Optimal Income Taxation in Unionized Labor Markets

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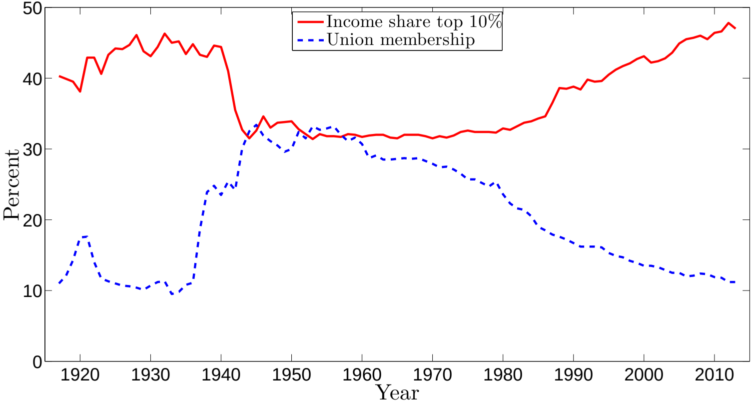
Research Questions

1. How should the government optimize income redistribution when labor markets are unionized?
2. Are unions a useful institution for redistribution?

Unions and inequality



Findings

1. *How should the government optimize income redistribution when labor markets are unionized?*
   - Lower income taxes
   - Lower unemployment benefits
   - Simulations: participation taxes significantly lower

2. *Are unions a useful institution for redistribution?*
   - Only for low-income workers whose welfare weight exceeds one

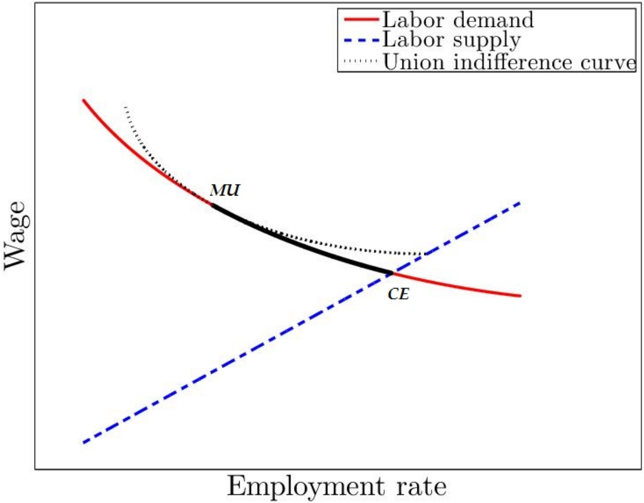
Outline talk

1. Model
2. How should taxes be optimally when there are unions?
3. Are unions a useful institution for redistribution?
4. Simulations
5. Conclusions

Model

- Households
  - Differ in participation costs φ and (sectoral) wages w_i
  - Household (i, φ) chooses whether to participate or not
- Unions
  - One union active in each sector i
  - Union i aims to maximize the expected utility of its members and bargains with firm-owners over the wage w_i
- Firm-owners
  - Own K units of capital and operate $F(K, L_1, .., L_I)$
  - Hire labor according to $w_i = F_i(\cdot)$
- Government
  - Observes labor earnings, employment status and profits
  - Sets income taxes T_i, profit taxes T_f and unemployment benefit $-T_u$ to maximize a utilitarian objective

Labor-market equilibrium



Right-to-manage model

- Union's bargaining power $\rho_i \in [0, 1]$
  - Monopoly union: $\rho_i = 1$
  - Competitive outcome: $\rho_i = 0$
- Wage mark-up due to bargaining:

$$\rho_i = \varepsilon_i \frac{\Delta u_i}{u'(c_i) w_i}$$

- ε_i is the labor-demand elasticity, and Δu_i the utility loss resulting from involuntary unemployment
- Δu_i is a measure of the union's distortion ($\Delta u_i = 0$ if $\rho_i = 0$ and/or $\varepsilon_i \to \infty$)

A special case

- Consider the mark-up equation:

$$\rho_i = \varepsilon_i \frac{\Delta u_i}{u'(c_i) w_i}$$

- Wage demands increase when taxes T_i increase or benefits $-T_u$ increase

Assumption 1 Labor markets are independent: $F_{ij}(\cdot) = 0$ for all $i \neq j$
$\rightarrow \varepsilon_i$ depends only on L_i

Assumption 2 Rationing is efficient
$\rightarrow \Delta u_i$ is the utility loss of the employed worker with the highest participation costs, denoted $\hat{\varphi}_i$

Assumption 3 There are no income effects at the union level
$\rightarrow$ equilibrium only depends on the **participation** tax rate $t_i \equiv (T_i - T_u)/w_i$

Government

- Social welfare:

$$\mathcal{W} = \sum_i N_i \left(\int_{\underline{\varphi}}^{\hat{\varphi}_i} u(c_i - \varphi)\mathrm{d}G(\varphi) + \int_{\hat{\varphi}_i}^{\overline{\varphi}} u(c_u)\mathrm{d}G(\varphi) \right) + u(c_f)$$

- Government's budget constraint:

$$\sum_i N_i(T_u + E_i t_i w_i) + T_f = 0$$

- Here, E_i denotes the rate of employment of type-i workers

Optimal taxation

Proposition (1)

When unemployment benefits $-T_u$, profit taxes T_f and participation tax rates t_i are optimally set, the following conditions must hold:

$$\omega_u b_u + \sum_i \omega_i b_i = 1$$

$$b_f = 1$$

$$\left(\frac{t_i + \tau_i}{1 - t_i}\right)\eta_i = (1 - b_i) + (b_i - 1)\kappa_i, \qquad 0 < \kappa_i < 1$$

- ω_j: labor force share of group $j \in \{i, u\}$
- b_j: welfare weight of group $j \in \{i, u, f\}$
- $\tau_i = \rho_i b_i / \varepsilon_i$: monetized utility costs of involuntary unemployment (i.e., union wedge, or implicit tax)
- η_i (κ_i): employment (wage) elasticity with respect to t_i

Optimal taxation

- Optimal unemployment benefit $-T_u$:

$$\sum_i \omega_i b_i + \omega_u b_u = 1$$

  Unemployment benefit acts as a guaranteed income

- Optimal profit tax T_f:

$$b_f = 1$$

  Profit taxes fully non-distortive

- Optimal participation tax rate t_i:

$$\underbrace{\left(\frac{t_i + \tau_i}{1 - t_i}\right)\eta_i}_{\text{Distortionary costs}} = \underbrace{(1 - b_i) + (b_i - 1)\kappa_i}_{\text{Redistributional gains}}$$

Optimal taxation

- Unions create implicit taxes
- Tax-benefit system (partially) off-sets these implicit taxes
- Optimal income taxes and benefits lower
- EITC more likely to be desirable
- Results from Diamond (1980), Saez (2002) and Christiansen (2015) nested as a special case (i.e., when $\rho_i = 0$ and/or $\varepsilon_i \to \infty$)

Desirability of unions

Proposition (2)

If taxes and transfers are set according to Proposition 1, increasing the bargaining power of the union ρ_i in sector i raises social welfare if and only if the welfare weight of the workers in sector i exceeds one:

$$\frac{\partial \mathcal{W}}{\partial \rho_i} > 0 \quad \leftrightarrow \quad b_i > 1$$

- Similar to minimum wage result Lee and Saez (2012)
- Intuition: whenever $b_i > 1$, participation is subsidized on a net basis (Diamond, 1980) $\rightarrow$ excessive labor force participation
- Unions can alleviate the distortions from taxation
- When participation is taxed (typical case), unions exacerbate the distortions from taxation

Robustness

The two main findings

(i) Stronger unions $\rightarrow$ EITC-programs optimal

(ii) Unions desirable when $b > 1$

are robust to changing some of the underlying assumptions:

- Accounting for income effects income effects
- Binding restriction on profit taxes restricted profit taxation
- Spill-over effects between labor markets interdependent labor markets
- Inefficient rationing of unemployment inefficient rationing
- Bargaining over multiple wages bargaining over multiple wages
- Bargaining over wages and employment efficient bargaining

Simulations

- We calculate the optimal tax and benefit system using a sufficient statistics approach introduced by Kroft et al. (2016)
- Labor market and tax inputs from CPB Dutch Bureau of Economic Policy Analysis
- Participation elasticity: 0.16 (Mastrogiacomo et al., 2013)
- Labor demand elasticity: 0.6 (Lichter et al., 2014)
- Welfare weights:

$$b_i = \frac{1}{\lambda(w_i(1-t_i) - T_u)^{\nu}}, \quad b_u = \frac{1}{\lambda(-T_u)^{\nu}}$$

- ν related to the concavity of the social welfare function ($\nu = 1$ in baseline simulations)

Simulation inputs

Table 2: Simulation inputs Netherlands

	(1) Primary education	(2) Lower secondary education	(3) Upper secondary education	(4) Bachelor degree	(5) Master degree
Average wage (w_i)	22912	25430	30661	42344	59886
Employment rate (E_i)	0.646	0.771	0.879	0.927	0.917
Average income tax (T_i)	5471	6771	9120	14587	22423
Unemployment benefit ($-T_u$)	8000	8000	8000	8000	8000
Labor force shares ($N_i/\sum_j N_j$)	0.081	0.230	0.432	0.174	0.083
Labor-demand elasticity (ε_i)	0.6	0.6	0.6	0.6	0.6
Participation elasticity (π_i)	0.16	0.16	0.16	0.16	0.16

Data obtained from CPB Netherlands Bureau of Economic Policy Analysis.

Simulations

Three scenarios:

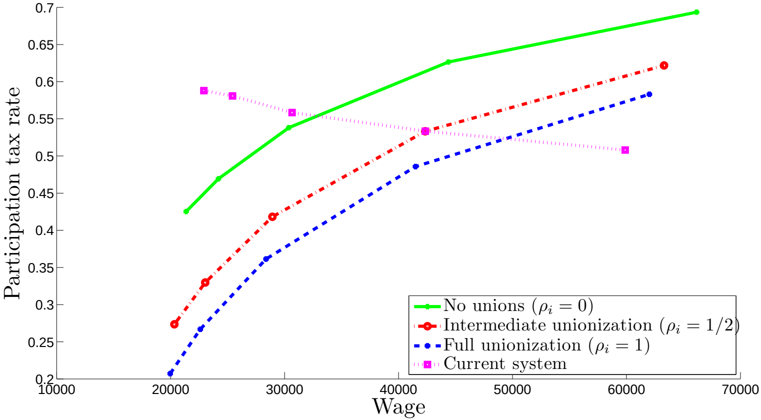
(i) No unions: $\rho_i = 0$ for all i

(ii) Intermediate degree of unionization: $\rho_i = 1/2$ for all i

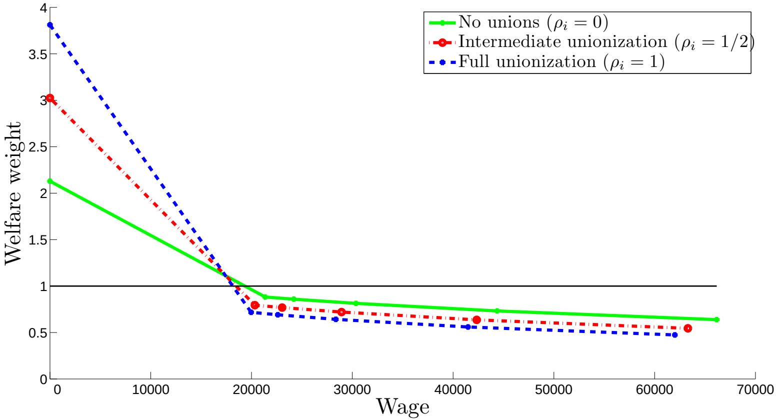
(iii) Monopoly unions: $\rho_i = 1$ for all i

Scenarios (i)-(iii) are compared to the current tax system

Optimal participation taxes



Social welfare weights



Simulations

Main take-aways:

- Participation tax rates significantly reduced (from 43% to 21% for the lowest income groups)
- Welfare weight of the working poor does not exceed one $\rightarrow$ unions not desirable (**but...** sensitive to specification of social welfare)

Conclusions

- *How should the government set income taxes and unemployment benefits in unionized labor markets?*
  - lower participation taxes, possibly subsidize participation
  - simulations: substantially lower taxes and benefits
- *Can unions be socially desirable?*
  - only for lowest income groups (whose welfare weight exceeds one)
  - simulations: never the case
- Further research:
  - strategic interaction between unions and gov't
  - intensive margin considerations

Thank you for your attention!

Income effects

- With income effects:

$$\frac{\partial w_i}{\partial T_i} \neq -\frac{\partial w_i}{\partial T_u}, \quad \frac{\partial E_i}{\partial T_i} \neq -\frac{\partial E_i}{\partial T_u}$$

- Only the expression for the optimal unemployment benefit needs to be modified:

$$\sum_i \omega_i b_i + \omega_u b_u = 1 - \sum_i \omega_i (1 - b_i) \iota_i$$

- Income effect captured by:

$$\iota_i \equiv 1 - \frac{u'_u}{\hat{u}'_i - (\hat{u}_i - u_u)\frac{\overline{u''_i}}{\overline{u'_i}}}$$

- When $u(\cdot)$ is of the CARA-type, $\iota_i = 0$

back

Restricted profit taxation

Corollary (1)

When unemployment benefits $-T_u$ and participation tax rates t_i are optimally set for a given level of profit taxation T_f, the following conditions must hold:

$$\omega_u b_u + \sum_i \omega_i b_i = 1$$

$$\left(\frac{t_i + \tau_i}{1 - t_i}\right) \eta_i = (1 - b_i) + \left(\frac{b_i - b_f + (1 - b_i) t_i}{1 - t_i}\right) \kappa_i$$

- Furthermore, increasing the union i's bargaining power raises social welfare if and only if $b_i > 1$
- Intuition: government can already influence wages via the tax and benefit system

back

Interdependent labor markets

Proposition (5)

Optimal unemployment benefits $-T_u$, profit taxes T_f, and participation tax rates t_i when labor markets are interdependent are determined by:

$$\sum_i \omega_i b_i + \omega_u b_u = 1$$

$$b_f = 1$$

$$\sum_j \omega_j \left(\frac{t_j + \tau_j}{1 - t_j} \right) \eta_{ji} = \omega_i (1 - b_i) + \sum_j \omega_j (b_j - 1) \kappa_{ji},$$

where $\eta_{ji} \equiv -\frac{\partial E_j}{\partial t_i} \frac{1-t_i}{E_j} \frac{w_j(1-t_j)}{w_i(1-t_i)}$ and $\kappa_{ji} \equiv \frac{\partial w_j}{\partial t_i} \frac{1-t_i}{w_j} \frac{w_j(1-t_j)}{w_i(1-t_i)}$ denote the cross elasticities of employment and wages in sector j with respect to participation taxes in sector i.

- Increasing ρ_i raises social welfare iff $b_i > 1$

back

Inefficient rationing

- **Rationing schedule**: $e_i(E_i, \bar{\varphi}_i, \varphi)$ gives employment rate $e_i \in [0, 1]$ at participation cost $\varphi \in [\underline{\varphi}, \bar{\varphi}_i]$ for given aggregate employment E_i in sector/occupation i and participation threshold $\bar{\varphi}_i \equiv w_i(1 - t_i)$
- e_i increases in E_i, decreases in $\bar{\varphi}_i$
- Example uniform rationing: $e_i = E_i/G(\bar{\varphi}_i)$, where $G(\cdot)$ is the CDF of participation costs

Proposition (6)

Assume that the employment probability of worker $\varphi \in [\underline{\varphi}, \bar{\varphi}_i]$ in sector i is $e_i(E_i, \bar{\varphi}_i, \varphi)$. Under Assumption 1 and in the absence of income effects, the optimal participation tax is determined by

$$\left(\frac{t_i + \hat{\tau}_i}{1 - t_i}\right)\eta_i - \left(\frac{\psi_i}{1 - t_i}\right)\gamma_i = (1 - b_i) + (b_i - 1)\kappa_i$$

where the definition of the union wedge τ_i is modified to

$$\hat{\tau}_i \equiv \int_{\underline{\varphi}}^{\overline{\varphi}_i} e_{iE_i}(E_i, \overline{\varphi}_i, \varphi)\left(\frac{u(w_i(1 - t_i) - T_u - \varphi) - u(-T_u)}{\lambda w_i}\right)\mathrm{d}G(\varphi)$$

and ψ_i denotes the 'rationing wedge', defined as

$$\psi_i \equiv \frac{e_i(E_i, \overline{\varphi}_i, \overline{\varphi}_i)}{E_i / G(\overline{\varphi}_i)} \int_{\underline{\varphi}}^{\bar{\varphi}_i} \frac{e_{i\bar{\varphi}_i}(E_i, \bar{\varphi}_i, \varphi)}{\int_{\underline{\varphi}}^{\bar{\varphi}_i} e_{i\bar{\varphi}_i}(E_i, \bar{\varphi}_i, \varphi)\mathrm{d}G(\varphi)}\left(\frac{u(w_i(1 - t_i) - T_u - \varphi) - u(-T_u)}{\lambda w_i}\right)\mathrm{d}G(\varphi)$$

Finally, $\gamma_i \equiv -\frac{\partial G(\overline{\varphi}_i)}{\partial t_i}\frac{1-t_i}{G(\overline{\varphi}_i)} > 0$ denotes the participation elasticity with respect to the participation tax rate in sector i.

Inefficient rationing

Corollary (3)

Consider the case where taxes are set in accordance with Proposition 6. Then, an increase in the union i's bargaining power ρ_i raises social welfare if and only if

$$b_i > 1 + \left(\frac{\psi_i}{1 - t_i} \right) \gamma_i$$

- The higher the rationing wedge, the lower the participation tax (intuition: replace involuntary by voluntary unemployment)
- If rationing is very inefficient, unions less likely to be desirable

◂ back

Bargaining over multiple wages

- Suppose there is a *single* union which bargains with firm-owners over *all wages*
- The union has a utilitarian objective

$$\Lambda = \sum_i N_i \left(\int_{\underline{\varphi}}^{\hat{\varphi}_i} u(c_i - \varphi)\mathrm{d}G(\varphi) + \int_{\hat{\varphi}_i}^{\overline{\varphi}} u(c_u)\mathrm{d}G(\varphi) \right)$$

- When labor types are complementary in production (i.e., $F_{ij} \neq 0$ if $i \neq j$), unions can strive for wage compression
- By demanding a low wage for high-income workers, employment in the high-skilled sector increases, which also benefits low-skilled workers
- How should taxes be set? $\rightarrow$ Same optimal tax expressions as with interdependent labor markets

Bargaining over multiple wages

Proposition (7)

When there is a single union which bargains with firm-owners over all wages, an increase in the union's bargaining power leads to an increase in social welfare if and only if

$$\sum_{i \in k(\beta)} \omega_i (b_i - 1)(-\mathrm{d}t_i^*) > 0,$$

where $k(\beta)$ *is defined as*

$$k(\beta) \equiv \{i | G(w_i(1 - t_i)) > E_i\}$$

and the $\mathrm{d}t_i^*$*'s solve*

$$\forall i \in k(\beta): \quad \sum_{j \in k(\beta)} \frac{\partial w_i(t_1, ..., t_I, \beta)}{\partial t_j} \mathrm{d}t_j^* + \frac{\partial w_i(t_1, ..., t_I, \beta)}{\partial \beta} \mathrm{d}\beta = 0,$$

back

Efficient bargaining

- In the efficient bargaining-model (McDonald and Solow, 1981), firms and unions bargain over wages *and* employment
- Outcome lies on the contract curve:

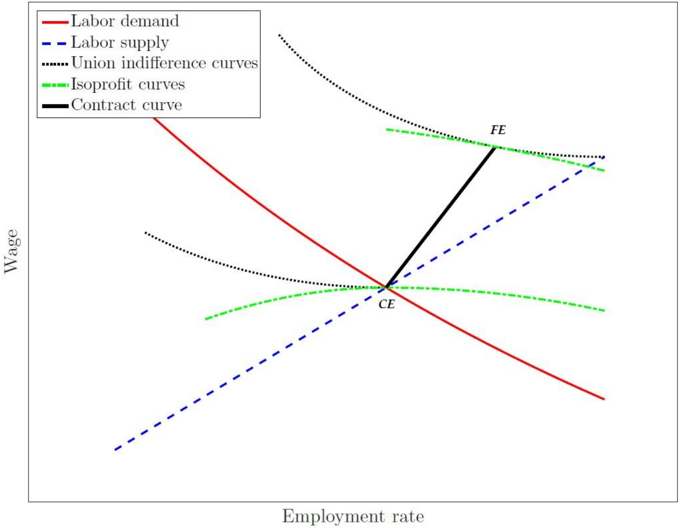
$$\frac{u(w_i - T_i - \hat{\varphi}_i) - u(-T_u)}{E_i \overline{u'(w_i - T_i - \varphi)}} = \frac{w_i - F_i(\cdot)}{E_i}$$

- Rent-sharing rule:

$$w_i = (1 - \sigma_i)F_i(\cdot) + \sigma_i \phi_i(\cdot)$$

- $\sigma_i \in [0, 1]$ denotes union i's bargaining power, and $\phi_i = (F(\cdot) - F(\cdot)|_{E_i=0})/(N_i E_i)$ the average additional output per worker in sector i

Efficient bargaining



Efficient bargaining

Proposition (8)

In the efficient bargaining model, optimal unemployment benefits $-T_u$, profit taxes T_f and participation tax rates t_i are determined by:

$$\omega_u b_u + \sum_i \omega_i b_i = 1,$$

$$b_f = 1,$$

$$\left(\frac{t_i + \tau_i - m_i}{1 - t_i}\right)\eta_i = (1 - b_i) + (b_i - 1)\kappa_i,$$

where $m_i \equiv \frac{w_i - F_i}{w_i} = \sigma_i \frac{\phi_i - F_i}{w_i}$ is the labor-demand wedge.

Efficient bargaining

Proposition (9)

If taxes and transfer are set according to Proposition 7, increasing the bargaining power σ_i of the union in sector i in the efficient bargaining model raises social welfare if and only if $b_i > 1$.

- Unions are still useful to combat *overemployment*
- Intuition: *Conditional on income*, increasing the union's bargaining power lowers employment

back

Simulation inputs (US)

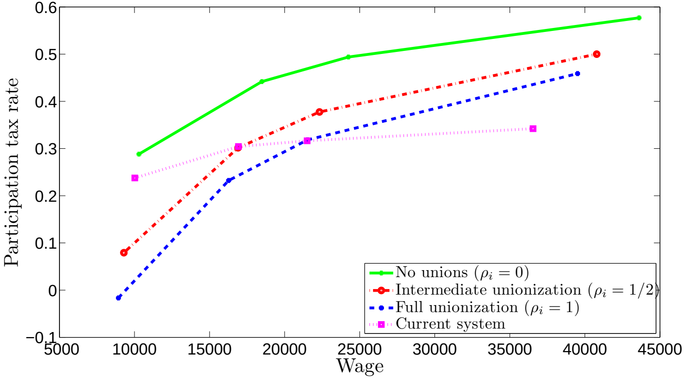
Table 1: Simulation inputs U.S.

	(1) High-school dropout	(2) High-school graduate	(3) Some college	(4) Bachelors degree plus
Average wage (w_i)	10021	16925	21503	36547
Employment rate (E_i)	0.459	0.714	0.802	0.892
Average income tax (T_i)	312	3079	4733	10430
Unemployment benefit ($-T_u$)	2070	2070	2070	2070
Labor force shares ($N_i/\sum_j N_j$)	0.138	0.332	0.298	0.233
Labor-demand elasticity (ε_i)	0.6	0.6	0.6	0.6
Participation elasticity (π_i)	0.4	0.4	0.4	0.4

Descriptive statistics are obtained from Kroft et al. (2015) and an earlier version of their paper. The values for T_i and T_u are calculated for single women without children.[30]

Simulation inputs Netherlands

Optimal participation tax rates (US)



Social welfare weights (US)