Labor Unions and Social Insurance

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Roles of Labor Unions

- U.S. experienced a large decline of labor unions in private sectors
  - Union density: More than 30% in the 1950s; less than 10% in recent years
- What are the roles of unions? Possible policy intervention?
- What contributed to the decline of unions?
- Many studies on labor unions focus on unions effects on wages and wage inequality
  - Potentially distort labor demand and production
- This paper: Unions may also affect **insurance** provided by firms
  - Provision of non-wage benefits (e.g. health insurance) and job security
  - Policy relevant: Biden administration issued an executive order to promote unions, explicitly recognizing unions' influence on both wages and insurance

Insurance Role of Unions and Social Insurance

- Insurance role of unions is closely linked to how the **social insurance system** is designed
  - Social insurance may mitigate the insurance loss from union decline
  - However, social insurance expansion can crowd out unions if workers join unions for insurance, exacerbating labor market inequality
- How does the **interaction of unions and social insurance** shape the equilibrium labor market and welfare impacts of unions?

Overview of This Paper

Study how unions affect firms' insurance provisions and interaction with social insurance

- **Empirical evidence** for (i) union's insurance role and (ii) crowding out by social insurance
  - (i) Unionized firms → better access to insurance
  - (ii) Social insurance expansions → fewer unions
- **Search and matching model** with labor unions that jointly determines:
  - Union formation & firm's insurance provisions in addition to labor market outcomes
  - Both unionization and *union threat* affect insurance offering
- **Counterfactual analysis** on social insurance policies, union decline, and welfare
  - i. Social insurance policies affect wage inequality through (de)unionization
  - ii. Technological changes and social insurance explain sizable part of union decline
  - iii. Subsidizing unions improves worker welfare far *less* under generous social insurance

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Outline

Background: Firm, Union, and Non-Wage Benefits

- In the U.S., union formation and coverage typically occur at the establishment level through employee voting
- Many fringe benefits are also offered at establishment level
- Several descriptive patterns from establishment-level data (1997 Robert Wood Johnson Foundation Employer Health Insurance Survey)

			Estab. Size		Wage ($1,000)		ESHI Offer (%)	
Industry	Unionized (%)	Empl. Share (%)	Union	Nonunion	Union	Nonunion	Union	Nonunion
All	4.2	100.0	97.7	22.0	28.8	26.9	85.8	60.9
Construction	10.5	3.3	29.7	10.0	37.0	25.9	85.7	47.8
Mining and manufacturing	6.7	27.0	210.2	54.1	27.8	31.1	94.0	73.9
Wholesale/retaile trade	2.5	16.8	54.5	17.5	22.0	20.6	78.0	54.2
Finance/insurance/real estate	2.9	14.7	49.0	16.4	30.8	32.7	77.3	66.2
Other services	4.0	38.1	113.8	21.4	27.3	26.4	88.3	60.7

- Unionized establishments tend to be larger and provide higher wages
- Unionized establishments tend to provide HI regardless of industries

Unions Provide Better Access to Non-Wage Benefits

- Use individual-level panel data (Health and Retirement Study) to regress insurance coverage (binary) on union membership

$$Insurance_{it} = \beta \cdot Union_{it} + x_{it}'\gamma + \eta_i + \mu_t + \varepsilon_{it}$$

  - x_{it} include age, log earnings, log firm size, occupations, and industries

	ESHI	Pension	Life Ins.	LTC Ins.
	(1)	(2)	(3)	(4)
Union	0.056***	0.186***	0.039***	0.008
	(0.018)	(0.018)	(0.013)	(0.015)
Mean outcome	0.719	0.678	0.838	0.102
Observations	32,787	32,950	32,907	32,439
R^2	0.7618	0.7622	0.7019	0.5925

- Union workers also have better job security (smaller EU transition) Job security
- Some surveys report health insurance / job security are a primary reason for joining unions
  - e.g. Kochan (1979), Gallup's annual Work and Education survey (2022)

Social insurance $\rightarrow$ Decline in Unions?

- Now we know that unions provide better access to insurance
  - True in early years as well (in a few slides later)

- Given the insurance role of unions, **does social insurance reduce unions?**
  - No need to be in unions to get insurance $\rightarrow$ **Decline in unions?**

- Our empirical setting (today): Medicare
  - Federal health insurance program for old individuals, implemented in July 1965
  - Data: state-level union density in early years (1963-) produced by Hirsch (2001)

- (not today, in paper): Medicaid intro., ACA Medicaid, and UI Medicaid Intro ACA UI

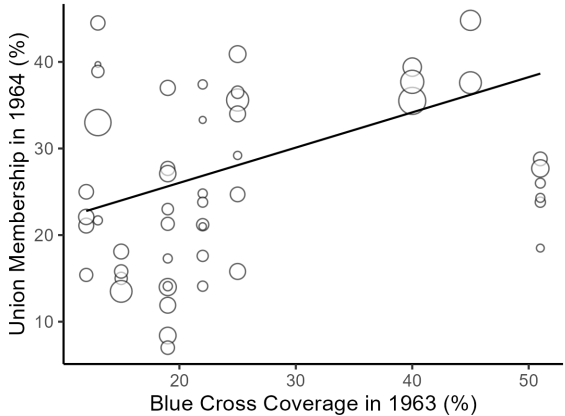
Medicare Impact on Unions

Exploit variation across states in **the exposure to the policy change**:

$$\log\left(\textit{Union density}_{st}\right) = \sum_{\tau=-1,\tau\neq 0}^{5} \beta_\tau \cdot \left(\textit{Exposure}_s\right) \cdot \mathbb{1}_{\{t=\tau+1965\}} + x_{st}'\gamma + \alpha_s + \lambda_t + \epsilon_{st}$$

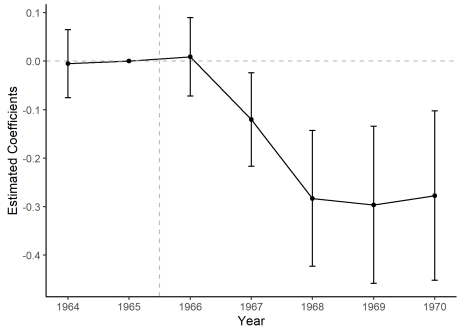
- $\textit{Exposure}_s$ = pre-reform private retiree HI coverage (Finkelstein 2007)
  - Higher pre-reform coverage $\rightarrow$ Larger replacement by Medicare
  - **Insurance role of unions**: Coverage is higher in more unionized regions (next slide)
- We ask: Larger $\textit{Exposure}_s$ $\rightarrow$ Larger decline in unions?
- Assumption: Strong parallel trend (Callaway, Goodman-Bacon, and Sant'Anna, 2024):
  - Differential effect of Medicare implementation across states arise only from $\textit{Exposure}_s$
  - Control state-level demographics, political environment
  - Manufacturing share x year to control differential exposure to trade / automation

Unionized Regions $\longleftrightarrow$ Higher Private Coverage



- Before Medicare introduction

Medicare Introduction $\rightarrow$ Decline in Unions



- Pooled regression: State with the highest pre-reform coverage (0.51) would have experienced an **9% greater decline** than the lowest counterpart (0.12)
- Based on the same research design, we find union elections also decrease

Raw Trends | Election Data: Result | Medicaid Control

Outline

Environment

- Infinite horizon, discrete time, search and matching (DMP) model with endogenous firm size
  - Analysis focus on the steady state economy

- Unit mass of risk averse workers, indexed by their skill types $x \in \{1, \ldots, X\} = \mathcal{X}$
  - Preferences $u_x(w, a)$ over wage w and amenities a, concave in w (risk averse)

- Measure N_f of risk neutral firms, indexed by their (production) types $y \in \{1, \ldots, Y\} = \mathcal{Y}$
  - Decreasing returns to scale technology $F_y(g)$

- Labor market friction: Random search in each **skill-specific** labor market
  - Each job is exogenously destroyed with probability $\delta_{x,k}$ where $k \in \{u, n\}$ is union status

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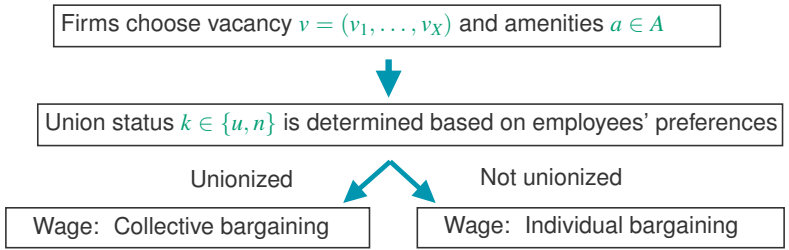
Timing & Firm and Worker Decisions



- Amenities $a \in A$: Part of job characteristics at the recruiting stage, not ex-post negotiable
  - Health insurance, workplace safety, ...
- Firms eventually decide union status $k \in \{u, n\}$, **accounting for workers' preferences for unionization**
  - Collective bargaining allows for the transfer of surplus across different workers
  - Individual bargaining is based on the marginal surplus of each match
- Workers decide whether to accept a job offer (no on-the-job search) Details

Firms: Production and Profit

- Decreasing returns to scale (DRS) production technology:

$$F_y(\boldsymbol{g}) = A_y \left(\sum_{x=1}^{X} z_x g_x^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}\alpha_y}, \qquad \alpha_y < 1$$

- Flow profit:

$$\pi_{y,k}(\boldsymbol{g}, a) = F_y(\boldsymbol{g}) - \underbrace{\sum_{x=1}^{X} [w_{x,y,k}(\boldsymbol{g}, a) + c_x(a)] g_x}_{\text{Wage and amenity cost}} - \underbrace{FC_a(a)}_{\text{Amenity fixed cost}} - \underbrace{C_{y,k}(\boldsymbol{g}, a)}_{\text{Union cost function}}$$

  - Amenity costs consist of per-worker cost $c_x(a)$ and firm-level fixed cost $FC_a(a)$
  - $C_{y,k}$ is the cost associated with union status $k = \{u, n\}$, **reflecting worker preferences for unionization**

Union Threat Cost and Union Maintenance Cost

- Nonunion firms incur *union threat cost*: Details

$$C_{y,n}(\boldsymbol{g}, a) = c_0 \max\{0, \mathcal{W}_{y,n}(\boldsymbol{g}, a)\}$$

where $\mathcal{W}_{y,n}(\boldsymbol{g}, a)$ is employees' aggregate **willingness to pay (WTP)** for unionization

  - More costly to prevent unions if workers are more desperate for unions

- Unionized firms incur *union maintenance cost*: Details

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  - FC_{union}: Fixed cost of union (incl. cost of providing better job security)

- If c_0 is large enough, unionization is solely determined by employees' WTP

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Wage Bargaining

- **Individual bargaining**: Each worker = marginal worker (Stole & Zwiebel, 1996; Brügemann, Gautier & Menzio 2019)

$$\max_{w_x} \underbrace{[V^E_{x,y,n}(w_x,a) - u_x(b_x,0) - \gamma V^U_x]^{\beta_n}}_{\text{Net worker surplus for type-}x} \times \underbrace{[\Delta_{y,x}(\boldsymbol{w},\boldsymbol{g},a)]^{(1-\beta_n)}}_{\substack{\text{Marginal net surplus} \\ \text{from type-}x\text{ worker}}}, \quad x = 1,\dots,X$$

  - $\Delta_{y,x}(\boldsymbol{w},\boldsymbol{g},a)$ depends on **marginal** productivity and wage & amenity cost Details

- **Collective bargaining**: *n*-players Nash bargaining (Taschereau-Dumouchel, 2020)

$$\max_{w_1,w_2,\dots,w_X} \underbrace{\left[\prod_x (V^E_{y,x,u}(w_x,a) - u_x(b_x,0) - \gamma V^U_x)^{\frac{g_x}{\sum_x g_x}}\right]^{\beta_u}}_{\text{Net surplus for all workers}} \times \underbrace{[D_y(\boldsymbol{w},\boldsymbol{g},a)]^{(1-\beta_u)}}_{\text{Net firm surplus}}$$

  - Union's objective $\rightarrow$ wage compression effects
  - $D_y(\boldsymbol{w},\boldsymbol{g},a)$ depends on **total** production, wage & amenity cost Details

$\rightarrow$ $D_y(\boldsymbol{w},\boldsymbol{g},a)$ includes insurance fixed cost FC_a but $\Delta_{y,x}(\boldsymbol{w},\boldsymbol{g},a)$ does not

Hiring, Amenity Choice & Unionization

1. Vacancies: Posting each vacancy costs κ
   Noting the the choice of $v \iff$ choice of $\boldsymbol{g}$ in a steady state, Details

$$\hat{J}_{y,k}(a) = \frac{1}{1-\gamma} \max_{\boldsymbol{g}} \quad \underbrace{\pi_{y,k}(\boldsymbol{g}, a)}_{\text{Flow profit}} - \underbrace{\psi_{y,k}(\boldsymbol{g}, a)}_{\substack{\text{(Net) vacancy} \\ \text{posting cost}}}, \qquad y \in \mathcal{Y}, k \in \{u, n\}.$$

2. Amenities:

$$J_{y,k}(\boldsymbol{\epsilon}) = \max_{a \in \boldsymbol{\mathcal{A}}} \left\{ \hat{J}_{y,k}(a) + \epsilon_a \right\}, \qquad y \in \mathcal{Y}, k \in \{u, n\}.$$

3. Unionization:

$$\max_{k \in \{u,n\}} \{J_{y,k}(\boldsymbol{\epsilon}) + \varepsilon_k\}, \qquad y \in \mathcal{Y}.$$

- Close the model: Tightness $\{\theta_x\}$ is pinned down by the intersection of job creation curves and beverage curves

Mechanisms: Incentive to Unionize and Provide Amenity

$$\pi_{y,k}(\boldsymbol{g}, a) = F_y(\boldsymbol{g}) - \sum\nolimits_x [w_{x,y,k}(\boldsymbol{g}, a) + c_x(a)]g_x - FC_a(a) - C_{y,k}(\boldsymbol{g}, a)$$

1. Union advantage in charging amenity costs via collective bargaining (CB)
   - Overcoming holdup: workers incur part of the amenity fixed cost in CB
   - CB simultaneously adjusts wages of *all* workers to charge amenity costs
2. Trade-off of unionization: Surplus extraction in bargaining vs. union threat cost
   - DRS tech $\rightarrow$ Firms extract more surplus in indiv. bargaining (Why? Sum of marginal < Total)
     - Can push down wages more in individual bargaining
     - But then workers tend to prefer unionization $\rightarrow$ Preventing unionization is costly
     - Large α_y (large firms) $\rightarrow$ less surplus extraction $\rightarrow$ more likely to unionize
3. Interaction between union formation and amenity
   - Union advantage in charging amenity costs, incentivizing unionization
   - Nonunion firms can provide amenity to alleviate union threat because of wage incidence

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Outline

Empirical Specification

- We consider health insurance as our non-wage benefits in the model
  - $a = 1$: insured, $a = 0$: uninsured
- Direct utility function

$$u_x(w, a) = \int \log C(w, a, m) dH_x(m)$$

  where H_x is the distribution of medical costs for type-x workers
  - Consumption level is given by $C(w, a, m) = \max\{w - OOP(m; a), \underline{c}\}$

- Worker heterogeneity: High-skill worker (college) and low-skill workers (high-school)
- Firm heterogeneity: α_y follows a beta distribution
- We model public health insurance programs (Medicaid and Medicare) by extending to a stochastic life-cycle model with retirement

Overview of Estimation

- Target 2007 economy for policy analysis; and 1955 economy for union decline analysis
  - Data: CPS, MEPS, and Census Business Dynamics Statistics
- Estimate parameters related to production, insurance provision, and unionization
  - Targets: (i) joint dist of union, ESHI coverage, and firm size; (ii) wage and employment
- Key findings from the estimation:
  - Average $\alpha_y \approx 0.71$ (in line with ones in the literature estimating labor demand models)
  - Generates modest but reasonable union wage premium (up to 3%, untargeted)
  - Non-negligible quarterly fixed costs of union ($= \$21K$) and insurance provision ($= \$16K$)

Externally Set | Estimated Parameters | Sensitivity (Andrews et al 2017) | Model Fit

Outline

Policy 1: Social Insurance for All Workers

- Free health insurance for all, financed by taxes on firms

	Baseline	**SI for all**	Targeted SI	ESHI Subsidy
Union density (%)	8.6	**5.2**	6.8	6.9
ESHI rate (%)				
Overall	60.4	**0.0**	59.0	68.2
Low skill	57.2	**0.0**	55.5	65.4
High skill	62.4	**0.0**	61.1	70.1
Unemp. rate (%)				
Overall	4.8	**7.6**	6.1	4.9
Low skill	8.7	**14.8**	11.8	8.9
High skill	2.1	**2.7**	2.2	2.0
Average wage ($1K)	11.9	**11.8**	12.0	11.9
Skill wage gap (log points)	55.7	**59.0**	53.5	56.2

- Insurance provisions no longer relevant $\rightarrow$ Worker's surplus from unionized firms decrease
  $\rightarrow$ Positive pressure on union wages
  $\rightarrow$ Lower unions
- Deunionization $\rightarrow$ Widen inequality in terms of wages & employment

Policy 2: Social Insurance Targeted to the Low-skill Unemployed

- Free insurance for low-skill unemployed workers ($\approx$ Medicaid), financed by taxes on firms

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- Opposite impact despite union decline
  - Targeted at the unemployed $\rightarrow$ Push up wages
  - Targeted at the low-skill $\rightarrow$ Close down wage gap

Policy 3: Tax Subsidy for ESHI

- Reduce the fixed cost of ESHI by 30%

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- Reduce union's cost advantage $\rightarrow$ Lower unionization
- Larger wage inequality:
  - Endogenous decline in unions $\rightarrow$ Additional source of regressivity from ESHI

What Caused the Decline in Unions?

- Calibrate the model to the 1955 economy and simulate the effects of three forces Details
  1. Skill-Biased Tech Change: Adjust relative productivity and proportion of skill types
  2. Social Insurance: Medicare + Medicaid (mainly for the low-skill and the retired)
  3. Right to Work (RTW) Laws: calibrate its effect on the union maintain cost to rationalize the recent event study analysis of the effect of RTW on unions

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     → Explain **32.1%** of the decline in unions

  2. Social Insurance: Medicare + Medicaid (mainly for the low-skill and the retired)

     → Explain **14.8%** of the decline in unions

  3. Right to Work (RTW) Laws: calibrate its effect on the union maintain cost to rationalize the recent event study analysis of the effect of RTW on unions

     → Explain **6.8%** of the decline in unions

- Key takeaway: tech change and social insurance expansions account for significant part of the decline in unions

Welfare Impact of Unionization

	Baseline	SI for all	Targeted SI	Job security	Insurance subsidy	Insurance quality
Union density (p.p. change)	15.61	10.80	13.41	13.07	13.47	10.20
Worker welfare (% change)						
All workers (ex-ante)	0.25	0.19	0.21	0.21	0.23	0.18
Low-skill	0.77	0.58	0.64	0.69	0.75	0.56
High-skill	-0.11	-0.09	-0.09	-0.11	-0.12	-0.09
Social welfare (% change)	-0.43	-0.36	-0.44	-0.43	-0.41	-0.42

- Provide subsidies for unionization under various scenarios (= 1/3 of union fixed costs)
- Subsidies increase union density similarly across different economies
- **Generous social insurance $\rightarrow$ Limited welfare gains for workers**

Conclusion

- Develop a framework of labor unions with amenities to explore how unions influence firms' insurance provisions and their interaction with social insurance
- Social insurance policies have equilibrium labor market impacts through changes in unionization
- Social insurance expansions matter in accounting for the decline in unions:
  15% of the decline, comparable to skill-biased tech changes (32%) and RTW (7%)
- Promoting unions improve worker welfare far *less* under generous social insurance

Appendix

Related Literature

- **Quantitative models of unions and labor markets:**
  Acemoglu, Aghion, and Violante (2001), Ackgoz, Tugrul, and Kaymak (2014), Dinlersoz and Greenwood (2016), Krusell and Rudanko (2016), Taschereau-Dumouchel (2020), Alder, Lagakos, and Ohanian (2023), Pickens (2023)

- **Empirical analysis of effects of unions on wage and non-wage benefits:**
  Freeman and Medoff (1984), Dinardo, Fortin, and Lemieux (1996), Card (2001), Buchmueller et al (2002), Knepper (2020), Farber, Herbst, Kuziemko, and Naidu (2021), Lagos (2021)

- **Equilibrium labor market model with non-wage benefits:**
  Sorkin (2018), Taber and Vejlin (2020), Lamadon, Lise, Meghir, and Robin (2024), and Morchio and Moser (2024)

- **Evaluating labor market and welfare impacts of social insurance policies:**
  Dey and Flinn (2005), De Nardi, French, and Jones (2010), French and Jones (2011), Low and Pistaferri (2015), Mitman and Rabinovich (2015), Aizawa (2019), Cole, Kim, and Krueger (2019), Aizawa and Fang (2020)

Union Formation

Steps for unionization under the National Labor Relations Act (NLRA):

1. Gather union authorization cards or petitions from at least 30% of their co-workers
2. File a petition for a union election with the National Labor Relations Board (NLRB)
3. A union is formed if more than 50% of workers are in favor of unionization

Bargaining unit:

- NLRA says “a group of two or more employees who share a community of interest"
- Determination is left to the discretion of NLRB
- In practice, most bargaining takes place at the enterprise level
- All workers at the same bargaining unit are covered by collective bargaining even if they are not union members

Union Workers Have Better Job Security

- Regress job loss (binary) on union membership (binary):

$$\textit{Job loss}_{it} = \beta \cdot \textit{Union}_{it} + x_{it}'\gamma + \mu_t + \varepsilon_{it},$$

	Job Losing			
	Pooled		High school	College
	(1)	(2)	(3)	(4)
Union	-0.0020***	-0.0020***	-0.0028***	-0.0012***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Demographics		X	X	X
Mean outcome	0.007	0.007	0.008	0.006
Observations	4,549,537	4,549,537	1,721,606	2,827,931
R^2	5e-04	0.0019	0.0025	0.0012

Data: SIPP panels 1996, 2001, 2004, 2008. Control for demographics, year FE.

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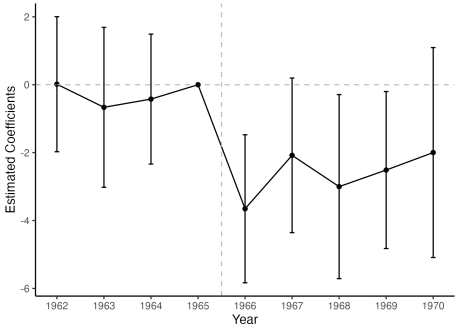
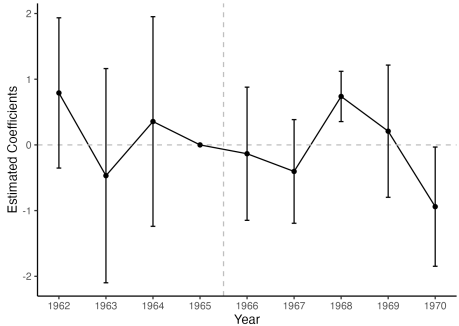
Medicare Impact on Union Election

NLRB Election Data



(a) Low Exposure



(b) High Exposure

- Outcome: Log number of union elections
- Regress by above/below median exposure groups to control better for pre-trend
- Key takeaway: negative Medicare effect among low exposure group

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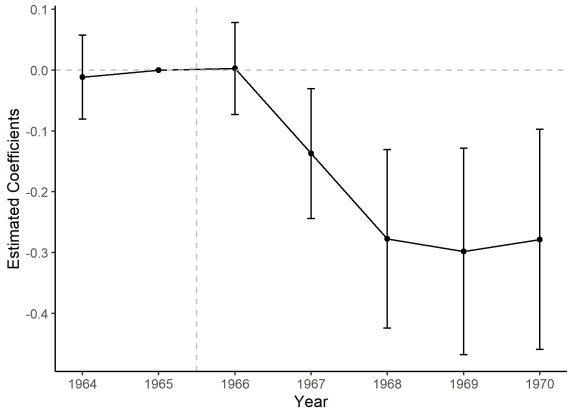
Medicare Impact on Union Density

Control Medicaid



- Control indicators for time before/after Medicaid implementations

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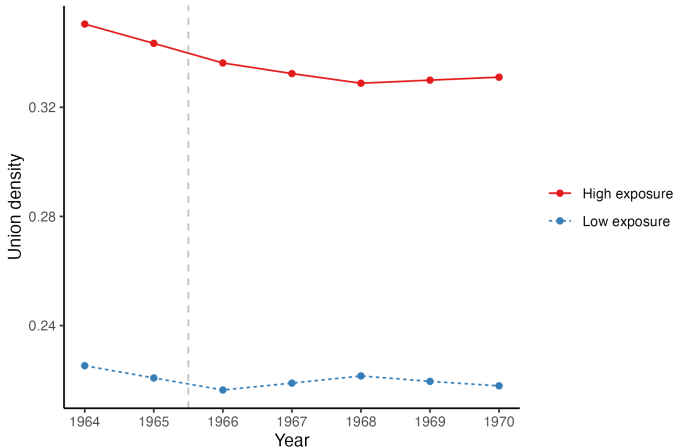
Medicare Impact on Union Density

Raw Trends



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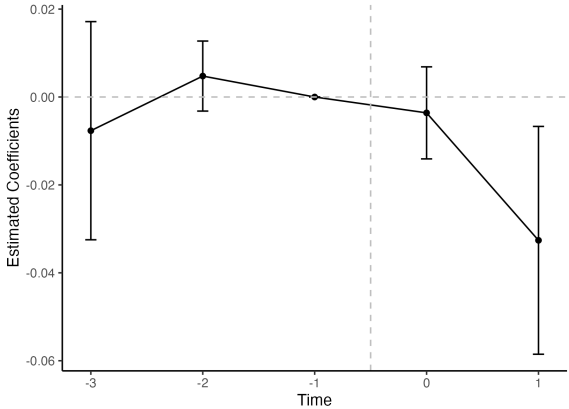
Estimate Impact of Medicaid Implementation

$$\log(\textit{Union density}_{st}) = \sum_{\tau=-3,\tau\neq-1}^{1} \beta_t \mathbb{1}_{\{t-E_s=\tau\}} + \beta_{-4}\mathbb{1}_{\{t-E_s\leq -4\}} + x_{st}'\gamma + \alpha_s + \lambda_t + \epsilon_{st}$$

- E_s: Timing of Medicaid Implementation. Most states implemented in 1966-1968.
- Without Medicaid, workers have strong incentives to be in unions to gain ESHI
  - Medicaid may mitigate such work incentives
  - Medicaid also acts as transfer to low-skilled: more costly for firms to hire low-skilled
  - Medicaid–> decline in Unions?
- Identifying assumption: Medicaid expansion and non-expansion states have parallel trends on union density without Medicaid expansions
  - control for time-varying political factors
  - robust to controlling for Medicare effect: Medicare exposure $\times$pre/post Medicare
  - robust to controlling for treatment heterogeneity (Sun and Abraham, 2021)

Medicaid Introduction $\rightarrow$ Decline in Unions

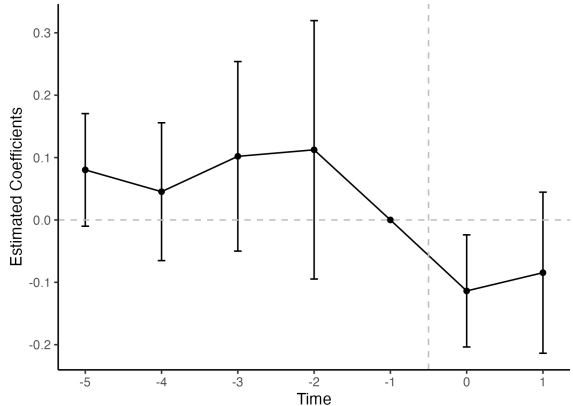


- Magnitude: Introduction of Medicaid decreases unions by 3%
- Based on the same research design, we find union elections also decrease

Election Data | Medicare Control | Sun and Abraham | ACA | UI

Medicaid impact on union election

NLRB Election Data



- Outcome: Log number of union elections

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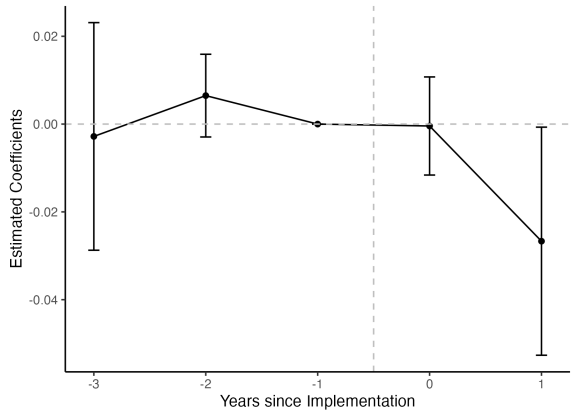
Medicaid Introduction $\rightarrow$ Decline in Unions

Control for Medicare Exposure



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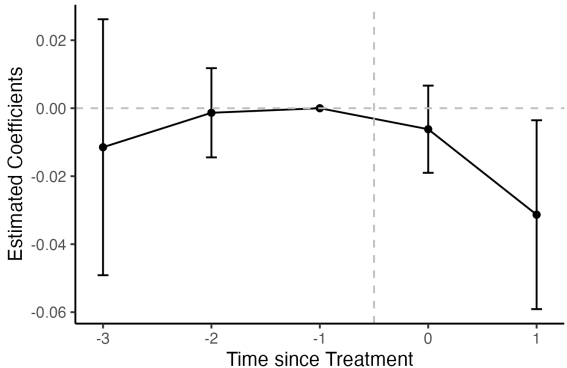
Medicaid Introduction → Decline in Unions

Sun and Abraham IW Estimator



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ACA Impact on Union Membership

Regress individual-level membership (binary) on ACA expansion:

$$Union_{ist} = \beta \cdot (ACA\ Medicaid)_{st} + x'_{ist}\gamma + \alpha_s + \lambda_t + \epsilon_{ist}, \quad (1)$$

	Union Membership		
	All	High School	College
	(1)	(2)	(3)
ACA Medicaid	-0.003	-0.005**	-0.001
	(0.003)	(0.003)	(0.003)
Mean outcome	0.118	0.103	0.125
Observations	1,177,618	393,223	784,395
R-sq	0.24	0.19	0.27

Note: Data is from the CPS 2010-2019.

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Unemployment Insurance Impact on Union Membership

Regress individual-level membership (binary) on UI replacement rate:

$$Union_{ist} = \beta \cdot (Replacement\ rate)_{ist} + \mathbf{x}'_{ist}\gamma + \eta_s + \mu_t + \varepsilon_{ist},$$

	Union Membership			
	(1)	(2)	(3)	(4)
Replacement Rate	-0.215***	-0.215***	-0.217***	-0.218***
	(0.020)	(0.020)	(0.020)	(0.021)
UI Duration FE		X	X	X
RTW Law			X	X
Political Control				X
Observations	2,680,517	2,680,517	2,680,517	2,598,633
R-sq	0.2543	0.2543	0.2545	0.2548

Note: Data is from CPS 2000-2019.

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Worker Values

- The flow utility $u_x(w, a)$ depends on income w and non-wage benefits a
- Value function of type-x worker employed in a type-y firm with union status k:

$$V^E_{x,y,k}(w, a) = u_x(w, a) + \gamma\left[\delta_{x,k} V^U_x + (1 - \delta_{x,k}) V^E_{x,y,k}(w_{x,y,k}, a_{x,y,k})\right].$$

- Value function for a type-x unemployed worker:

$$V^U_x = p(\theta_x)\mathbb{E}[\max\{V^E_{x,y,k}(w_{x,y,k}, a), V^U_x\}] + (1 - p(\theta_x))[u_x(b_x, 0) + \gamma V^U_x],$$

  where the expectation is taken over *equilibrium* distribution of vacancies posted by firms different in terms of firm types, union status, and insurance provision

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Worker Values (Continued)

$$\mathbb{E}[\max\{V^E_{x,y,k}(w_{x,y,k},a),V^U_x\}] = \sum_{y=1}^{Y}\Omega_{x,y}\sum_{a\in\mathcal{A}}\Big[\mathcal{Q}_y P_{y,u}(a)\max\{V^E_{x,y,u}(w_{x,y,u},a),V^U_x\} + (1-\mathcal{Q}_y)P_{y,n}(a)\max\{V^E_{x,y,n}(w_{x,y,n},a),V^U_x\}\Big]$$

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Modeling Union Costs

Willingness to Pay for Union / Nonunion

- **Workers in non-unionized firms:** Let $\mathcal{W}_{x,y,n}(\boldsymbol{g}, a)$ denote the willingness to pay for unionization of a type-x worker in a type-y nonunion firm with amenity a:

$$V^E_{x,y,u}(w_{x,y,u}(\boldsymbol{g}, a), a) = V^E_{x,y,n}(w_{x,y,n}(\boldsymbol{g}, a) + \mathcal{W}_{x,y,n}(\boldsymbol{g}, a), a),$$

- **Workers in unionized firms:** Let $\mathcal{W}_{x,y,u}(\boldsymbol{g}, a)$ denote willingness to accept de-unionization of a type-x worker in a type-y unionized firm that provides amenity a:

$$V^E_{x,y,u}(w_{x,y,u}(\boldsymbol{g}, a) + \mathcal{W}_{x,y,u}(\boldsymbol{g}, a), a) = V^E_{x,y,n}(w_{x,y,n}(\boldsymbol{g}, a), a).$$

- **Firm-level** employees' willingness to pay for avoiding the union status k is

$$\mathcal{W}_{y,k}(\boldsymbol{g}, a) = \sum_x \mathcal{W}_{x,y,k}(\boldsymbol{g}, a) \times g_x.$$

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Bargaining Details

Net marginal surplus for firm in individual bargaining:

$$\Delta_{x,y}(\boldsymbol{w},\boldsymbol{g},a) = \frac{\partial F_y(\boldsymbol{g})}{\partial g_x} - w_{x,y,n}(\boldsymbol{g},a) - c_x(a) - \sum_{x'\in\mathcal{X}} \frac{\partial w_{y,x',n}(\boldsymbol{g})}{\partial g_x} g_{x'} - \left(-\frac{\gamma\kappa(1-\delta_{x,n})}{q(\theta_x)}\right).$$

Last term = net cost of vacancy posting in case negotiation breaks down

Net total surplus for firm in collective bargaining:

$$D_y(\boldsymbol{w},\boldsymbol{g},a) = F_y(\boldsymbol{g}) - \sum_{x\in\mathcal{X}} (w_{x,y,u}(\boldsymbol{g},a) + c_x(a))g_x - FC_a(a) - \left(-\kappa\gamma \sum_{x\in\mathcal{X}} \frac{(1-\delta_{x,u})g_x}{q(\theta_x)}\right)$$

Last term = net cost of vacancy posting in case negotiation breaks down Back

Externally Set / Externally Calibrated Parameters (2007 Economy)

Parameter	Description	Value	Target
γ	Discount rate	0.984	5% annual interest rate
σ	Elasticity of substitution between skills	1.5	Johnson (1997)
μ	Match efficiency	1.0	Normalization
ζ	CRRA parameter	1.0	
$\underline{c}$	Consumption floor ($1K)	0.1	
β_u	Bargaining power of union workers	0.5	
β_n	Bargaining power of nonunion workers	0.5	
N_x	Measure of workers of each type	0.41, 0.59	Fraction of each skill group
M	Measure of total firms	0.042	Average firm size
$\delta_{u,x}$	Job destruction rate (union)	0.05, 0.03	See text
$\delta_{n,x}$	Job destruction rate (nonunion)	0.06, 0.03	See text
b_x	Consumption during unemp. ($1K)	6.96, 12.01	85% of average wages for each skill
c_x	Variable insurance cost ($1K)	0.77, 0.72	Expected insurer's cost
$\mu_{H,x}$	Medical exp. distribution: location	-1.21, -1.08	Medical exp. distribution for each skill
$\sigma_{H,x}$	Medical exp. distribution: scale	1.73, 1.56	Medical exp. distribution for each skill
$p_{0,x}$	Medical exp. distribution: mass at zero	0.23, 0.11	Medical exp. distribution for each skill

Back

Vacancy cost

$$\psi_{y,k}(\boldsymbol{g}, a) = \kappa \sum_x \frac{g_x}{q(\theta_x)} - \kappa\gamma \sum_x (1-\delta_x)\frac{g_x}{q(\theta_x)}$$

- Given the vacancy-filling probability $q(\theta_x)$, hiring g_x workers requires $\nu_x = \frac{g_x}{q(\theta_x)}$ vacancies to be posted
- 2nd term: Vacancy posting costs needed to hire $(g_1, \ldots, g_X)$
- 3rd term: $(1-\delta_x)g_x$ workers remain for each x, lowering future hiring costs

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Sensitivity Analysis

		Percentage Impact on Moment				
Parameter	Description	Union	Unemployment	Wage	Insurance	Firm size
Union						
FC_{union}	Fixed cost of unionization	3.29	0.32	0.02	0.73	0.30
σ_{union}	Std. dev. of union cost shock	15.21	0.22	0.01	1.27	1.06
c_0	Cost of union threat	9.60	0.49	0.02	0.60	0.58
Insurance						
FC_a	Fixed cost of insurance provision	0.16	0.33	0.02	0.88	0.34
σ_a	Std. dev. of insurance cost shock	0.38	0.34	0.03	0.63	0.41
Labor market						
κ	Vacancy posting cost	0.89	1.11	0.02	0.57	0.28
Production						
A	TFP	0.66	0.15	0.03	0.86	0.36
$Beta(a,b):a$	Production curvature distribution	1.35	0.12	0.03	1.05	0.43
$Beta(a,b):b$	Production curvature distribution	0.01	0.38	0.02	0.69	0.33
z_1	Low-skill worker relative productivity	0.15	0.23	0.02	0.66	0.31

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Parameters Estimated within the Model

Parameter	Description	Estimate	Std. Err.
A	TFP	41.30	0.023
$Beta(a,b):a$	Production curvature distribution	1.16	0.006
$Beta(a,b):b$	Production curvature distribution	1.00	0.001
z_1	Low-skill worker relative productivity	0.30	0.0003
FC_a (in \$1,000)	Fixed cost of insurance provision	15.79	0.084
σ_a (in \$1,000)	Std. dev. of insurance cost shock	0.88	0.269
FC_{union} (in \$1,000)	Fixed cost of unionization	21.56	0.239
σ_{union} (in \$1,000)	Std. dev. of union cost shock	5.58	0.513
c_0	Marginal cost of union threat	0.15	0.006
κ (in \$1,000)	Vacancy posting cost	1.89	0.021

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Model Fit

Moments	Data	Model
Union density	0.09	0.09
ESHI coverage: union	0.83	0.81
ESHI coverage: nonunion	0.59	0.58
ESHI coverage: low skill	0.53	0.57
ESHI coverage: high skill	0.66	0.62
Unemployment rate	0.05	0.05
Average wage: low skill ($1K)	8.19	8.21
Average wage: high skill ($1K)	14.12	14.33
Employment share of firms with ≥ 10 workers: union	0.94	0.96
Employment share of firms with ≥ 10 workers: nonunion	0.83	0.88
Employment share of firms with ≥ 100 workers: union	0.80	0.80
Employment share of firms with ≥ 100 workers: nonunion	0.56	0.55

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Effect of Union Threat

- Remove the union threat cost while fixing union status of firms

	Baseline	No Threat
ESHI coverage (%)		
Overall	60.4	55.5
Union	81.3	80.2
Nonunion	58.4	53.4
Unemployment rate (%)		
Overall	4.8	4.4
Low skill	8.7	7.7
High skill	2.1	2.1
Average wage ($1K)	11.9	12.0
Skill wage gap (log points)	55.7	55.2

- No threat $\rightarrow$ Decline in ESHI rate, **primarily driven by nonunionized firms**
- Mechanism: Interaction between bargaining protocol and union threat
  1. Offering ESHI lowered the union threat because of wage incidence in union bargaining
  2. Composition effect: firms will hire more low skilled without the union threat
     Lack of cost sharing in nonunion bargaining $\rightarrow$ less profitable to insure them
- *Possibility* of unionization improves ESHI coverage

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	SI for all	Targeted SI	Insurance subsidy	Job security	Insurance quality
Union density (%)	8.62	5.22	6.78	6.86	6.81	3.34
ESHI coverage (%)						
Overall	60.35	0.00	58.95	68.23	59.94	68.49
Union	81.32	0.00	73.42	83.24	74.42	60.19
Nonunion	58.37	0.00	57.90	67.12	58.88	68.77
Low skill	57.17	0.00	55.53	65.36	56.65	65.48
High skill	62.40	0.00	61.08	70.06	62.06	70.41
Unemployment rate (%)						
Overall	4.82	7.65	6.14	4.86	4.54	4.90
Low skill	8.70	14.79	11.80	8.93	8.21	9.06
High skill	2.14	2.72	2.24	2.05	2.01	2.03
Output per capita (% change)	0.00	-1.88	-0.81	0.03	0.20	0.00
Labor productivity (% change)	0.00	1.13	0.59	0.07	-0.10	0.09
Average wage (% change)	0.00	-1.52	0.56	-0.59	-0.04	-0.60
Skill wage gap (log points)	55.65	59.05	53.47	56.25	55.85	56.56
Average firm size						
Overall	22.50	21.83	22.20	22.49	22.57	22.48
Union	56.47	41.24	45.17	47.92	41.61	27.10
Nonunion	21.29	21.28	21.41	21.64	21.84	22.34

Column (4): Force nonunion firms provide better job security than baseline

- Set nonunion's destruction rate to halfway between the baseline $\delta_{x,u}$ and $\delta_{x,n}$

Column (6): Reduce insurance fixed costs by one third **only for nonunion firms**

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Calibration for the 1955 Economy

Externally Set Parameters (RTW Economy)

Parameter	Description	Value		Target
		RTW	No RTW	
γ	Discount rate	0.984	0.984	5% annual interest rate
σ	Elasticity of substitution between skills	1.5	1.5	Johnson (1997)
μ	Match efficiency	1.0	1.0	Normalization
ζ	CRRA parameter	1.0	1.0	
$\underline{c}$	Consumption floor ($1K)	0.1	0.1	
β_u	Bargaining power of union workers	0.5	0.5	
β_n	Bargaining power of nonunion workers	0.5	0.5	
N_x	Measure of workers of each type	0.868, 0.132	0.835, 0.165	Fraction of each skill group
M	Measure of total firms	0.057	0.057	Average firm size
$\delta_{u,x}$	Job destruction rate (union)	0.063, 0.031	0.071, 0.038	See text
$\delta_{n,x}$	Job destruction rate (nonunion)	0.071, 0.034	0.079, 0.042	See text
b_x	Consumption during unemp. ($1K)	0.62, 0.97	0.80, 1.12	85% of average wages for each skill
c_x	Variable insurance cost ($1K)	0.029, 0.020	0.029, 0.020	Expected insurer's cost
$\mu_{H,x}$	Medical exp. distribution: location	-3.52, -3.84	-3.52, -3.84	Medical exp. distribution for each skill
$\sigma_{H,x}$	Medical exp. distribution: scale	1.02, 1.01	1.02, 1.01	Medical exp. distribution for each skill
$p_{0,x}$	Medical exp. distribution: mass at zero	0.12, 0.09	0.12, 0.09	Medical exp. distribution for each skill

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Calibration for the 1955 Economy

Internally Estimated Parameters

Parameter	Description	Estimate	
		RTW	No RTW
A	TFP	2.7	3.5
$\alpha \sim Beta(a, b)$	Production curvature distribution	0.16, 0.64	0.16, 0.64
z_1	Low-skill worker relative productivity	0.73	0.71
FC_a	Fixed cost of insurance provision	0.24	0.21
σ_a	Std. dev. of insurance cost shock	0.33	0.28
FC_{union}	Fixed cost of unionization	1.26	0.84
σ_{union}	Std. dev. of union cost shock	0.35	0.35
c_0	Cost of union threat	0.19	0.13
κ	Vacancy posting cost	0.10	0.13

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Calibration for the 1955 Economy

Model Fit

	RTW		No RTW	
Moments	Data	Model	Data	Model
Union density	0.19	0.19	0.39	0.37
ESHI coverage: union	0.84	0.84	0.75	0.78
ESHI coverage: nonunion	0.60	0.63	0.56	0.56
ESHI coverage: low skill	0.64	0.68	0.62	0.65
ESHI coverage: high skill	0.71	0.59	0.68	0.60
Unemployment rate	0.05	0.05	0.05	0.05
Average wage: low skill ($1K)	0.73	0.75	0.94	0.97
Average wage: high skill ($1K)	1.14	1.13	1.31	1.27
Employment share of firms with ≥ 10 workers: union	0.99	0.97	0.98	0.95
Employment share of firms with ≥ 10 workers: nonunion	0.86	0.77	0.83	0.74
Employment share of firms with ≥ 100 workers: union	0.95	0.94	0.84	0.89
Employment share of firms with ≥ 100 workers: nonunion	0.59	0.59	0.55	0.52

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Technological Change and Welfare

- Given deunionization effect of tech change, what social insurance can do for workers?

	Impact of Technological Change				
	Baseline	SI	Full SI	UI	Full SI + UI
Union density (p.p. change)	-8.66	-5.19	-3.07	-5.39	-8.14
Worker welfare (% change)					
All workers (ex-ante)	3.61	3.76	4.10	4.86	5.87
Low-skill	-23.40	-22.39	-21.95	-21.68	-19.81
High-skill	-1.38	-1.67	-1.62	-1.40	-0.74

- Simulate tech change in economies with various social insurance
- Technological change & deunionization particularly damages low-skill workers
- **Social insurance shields low-skill workers, improving ex-ante welfare gain from tech change**