Wages and the Value of Nonemployment

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- **Prominent view of wage setting**: bargaining, e.g. Nash:

\[ \text{Wage} = \phi \cdot [\text{Inside Value of Job}] + (1 - \phi) \cdot [\text{Value of Outside Option}] \]

Common specification: workers’ outside option is (brief) nonemployment

⇒ Nonemployment outside option is a key determinant of wages

- **Theory**: e.g., canonical DMP model & Nash bargaining
  
  Pissarides (2000); Shimer (2005); Hagedorn & Manovskii (2008); Ljungqvist and Sargent (2017); Christiano, Eichenbaum & Trabandt (2017),...

- **Policy**: wage pressure channel of UI

  Krusell, Mukoyama & Sahin (2010); Hagedorn, Karahan, Manovskii and Mitman (2015); Chodorow-Reich, Coglianese and Karabarbounis (2017)

- **Evidence**: wages comove with aggregate LM conditions

  Pissarides (2009); Phillips curve; Beaudry & DiNardo (1991), Blanchflower Oswald (1994); Hagedorn & Manovskii (2013); Chodorow-Reich & Karabarbounis (2015),...
The Paper: Estimate Wage Sensitivity to NE Value

Variation is quasi-experimental shifts in UI benefit levels $b_i$.

\[
\frac{dw_i}{db_i} = \hat{\sigma}_{w,b}
\]
Empirical Strategy

Four UIB reforms in Austria from 1976 to 2001

Sharp, large and quasi-experimental variation in benefit levels

Treatment groups $db > 0$ and control groups $db = 0$

Treatment $\frac{db}{w}$ often multiple percentage points

Main focus: existing employment relationships and wages

⇒ Isolate bargaining channel

Rather than McCall channel and search behavior of unemployed

Schmieder, von Wachter and Bender (2016), Nekoei and Weber (2017),...

Extension: we also study wages in new jobs
Example: 1989 Reform of Benefit Levels
The Paper: Estimate Wage Sensitivity to NE Value

Variation is quasi-experimental shifts in UI benefit levels $b_i$.

\[ \frac{dw_i}{db_i} = \hat{\sigma}_{w,b} \]

Derive theoretical benchmark from calibrated Nash bargain model:

\[ \sigma_{w,b}^{\text{Nash}} \approx 0.40 \]

Our estimate reveals empirical insensitivity of wages to UIBs:

\[ 0.00 \leq \hat{\sigma}_{w,b} \leq 0.03 \]

Little heterogeneity, e.g. local unemp. rate, time on UI...

Small effect extends to new hires

⇒ Micro evidence for models insulating wages from NE value

- Alternating offer bargaining (Hall and Milgrom 2008)
- Employer competition models (e.g. Cahuc et al. 2006)
- Non-bargaining models of wage determination
Outline

1. Theoretical Prediction for Wage–UI Benefit Sensitivity from Calibrated Bargaining Model

2. Institutional Setting and Data


4. Discussion & Alternative Interpretations
Nash Bargaining: Background

\[ w = \phi \cdot p + (1 - \phi) \cdot \Omega \]

\( p \): Inside value (e.g. productivity, amenities,...)

\( \Omega \): Worker outside option (e.g. retirement, another job,...)

\( \phi \): Worker bargaining power

Wage-inside value sensitivity:

\[ \Rightarrow dw = \phi \cdot dp \]

Wage-outside option sensitivity:

\[ \Rightarrow dw = (1 - \phi) \cdot d\Omega \]

Wage-benefit sensitivity:

\[ \frac{dw}{db} = (1 - \phi) \cdot \frac{d\Omega}{db} \]
Model: Roadmap

Nash wage:

\[ w = \phi \cdot p + (1 - \phi) \cdot \Omega \]

Wage-benefit sensitivity:

\[ \frac{dw}{db} = (1 - \phi) \cdot \frac{d\Omega}{db} \]

Roadmap:

1. Calibrate \( \phi \)
2. Specify \( \Omega \) and derive \( \frac{d\Omega}{db} \)
3. Derive theoretical benchmark for \( \frac{dw}{db} \)
4. Show robustness to market adjustment and micro reoptimization
Model: Roadmap

Nash wage:

\[ w = \phi \cdot p + (1 - \phi) \cdot \Omega \]

Wage-benefit sensitivity:

\[ \frac{dw}{db} = (1 - \phi) \cdot \frac{d\Omega}{db} \]

Roadmap:

1. Calibrate \( \phi \)

\[ dw = \phi \cdot dp \]

2. Define \( \Omega \) and \( \frac{d\Omega}{db} \)

3. Derive theoretical benchmark for \( \frac{dw}{db} \)

4. Show robustness to market adjustment and micro reoptimization
Rent sharing coefficients: see Card, Cardoso, Heining and Kline (2018)
Model: Roadmap

Nash wage:

\[ w = \phi \cdot p + (1 - \phi) \cdot \Omega \]

Wage-benefit sensitivity:

\[ \frac{dw}{db} = (1 - \phi) \cdot \frac{d\Omega}{db} \]

Roadmap:

1. Calibrate \( \phi \)
2. Define \( \Omega \) and \( \frac{d\Omega}{db} \)
3. Derive theoretical benchmark for \( \frac{dw}{db} \)
4. Show robustness to market adjustment and micro reoptimization
\( \Omega \) and \( b \)

Outside option:

\[
\Omega \equiv \rho N = b + f \cdot (E(w') - N)
\]

Re-employment value

\[
\rho E(w') = w' + \delta(N - E(w'))
\]

Solved for outside option:

\[
\Rightarrow \rho N = b + \frac{\rho + \delta}{\rho + f + \delta} \cdot w'
\]

\[
= \tau \cdot b + (1 - \tau) \cdot w'
\]
The Sensitivity of $w$ to $b$

Nash wage:

$$w = \phi \cdot p + (1 - \phi) \cdot \left( \tau \cdot b + (1 - \tau) \cdot w' \right)$$

$$\Rightarrow \frac{dw}{db} = (1 - \phi) \cdot \begin{pmatrix} \tau & \left(1 - \tau\right) \frac{dw'}{db} \end{pmatrix}$$

$$\text{"Direct effect"}$$

$$\text{"Feedback"}$$

Nash bargaining in next job implies that $\frac{dw}{db} = \frac{dw'}{db}$, and thus:

$$\frac{dw}{db} = (1 - \phi) \cdot \frac{\tau}{1 - (1 - \phi)(1 - \tau)} = (1 - \phi) \cdot \frac{1}{1 + \phi \left(\tau^{-1} - 1\right)} \approx 0.39$$

• $\phi = .10$ – rent sharing estimates
• $\tau = .07$ – post-separation time in on UI when $\rho = 0$ (conservative)
\( \frac{dw}{db} \) as Function of \( \tau \) given \( \phi \)
The Sensitivity of $w$ to $b$

Wage-benefit sensitivity:

$$\frac{dw}{db} = (1 - \phi) \cdot \frac{1}{1 + \phi \left( \tau^{-1} - 1 \right)}$$

$\Leftrightarrow$ Worker bargaining power implied by given estimate of $dw/db$:

$$\Leftrightarrow \phi = \frac{1 - \frac{dw}{db}}{1 + \frac{dw}{db} \cdot (\tau^{-1} - 1)}$$
The Sensitivity of $w$ to $b$ as Function of $\phi$ given $\tau$
Rent sharing coefficients: see Card, Cardoso, Heining and Kline (2018)
Model: Roadmap

Nash wage:

\[ w = \phi \cdot p + (1 - \phi) \cdot \Omega \]

Wage-inside value sensitivity:

\[ \Rightarrow dw = \phi \cdot dp \]

Wage-outside option sensitivity:

\[ \Rightarrow dw = (1 - \phi) \cdot d\Omega \]

Wage-benefit sensitivity:

\[ \frac{dw}{db} = (1 - \phi) \cdot \frac{d\Omega}{db} \]

Roadmap:

1. Calibrate \( \phi \)
2. Define \( \Omega \) and \( \frac{d\Omega}{db} \)
3. Derive theoretical benchmark for \( \frac{dw}{db} \)
4. Robustness: market adjustment and micro reoptimization
Robustness

\[ \rho N = \begin{bmatrix} b + f \end{bmatrix} \left[ E(w') - N \right] \]

\[ \Rightarrow \frac{\partial N}{\partial b} = \frac{\partial N}{\partial b} + \frac{\partial N}{\partial w'} \frac{d w'}{d b} \]

Benchmark calibration “holding \( \tau \) fixed”

Mechanical effect

Feedback of wage response
Richer Instantaneous Payoff from Nonemployment

\[
\rho N = [z(b, .., .) + f \left[ E(w') - N \right]]
\]

\[
\Rightarrow \frac{dN}{db} = \frac{\partial N}{\partial b} + \frac{\partial N}{\partial w'} \frac{dw'}{db}
\]

- Benchmark calibration “holding \( \tau \) fixed”
- Mechanical effect
- Feedback of wage response

\[z(b): \text{ inst. payoff while nonemployed } z = b + [\text{other}]\]
Richer Instantaneous Payoff from Nonemployment

\begin{equation}
    z(b, c^*, x) = b_i + \frac{v_i(h > 0) - v_i(h = 0)}{\lambda_i} - c(e) - \gamma_i + y_i + \ldots
\end{equation}

- \( b_i \): Unemployment benefits
- \( v(h) \): Disutility of labor
- \( \lambda_i \): Budget constraint Lagrange multiplier
- \( c(e) \): Job search effort costs
- \( \gamma_i \): Stigma from unemployment
- \( y_i \): Other nonemployment-conditional income sources or transfers

- **Strategy:**

  Directly quantifiable variation in the level of UIBs \( b_i \).

  Derive and estimate in levels: dollar-for-dollar sensitivity \( \frac{dw}{db} \)

  \[ \Rightarrow \] No need to know share of \( b \) among other components
Micro Choice Variables $\mathbf{c}$

$$
\rho N(\mathbf{c}) = [z(b, \mathbf{c}) + f(\mathbf{c})][E(w', \mathbf{c}) - N(\mathbf{c})]
$$

$$
\Rightarrow \frac{dN}{db} = \left( \frac{\partial N}{\partial b} + \frac{\partial N}{\partial w'} \frac{dw'}{db} \right)
$$

**Benchmark calibration “holding $\tau$ fixed”**

- Mechanical effect
- Feedback of wage response

$z(b)$: inst. payoff while nonemployed $z = b + [\text{other}]$

$c$: choice variables
Envelope Theorem

\[ \rho N(c) = \max_c [z(b, c) + f(c)[E(w', c) - N(c)]] \]

\[ \Rightarrow \nabla_c N(c^*) = 0 \]

\[ \Rightarrow \frac{dN}{db} = \left[ \frac{\partial N}{\partial b} \right]_{db} + \left[ \frac{\partial N}{\partial w'} \right]_{dw'} \]

Benchmark calibration “holding \( \tau \) fixed”

Mechanical effect + Feedback of wage response

\( z(b) \): inst. payoff while nonemployed \( z = b + [\text{other}] \)

\( c \): choice variables
Micro-Reoptimization ⇒ Envelope Theorem

\[ \rho N(c) = \max_c [z(b, c) + f(c)][E(w', c) - N(c)] \]

\[ \Rightarrow \nabla_c N(c^*) = 0 \]

\[ \Rightarrow \frac{dN}{db} = \left( \frac{\partial N}{\partial b} \right)_{\text{Mechanical effect}} + \left( \frac{\partial N}{\partial w'} \frac{dw'}{db} \right)_{\text{Feedback of wage response}} \]

Benchmark calibration “holding \( \tau \) fixed”

\[ = 0 \text{ by envelope theorem} \]

\[ + \nabla_c N(b, c^*, x) \cdot \nabla_b c^* \text{ Micro re-optimization} \]

\( z(b) \): inst. payoff while nonemployed \( z = b + [\text{other}] \)

\( c \): choice variables
Net Out Market-Level Effects w/ Control Group

\[ \rho N(c, x) = \max_c [z(b, c, x) + f(c, x)[E(w', c, x) - N(c, x)]] \]

\[ \Rightarrow \nabla_c N(c^*, x) = 0 \]

Benchmark calibration "holding \( \tau \) fixed"

\[ \Rightarrow \frac{dN}{db} = \frac{\partial N}{\partial b} + \frac{\partial N}{\partial w'} \frac{dw'}{db} \]

Mechanical effect Feedback of wage response

Net out with control group

\[ + \nabla_x N \cdot \nabla_b x \]

Market Adjustment

\[ + \frac{\nabla_c N(b, c^*, x) \cdot \nabla_b c^*}{N(c^*, x)} \]

Micro re-optimization

\( z(b) \): inst. payoff while nonemployed \( z = b + [\text{other}] \)

\( c \): choice variables

\( x \): factors taken as parametric by household also hitting control group
Theoretical Robustness — In Paper

- Multiple components of nonemployment payoff $z$ (ex. value of leisure, stigma, job search effort cost,...)
  - No need to take stand on share $\frac{b}{z}$

- Equilibrium market-level adjustment
  - Net out with *control group* in same market
  - Provide calibrated equilibrium model for segmented markets (DMP)

- Micro re-optimization (search effort, spousal labor supply, endogenous UI take-up, ...)
  - Envelope theorem

- Myopia/liquidity constraints

- Finite benefit duration

- Incomplete take-up/eligibility

- Multi-worker firms,...
Outline

1. Theoretical Prediction for Wage–UI Benefit Sensitivity from Calibrated Bargaining Model

2. Institutional Setting and Data


4. Discussion & Alternative Interpretations
Features of Austrian UI For Mapping into Model

A No experience rating
   - Funded through fixed linear payroll tax

B Voluntary quitters eligible for UI
   - US, Portugal: Quitters entirely ineligible
   - Germany, Sweden: longer wait periods
   - Austria: 28-day wait period for quitters

C Substantial and clean variation in UIB schedules, multiple reforms
   - Vs. more common potential benefit duration variation (constant benefits)

D High take-up
   - Fraction w/ UIB receipt conditional on E–N transition > 70%

E Post-UI benefits ("Notstandshilfe") are indexed to worker’s UIBs
Data

1. Austrian Social Security Register (ASSD)
   - Matched employer-employee data
   - Universe of dependently employed, private-sector workers and firms (1972 onwards)
   - Detailed information on (annual) earnings, employment status, industry, and occupation (blue/white collar)

   • Sample Restrictions:
     - Age 25-54
     - Full-year employment in pre-reform year \( t \)
     - Robustness: stayers/movers; longer-tenured workers;...

2. Austrian Unemployment Register (AMS)
   - Universe of unemployment spells (1987 onwards)
Outline

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4. Discussion & Alternative Interpretations
Roadmap: Difference-in-Differences Analyses

We estimate $\sigma$: dollar-for-dollar sensitivity of wages to UI:

$$dw_{i,t} = \sigma \cdot db_{i,t}$$

$$\Leftrightarrow \frac{dw_{i,t}}{w_{i,t-1}} = \sigma \cdot \frac{db_{i,t}}{w_{i,t-1}}$$

Our theoretical benchmark:

$$\sigma^{\text{Nash,} \phi=0.1} = .39$$

A Visualize evidence in raw data

B Regression approach with controls & placebo checks

C Theory-driven heterogeneity cuts
Variation: Reform-Induced UI Benefit Changes

Benefit schedule:

\[ b_t(w_{i,t-1}) : \text{ for worker with pre-determined (pre-separation) wage } w_{i,t-1} \]

We isolate reform-induced benefit changes:

\[ db_{i,t} = b_t(w_{i,t-1}) - b_{t-1}(w_{i,t-1}) \]

\[ \Rightarrow \text{ Difference: benefits in regime } t \text{ minus counterfactual benefits absent the reform (i.e. } t - 1 \text{) holding fixed reference wage} \]

Example 2001 reform: \( \tilde{w}_{i,2001} = w_{i,2000} \):

\[ db_{i,2001} = b_{2001}(w_{i,2000}) - b_{2000}(w_{i,2000}) \]
2001 Reform: Benefit Changes

Nom. Earnings in Base Year vs. Benefit Change (Pct Pts)

- Nom. Earnings in Base Year
- Benefit Change (db/w)
2001 Reform: Empirical Wage Effects

One-Year Difference: -.08
2001 Reform: Wage Effects: Two Years

Nom. Earnings in Base Year

Benefit Change (db/w)

Two-Year Effects (dw/w)

Two-Year Difference: .54
2001 Reform

Nom. Earnings in Base Year

Benefit Change (db/w)

Predicted Wage Effects

One-Year Effects (dw/w)

Two-Year Effects (dw/w)

One-Year Difference: -.37
Two-Year Difference: .07
1976 Reform

Nom. Earnings in Base Year

<table>
<thead>
<tr>
<th>Change (Pct Pts)</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>3500</th>
<th>4000</th>
<th>4500</th>
</tr>
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<tbody>
<tr>
<td>Benefit Change</td>
<td></td>
<td></td>
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<tr>
<td>Predicted Wage</td>
<td></td>
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<tr>
<td>Effects One-Year</td>
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<tr>
<td>Effects Two-Year</td>
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<td></td>
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</tr>
<tr>
<td>One-Year Difference</td>
<td>-2.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-Year Difference</td>
<td>-3.5</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

One-Year Difference: -2.06
Two-Year Difference: -3.5
1985 Reform

Nom. Earnings in Base Year

Benefit Change (db/w)
Predicted Wage Effects
One-Year Effects (dw/w)
Two-Year Effects (dw/w)

One-Year Difference: -.26
Two-Year Difference: -.5700000000000001
1989 Reform

Nom. Earnings in Base Year

Benefit Change (db/w)
Predicted Wage Effects
One-Year Effects (dw/w)
Two-Year Effects (dw/w)

One-Year Difference: .71
Two-Year Difference: 1.69
Estimated Wage Sensitivity $\sigma$: -0.008 (SE: 0.0174)
Predicted Semi-Elasticity: 0.61
Wage vs. Benefit Changes: Two-Year Effects

Estimated Wage Sensitivity $\sigma$: -.028 (SE: .0602)
Predicted Semi-Elasticity: .61
Roadmap: Difference-in-Differences Analyses

We estimate $\sigma$: dollar-for-dollar sensitivity of wages to UI:

$$dw_{i,t} = \sigma \cdot db_{i,t}$$

$$\Leftrightarrow \frac{dw_{i,t}}{w_{i,t-1}} = \sigma \cdot \frac{db_{i,t}}{w_{i,t-1}}$$

Our theoretical benchmark:

$$\sigma^{\text{Nash}, \phi=0.1} = 0.39$$

A Visualize evidence in raw data

B Regression approach with controls & placebo checks

C Theory-driven heterogeneity cuts
Regression Model

\[
\frac{d w_{i,r,t}}{w_{i,r,t-1}} = \sigma_0 \times \mathbb{1}_{(t=r)} \times \frac{d b_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}}
\]

\[
+ \sum_{e=-L}^{-1} \tilde{\sigma}_e \times \mathbb{1}_{(t-r=e)} \times \left( \frac{d b_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}} \right) \text{Placebo}
\]

\[
+ \tau_{r,P_t} + \theta_{r,t} + f_t(w_{i,r,t-1}) + X_{i,r,t}' \phi_{r,t} + \epsilon_{i,r,t}
\]

- \(\sigma_0\): treatment effect
- \(\sigma_e\): placebo treatment effect ⇒ test for parallel pretrends
- \(\phi_{r,t}\): controls with year-specific slopes
- \(f_t(\cdot)\): parametric earnings control (e.g. ln \(w\))
- SEs: Two-way clustering at individual and earnings percentiles.
### Wage Sensitivity: Regression Outcomes

<table>
<thead>
<tr>
<th>Predicted</th>
<th>One-Year Outcomes</th>
<th>Two-Year Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>-0.20</td>
<td>-0.20</td>
</tr>
<tr>
<td>Mincer</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Mincer + Ind-Occ</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Firm FE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Controls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Graph:**
- **Earnings Change**
  - **One-Year Outcomes**
  - **Two-Year Outcomes**
- **Legend:**
  - None
  - Mincer
  - Mincer + Ind-Occ
  - Ind-Occ FE
  - Firm FE
  - All Controls
  - Predicted
Wage Sensitivity: $t - 3$ Placebos

![Graph showing earnings change for one-year and two-year outcomes with different models and control variables.](image-url)
Robustness Checks

Selection concerns: No effect on separation rates or J2J mobility.

Efficiency wage concerns: No effect on sick leave (shirking proxy)

Specification choices
- Level of SE clustering.
- Parametric earnings controls.
- Winsorization.

Potential benefit duration vs. UIB level: No wage effect from 1989 PBD reform.
The Sensitivity of $w$ to $b$ as Function of $\tau$ given $\phi$
Heterogeneity by $\tau$: Predicted Time on UI

-0.2  0.2  0.4  0.6  0.8
-0.1  0.0  0.1  0.2  0.3

Months on UI Post-Sep. (Quintiles)

Empirical Estimate

Predicted
Wage Sensitivity by Transition Type

- .2
- 0
- .2
- Estimated Group-Specific Coefficient

Pooled
Stayers
Recalled
Movers, EE+EUE
One-Year Effect
Two-Year Effect
Predicted

- .2
- 0
- .2

One-Year Effect
Two-Year Effect
Predicted
EE Movers

Wage-Benefit Sensitivity

One-Year Outcomes
- None
- Mincer + Ind-Occ
- Min + I-O + Firm FE

Two-Year Outcomes
- None, Fully Inter.
- Min + I-O, Fully Inter.
- Min + I-O + Firm, Fully Inter.

Predicted
Heterogeneity Analyses

Unemployment Risk
- Pred. Mths UE W/Controls
- Ind.-Occ. Expected Mths UE
- Ind.-Occ. Prob. of >6 Mths UE
- Pred. Prob. > 6 Mths UE W/Controls
- Local Unemployment Rate
- Pred. Sep. Rate W/Controls
- Ind.-Occ. Separation Rate
- Mths since UI Receipt
- Mths since UI Receipt, No Recalls
- Mths since Non-Emp.
- Mths since Non-Emp., No Recalls

Firm Characteristics
- Firm Log Wage Premium (AKM Firm FE)
- Industry Growth Rate
- SD of Earnings Growth
- P75-P25 Earnings Growth Diff.
- Resid. SD of Earnings
- Mean Sq. Resid. of Earnings
- Share Non-Emp. Last 2 Yrs
- Firm Size

Individual Characteristics
- Tenure
- Male
- Female
- Age
- Blue Collar
- White Collar

Unemployment Risk
- -.2
- -.1
- 0
- .1
- .2
- .3
- .4

Wage-Benefit Sensitivity
Sensitivity Estimates with Firm-Level Treatment

- One-Year Outcomes
  - Firm, None
  - Firm, Mincer
  - Firm, Ind-Occ FE
  - Firm, Mincer + I-O

- Two-Year Outcomes
  - Predicted

Earnings Change

One-Year Outcomes

Two-Year Outcomes

- Firm, None
- Firm, Mincer
- Firm, Ind-Occ FE
- Firm, Mincer + I-O
- Predicted
Outline

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4. Discussion & Alternative Interpretations
The Sensitivity of $w$ to $b$ as Function of $\phi$ given $\tau$
The Sensitivity of $w$ to $b$

Wage-benefit sensitivity:

$$\frac{dw}{db} = (1 - \phi) \cdot \frac{1}{1 + \phi (\tau^{-1} - 1)}$$

$\Leftrightarrow$ Worker bargaining power implied by given estimate of $dw/db$:

$$\Leftrightarrow \phi = \frac{1 - \frac{dw}{db}}{1 + \frac{dw}{db} \cdot (\tau^{-1} - 1)}$$
Possible Interpretation: $\phi \approx 1$?

Rent sharing coefficients: see Card, Cardoso, Heining and Kline (2018)
The Insensitivity of Wages to the Nonemployment Value

⇒ Micro-evidence for insensitivity of wages to nonemployment value (here: UI)

Hard to square with in Nash framework w/ NE as outside option for plausible $\phi$ values

Promising alternative models that insulate wages from NE value:

- Credible bargaining (Hall and Milgrom (2008))
- Employer competition (e.g. Cahuc, Postel-Vinay and Robin (2006))
- Non-bargaining models of wage determination

Aggregate empirical comovement between wages and labor market conditions – e.g. wage Phillips curve; wage procyclicality – perhaps not driven by outside option channel in bargaining.
Treatment and Control Groups

Diff-in-diff value:

\[
\frac{d(\rho N^T)}{db^T} - \frac{d(\rho N^C)}{db^T} = \frac{\partial(\rho N)}{\partial b} + \frac{\partial(\rho N)}{\partial w'} \cdot \left[ \frac{dw'^T}{db^T} - \frac{dw'^C}{db^T} \right]
\]

\[= \tau + (1 - \tau) \cdot \left[ \frac{dw'^T}{db^T} - \frac{dw'^C}{db^T} \right] \]

Diff-in-diff Nash wage:

\[
\frac{dw^T}{db^T} - \frac{dw^C}{db^T} = (1 - \phi) \left[ \frac{d(\rho N^T)}{db^T} - \frac{d(\rho N^C)}{db^T} \right]
\]

\[= (1 - \phi) \left( \tau + (1 - \tau) \left[ \frac{dw'^T}{db^T} - \frac{dw'^C}{db^T} \right] \right) \]

Using Nash bargaining of reemployment wage:

\[
\Rightarrow \frac{dw^T}{db^T} - \frac{dw^C}{db^T} = (1 - \phi) \frac{\tau}{1 - (1 - \phi)(1 - \tau)}
\]
Heterogeneity Analyses: Strategy

1. Split up the worker sample into subgroups $g$ (gender, firm size,...)

2. Allow for group-specific wage sensitivities

\[
\frac{dw_{i,r,t}}{w_{i,r,t-1}} = \sum_{g \in G} \sigma^g_0 \times 1_{(i \in g)} \times 1_{(t=r)} \times \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}} \\
+ \sum_{g \in G} \sum_{e=-L}^{-1} \tilde{\sigma}^g_e \times 1_{(i \in g)} \times 1_{(t-r=e)} \times \left( \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}} \right) \text{ Placebo} \\
+ \tau_{r,P_t} + \theta_{r,t} + f_t(w_{i,r,t-1}) + X'_{i,r,t} + \phi_{r,t} + \epsilon_{i,r,t}
\]
Wage Sensitivity: $t - 3$ Placebos

<table>
<thead>
<tr>
<th>Earnings Change</th>
<th>One-Year Outcomes</th>
<th>Two-Year Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Mincer Ind-Occ FE</td>
<td>Mincer Ind-Occ FE</td>
</tr>
<tr>
<td>Mincer Ind-Occ</td>
<td>Mincer Ind-Occ FE</td>
<td>Mincer Ind-Occ FE</td>
</tr>
<tr>
<td>Firm FE</td>
<td>Mincer Ind-Occ FE</td>
<td>Mincer Ind-Occ FE</td>
</tr>
<tr>
<td>All Controls</td>
<td>Mincer Ind-Occ FE</td>
<td>Mincer Ind-Occ FE</td>
</tr>
</tbody>
</table>

Predicted
Features of Austrian UI For Mapping into Model

A No experience rating
  • Funded through fixed linear payroll tax

B Voluntary quitters eligible for UI
  • US, Portugal: Quitters entirely ineligible
  • Germany, Sweden: longer wait periods
  • Austria: 28-day wait period for quitters

C Substantial and clean variation in UIB schedules, multiple reforms
  • Vs. more common potential benefit duration variation (constant benefits)

D High take-up
  • Fraction w/ UIB receipt conditional on E–N transition > 70%

E Post-UI benefits ("Notstandshilfe") are indexed to worker’s UIBs

F Population-level matched employer-employee data
DMP Equilibrium Adjustment

\[ dw^{\text{DMP}} = (1 - \phi)db + \phi kd\theta \]  

(1)

Next we solve the free entry condition \( \frac{k}{q(\theta)} = J = \frac{p-w'}{\rho+\delta} \) for \( kd\theta = -dw' \cdot \frac{1}{\eta} \frac{f(\theta)}{\rho+\delta} \) to move into the wage equation:

\[ dw^{\text{DMP}} = (1 - \phi)db + \phi \left[ -dw'^{\text{DMP}} \cdot \frac{1}{\eta} \frac{f(\theta)}{\rho+\delta} \right] \]

(2)

\[ \Leftrightarrow \frac{dw^{\text{DMP}}}{db} = \frac{1 - \phi}{1 + \phi \frac{1}{\eta} \frac{f(\theta)}{\rho+\delta}} \]

(3)

\[ \approx \frac{1 - \phi}{1 + \phi \cdot \frac{1}{\eta} \cdot (u^{-1} - 1)} \approx (?) \frac{1 - \phi}{1 + \phi \cdot (\tau^{-1} - 1)} \]

(4)

since \( \frac{f}{\rho+\delta} \approx \frac{f}{\delta} \approx \frac{1-u}{u} = u^{-1} - 1 \)
Wage Setting in the Austrian Labor Market

- High degree of flexibility even in presence of central bargaining  
  Hofer et al. (2001)

- 95% of workers covered by central bargaining agreements (CBAs)
  - Negotiated by unions and employer associations, primarily at industry level
  - Regulate working conditions, hours, and wage **floors**

- Substantial scope for wage negotiations at firm and worker level
  - Traxler (1994): “in practice local works councils often negotiate supplementary wage increases”

- Opening clauses allow for paying below-CBA wages
- Actually paid wages, on average, 34% higher than wage floors  
  Leoni and Pollan (2011)

- Lower wage rigidity than Germany or United States  
  Dickens et al. (2007)

- Borovickova and Shimer (2017) find large wage dispersion between firms even within industry
In our data: substantial wage and wage growth dispersion among full-time workers

- Average deviation from industry $\times$ occupation $\times$ experience cell average: 18.5%
- Standard deviation of within-firm, within-worker earnings growth: 4.4%
Standard Deviation of Within-Firm Earnings Growth

![Histogram of SD of Earnings Growth](image-url)
Rent-Sharing in Austria

Rent-sharing coefficients
Level-on-level specification: 0.046 (se 0.009)
Log-log specification: 0.36 (se 0.017)

Note: Own calculations based on BvD data. Specifications include firm, year, and industry-by-year effects. Standard errors clustered at the firm level.
Rent-Sharing in Austria in Comparison

Macro Calibrations
Industry-Level Specifications
Firm-Level Specifications
Worker-Level Specifications

Rent-Sharing Estimates and Implied Worker Bargaining Power $\phi$

Avg.: 0.104
Salience and Knowledge of UIBs: 2006 Survey

Mean observed UIB % = 65.29%
Mean belief about UIB % = 64.03 %
Non-Wage Outcomes: Mobility, UE Duration, Sickness

Alternate Outcomes

One-Year Outcomes
- Mover
- Recalled
- ENE
- EUE
- Mth NE
- Mth UI
- Mth Sick

Two-Year Outcomes
- No Ctrls
- Mincer + Ind-Occ FE
- Min + I-O + Firm FE
The Reforms Across the Earnings Distribution

![Graph showing benefit changes across earnings distribution for different years: 1976, 1985, 1989, and 2001. The x-axis represents earnings percentile, ranging from 0 to 100, and the y-axis represents benefit change (db/w), ranging from 0 to 20. The UI Reform Year is indicated at the bottom: 1976, 1985, 1989, and 2001. The graph illustrates how changes in UI reform relate to benefit changes across different earning percentiles.]
1976 Reform: Benefit Schedules

![Graph showing benefit schedules for 1975 and 1976. The graph plots benefits against monthly gross earnings (ATS). The benefits decrease as earnings increase, with a steeper decrease for earnings above 5000 ATS. The schedule for 1976 shows a slight increase in benefits compared to 1975.]
1985 Reform: Benefit Schedules

The graph illustrates the benefit schedules for 1984 and 1985. The y-axis represents benefits as a percentage of gross earnings, while the x-axis shows monthly gross earnings in ATS.

For 1984, the benefit schedule is shown by the blue line, starting with high benefits at low earnings levels and decreasing gradually as earnings increase. In 1985, the red line indicates a similar trend but with slightly reduced benefits across all earnings levels compared to 1984.

This visual representation highlights the changes in benefit schedules and how they affect the relationship between earnings and benefits under the 1985 reform.
1989 Reform: Benefit Schedules

The graph illustrates the benefit schedules for two years: 1988 (blue line) and 1989 (red line). The x-axis represents monthly gross earnings in ATS, ranging from 0 to 25,000, and the y-axis shows benefits (b/w) ranging from 0 to 60. The benefits decrease sharply as earnings increase, indicating a progressive benefit system where higher earners receive significantly lower benefits relative to their earnings.
2001 Reform: Benefit Schedules

![Graph showing benefit schedules for 2000 and 2001. The graph plots monthly gross earnings (ATS) against benefits (b/w). The y-axis represents benefits ranging from 0 to 60, and the x-axis represents monthly gross earnings ranging from 0 to 40,000 ATS. The graph shows a decrease in benefits as monthly gross earnings increase.]

- **Benefits (b/w)**
- **Monthly Gross Earnings (ATS)**
- **Legend:**
  - 2000
  - 2001
1989 PBD Increase for workers 40-49

Potential UI Duration Eligibility (Weeks)

Age

30 32 34 36 38 40

Treated Year (1988)

Control Year (1987)

Treated Year (1988) vs Control Year (1987)
Two-Year Earnings Growth: Age Gradients

The graph illustrates the two-year earnings growth as a percentage change over different age groups, with specific years labeled as '86-'88 and '88-'90. The earnings growth for each year is plotted against age, showcasing a trend where earnings tend to increase until a certain age, after which they may start to decrease. The difference in growth between these two periods is also indicated, showing variations in earnings growth over the specified years.
1976: Reform-Induced vs. Actual Benefit Changes

- Nom. Earnings in Base Year
- Replacement Rate Change
- Realized RR Change

Change (Pct Pts)

- 0 to 20

- 2000 to 7000

- Green: Replacement Rate Change
- Red: Realized RR Change
1985: Reform-Induced vs. Actual Benefit Changes

Change (Pct Pts)

Nom. Earnings in Base Year

Replacement Rate Change

Realized RR Change

Graph showing the comparison between reform-induced and actual benefit changes. The x-axis represents nominal earnings in the base year, ranging from 10,000 to 25,000. The y-axis represents the change in replacement rate, measured in percentage points. Two lines are depicted: one for replacement rate change and another for realized replacement rate change.
1989: Reform-Induced vs. Actual Benefit Changes

Change (Pct Pts)

Nom. Earnings in Base Year

Replacement Rate Change

Realized RR Change

Nom. Earnings in Base Year

5000

10000

15000

0

2

4

6

8

Change (Pct Pts)
Variation: UI Benefit Levels and Replacement Rates

- Replacement rate $= \frac{\text{Benefit(Previous Earnings)}}{\text{Previous Earnings}}$

- Earnings base for “previous earnings”:
  - Until 1987: last month’s earnings
  - 1987 - 1996: average of last six months’ earnings
  - 1996 - 1999: average earnings in previous calendar year (or year before)
  - 2000 - today: no RR reforms

- Series of reforms shifting replacement rates and maximum benefits
  - We identify all reforms to the RR schedule from 1972 to 1999
Validation: Actual Benefit Receipts vs. Predicted Receipts from Measured Lagged Average Earnings

Note: $\beta=0.974$ (se 0.006), $R^2=0.69$. 