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 $b_i$.

$$\frac{dw_i}{db_i} = \sigma_{w,b}$$

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:

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

Wage-benefit sensitivity:

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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
φ: Macro Calib’s & Micro Evidence (Rent Sharing)

- **Rent-Sharing Estimates and Implied Worker Bargaining Power**
- **Average**: 0.099

**Macro Calibrations**
- Shimer (2005)
- Hagedorn and Manovskii (2008)
- Chodorow-Reich et al. (2017)
- Abowd and Lemieux (1993)
- Van Reenen (1996)

**Industry-Level Specifications**
- Chinhuijzen and Wennekers (2003)
- Nude and Leman (2011)
- Our Study: Rent-Sharing Austria
- Estevao and Tevlin (2003)

**Firm-Level Specifications**
- Christian, Eichenbaum and Trabandt (2017)
- Gertler and Trigari (2009)
- Pissarides (2009)
- Christofides and Oswald (1992)
- Blanchflower, Oswald, Sanfey (1996)

**Worker-Level Specifications**
- Christian, Eichenbaum and Trabandt (2017)
- Gertler and Trigari (2009)
- Van Reenen (1996)
- Hildreth and Oswald (1997)
- Guiso, Pistaferri, and Schivardi (2005)
- Guertzgen (2009)

**References**
- Arai and Hayman (2009)
- Card, Divincienti and Maida (2014)
- Carlsson, Messina, and Skans (2014)
- Card, Cardoso, Kline, and Williams (2014, Between Firm)
- Card, Cardoso, Kline (2014, Stayers)
- Bagger, Christensen, Mortensen (2014, Mfg)
- Kline, Petkova, Williams, and Zidar (2017)

**Others**
- Garin and Silverio (2018)
- Jäger, Schoefer, and Heining (2019)

**Note**
- Synthetic data, simulations, and surveys used for estimation.
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
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:

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

Post-Separation Time in Nonemployment

\[ \equiv \tau \]

Post-Separation Time in Re-Employment

\[ \equiv 1 - \tau \]

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

Nash wage:

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

$$\Rightarrow \frac{dw}{db} = (1 - \phi) \cdot \left( \tau \frac{\Omega}{\tau \cdot b + (1 - \tau) \cdot w'} + (1 - \tau) \frac{dw'}{db} \right)$$

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)
\[ \frac{d w}{d b} \] as Function of $\tau$ given $\phi$
The Sensitivity of $w$ to $b$

Wage-benefit sensitivity:

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

⇔ 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 $\tau$
\( \phi \): Macro Calib’s & Micro Evidence (Rent Sharing)

- **Macro Calibrations**
- **Industry-Level Specifications**
- **Firm-Level Specifications**
- **Worker-Level Specifications**
- **Bargaining with Nonemployment Outside Option**

<table>
<thead>
<tr>
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<td>Fakhfakf and FitzRoy (2004)</td>
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<td>Bagger, Christensen, and Mortensen (2014)</td>
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<td>Kaas (2001)</td>
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**Average:** 0.099

**Notes:**
- **Rent-Sharing Estimates and Implied Worker Bargaining Power \( \phi \)**
- **Our Study:** Full Controls, Two-Year Horizon
- **Our Study:** Full Controls, One-Year Horizon
- **Our Study:** No Controls, Two-Year Horizon
- **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, One-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

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

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

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

Mechanical effect Feedback of wage response
Richer Instantaneous Payoff from Nonemployment

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

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

- 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

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

- **\( b_i \):** 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 $c$

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

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

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

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

$c$: choice variables
Envelope Theorem

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

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

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

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

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

\( c \): choice variables
Micro-Reoptimization $\Rightarrow$ 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

$$= 0 \text{ by envelope theorem}$$

$$+ \nabla_c N(b, c^*, x) \cdot \nabla_b c^*$$

Micro re-optimization

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

$c$: choice variables
Net Out Market-Level Effects w/ Control Group

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

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

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

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

Mechanical effect

Feedback of wage response

Net out with control group

\[ + \left( \nabla_x N \cdot \nabla_b x \right) \]

Market Adjustment

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

Micro re-optimization

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

\( c \): choice variables
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:

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

⇒ Difference: benefits in regime \( t \) minus 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
2001 Reform: Benefit Changes

![Graph showing 2001 Reform Benefit Changes](image_url)

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

<table>
<thead>
<tr>
<th>Nom. Earnings in Base Year</th>
<th>Replacement Rate Change</th>
<th>Realized RR Change</th>
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<tr>
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<td>30000</td>
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</table>
The Reforms Across the Earnings Distribution

![Graph showing Benefit Change (db/w) vs Earnings Percentile for UI Reform Years 1976, 1985, 1989, and 2001.]
2001 Reform

Monthly Earnings (ATS)

Change (Pct Pts)

Benefit Change (db/w) Predicted Wage Effects
One-Year Effects (dw/w) Two-Year Effects (dw/w)
The Reforms Across the Earnings Distribution

![Graph showing benefit changes across earnings percentiles for different UI reform years (1976, 1985, 1989, 2001).]
1985 Reform

Change (Pct Pts) 12000 15000 18000 21000 24000 27000
Monthly Earnings (ATS)
Benefit Change (db/w) Predicted Wage Effects
One-Year Effects (dw/w) Two-Year Effects (dw/w)
1989 Reform

Change (Pct Pts) | Monthly Earnings (ATS) | Benefit Change (db/w) | Predicted Wage Effects | One-Year Effects (dw/w) | Two-Year Effects (dw/w)
--- | --- | --- | --- | --- | ---
0 | 6000 | 0 | 6000 | 0
2 | 8000 | 0 | 8000 | 0
4 | 10000 | 0 | 10000 | 0
6 | 12000 | 0 | 12000 | 0
8 | 14000 | 0 | 14000 | 0
10 | 16000 | 0 | 16000 | 0
Wage vs. Benefit Changes: One-Year Effects

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

Estimated Wage Sensitivity $\sigma$: 0.026 (SE: 0.0181)
Predicted Semi-Elasticity: 0.483
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

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

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

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

\(\sigma_0\): treatment effect

\(\sigma_e\): placebo treatment effect \(\Rightarrow\) 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

None
Mincer
Ind.-Occ. FEs
Mincer + Ind.-Occ. FEs
Firm-Year FEs
Mincer + Ind.-Occ. FEs + Firm-Year FEs + Transition Int.

One-Year Estimates
Two-Year Estimates
Prediction
Wage Sensitivity: $t - 3$ Placebos
**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

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<th>Predicted Fraction of Post-Separation Time on UI ($\tau$)</th>
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Predicted Fraction of Post-Separation Time on UI ($\tau$)

- Empirical Estimate
- Predicted
Wage Sensitivity by Transition Type

![Graph showing wage sensitivity by transition type. The x-axis represents different types of transition: Full Sample, Job Stayers, Recalled Workers, and Job Movers. The y-axis represents the transition-specific estimate. The graph includes one-year and two-year estimates, with one-year estimates depicted by blue squares and two-year estimates by blue circles. The prediction line is shown in orange.](image-url)
Earnings Effects

Mincer + Ind.-Occ. FEs
Mincer + Ind.-Occ. FEs + Transition Int.
Mincer + Ind.-Occ. FEs + Firm-Year FEs
Mincer + Ind.-Occ. FEs + Firm-Year FEs + Transition Int.

One-Year Estimates
Two-Year Estimates
Prediction
Sensitivity Estimates with Firm-Level Treatment

Earnings Effects

One-Year Estimates

Two-Year Estimates

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

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

⇔ 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.
APPENDIX SLIDES
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

\[
\frac{dw_{i,r,t}}{w_{i,r,t-1}} = \sum_{g \in G} \sigma^g_0 \times \mathbb{1}_{(i \in g)} \times \mathbb{1}_{(t=r)} \times \frac{db_{i,r,t}(w_{i,r,t-1})}{w_{i,r,t-1}}
\]

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

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

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

- **Placebo Estimates**

- **Prediction**

- **Two-Year Estimates**
  - None
  - Mincer
  - Ind.-Occ. FEs
  - Mincer + Ind.-Occ. FEs
  - Firm-Year FEs
  - Mincer + Ind-Occ + Firm-Year FEs + Transition Int.
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 \( kd\theta = -dw' \cdot \frac{1}{\eta} f(\theta) \frac{1}{\rho + \delta} \) to move into the wage equation:

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

(2)

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

(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
Wage Setting in the Austrian Labor Market

- 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

Average Reform-Induced Benefit Change at Firm Level
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

![Graph showing rent-sharing estimates and implied worker bargaining power.](image)

**Implied Worker Bargaining Power $\varphi$**

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

**Avg.: 0.099**

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Salience and Knowledge of UIBs: 2006 Survey

- Actual UIB Observed in AMS Data:
  - Mean observed UIB % = 65.29%

- Beliefs (Eurobarometer):
  - Mean belief about UIB % = 64.03%
Non-Wage Outcomes: Mobility, UE Duration, Sickness

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

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

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

![Graph showing the impact of UI reforms on earnings distribution across different percentiles from 1976 to 2001.](image-url)
1976 Reform: Benefit Schedules

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

- 1975
- 1976
1985 Reform: Benefit Schedules

The graph illustrates the benefit schedules for two years, 1984 and 1985, in relation to monthly earnings (ATS). The x-axis represents monthly earnings ranging from 0 to 40,000 ATS, while the y-axis denotes benefits ranging from 0 to 60. The line for 1984 (dashed) shows a steeper decline in benefits as earnings increase compared to the line for 1985 (solid), indicating changes in the benefit schedule over these two years.
1989 Reform: Benefit Schedules
2001 Reform: Benefit Schedules
1989 PBD Increase for workers 40-49

Potential UI Duration Eligibility (Weeks) vs Age

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

Wage Growth dw/w (By Group and Diff.)

Age

Wage Growth '87-'88
Wage Growth '88-'89
Difference
Two-Year Earnings Growth: Age Gradients

![Graph showing wage growth and difference by age group between 1986-88 and 1988-90.](image)
1976: Reform-Induced vs. Actual Benefit Changes

![Graph showing the difference between reform-induced and realized replacement rate changes based on nominal earnings in the base year.](graph.png)
1985: Reform-Induced vs. Actual Benefit Change

![Graph showing the comparison of Reform-Induced vs. Actual Benefit Changes.](image-url)
1989: Reform-Induced vs. Actual Benefit Changes

![Graph showing the comparison of Reform-Induced vs. Actual Benefit Changes in 1989. The x-axis represents Nom. Earnings in Base Year, ranging from 6000 to 16000, and the y-axis represents Change (Pct Pts), ranging from 0 to 8. Two lines are plotted: one for Replacement Rate Change and the other for Realized RR Change.](image-url)
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=0.003), $R^2=0.451$. 