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

\[\Rightarrow\] 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:

$$\sigma_{w,b}^{\text{Nash}} \approx 0.48$$

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:

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

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

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
\(\phi: \text{Macro Calib's} & \text{Micro Evidence} \ (\text{Rent Sharing})\)

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

Average: 0.099

**References:**
- Shimer (2005)
- Hagedorn and Manovskii (2008)
- Chodorow-Reich et al. (2017)
- Gertler and Trigari (2009)
- Pissarides (2009)
- Christofides and Oswald (1992)
- Blanchflower, Oswald, Sanfey (1996)
- Estevao and Tevlin (2003)
- Christian, Eichenbaum and Trabandt (2017)
- Abowd and Lemieux (1993)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
- Estevao and Tevlin (2003): profits
- Our Study: Rent-Sharing Austria
- Guiso, Pistaferri, Schivardi (2005), permanent
- Cardoso and Portela (2009)
- Card, Cardoso, Kline (2014), Between Firm
- Card, Cardoso, Heining and Kline (2018), AKM specification
- Arai and Hayman (2009)
- Card, Divincienti and Maida (2014)
- Carlsson, Messina and Skans (2014)
- Carlsson, Messina and Skans (2014)
- Garin and Silverio (2018)
- Jäger, Schoefer and Heining (2019)
- Kline, Petkova, Williams and Zidar (2017)
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
Ω 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:

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

Post-Separation Time in Nonemployment

Post-Separation Time in Re-Employment

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

Nash wage:

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

$$\Rightarrow \frac{dw}{db} = (1 - \phi) \cdot \begin{pmatrix} \tau \\ \text{“Direct effect”} \end{pmatrix} + (1 - \tau) \frac{dw'}{db} \quad \text{“Feedback”}$$

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

$$\frac{dw}{db} = (1 - \phi) \cdot \frac{\tau}{1 - (1 - \phi)(1 - \tau)} = (1 - \phi) \cdot \frac{1}{1 + \phi \left(\tau^{-1} - 1\right)} \approx 0.48$$

- $\phi = .10$ – rent sharing estimates
- $\tau = .10$ – 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:

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

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

$$\Leftrightarrow \phi = \frac{1 - \frac{dw}{db}}{1 + \frac{dw}{db} \cdot (\tau^{-1} - 1)}$$
The Sensitivity of $w$ to $b$ as Function of $\phi$ given $\tau$
Macro Calib’s & Micro Evidence (Rent Sharing)

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

- Average: 0.099

- Our Study: Rent-Sharing Austria
- Our Study: No Controls, One-Year Horizon
- Our Study: Full Controls, One-Year Horizon
- Our Study: No Controls, Two-Year Horizon
- Our Study: Full Controls, Two-Year Horizon

- Estevao and Tevlin (2003): profits
- Estevao and Tevlin (2003): value-added
- Abowd and Lemieux (1993)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
- Barth, Davis and Freeman (2014)
- Margolis and Salvanes (2001), France
- Margolis and Salvanes (2001), Norway
- Guiso, Pistaferri, Schivardi (2005), permanent
- Fakhfakf and FitzRoy (2004)
- Caju, Rycx and Tojerow (2009)
- Martins (2009)
- Guertzgen (2009)
- Cardoso and Portela (2009), permanent
- Card, Cardoso, Heining and Kline (2018), AKM specification
- Arai and Hayman (2009)
- Card, Devicienti and Maida (2014)
- Card, Cardoso, Kline (2014), Between Firm
- Card, Cardoso, Kline (2014), Stayers
- Bagger, Christensen Mortensen (2014), Mfg
- Kline, Petkova, Williams and Zidar (2019)
- Our Study: No Controls, One-Year Horizon
- Our Study: Full Controls, One-Year Horizon
- Our Study: No Controls, Two-Year Horizon
- Our Study: Full Controls, Two-Year Horizon
**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

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

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

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

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

Mechanical effect Feedback of wage response

Market Adjustment Micro re-optimization

\( c \): choice variables \( x \): factors taken as parametric by household also hitting control group
Richer Instantaneous Payoff from Nonemployment

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

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

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

Mechanical effect Feedback of wage response

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

\[ z(b, c^*, x) = b_i + \frac{v_i(h > 0) - v_i(h = 0)}{\lambda_i} - c(e) - \gamma_i + y_i + ... \]

- \( b_i \): 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 \( \frac{dw}{db} \)

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

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

$$
\Rightarrow \nabla c \frac{dN}{db} = \frac{\partial N}{\partial b} + \frac{\partial N \, dw'}{\partial w' \, db}
$$

Benchmark calibration "holding $\tau$ fixed"  

Mechanical effect  
Feedback of wage response

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

$\mathbf{c}$: choice variables
Envelope Theorem

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

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

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

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

Mechanical effect

Feedback of wage response

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

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

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

⇒ \[\nabla_c N(c^*) = 0\]

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

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

- Mechanical effect
- Feedback of wage response

=0 by envelope theorem

\[\nabla_c N(b, c^*, x) \cdot \nabla_b c^*
\]

Micro re-optimization

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

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

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

\[ \Rightarrow \nabla_{\mathbf{c}} N(\mathbf{c}^*, \mathbf{x}) = 0 \]

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

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

Mechanical effect Feedback of wage response

Net out with control group

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

\[ \nabla_{\mathbf{x}} N \cdot \nabla_{\mathbf{b}} \mathbf{x} \]

Market Adjustment

\[ \nabla_{\mathbf{c}} N(b, \mathbf{c}^*, \mathbf{x}) \cdot \nabla_{\mathbf{b}} \mathbf{c}^* \]

Micro re-optimization

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

\( \mathbf{c} \): choice variables
**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

1. Theoretical Prediction for Wage–UI Benefit Sensitivity from Calibrated Bargaining Model
2. Institutional Setting and Data
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:

$$ \sigma_{Nash,\phi=0.1} = .48 $$

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:

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

\( \Rightarrow \) Difference: benefits in regime \( t \) minus \textit{counterfactual benefits absent the reform} (i.e. \( t - 1 \)) 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 Schedules

Monthly Earnings (ATS) vs. Benefits (b/w)

- 2000
- 2001
## 2001 Reform: Benefit Changes

<table>
<thead>
<tr>
<th>Nom. Earnings in Base Year</th>
<th>Replacement Rate Change</th>
<th>Realized RR Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20000</td>
<td></td>
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<tr>
<td>25000</td>
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<tr>
<td>30000</td>
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</tbody>
</table>

### Notes
- The chart shows the changes in replacement rates and realized rates for various nominal earnings levels in the base year.
- The changes are measured in percentage points (Pct Pts).
- The x-axis represents nominal earnings, while the y-axis shows the change in rates.
The Reforms Across the Earnings Distribution

![Graph showing earnings percentiles and benefit changes across UI reform years 1976, 1985, 1989, and 2001.](image-url)
The Reforms Across the Earnings Distribution
1976 Reform

Change (Pct Pts)

Monthly Earnings (ATS)

- Benefit Change (db/w)
- Predicted Wage Effects
- One-Year Effects (dw/w)
- Two-Year Effects (dw/w)
Wage vs. Benefit Changes: One-Year Effects

- Predicted Wage Sensitivity $\sigma$: -.01 (SE: .0083)
- Predicted Semi-Elasticity: .483

Estimated Wage Sensitivity $\sigma$: -.01 (SE: .0083)
Predicted Semi-Elasticity: .483
Wage vs. Benefit Changes: Two-Year Effects

Estimated Wage Sensitivity $\sigma$: .026 (SE: .0181)
Predicted Semi-Elasticity: .483
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:

$$\sigma_{\text{Nash}, \phi=0.1} = .48$$

A Visualize evidence in raw data

B Regression approach with controls & placebo checks

C Theory-driven heterogeneity cuts
Regression Model

\[
\frac{dw_{i,r,t}}{w_{i,r,t-1}} = \sigma_0 \times \mathbb{1}_{(t=r)} \times \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}} \\
+ \sum_{e=-L}^{-1} \tilde{\sigma}_e \times \mathbb{1}_{(t-r=e)} \times \left( \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}} \right) \text{ Placebo} \\
+ \tau_{r,P_t} + \theta_{r,t} + f_t(w_{i,r,t-1}) + X'_{i,r,t} \phi_{r,t} + \epsilon_{i,r,t}
\]

\(\sigma_0\): treatment effect

\(\sigma_e\): placebo treatment effect \(\Rightarrow\) test for parallel pretrends

\(\phi_{r,t}\): controls with year-specific slopes

\(f_t(.)\): parametric earnings control (e.g. \(\ln w\))
Wage Sensitivity: Regression Outcomes

<table>
<thead>
<tr>
<th>Earnings Effects</th>
<th>None</th>
<th>Mincer</th>
<th>Ind.-Occ. FEs</th>
<th>Mincer + Ind.-Occ. FEs</th>
<th>Firm-Year FEs</th>
<th>Mincer + Ind.-Occ. FEs + Firm-Year FEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Year Estimates</td>
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<td>Two-Year Estimates</td>
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<tr>
<td>Prediction</td>
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</tbody>
</table>
Wage Sensitivity: $t - 3$ Placebos

One-Year Estimates
- None
- Mincer
- Ind.-Occ. FEs
- Mincer + Ind.-Occ. FEs
- Firm-Year FEs
- Mincer + Ind.-Occ. + Firm-Year FEs

Placebo Estimates
- None
- Mincer
- Ind.-Occ. FEs
- Mincer + Ind.-Occ. FEs
- Firm-Year FEs
- Mincer + Ind.-Occ. + Firm-Year FEs

Prediction
- None
- Mincer
- Ind.-Occ. FEs
- Mincer + Ind.-Occ. FEs
- Firm-Year FEs
- Mincer + Ind.-Occ. + Firm-Year FEs

Two-Year Estimates
- None
- Mincer
- Ind.-Occ. FEs
- Mincer + Ind.-Occ. FEs
- Firm-Year FEs
- Mincer + Ind.-Occ. + Firm-Year FEs
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 \( \phi \)

![Graph showing the sensitivity of \( w \) to \( b \) as a function of \( \tau \) given \( \phi \). The graph includes curves for different values of \( \phi \): \( \phi = 0.02 \), \( \phi = 0.1 \), \( \phi = 0.2 \), and \( \phi = 0.5 \).](image-url)
Heterogeneity by $\tau$: Predicted Time on UI

Predicted Fraction of Post-Separation Time on UI ($\tau$)

- Empirical Estimate
- Predicted

Wage-Benefit Sensitivity

Predicted -0.2 0.2 0.4 0.6

Empirical Estimate -0.2 0.2 0.4 0.6
Wage Sensitivity by Transition Type

Transition-Specific Estimate

Full Sample  Job Stayers  Recalled Workers  Job Movers

One-Year Estimates  Two-Year Estimates  Prediction
EE Movers

![Graph showing earnings effects with various models and estimates]

- One-Year Estimates
- Two-Year Estimates
- Prediction

Models compared:
- Mincer + Ind.-Occ. FEs
- Mincer + Ind.-Occ. FEs + Transition Int.
- Mincer + Ind.-Occ. FEs + Firm-Year FEs
- Mincer + Ind.-Occ. FEs + Transition Int.
Heterogeneity Analyses

- Wage Premium (AKM FE)
- Wage Distance from CBA Floor (Proxy)
- Local Unemployment Rate
- Months since UI Receipt
- Months since Non-Emp.
- Age
- Share Non-Emp Last 2 Yrs
- Gender: Male (Square) / Female (Circle)
- Industry EU Transition Rate
- Industry Growth Rate
- Months since Non-Emp.
- SD of Earnings Growth
- Unemployment Risk
- Firm Characteristics
- Firm Characteristics
- Worker Characteristics
- Worker Characteristics
- Tenure
- Age
- Gender: Male (Square) / Female (Circle)
- Occupation: Blue (Square) / White Collar (Circle)
Outline

1. Theoretical Prediction for Wage–UI Benefit Sensitivity from Calibrated Bargaining Model
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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: $\phi \approx 1$?
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:

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

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

2 Allow for group-specific wage sensitivities

\[
\frac{dw_{i,r,t}}{w_{i,r,t-1}} = \sum_{g \in G} \sigma_0^g \times \mathbb{I}_{(i \in g)} \times \mathbb{I}_{(t=r)} \times \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}}
\]

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

\[
+ \tau_{r,P_t} + \theta_{r,t} + f_t(w_{i,r,t-1}) + X'_{i,r,t} \phi_{r,t} + \epsilon_{i,r,t}
\]
Wage Sensitivity: \( t - 3 \) Placebos

<table>
<thead>
<tr>
<th>Earnings Effects</th>
<th>None</th>
<th>Mincer</th>
<th>Ind.-Occ. FEs</th>
<th>Mincer + Ind.-Occ. FEs</th>
<th>Firm-Year FEs</th>
<th>Mincer + Ind-Occ + Firm-Year FEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction</td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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# One-Year Estimates

- Placebo Estimates
- Prediction

# Two-Year Estimates

- Placebo Estimates
- Prediction
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 \( kd\theta = -dw' \cdot \frac{1}{\eta \rho+\delta} f(\theta) \) to move into the wage equation:

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

(2)

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

(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
Wage Setting in the Austrian Labor Market

- In our data: substantial wage and wage growth dispersion among full-time workers
  - Average deviation from industry×occupation×experience cell average: 18.5%
  - Standard deviation of within-firm, within-worker earnings growth: 4.4%
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
- Shimer (2005)
- Hagedorn and Manovskii (2008)
- Chodorow-Reich et al. (2017)
- Abowd and Lemieux (1993)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
- Hildreth (1998)
- Cardoso and PORTER (2001)
- Elsinger et al. (2009)
- Bagger, Christensen Mortensen (2014), Mfg

Industry-Level Specifications
- Gertler and Trigari (2009)
- Pissarides (2009)
- Christofides and Oswald (1992)
- Blanchflower, Oswald, Sanfey (1996)
- Christian, Eichenbaum and Trabandt (2017)
- Estevao and Tevlin (2003)
- Akowod and Lande (2001)
- Hildreth and Oswald (1997)
- de la Vallée (2004)
- Guenzburg (2006)
- Guenzburg, Gertler (2008)
- Guertgen (2009)
- Guzman (2009)
- Garin and Silverio (2018)
- Kline, Petkova, Williams and Zidar (2017)
- Jäger, Schoefer and Heining (2019)

Firm-Level Specifications
- Estevao and Tevlin (2003): profits
- Estevao and Tevlin (2003): value-added
- Gertler and Trigari (2009)
- Pissarides (2009)
- Abowd and Lemieux (1993)

Worker-Level Specifications
- Our Study: Rent-Sharing Austria
- Abowd and Lemieux (1993)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
- Hildreth (1998)
- Cardoso and PORTER (2001)

Avg.: 0.099

Implied Worker Bargaining Power $\phi$

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

- Shimer (2005)
- Hagedorn and Manovskii (2008)
- Chodorow-Reich et al. (2017)
- Abowd and Lemieux (1993)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
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- Hildreth (1998)
- Cardoso and PORTER (2001)
- Elsinger et al. (2009)
- Bagger, Christensen Mortensen (2014), Mfg

Avg.: 0.099
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

One-Year Outcomes

Two-Year Outcomes

Alternative Outcomes

No Controls  Min + I-O FE  All Controls
The Reforms Across the Earnings Distribution

UI Reform Year
- 1976
- 1985
- 1989
- 2001
1976 Reform: Benefit Schedules

The diagram shows the benefit schedules for 1975 (dashed line) and 1976 (solid line) against monthly earnings in ATS. The x-axis represents monthly earnings ranging from 0 to 15,000 ATS, while the y-axis represents benefits ranging from 0 to 60.

The schedule indicates that benefits start at a higher rate for lower earnings and decrease as monthly earnings increase. The 1976 reform shows a steeper decline in benefits compared to 1975, particularly for higher earnings levels.
1985 Reform: Benefit Schedules

- **1984**
- **1985**

![Graph showing the comparison of benefit schedules between 1984 and 1985.](image-url)
1989 Reform: Benefit Schedules
2001 Reform: Benefit Schedules

The image shows a graph depicting the 2001 Benefit Schedules. The graph plots benefits against monthly earnings in ATS for the years 2000 and 2001. The x-axis represents monthly earnings in ATS ranging from 0 to 40,000, while the y-axis shows the benefits ranging from 60 to 0. The solid line represents the benefit schedule for 2001, while the dashed line represents the schedule for 2000. The graph illustrates how benefits decrease as earnings increase, with a more abrupt decrease in the 2001 schedule compared to 2000.
1989 PBD Increase for workers 40-49

Potential UI Duration Eligibility (Weeks)

Age

Treated Year (1988)

Control Year (1987)
One-Year Earnings Growth: Age Gradients
Two-Year Earnings Growth: Age Gradients

<table>
<thead>
<tr>
<th>Age</th>
<th>Wage Growth '86-'88</th>
<th>Wage Growth '88-'90</th>
<th>Difference</th>
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<td>34</td>
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<td>42</td>
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</tbody>
</table>

Graph showing wage growth and differences by age group.
1976: Reform-Induced vs. Actual Benefit Changes

![Graph showing the comparison between reform-induced and realized replacement rate changes based on nominal earnings in the base year. The graph illustrates the change in replacement rate as a percentage of nominal earnings for different levels of earnings.}]
1985: Reform-Induced vs. Actual Benefit Changes

![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 30,000. The y-axis shows the change in replacement rate, ranging from 0 to 10 percent points. Two lines are depicted: one for replacement rate change and another for realized replacement rate change.]
1989: Reform-Induced vs. Actual Benefit Changes

Nom. Earnings in Base Year

Replacement Rate Change

Realized RR Change
Variation: UI Benefit Levels and Replacement Rates

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

- 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 = 0.003), $R^2 = 0.451$. 