Worker Beliefs About Outside Options

Simon Jäger  
MIT

Christopher Roth  
U Cologne

Nina Roussille  
LSE

Benjamin Schoefer  
UC Berkeley

Columbia  
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What Do Workers Know About Their Outside Options?

Starting point:

- Across firms and jobs, large wage differences between similar workers
  Slichter (1950); Abowd, Kramarz and Margolis (1999); Card, Heining and Kline (2013); Bonhomme, Holzheu, Lamadon, Manresa, Mogstad and Setzler (2020)

How can these differences persist in equilibrium?

- Compensating differentials
  Rosen (1986)

- Heterogeneity in preferences
  Card, Cardoso, Heining and Kline (2018); Berger, Herkenhoff and Mongey (2022); Lamadon, Mogstad and Setzler (2021)

- Search/switching costs

- Misperceptions
Our Paper: Workers’ Subjective vs. Objective Outside Options

We ask:

1. Do workers accurately perceive wage differences across firms?
2. How systematic are workers’ biases about outside options with other employers?
3. What are equilibrium consequences of misperceptions about outside options?
Our Paper: Workers’ Subjective vs. Objective Outside Options

- Representative survey of workers’ beliefs about their outside options
  - Integrated into German Socio-Economic Panel (GSOEP)
  - Linked to respondents’ administrative labor market data (IAB)

- Compare subjective beliefs with (proxies for) objective outside options
  - Wage changes of coworkers when they move out of the firm
  - External labor market: wages of workers in the same occupation

- Experiment (in separate, follow-up survey): information treatment about average wage of similar workers in respondent’s labor market cell
Our Paper: Preview of Main Results

- Workers have systematic misperceptions about outside options
  - Workers mistakenly believe outside options are similar to current employment conditions (“anchoring”)
  - Workers, especially at low-paying firms, underestimate their outside options.

- Analyze equilibrium consequences of worker misperception in very simple labor market model
  Adopt and extend product market framework in Salop and Stiglitz (1977) to labor market and allow for misperceptions (anchoring)
  - Key insight: Misperceptions can be source of monopsony, wage markdowns, and labor market segmentation.
    Formalization of Robinson’s (1933) insight
  - Evaluate model predictions in the data
Literature:

**Reynolds (1951):** survey of 1,000 manual workers in New Haven labor market (1946-48)

- “Very few [workers] knew [...] how much they could expect to earn [at other plants]”
- Workers at low-paying firms underestimate wages elsewhere

Growing literature on **labor market expectations** (Faberman, Mueller, Şahin and Topa, 2017; DellaVigna, Lindner, Reizer and Schmieder, 2017; DellaVigna, Heining, Schmieder and Trenkle, 2020; Mueller, Spinnewijn and Topa, 2021)

- Survey on job-seekers’ beliefs about, e.g., **future wage offers** (Conlon, Pilossoph, Wiswall and Zafar, 2018) or **future job finding rates** (Spinnewijn, 2015; Mueller and Spinnewijn, 2021)
- Limited information even about **coworker wages** (Card, Mas, Moretti and Saez, 2012; Cullen and Perez-Truglia, 2018)

**Our paper:**

- Direct measure of beliefs about outside options
- Comparisons to objective benchmarks in admin data
- Experimental shifter of beliefs
- Model-guided analysis of equilibrium consequences
Research Design: Subjective vs. Objective Outside Options

Microfoundation: Bayesian Learning Model
Research Design: Subjective vs. Objective Outside Options

Unbiased beliefs
Slope = 1, intercept = 0

Subjective Wage Change at Outside Option vs. Actual Wage Change at Outside Option

Microfoundation: Bayesian Learning Model
Research Design: Subjective vs. Objective Outside Options

Homogeneous overestimation
Slope = 1, intercept > 0

Subjective Wage Change at Outside Option
Actual Wage Change at Outside Option

Microfoundation: Bayesian Learning Model
Research Design: Subjective vs. Objective Outside Options

Subjective Wage Change at Outside Option

Actual Wage Change at Outside Option

Homogeneous underestimation
Slope = 1, intercept < 0

Microfoundation: Bayesian Learning Model
Research Design: Subjective vs. Objective Outside Options

Subjective Wage Change at Outside Option vs. Actual Wage Change at Outside Option

Heterogeneity: bias towards identical OOs
Slope < 1

Microfoundation: Bayesian Learning Model
Research Design: Subjective vs. Objective Outside Options

Subjective Wage Change at Outside Option

Actual Wage Change at Outside Option

Underestimation of wage increase

Underestimation of wage decrease

Heterogeneity: bias towards identical OOs
Slope < 1

Microfoundation: Bayesian Learning Model
Research Design: Implementation

Actual Wage Change at Outside Option

Subjective Wage Change at Outside Option
Research Design: Beliefs

Worker belief about own wage change if forced to separate from current firm

Actual Wage Change at Outside Option

Subjective Wage Change at Outside Option

Worker belief about own wage change if forced to separate from current firm
Imagine that you were forced to leave your current job and that you had 3 months to find a job at another employer in the same occupation. Do you think that you would find a job that would offer you a higher overall pay, the same pay, or a lower pay?

If previous answer is not “Same pay”: What do you think: how much more/less would you earn in that new job? ⇒ Worker Belief about Outside Option

- Elicit other belief data:
  - Wage changes of coworkers who left the firm
  - Rank in within-occupation wage distribution
  - Median salary in occupation in external labor market

Integrate this Q + custom questionnaire into GSOEP (2019, 2020 waves) & link to administrative matched employer-employee data (SOEP-ADIAB)
Germain Socio-Economic Panel (GSOEP)

- Representative, probability-based sample of German population
- High quality: face-to-face or computer-aided telephone interviews
- We included our tailored survey module in the 2019 and 2020 waves of the GSOEP Innovation Sample
- 1,604 respondents, with panel structure across the two waves
- Link to administrative matched employer-employee data (SOEP-ADIAB)
  - SOEP respondents asked for consent for linkage
  - Match rate of 87% (based on names, gender, date of birth, and address)

Additional surveys: academic experts & additional survey for robustness checks
Validation I: Beliefs are Persistent

Slope: 0.290 (SE 0.035)
Validation II: Beliefs Predict Intentions to Search

Prob of Seeking New Job (%)

Belief: Wage Change

Uncontrolled, Slope: 50.057 (SE 14.674)
Controlling for Objective Benchmark, Slope: 51.532 (SE 14.884)

Reservation Wage Cut
Intentions to Bargain
Bargaining Magnitude
Robustness Checks: Beliefs

- Drop respondents who report "same pay"
- Elicit beliefs without "same pay" option
- Do not condition on staying in occupation
- Vary time horizon of search
- Vary reason for separation
Research Design: Objective Proxy

Mean log wage change of coworkers (2015-2019)
EUE moves (proxy for involuntary)
Two measurement error corrections: Empirical Bayes & IV
Additional proxy: Machine-learning prediction (in full data set) for EUE wage change
Coworker Wage Changes Correlated with Firm AKM Effect

Data, Slope: -.474 (SE .099)
Coworker Wage Changes Predictive of Past GSOEP Wage Changes

Slope: 1.047 (SE .068), N=1877

SOEP Mover Wage Changes

EB-Adjusted Mover Wage Changes
Research Design: Expert Prediction

Null: Unbiased Beliefs
Slope: 1
Expert Prediction
Slope: 0.708

Belief: Own Wage Change

Objective Benchmark: EB-Adjusted Mover Wage Changes
Results

Null: Unbiased Beliefs
Slope: 1
Expert Prediction
Slope: 0.708
Slope: 0.089

Belief: Own Wage Change

Objective Benchmark: EB-Adjusted Mover Wage Changes
Average Bias (Belief - Actual): -0.023 (SE 0.011)

Empirical Bayes Methodology
Results

Null: Unbiased Beliefs
Slope: 1
Expert Prediction
Slope: .708

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes
Average Bias (Belief - Actual): -.023 (SE 0.011)

Empirical Bayes Slope: .089 (SE .045)
Split-Sample IV Slope: .049 (SE .061)
Unadjusted Slope: .024 (SE .013)
1. Alternative Set of Coworkers

(a) Same Education

(b) Same Occupation

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.149 (SE 0.070)

Split-Sample IV Slope: 0.130 (SE 0.099)

Unadjusted Slope: 0.023 (SE 0.025)

Empirical Bayes Slope: 0.078 (SE 0.085)

Split-Sample IV Slope: 0.036 (SE 0.067)

Unadjusted Slope: 0.014 (SE 0.029)

- Predict GSOEP respondents’ wage changes if they left their current firm, based on a rich set of covariates
- Estimate a Lasso model of log wage change of "involuntary" (EUE) movers

![Graph showing the relationship between belief and objective benchmark with a raw slope of 0.095 (SE 0.021), N=519.](image.png)
3a. Alternative Comparison: Coworkers’ Wage Changes if Moving Out

Null: Unbiased Beliefs

Slope: 1

Belief: Coworker Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.125 (SE 0.047)

Split-Sample IV Slope: 0.104 (SE 0.040)

Unadjusted Slope: 0.052 (SE 0.018)

IV First Stage

Median

Diff Time Horizon

20+ Moves

Excluding "Same Wage"

Question
Red bars plot actual pay rank in occupation, calculated using admin ADIAB data and 4-digit occupation codes.
3b. Alt. Comparison: Own Rank in Occupation (Beliefs vs. Truth)

Red bars plot actual pay rank in occupation, calculated using GSOEP data and 4-digit occupation codes.
3b. Alt. Comparison: Own Rank in Occupation (Beliefs vs. Truth)

(a) Belief Distribution

(b) Belief vs Actual Rank

Red bars plot actual pay rank in occupation, calculated using GSOEP data and 4-digit occupation codes.

Question
Taking Stock: Comparing Subjective and Objective Outside Options

- Systematic misperceptions of own and coworker wage changes: “anchoring” beliefs about OO on current wage.

- Consistent with workers perceiving (relevant) external labor market to be more similar to current job/employer than it actually is – and using their current (jobs/employer’s) wage as a signal about the overall labor market

  - Anchoring-and-adjustment heuristic (Kahneman and Tversky, 1974)

Next:

- Do beliefs correlate with intended labor market behaviors?

- Does providing workers with information change their labor market behavior?
Beliefs Correlate With Intentions to Search

![Graph showing the correlation between beliefs and the probability of seeking a new job. The graph includes two lines: one uncontrolled with a slope of 50.057 (SE 14.674) and one controlling for objective benchmark with a slope of 51.532 (SE 14.884).]
Beliefs Correlate With Intended Labor Market Behavior

(a) Reservation Wage Cut
- Belief: Wage Change
  - Uncontrolled, Slope: -27.688 (SE 5.677)
  - Controlling for Objective Benchmark, Slope: -27.474 (SE 5.646)

(b) Search for New Job
- Belief: Wage Change
  - Uncontrolled, Slope: 50.057 (SE 14.674)
  - Controlling for Objective Benchmark, Slope: 51.532 (SE 14.884)

(c) Negotiate for Higher Pay
- Belief: Wage Change
  - Uncontrolled, Slope: 74.448 (SE 19.885)
  - Controlling for Objective Benchmark, Slope: 73.237 (SE 19.816)
Information Provision Experiment (Pre-registered)

- In GSOEP-IS sample: underpowered experiment (didn’t shift beliefs ⇒ no first stage?)

Results II

- New experiment: online survey of ≈ 3,000 German respondents in full-time employment

- Professional survey companies (Bilendi, Dynata)

- Elicit beliefs about mean wage of observably similar peers
  - Workers of the same gender, age, education, labor market region, 5-digit occupation

- Information treatment: randomly provide 50% of respondents with the objective mean wage of similar worker

- Study effects on
  - beliefs about outside options
  - intended labor market behaviors
Information about the Wages of Workers with Similar Characteristics to You

You have estimated that other people with your characteristics earn 2800 dollars per month.

Based on data from the Federal Employment Agency, we have calculated how much people with your characteristics actually earn per month.

Employees with your characteristics earn an average of 4097 dollars per month.
Information about the Wages of Workers with Similar Characteristics to You

You have estimated that other people with your characteristics earn **2800 dollars** per month.

Based on data from the Federal Employment Agency, we have calculated how much people with your characteristics actually earn per month.

Employees with your characteristics earn an average of **4097 dollars** per month.

![Average Monthly Earnings of People Like You (In Dollars)]
Information Treatment Screen

(a) Treatment Group

Information about the Wages of Workers with Similar Characteristics to You

You have estimated that other people with your characteristics earn **2800 dollars** per month.

Based on data from the Federal Employment Agency, we have calculated how much people with your characteristics actually earn per month.

Employees with your characteristics earn an average of **4097 dollars** per month.

---

(b) Control Group

Your Guess

You have estimated that other people with your characteristics earn **2800 dollars** per month.

![Bar Chart](chart.png)

**Your Estimate vs Your Wage**

- **Your Wage**: 3,100
- **Your Estimate of the Wage of People Like You**: 2,800
Validation Check: The Information Treatment Reduces the Estimation Error About Peer Salary

![Graph showing the relationship between pre-treatment estimation error and post-treatment estimation error for two types of belief updating: full belief updating (slope = 0) and no belief updating (slope = 1). The graph illustrates how the information treatment reduces the estimation error.]
Validation Check: The Information Treatment Reduces the Estimation Error About Peer Salary

Control Slope: 0.893 (SE 0.04)

Full Belief Updating
Slope = 0

No Belief Updating
Slope = 1
Validation Check: The Information Treatment Reduces the Estimation Error About Peer Salary

Post-Treatment Estimation Error (Peer Salary, %)

Pre-Treatment Estimation Error (Peer Salary, %)

Full Belief Updating
Slope = 0

No Belief Updating
Slope = 1

Treatment Slope: .361 (SE .033)
Control Slope: .893 (SE .04)
First Stage: Effects on Outside Option Beliefs

-20 0 20 40
Post-Treatment Belief: Own Wage Change (%)
-50 -30 -10 10 30 50
Pre-Treatment Estimation Error (Peer Salary, %)
First Stage: Effects on Outside Option Beliefs

![Graph showing the relationship between pre-treatment estimation error and post-treatment belief about own wage change. The control slope is 0.045 (SE 0.022).]
First Stage: Effects on Outside Option Beliefs

Post-Treatment Belief: Own Wage Change (%)

Pre-Treatment Estimation Error (Peer Salary, %)

Treatment Slope: -.443 (SE .025)
Control Slope:  .045 (SE .022)

GSOEP Info Treatment
### First Stage

#### Information Experiment: Main Results

<table>
<thead>
<tr>
<th></th>
<th>(1) Post-Treat Estimation Error</th>
<th>(2) Post-Treat Beliefs: Own Wage Change</th>
<th>(3) Intended Quit Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treated \times Pre-Treat Estimation Error</strong></td>
<td>-0.528*** (0.051)</td>
<td>-0.451*** (0.034)</td>
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<tr>
<td><strong>Treated</strong></td>
<td>-1.644 (1.222)</td>
<td>4.199*** (0.732)</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-Treat Estimation Error</strong></td>
<td>0.902*** (0.037)</td>
<td>0.025 (0.022)</td>
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<tr>
<td><strong>Constant</strong></td>
<td>4.120*** (0.917)</td>
<td>4.066*** (0.499)</td>
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<tr>
<td><strong>Mean Dep. Var.</strong></td>
<td>-6.83</td>
<td>3.91</td>
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<td><strong>Nb. obs</strong></td>
<td>3206</td>
<td>3206</td>
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#### IV: Belief: % Wage Change at OO

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<table>
<thead>
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<tr>
<td><strong>Constant</strong></td>
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<td><strong>Control Group Mean</strong></td>
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<tr>
<td><strong>First-Stage F-Stat</strong></td>
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## IV: Effects on Intended Labor Market Behavior: Quit Probability

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<tr>
<td>Treated ( \times ) Pre-Treat Estimation Error</td>
<td>-0.528*** (0.051)</td>
<td>-0.451*** (0.034)</td>
<td>-0.121*** (0.043)</td>
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<tr>
<td>Treated</td>
<td>-1.644 (1.222)</td>
<td>4.199*** (0.732)</td>
<td>1.152 (1.096)</td>
</tr>
<tr>
<td>Pre-Treat Estimation Error</td>
<td>0.902*** (0.037)</td>
<td>0.025 (0.022)</td>
<td>-0.036 (0.032)</td>
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<tr>
<td>Constant</td>
<td>4.120*** (0.917)</td>
<td>4.066*** (0.499)</td>
<td>22.823*** (0.776)</td>
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<td>Mean Dep. Var.</td>
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### IV: Belief: % Wage Change at OO

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<tr>
<td>Constant</td>
<td>0.269*** (0.078)</td>
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<tr>
<td>Control Group Mean</td>
<td>23.055</td>
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<td>First-Stage F-Stat</td>
<td>171.515</td>
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### IV: Effects on Intended Labor Market Behavior

<table>
<thead>
<tr>
<th></th>
<th>(3) Intended Quit Probability</th>
<th>(4) Intended Search Probability</th>
<th>(5) Intended Negotiation Probability</th>
<th>(6) Intended Neg Magnitude (No Neg = 0)</th>
<th>(7) Reservation Wage Cut</th>
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</thead>
<tbody>
<tr>
<td><strong>Treated × Pre-Treat Estimation Error</strong></td>
<td>-0.121*** (0.043)</td>
<td>-0.066 (0.044)</td>
<td>-0.187*** (0.048)</td>
<td>-0.029*** (0.005)</td>
<td>0.036 (0.035)</td>
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<tr>
<td><strong>Treated</strong></td>
<td>1.152 (1.096)</td>
<td>2.499** (1.115)</td>
<td>0.945 (1.295)</td>
<td>0.166 (0.132)</td>
<td>-2.718 (2.014)</td>
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<tr>
<td><strong>Pre-Treat Estimation Error</strong></td>
<td>-0.036 (0.032)</td>
<td>-0.056* (0.030)</td>
<td>0.088** (0.034)</td>
<td>0.007* (0.004)</td>
<td>-0.028 (0.033)</td>
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<td><strong>Constant</strong></td>
<td>22.823*** (0.776)</td>
<td>24.235*** (0.768)</td>
<td>39.134*** (0.923)</td>
<td>6.942*** (0.092)</td>
<td>11.621*** (1.998)</td>
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<td><strong>Mean Dep. Var.</strong></td>
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<td>3,206</td>
<td>3,204</td>
</tr>
<tr>
<td><strong>IV: Belief: % Wage Change at OO</strong></td>
<td>0.269*** (0.078)</td>
<td>0.223*** (0.079)</td>
<td>0.382*** (0.092)</td>
<td>0.059*** (0.010)</td>
<td>-0.176 (0.167)</td>
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<td>21.739*** (0.725)</td>
<td>24.083*** (0.734)</td>
<td>37.261*** (0.856)</td>
<td>6.659*** (0.090)</td>
<td>11.381*** (1.557)</td>
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<td><strong>Control Group Mean</strong></td>
<td>23.055</td>
<td>24.595</td>
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<td><strong>First-Stage F-Stat</strong></td>
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<td>171.515</td>
<td>171.515</td>
<td>170.520</td>
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</tbody>
</table>
Post-Treatment: Personal Outside Option Beliefs vs ML Predictions

Belief: Own Wage Change (%) vs ML Predicted Wage Change (%)

-80 -60 -40 -20 0 20 40

ML Predicted Wage Change (%)
Post-Treatment: Personal Outside Option Beliefs vs ML Predictions

Control Slope: 0.326 (SE 0.017)
Post-Treatment: Personal Outside Option Beliefs vs ML Predictions

- Treatment Slope: 0.626 (SE 0.019)
- Control Slope: 0.326 (SE 0.017)
Equilibrium Consequences of Worker Misperceptions

- Old hypothesis (Robinson, 1933): Workers’ misperceptions may generate employer monopsony, and may help sustain wage markdowns and wage dispersion.

- Simple equilibrium model (adopt and extend product market framework of Salop and Stiglitz, 1977, to labor market and misperceptions (anchoring)):
  - Sophisticated and naive workers: experts and amateurs
  - Firms strategically set wages to maximize profits

- Largely graphical intuitions in slides; full paper has Full Model
Timing

1. $N$ firms enter labor market and post wage $w$
2. Randomly allocate $L$ workers across $N$ firms
3. Workers observe their firm’s wage, choose whether to search (costly) and move to higher (highest) paying firm
   - Share $\alpha$ of **experts**: costless search and accurate beliefs
   - Share $(1 - \alpha)$ of **amateurs**: search costs $c_A$ and anchored beliefs
4. Production and wage payments
Standard Competitive Equilibrium

\[ w^{\ast} \]

\[ w \]

\[ MPL \]

\[ \ell^{\ast} \]

\[ \ell \]
Competitive Firm Size

\[ w \] vs. \[ \ell \]

\[ w^* \]

\[ \ell^* \]

\[ \frac{L}{N} \]

MPL
Low-Wage Firm Size

\[ w = \frac{\ell_i}{L} (1 - \alpha) \frac{L}{N} \]

\[ w^* \]

\[ \ell_i \]

\[ \ell^* \]

\[ \frac{L}{N} \]

\[ \frac{L}{N} \]

MPL
High-Wage Firm Size

\[ w \]

\[ \ell \]

\[ (1 - \alpha) \frac{L}{N} \]

\[ \frac{L}{N} (1 - \alpha + \frac{\alpha}{\beta}) \frac{L}{N} \]

\[ w^* \]

\[ \ell_l \]

\[ \ell^* \]

\[ \ell_h \]
Wages in the High-Wage Sector
Wages in the Low-Wage Sector

\[ w = MPL \]

\[ w = \frac{(1 - \alpha)L}{N} \]

\[ w = \frac{L}{N} (1 - \alpha + \frac{\alpha}{\beta}) \frac{1}{N} \]
Wage Markdowns in the Low-Wage Sector

\[ w = \frac{L}{N} \quad (1 - \alpha) \frac{L}{N} \quad \frac{L}{N} \quad (1 - \alpha + \frac{\alpha}{\beta}) \frac{L}{N} \]

\( w^* \)
\( w_h \)
\( w_l \)
\( \ell_l \)
\( \ell^* \)
\( \ell_h \)
Wage-Setting: Worker Beliefs and Reservation Wages

- Simple setup: amateurs’ priors are weighted avg of current wage and true max wage:

\[
\tilde{w}^{\text{max}} = \gamma \cdot w_j + (1 - \gamma) \cdot w^{\text{max}}
\]  

(1)

- \( \gamma \in [0, 1] \) guides the degree of anchoring

- Since true max wage is the competitive wage \( w^* \), optimal \( w' \) is:

\[
w_l = w^* - \frac{c_A}{1 - \gamma}
\]

(2)

- Higher search costs or stronger anchoring push down \( w_l \)
Effects of Anchoring on Equilibrium

![Graph showing competitive and segmented equilibrium]
Effects of Search Costs on Equilibrium

- Competitive Equilibrium without Anchoring ($\gamma = 0$)
- Segmented Equilibrium with Anchoring ($\gamma = 0.9$)
- Competitive Equilibrium without Anchoring ($\gamma = 0$)
- Segmented Equilibrium without Anchoring ($\gamma = 0$)

Wages vs. Share of Low-wage Jobs

- $w^*$
- $w_h (\gamma = 0)$
- $w_l (\gamma = 0)$
- $S_l (\gamma = 0)$

Search Cost ($c_A$)
Effects of Search Costs on Equilibrium

- Competitive Equilibrium without Anchoring ($\gamma = 0$)
- Segmented Equilibrium with Anchoring ($\gamma = 0.9$)
- Segmented Equilibrium without Anchoring ($\gamma = 0$)
- Competitive Equilibrium without Anchoring ($\gamma = 0$)

Search Cost ($c_A$)

Wages

Share of Low-wage Jobs

Effects of Search Costs, With and Without Anchoring

$w^*$

$S_l (\gamma = 0.9)$

$w_h (\gamma = 0)$

$w_l (\gamma = 0)$

$S_l (\gamma = 0)$

$w_l (\gamma = 0.9)$

$w_h (\gamma = 0.9)$

$S_l (\gamma = 0.9)$

Full Model
Key Feature and Prediction: Misinformed Workers in Low-Wage Firms

\[ w \]

\[ \frac{L}{N} \]

\[ \frac{L}{N} \]

\[ \frac{(1 - \alpha) L}{N} \]

\[ \frac{(1 - \alpha + \frac{\alpha}{\beta}) L}{N} \]

\[ \ell \]

\[ \ell^* \]

\[ \ell_h \]

\[ \ell_l \]

\[ w^* \]

\[ w_h \]

\[ w_l \]
Beliefs vs Coworker Wage Changes by AKM Firm Effect

Beliefs About Coworkers
Beliefs vs Coworker Wage Changes by AKM Firm Effect

Beliefs About Coworkers
Errors (Own Wage Change) by AKM Firm Effect

Slope: 0.385 (SE 0.097), N=342

Beliefs About Coworkers
Errors (Rank in Occupation) by AKM Firm Effect

Estimation Error (Belief - Actual Rank in Occupation)

AKM Firm Effect:
Slope: -40.927 (SE 7.048), N=407
Errors (Median Salary in Occupation) by AKM Firm Effect

Slope: 0.222 (SE 0.078), N=475

Estimation Error
(Belief - Actual Wage in Occupation)

AKM Firm Effect

Slope: 0.222 (SE 0.078), N=475
Recalculate surplus: replace subjective wage component with coworker mover wage change (average in AKM ventile) or ML prediction for wage change, keep non-wage component fixed. 🔗 Full Methodology
Recalculate surplus: replace subjective wage component with coworker mover wage change (average in AKM ventile) or ML prediction for wage change, keep non-wage component fixed.

Full Methodology
Conclusion

1. Do workers accurately perceive wage differences across firms?
   - No: workers underestimate wage differences across firms
   - Workers anchor beliefs about external labor market on current employer

2. How systematic are workers’ biases about outside options with other employers?
   - Workers, especially at low-paying firms, underestimate their outside options.
   - Targeted wage information improves accuracy of workers’ beliefs and leads them to shift their planned behavior

3. What are equilibrium consequences of misperception about outside options?
   - Monopsony and wage markdowns
   - Labor market segmentation with high- and low-wage sector
Worker Beliefs About Outside Options

Simon Jäger
MIT

Christopher Roth
U Cologne

Nina Roussille
LSE

Benjamin Schoefer
UC Berkeley

Columbia
October 2022
Our Paper: Main Results

- Workers have systematic misperceptions about outside options
  - Workers mistakenly believe outside options are similar to current employment conditions (anchoring)
  - Workers, especially at low-paying firms, underestimate their outside options.

- Targeted wage information improves accuracy of workers’ beliefs and leads them to shift their planned behavior

- Analyze equilibrium consequences of worker misperception in very simple labor market model
  
  Adopt and extend product market framework in Salop and Stiglitz (1977) to labor market and allow for misperceptions (anchoring)

  - Key insight: Misperceptions can be source of monopsony, wage markdowns, and labor market segmentation.

  Formalization of Robinson's (1933) insight

  - Evaluate model predictions in the data
Biased Beliefs Among All Subgroups

(a) Tenure

(b) Coworker Turnover

(b) Confidence

Split workers by whether above/below median of heterogeneity variable.


Robinson, Joan, The Economics of Imperfect Competition, Macmillan, 1933.


Appendix
### GSOEP-IS - Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Obs.</th>
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### Main Specification in GSOEP

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<td>(0.033)</td>
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<td>15.070***</td>
<td>22.970***</td>
<td>14.968***</td>
<td>3.336***</td>
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<td>(0.558)</td>
<td>(1.293)</td>
<td>(1.740)</td>
<td>(0.554)</td>
<td>(0.067)</td>
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**Nb. obs**
- Treated: 1,186
- Estimation Error: 1,186
- Constant: 1,167

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
## Expert Survey - Summary Statistics

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</table>
Beliefs About Own Wage Change (Percent)

- Mean: -0.26
- Median: 0.00
- Experts' mean: -0.72
- Experts' median: 0.0

Beliefs: Own Wage Change

Fraction

Back
Beliefs About Own Wage Change (Euros)

Mean: -525.75
Median: 0.00
Persistence of Beliefs (Euros)

Slope: 0.460 (SE 0.042)
Robustness

In July 2021 we fielded a robustness survey which demonstrates robustness of beliefs to:

- **Elicitation format** (change vs. level elicitation)
- Conditioning on **staying in the same occupation**
- Different **time horizons** of search (3 months vs 12 months)
- Different **framing** of reason for separation (general framing vs. layoff)
- **Prediction incentives** for beliefs about median wage in own occupation
- **Elicitation of min pay raise** at another firm to quit, rather than pay cut at current firm

In May 2021, conducted a survey with **German HR managers** to shed light on the firm-sides
Imagine you are forced to leave your current job and had [three months / 12 months] to find a job with another employer [in the same occupation].

In the job with another employer, how much would you receive per month as gross employment income in Euro? ___ Euro

[Reminder: Your current gross monthly income is ___ Euro.]

How confident are you in your previous estimate? (very certain, certain, uncertain, very uncertain)
Robustness to Elicitation Format II: No "Same Pay" Option
Robustness to Occupation-Specific Search

Cumulative Probability

Belief: Own Wage Change

Conditioning on Occupation
Not Conditioning on Occupation

Back to question in main slides
Robustness to Time Horizon of Search

Cumulative Probability vs. Belief: Own Wage Change

- 3 Months to Find a New Job
- 12 Months to Find a New Job
Robustness to Framing of Reason for Separation

Belief: Own Wage Change

General Framing
Firm Closure Framing

Back to question in main slides
Robustness to Prediction Incentives

Elicitation Without Incentive
Elicitation With Incentive

Bias in Beliefs in Euro
Cumulative Probability

Back to question in main slides
Robustness to Reservation Wage Elicitation: Cut vs Raise

Slope: .507 (SE .059), N=1,537

Back to question in main slides
Beliefs Predict Reservation Wage Cuts

- Belief: Wage Change

Uncontrolled, Slope: -27.688 (SE 5.677)

Controlling for Objective Benchmark, Slope: -27.474 (SE 5.646)
Beliefs Predict Intentions to Bargain

Belief: Wage Change

Uncontrolled, Slope: 74.448 (SE 19.885)
Controlling for Objective Benchmark, Slope: 73.237 (SE 19.816)
Beliefs Predict Intended Magnitude of Negotiation

Pay Rise Magnitude (%) vs. Belief: Wage Change

- Uncontrolled, Slope: 19.994 (SE 4.122)
- Controlling for Objective Benchmark, Slope: 20.101 (SE 4.167)
Robustness: No "Same Pay" Option

![Graph showing cumulative probability of belief change for different elicitation methods.]
Robustness: Don’t Condition on Staying in Occupation

Cumulative Probability

Belief: Own Wage Change

Conditioning on Occupation
Not Conditioning on Occupation
Robustness: Vary Time Horizon of Search

Belief: Own Wage Change

Cumulative Probability

-6 -4 -2 0 .2 .4 .6 .8 1

Belief: Own Wage Change

3 Months to Find a New Job
12 Months to Find a New Job
Robustness: Vary Reason for Separation

- General Framing
- Firm Closure Framing

Belief: Own Wage Change

Cumulative Probability

Belief: Own Wage Change

0.2 0.4 0.6 0.8 1.0

Cumulative Probability

-1 -0.8 -0.6 -0.4 -0.2 0.2 0.4 0.6 0.8 1.0

Belief: Own Wage Change
Bayesian Model with Normal Learning

- $N$ firms

- Worker’s prior beliefs about wages are given by
  
  \[
  w_j | \theta \sim N(\theta, 1/\pi) \quad \forall j \tag{3}
  \]
  
  \[
  \theta \sim N(\mu, 1/\tau). \tag{4}
  \]

- Worker employed at firm $j$ observes the wage $w_j$ and updates her beliefs about $\theta$ according to Bayes rule:
  
  \[
  \theta | w_j \sim N\left(\frac{w_j \pi + \mu \tau}{\pi + \tau}, \pi + \tau\right), \tag{5}
  \]

$\Rightarrow$ Posterior belief about $\theta$ will be increasing in the current wage $w_j$ (as long as some uncertainty over $\theta$ and finite variance of wages)
Formation of Worker’s Posterior About Wages at Other firms

We use Bayes’ Rule to write the employed worker’s joint posterior:

\[
    f(w_k, \theta|w_j) = \frac{f(w_j|w_k, \theta)f(w_k|\theta)f(\theta)}{f(w_j)} f(w_j)
\]

\[
    = \frac{f(w_j|\theta)f(w_k|\theta)f(\theta)}{f(w_j)} \quad | \text{by cond. ind.}
\]

The marginal posterior for \( \theta \) is given by integrating over the wage \( w_k \):

\[
    f(\theta|w_j) \propto \int f(w_j|\theta)f(w_k|\theta)f(\theta)dw_k \\
    = f(w_j|\theta)f(\theta) \\
    = \phi(\theta; w_j, \pi)\phi(\theta; \mu, \tau) \quad | \text{by sym. of Normal distr.}
\]

Utilizing product characteristics of normal distributions, gives:

\[
    \theta|w_j \sim N\left(\frac{w_j\pi + \mu\tau}{\pi + \tau}, \pi + \tau\right)
\]
Empirical Bayes Methodology

• Firm $j$'s mean coworker wage change $\hat{\Delta}_j$ is the firm's "true" leaver wage change parameter $\Delta_j$ plus random error:

$$
\hat{\Delta}_j = \Delta_j + \epsilon_j
$$

$$
\hat{\Delta}_j \mid \Delta_j, \sigma_j^2 \sim N(\Delta_j, \sigma_j^2)
$$

• Suppose we know underlying distribution of leaver wage change parameters:

$$
\Delta_j \sim N(\bar{\Delta}, \sigma^2)
$$

• Idea: shrink $\Delta_j$ towards $\bar{\Delta}$ to reduce influence of $\epsilon_j$ on regression results

---

1Reference: Chandra, Finkelstein, Sacarny, and Syverson (2016), "ebayes.ado" by Adam Sacarny
Empirical Bayes Methodology

- Posterior distribution of $\Delta_j$ given observed mean $\hat{\Delta}_j$ and population parameters $\bar{\Delta}, \sigma^2$ is:

$$\Delta_j | \hat{\Delta}_j, \bar{\Delta}, \sigma^2 \sim N(\Delta_j^{EB}, \sigma_j^2 (1 - b_j))$$ (15)

where:

$$b_j = \sigma_j^2 / (\sigma_j^2 + \sigma^2)$$ (16)

$$\Delta_j^{EB} = (1 - b_j)\hat{\Delta}_j + b_j\bar{\Delta}$$ (17)

- $\Delta_j^{EB}$ is the posterior expected value of $\Delta_j$, and is a weighted average of the observed mean and true population mean, weighted by relative variances of observed mean and population distribution.
Empirical Bayes Methodology³

- How to estimate $\Delta_{j}^{EB}$?

- Estimate $\sigma_{j}^{2}$ using within-firm variance of mover wage changes (requires restricting to firms with $\geq 2$ movers)

- Estimate $\bar{\Delta}$ and $\sigma^{2}$ using an iterative procedure on population distribution of $\hat{\Delta}$

- Details in Appendix C of Chandra, Finkelstein, Sacarny, and Syverson (2016)

³Reference: Chandra, Finkelstein, Sacarny, and Syverson (2016), "ebayes.ado" by Adam Sacarny
Lasso Methodology I

- Take universe of transitions between main employment spells, involving an intermediate unemployment spell, in Germany between 2015 and 2019 (excluding GSOEP respondents)

- Lasso regression
  - Dependent variable: log wage change associated with transition
  - Independent variables: worker and origin-firm covariates

- Use selected variables and estimated coefficients to generate predicted wage changes for GSOEP respondents
Lasso Methodology II

Included covariates, in descending order of partial R-squared values:

- Wage at initial firm
- Age $\times$ education dummies
- Occupation (1-digit) at initial firm
- Industry $\times$ region dummies
- Gender
- Initial firm’s AKM effect
- Age, tenure, education, and firm size, turnover, employment growth, wage dispersion, region, industry

No covariates end up excluded
Subjective Outside Options: Median Coworker Wage Change

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Split-Sample IV Slope: 0.129 (SE 0.075)

Unadjusted Slope: 0.024 (SE 0.014)
Subjective Outside Options: Different Time Horizon

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.102 (SE 0.073)
Split-Sample IV Slope: 0.220 (SE 0.208)
Unadjusted Slope: 0.021 (SE 0.016)
20+ Coworker Moves (Own Wage Change)

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.025 (SE 0.051)

Split-Sample IV Slope: 0.029 (SE 0.038)

Unadjusted Slope: 0.009 (SE 0.029)
20+ Coworker Moves (Coworker Wage Change)

Belief: Coworker Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.100 (SE 0.057)
Split-Sample IV Slope: 0.071 (SE 0.042)
Unadjusted Slope: 0.062 (SE 0.037)
Excluding "Same Wage" Responses (Own Wage Change)

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.143 (SE 0.084)

Split-Sample IV Slope: 0.160 (SE 0.082)

Unadjusted Slope: 0.055 (SE 0.038)
Excluding "Same Wage" Responses (Own Wage Change)

Belief: Own Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.143 (SE 0.084)
Split-Sample IV Slope: 0.160 (SE 0.082)
Unadjusted Slope: 0.055 (SE 0.038)
Excluding "Same Wage" Responses (Mover Wage Change)

Belief: Coworker Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.138 (SE 0.057)
Split-Sample IV Slope: 0.125 (SE 0.056)
Unadjusted Slope: 0.057 (SE 0.026)
Own Wage Change Question

Imagine that you were forced to leave your current job and that you had 3 months to find a job at another employer in the same occupation. Do you think that you would find a job that would offer you a higher overall pay, the same pay or a lower pay?

- Higher pay
- Same pay
- Lower pay

[Asked only if previous answer is not "Same pay"] What do you think: how much more/less would you earn in that new job?

- Between 0 and 50 Euros
- Between 50 and 100 Euros
- Between 100 and 200 Euros
- ... 
- Between 2000 and 3000 Euros
- More than 3000 Euros
(a) Same Age

Empirical Bayes Slope: 0.176 (SE 0.074)
Split-Sample IV Slope: 0.096 (SE 0.102)
Unadjusted Slope: 0.036 (SE 0.032)

(b) Same Income

Empirical Bayes Slope: 0.263 (SE 0.059)
Split-Sample IV Slope: 0.353 (SE 0.108)
Unadjusted Slope: 0.062 (SE 0.025)
Involunt. Move Wage Changes By AKM Firm Effect (Beliefs and Data)

- Wage Change Own (Belief) vs. Coworkers (Data)
  - AKM Firm Effect
    - Belief, Slope: -0.142 (SE 0.031)
    - Data, Slope: -0.477 (SE 0.100)
Beliefs About Coworkers: Median Coworker Wage Change

Split-Sample IV Slope: 0.122 (SE 0.041)
Unadjusted Slope: 0.084 (SE 0.018)
Beliefs About Coworkers: Different Time Horizon (2017-2019)

Belief: Coworker Wage Change

Objective Benchmark: Mover Wage Changes

Empirical Bayes Slope: 0.144 (SE 0.049)
Split-Sample IV Slope: 0.059 (SE 0.058)
Unadjusted Slope: 0.039 (SE 0.018)
Own Wage Rank Question

Think of all employees in Germany that work in the same occupation as you, but work at a different employer. What do you think: what percent of those employees receive a...

- Lower pay _ %
- Same pay _ %
- Higher pay _ %

(Please note: these numbers need to add up to 100%)
Median Salary Question

- Think of all employees in Germany that are full-time employed and work in the same occupation as you. What do you think is the typical monthly pay of those employees before taxes (in Euro)?

- Here, we refer to the "typical" monthly earnings as the median monthly earnings, i.e. the earnings that the average full-time employee earns in their job, so that half of the full-time employees earn more in their job and the other half less than this earnings in the occupation according to the 2010 occupation classification.
Beliefs vs Actual Coworker Wage Changes by AKM Firm Effect

- Slope: -.271 (SE .066)

Data, Wage Change of Movers (Belief and Data)
Beliefs vs Actual Coworker Wage Changes by AKM Firm Effect

Data, Slope: -.271 (SE .066)
Belief, Slope: -.105 (SE .034)
Errors (Coworker Wage Change) by AKM Firm Effect

Slope: 0.260 (SE 0.060), N=547

Estimation Error
(Belief - Actual Coworker Wage Change)
Survey Measure of Worker Surplus

- Definition: the worker surplus is the percent wage cut that makes the worker indifferent between her current firm and her second best option.

- Measure Worker Rent $c^*_i$ as follows:

  Imagine that your current employer were to permanently cut wages. This wage cut results from a change of the CEO in the company and is independent of the economic conditions in your industry. At which wage cut would you quit your job within one year?

  *I would quit my job if my current employer cut wages by more than $c^*_i$.*

Cf. Mui and Schoefer (2021) reservation wage change to/from nonemployment
Intentions on Mover Wage Changes

(a) Reservation Wage Cut
(b) Search for New Job
(b) Negotiate for Higher Pay
Worker Surplus (Euros)

- Mean: 6068.52
- Median: 3840.00

Fraction

0.1
0.2
0.3
0.4

Worker Rent (in Euro, per Year)

- Mean: 6068.52
- Median: 3840.00

Worker Rent (in Euro, per Year)
Persistence of Worker Surplus

Worker Surplus in 2020 (Flow, as % of Salary) vs Worker Surplus in 2019 (Flow, as % of Salary)

Slope: 0.3590 (0.0545)
Worker Surplus Predict Lower Actual Separations

Switched employer over the last 12 months

Worker Rent (Flow, as % of Salary)

slope: -0.0014 (0.0006)
Reasons for Not Switching Employers

- Job Security
- Atmosphere
- Schedule
- Colleagues
- Location
- Dislike Change
- Obligation
- Fear New Job
- Difficulty to Find New Job
- Other Reasons
Coworker Wage Change Question

Think of the typical employee with work experience that switches from your current employer to another employer. Would this employee receive a lower, higher or the same pay compared to his previous employer?

• Higher pay
• Same pay
• Lower pay

[Asked only if previous answer is not “Same pay”] How much lower/higher would the monthly pay before taxes of this employee be (in percent) after the switch compared to his/her prior employer?

• Between 0% and 2%
• Between 2% and 5%
• Between 5% and 10%
• ... 
• Between 50% and 75%
• More than 75%
Setting

- $N$ firms, each initially endowed with $\frac{L}{N}$ workers
- Produce a homogeneous good with DRS production function:
  \[ f(\ell) = \ell^\eta \quad (\eta \in (0, 1]) \]
- Normal competitive equilibrium:
  - Wages equal MPL
    \[ w^* = \eta \left( \frac{L}{N} \right)^{\eta-1} \quad (18) \]
    - Firms earn positive profits (no free entry)
Timing

1. Firms enter labor market endowed with their workers, post a wage

2. Workers learn their firm’s wage, choose whether to search (costly) and move to higher (highest) paying firm

   - Share $\alpha$ of experts: costless search and accurate beliefs
   - Share $(1 - \alpha)$ of amateurs: search costs $c_A$ and anchored prior beliefs

3. Production occurs
Wage-Setting: Temptation to Deviate?

- Suppose a competitive equilibrium.

- A firm has two options:
  - Pay competitive wage $w^*$, retain all workers, earn profits:
    \[
    \pi_j = \left( \frac{L}{N} \right)^\eta - w^* \frac{L}{N}
    \] (19)
  - Deviate: pay lower wage $w' < w^*$, retain only amateurs, earn profits:
    \[
    \pi_j = \left( (1 - \alpha) \frac{L}{N} \right)^\eta - w'(1 - \alpha) \frac{L}{N}
    \] (20)

- Tradeoff: paying lower wage leads to
  - $\pi \uparrow$ due to reduced wages ($w' < w^*$)
  - $\pi \downarrow$ due to reduced scale ($1 - \alpha$)
Wage-Setting: Reservation Wages

• What is the optimal choice of lower wage $w'$, conditional on deviating from competitive wage?

• Optimal $w'$ is the lowest wage that still retains amateur workers

• Amateurs search (and hence leave) if perceived benefits of search exceed costs:

$$\tilde{w}^\text{max}(w_j, w_{-j}) - w_j > c_A$$

⇒ Optimal $w' = w_l$ pushes amateur workers to reservation wage:

$$\tilde{w}^\text{max}(w_l, w_{-j}) - w_l = c_A$$
Wage-Setting: Worker Beliefs and Reservation Wages

- Simple setup: amateurs’ priors are weighted avg of current wage and true max wage:
  \[ \tilde{w}^{\text{max}} = \gamma \cdot w_j + (1 - \gamma) \cdot w^{\text{max}} \]  
  \[ \text{(23)} \]
  \[ \gamma \in [0, 1] \] guides the degree of anchoring

- Since true max wage is the competitive wage \( w^* \), optimal \( w' \) is:
  \[ w_l = w^* - \frac{c_A}{1 - \gamma} \]  
  \[ \text{(24)} \]

- Higher search costs or stronger anchoring push down \( w_l \)
Solving for the Equilibrium

• Profits in the competitive equilibrium:

\[ \pi^{\text{competitive}} = \left( \frac{L}{N} \right)^\eta - \eta \left( \frac{L}{N} \right)^\eta \]  

(25)

• Profits when deviating:

\[ \pi^{\text{deviating}} = \left( (1 - \alpha) \frac{L}{N} \right)^\eta - \left( \eta \left( \frac{L}{N} \right)^{\eta - 1} - \frac{c_A}{1 - \gamma} \right) (1 - \alpha) \frac{L}{N} \]  

(26)
Equilibrium Consequences of Worker Misperceptions

- Presence of amateur workers with anchored beliefs can lead to shift from competitive equilibrium to segmented labor market with high- and low-wage sector
  - Search costs and anchoring amplify each other
- Comparative statics: more anchoring leads to
  - Lower wages in low-wage sector
  - Larger low-wage sector
First Possibility: Competitive (One-Wage) Equilibrium

- If $\pi^{\text{competitive}} > \pi^{\text{deviating}}$, deviating is unprofitable and we get a normal competitive-wage equilibrium.

- This occurs if:

$$\frac{c_A}{1 - \gamma} < \frac{1 - \alpha \eta - (1 - \alpha)^\eta}{1 - \alpha} \left(\frac{N}{L}\right)^{1-\eta}$$  \hspace{1cm} (27)

- i.e., if search costs $c_A$ are low, anchoring $\gamma$ is weak, or the share of experts $\alpha$ is high.
Second Possibility: Segmented Equilibrium

- Either competitive equilibrium or a segmented, two-wage equilibrium

- If $\pi^{\text{competitive}} < \pi^{\text{deviating}}$, some firms deviate and pay low wage $w_l$

- Deviating firms increase their profits (by assumption)

- Non-deviating pay high wage $w_h$, and firms absorb the experts from deviating firms, increasing their size and hence their profits

- Deviations continue until profits in deviating and non-deviating firms are equal:

$$
\left( (1 - \alpha) \frac{L}{N} \right)^\eta - w_l (1 - \alpha) \frac{L}{N} = \left( \left( 1 - \alpha + \frac{\alpha}{\beta} \right) \frac{L}{N} \right)^\eta - w_h \left( 1 - \alpha + \frac{\alpha}{\beta} \right) \frac{L}{N}
$$

(28)

where $\beta$ is the share of high-wage (non-deviating) firms
Employment Levels in the Segmented Equilibrium

- High-wage sector employs all experts and all "lucky" amateurs
- High-wage firms are large:
  \[ \ell_h = \left(1 - \alpha + \frac{\alpha}{\beta}\right) \frac{L}{N} \]  
  \[ (29) \]
- Low-wage sector employers all "unlucky" amateurs
- Low-wage firms are small:
  \[ \ell_l = (1 - \alpha) \frac{L}{N} \]  
  \[ (30) \]
- Turnover in the low-wage sector is higher (experts leave low-wage firms), consistent with reality
Wage Levels in the Segmented Equilibrium

• High-wage firms pay wages equal to MPL at $\ell_h$

\[ w_h = \eta \left( \left( 1 - \alpha + \frac{\alpha}{\beta} \right) \frac{L}{N} \right)^{\eta - 1} \]  

(31)

• Low-wage firms pay the reservation wage preventing amateurs from searching

\[ w_l = w_h - \frac{c_A}{1 - \gamma} \]  

(32)
The Size of the Low-Wage Sector

- Low-wage sector employs all amateurs born into low-wage firms

⇒ # of workers in low-wage sector depends on share of firms, $1 - \beta$, that are low-wage, and share of workers, $1 - \alpha$, that are amateurs

- $\beta$ pinned down by equal-profit condition

$$
\left( (1 - \alpha) \frac{L}{N} \right)^\eta - w_l (1 - \alpha) \frac{L}{N} = \left( \left( 1 - \alpha + \frac{\alpha}{\beta} \right) \frac{L}{N} \right)^\eta - w_h \left( 1 - \alpha + \frac{\alpha}{\beta} \right) \frac{L}{N}
$$

- Non-deviant profits
- Deviant profits

- Given $\beta$, share of jobs that are low-wage is

$$
S_l = \frac{1 - \beta}{\alpha/(1 - \alpha) + \beta}
$$
Share of Nonviable Jobs if Workers Had Correct Beliefs

• How consequential are these misperceptions?

• Back-of-the-envelope calculation: calculate share of jobs that would not be viable if workers had accurate beliefs
Share of Nonviable Jobs with Corrected Beliefs

- How many jobs would not be viable at current wages if workers had correct beliefs?

- Draw on survey measure of subjective overall worker surplus:
  
  Imagine that your current employer permanently cut wages. This wage cut results from a change of the CEO in the company and is independent of the economic conditions in your industry. At which wage cut would you quit your job within one year?

  I would quit my job if my current employer cut wages by more than X%.

- Decompose overall subjective surplus into subjective wage component and nonwage component:

  $\tilde{S}_i = \tilde{W}_i + \tilde{A}_i$

  - Worker Surplus
  - Wage Component from OO Question
  - Residual "Amenity" Component
Subjective Worker Surplus (Flow, as % of Salary)

Mean: 14.23
Median: 10.00

Subjective Worker Surplus

Mean: 14.23
Median: 10.00

Fraction

0.0
0.2
0.4
0.6
0.8
1

0.0
0.1
0.2
0.3
0.4
0.5

Survey Question
Persistence
Predicts Separations
Share of Nonviable Jobs with Corrected Beliefs

- Decompose overall subjective surplus into nonwage component and subjective wage component:
  \[
  \tilde{S}_i = \tilde{W}_i + \tilde{A}_i.
  \]
  - Worker Surplus
  - Wage Component from OO Question
  - Residual "Amenity" Component

- Calculate corrected surplus by replacing subjective wage component with objective OO proxy:
  \[
  S_i = \tilde{S}_i + \left( \tilde{W}_i - \tilde{W}_i \right)
  \]
  - Worker Surplus: Corrected
  - Worker Surplus: Belief
  - Wage Change: Objective Benchmark
  - Wage Change: Belief

- OO proxy: mean coworker wage change in AKM ventile, or machine learning prediction
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<td>1.925**</td>
<td>2.515</td>
<td>0.333</td>
<td>-1.906*</td>
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<td>(0.858)</td>
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<td>(2.860)</td>
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<td>(0.114)</td>
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<td><strong>Treated × Overestimate</strong></td>
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<td>-0.288</td>
<td>-3.984</td>
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Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
## Average Treatment Effect by Under- and Overestimators

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### Control for Pre-Treatment Belief

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