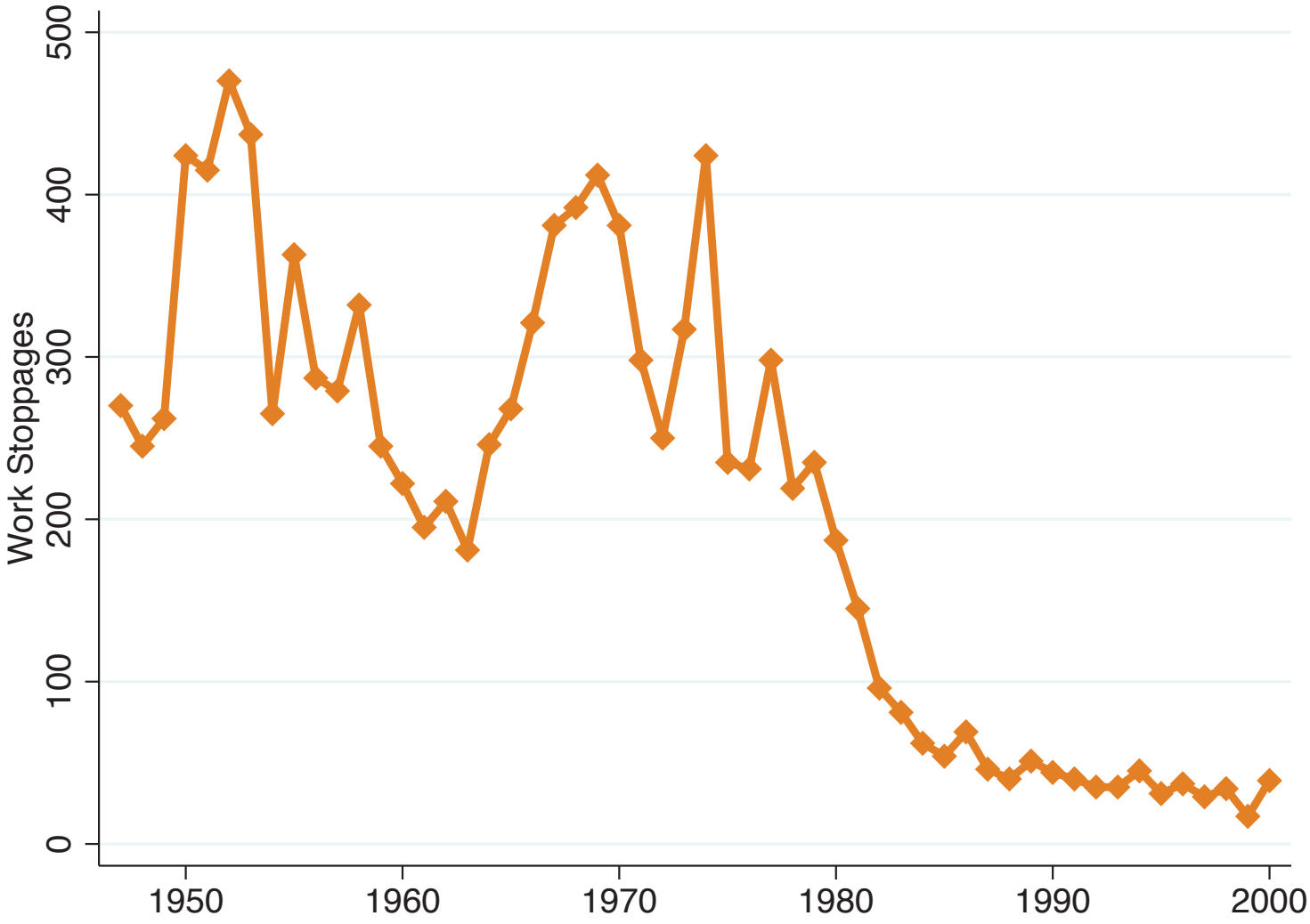
	Manufacturing	Services	Overall
Rust Belt	19.2	3.2	9.7
Rest of Country	2.7	0.9	1.6

Panel B: 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

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

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
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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:

$$m_t = z_t \cdot l_t$$

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

$$\beta_t = \arg\max_b \left((1-b)\,\Pi^R\right)^{1-\beta_t} \left(b\Pi^R\right)^{\beta_t}$$

- Results robust to alternative protocols
  (e.g. dynamic take-it-or-leave-it bargaining ▸ TIOLI)

Intermediate Firms' Dynamic Problem (Innovation)

In the Rest-of-Country:

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

In the Rust Belt:

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

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

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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:
  1. extent of competition from foreign producers (regional trade shares, 1950-2000)
     import shares are low in 1950 and rising gradually
  2. labor market frictions (estimated wage premiums, 1950-2000)
     wage premia high 1950 to early 1980s, followed by sharp drop
  3. structural change (manufacturing vs. non-manufacturing)
     secular decline of manufacturing employment share

Calibration

Parameters and Target Moments

- τ – iceberg trade costs
- χ^{*S} – productivity growth in foreign S manufacturing
- (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
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- χ^{*S} – productivity growth in foreign S manufacturing
- (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
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- (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
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (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
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 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
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- γ – curvature parameter of cost function
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- 8.5% Investment-to-GDP ratio (average, 1950-2000)
- μ – CES weight on manufactures
- χ^n – exogenous productivity growth in service sector
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- 8.5% Investment-to-GDP ratio (average, 1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- χ^n – exogenous productivity growth in service sector
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- 8.5% Investment-to-GDP ratio (average, 1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- 12.9% employment share of manufacturing (national, 2000)
- z^{*R}_{1950} – foreign Rust Belt productivity in 1950
- χ^{*R} – productivity growth in foreign R manufacturing

Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- 8.5% Investment-to-GDP ratio (average, 1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- 12.9% employment share of manufacturing (national, 2000)
- Rust Belt import share: 5.7% (1958)
- χ^{*R} – productivity growth in foreign R manufacturing

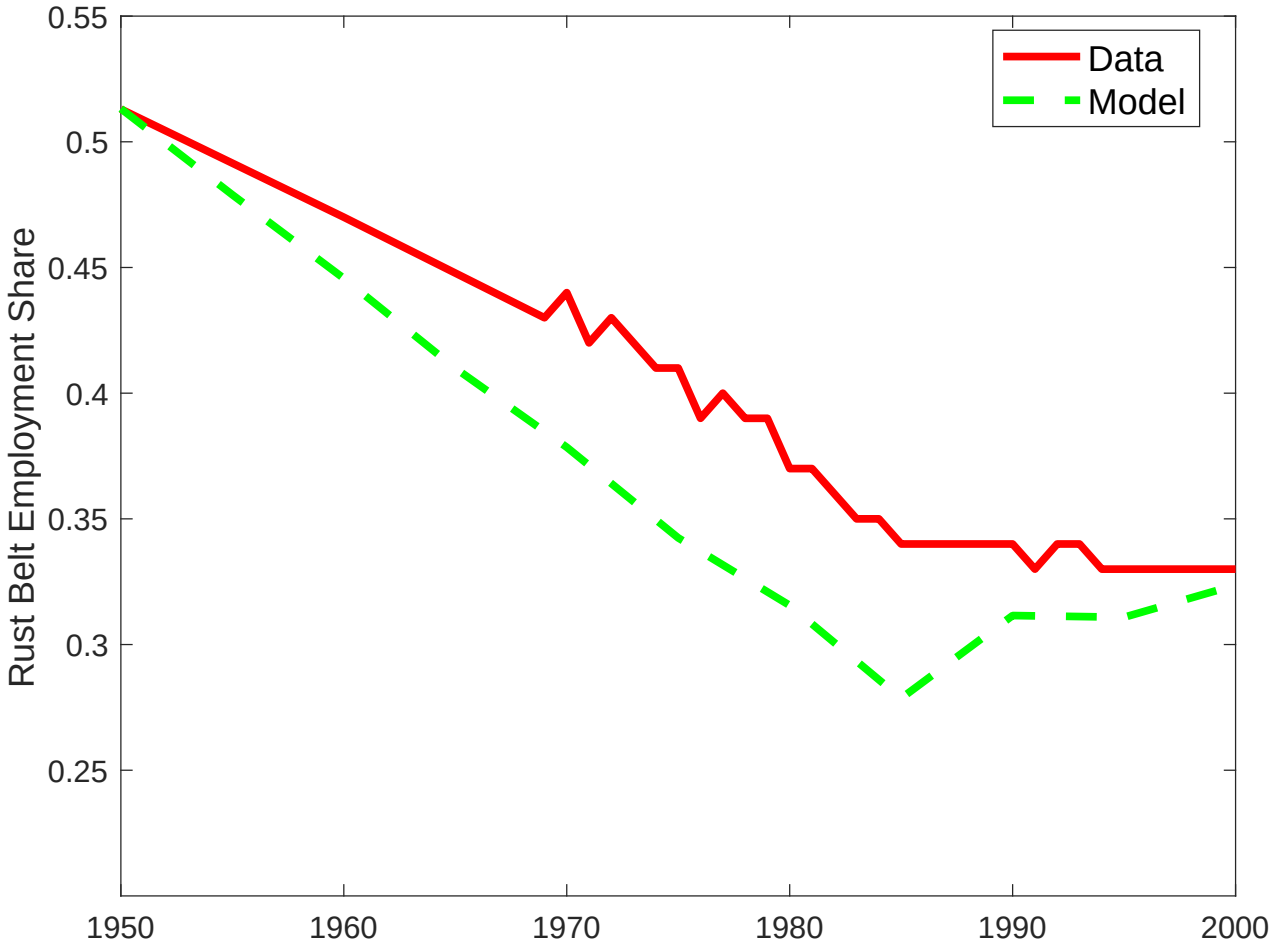
Calibration

Parameters and Target Moments

- Aggregate import share: 3% (1950)
- Aggregate import share: 12.3% (2000)
- Wage premium: 12% (pre-1985), 5% (post-1985)
- Rust Belt employment share (manufacturing): 51.3% (1950)
- 1.8% TFP growth (average, 1950-2000)
- 8.5% Investment-to-GDP ratio (average, 1950-2000)
- 30.2% employment share of manufacturing (national, 1950)
- 12.9% employment share of manufacturing (national, 2000)
- Rust Belt import share: 5.7% (1958)
- Rust Belt import share: 91% (1994)

Rust Belt Employment Share in Model and Data

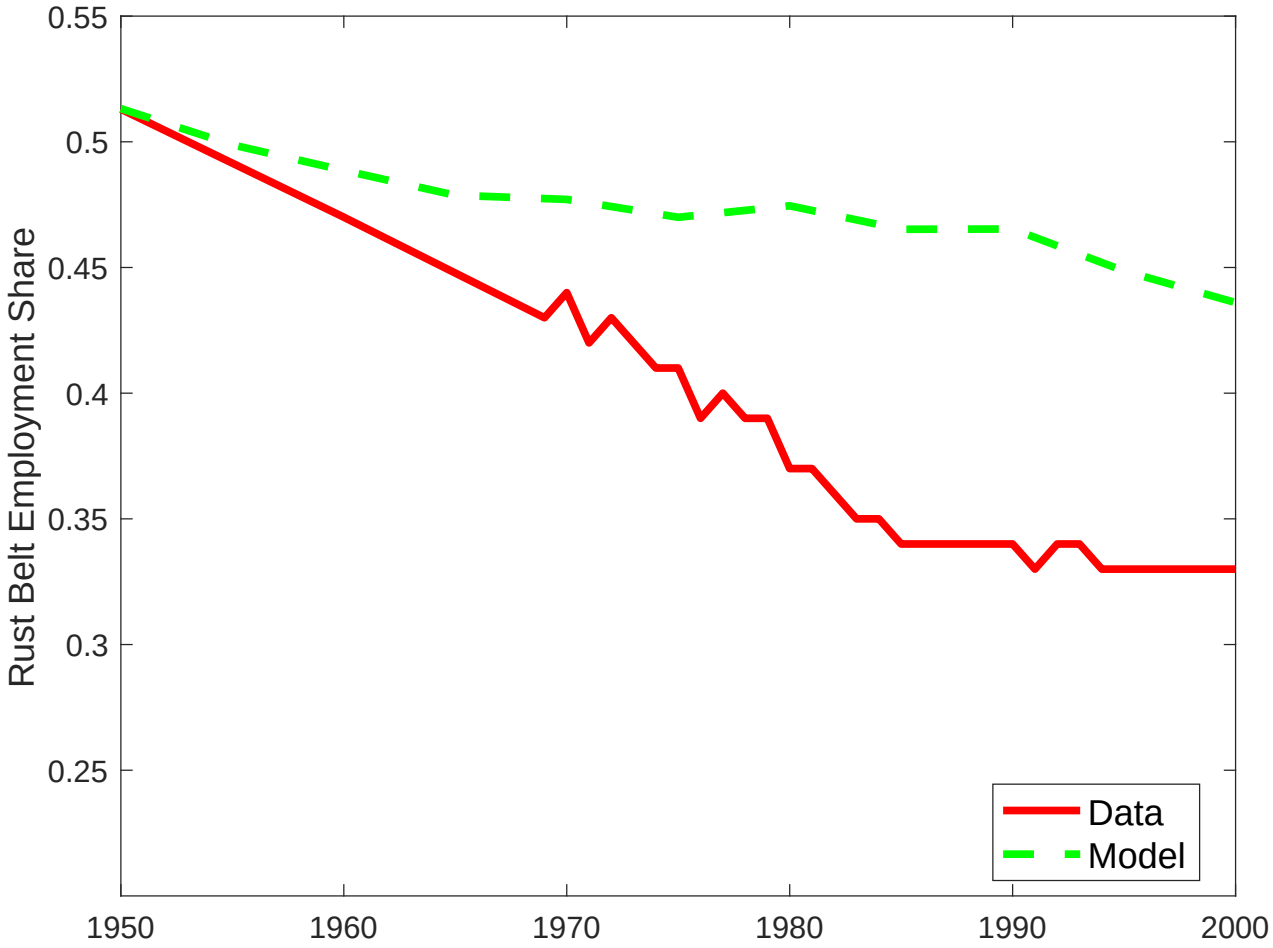
β_H (1950 to 1984) and β_L (1985 to 2000)



▸ Conclusion

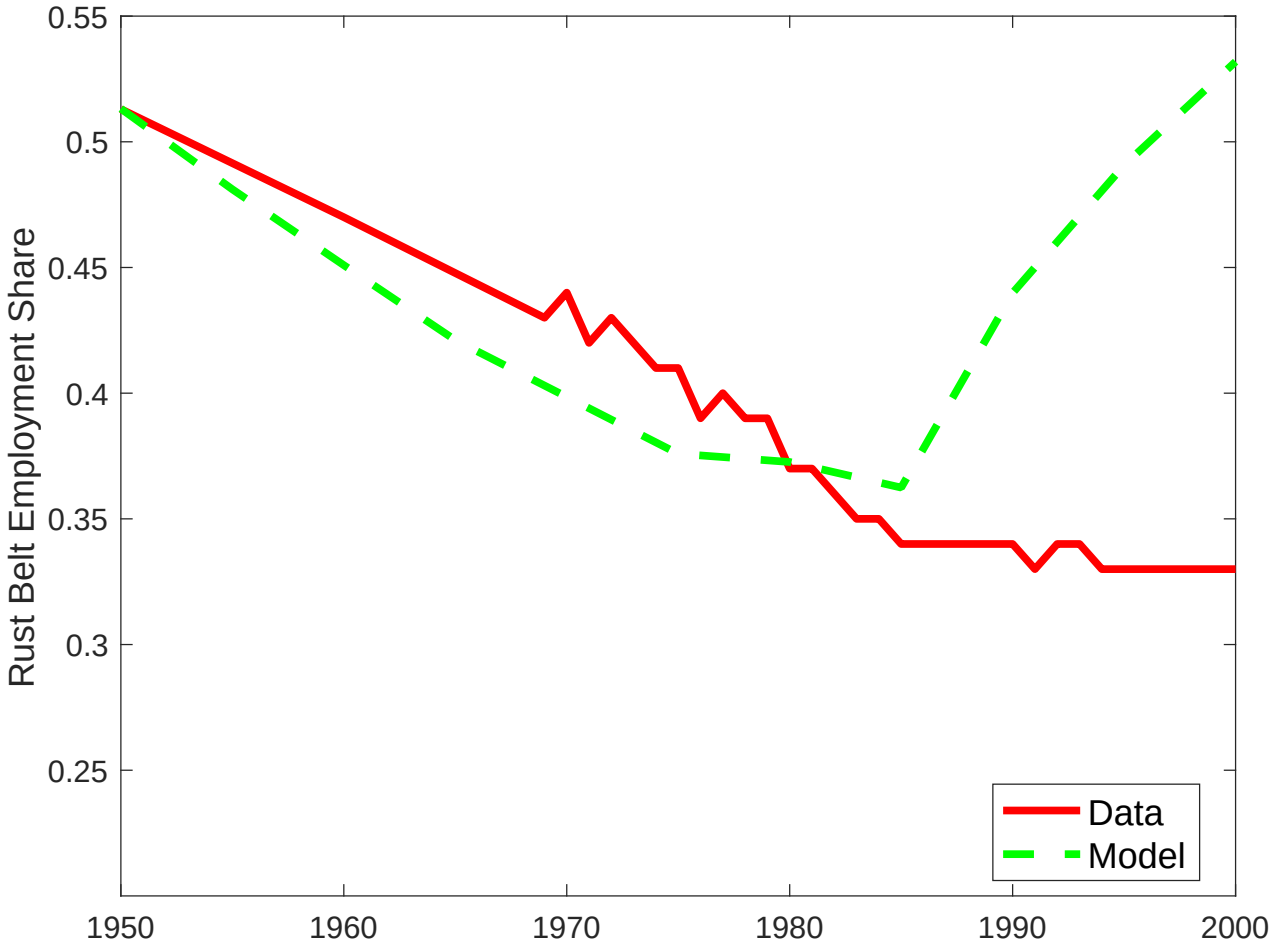
Counterfactual (1): Weak Unions

β_L (1950-2000)



Counterfactual (2): "No" Shift in Comparative Advantage

$\chi^{*R} = \chi^{*S}$



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