

WORKER BELIEFS ABOUT OUTSIDE OPTIONS*

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Abstract

Standard labor market models assume that workers hold accurate beliefs about the external wage distribution, and hence their outside options with other employers. We test this assumption by comparing German workers' beliefs about outside options with objective benchmarks. First, we find that workers wrongly anchor their beliefs about outside options on their current wage: workers that would experience a 10% wage change if switching to their outside option only expect a 1% change. Second, workers in low-paying firms underestimate wages elsewhere. Third, in response to information about the wages of similar workers, respondents correct their beliefs about their outside options and change their job search and wage negotiation intentions. Finally, we analyze the consequences of anchoring in a simple equilibrium model. In the model, anchored beliefs keep overly pessimistic workers stuck in low-wage jobs, which gives rise to monopsony power and labor market segmentation.

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I. Introduction

Firms differ substantially in the wages they pay to similar workers (Slichter 1950; Abowd, Kramarz, and Margolis 1999; Card, Heining, and Kline 2013). In the tradition of Stigler (1961), standard models of the labor market assume that workers have accurate beliefs about the differences in wages across firms (including in bargaining and wage posting models with search, as in Burdett and Mortensen 1998; Mortensen and Pissarides 1999; Cahuc, Postel-Vinay, and Robin 2006; Manning 2011; Hornstein, Krusell, and Violante 2011). While this fundamental assumption remains untested, its violation—in the form of worker misperceptions about the wage distribution—could lead to worker misallocation and act as a source of monopsony power (Robinson 1933).

In this paper, we assess the accuracy of workers’ beliefs about their outside options and explore consequences of potential misperceptions. To do so, we conduct a representative survey embedded in the German Socio-Economic Panel (SOEP), which asks each employed respondent about wages in the external labor market and the expected wage change that would accompany a switch to their next-best employer—their outside option. We compare these beliefs with proxies for actual outside options, which we construct using administrative matched employer-employee data.¹ Our main benchmark draws on realized wage changes of respondents’ coworkers who involuntarily left their firm.² To approximate involuntary moves, we draw on employer switches with at least a brief unemployment spell. We use several methods to address measurement error and to isolate factors common to a firm’s workforce. Our benchmark specification uses an Empirical Bayes shrinkage procedure of coworker wage changes, and we also provide robustness checks with split-sample IV measurement error correction. As a complement to the coworker-based benchmark, we employ a machine-learning prediction trained on all involuntary separations in the administrative data to construct a benchmark that uses a richer set of predictors than the respondent’s current firm.

In a stark rejection of the assumption of accurate beliefs, workers appear to *anchor* their beliefs about wages with other employers on their current wage: workers believe their outside option is much closer to their current wage than it actually is. Workers’ expectations for their own wage change are tightly com-

¹ Identifying workers’ outside options is notoriously challenging. See Lachowska (2016), Caldwell and Harmon (2019), Caldwell and Danieli (2022), Jäger et al. (2020), Schubert, Stansbury, and Taska (2023), Di Addario et al. (2022), and Jäger, Schoefer, and Zweimüller (2023) for recent research on the impact of outside options on wages.

² The coworker-based benchmark builds on the evidence for substantial between-firm wage differentials (see, e.g., Card et al. 2018; Bonhomme et al. 2023, for overviews of the literature), as well as the large and heterogeneous (across firms) wage effects of job loss (Jacobson, LaLonde, and Sullivan 1993; Schmieder, Wachter, and Heining 2023; Lachowska, Mas, and Woodbury 2020).

pressed around zero—even for workers in firms where coworkers systematically experience large wage changes upon leaving. We estimate a slope of 0.107 (SE 0.040) between predicted own wage changes and actual coworker wage changes. Similarly, we find slopes around 0.1 with the machine learning benchmark, and a series of robustness checks. Anchoring also emerges with narrower definitions of coworker wage changes, for instance, focusing on coworkers with the same occupation or education level.

This slope between beliefs and actual outside options is far from the benchmark slope of one for accurate beliefs. It is closer to zero, as would emerge if workers’ beliefs were anchored on their current wages and unresponsive to actual outside options. In line with anchoring, we also find that respondents anchor beliefs about wage changes of coworkers who move out of the firm and the external wage distribution in their occupation, both of which we can directly compare to their empirical counterparts in the administrative data. Overall, our results are consistent with a model in which workers hold incorrect and imprecise beliefs about the statistical properties of the external wage distribution, and strongly rely on their current wage as a signal for their outside option.

These findings raise the possibility that workers’ misperceptions may affect the allocation of workers to firms, and specifically keep some workers in low-wage firms that would, if given correct information, search and leave their employer. Indeed, we find that workers in low-wage firms (as proxied by [Abowd, Kramarz, and Margolis 1999](#), (AKM) firm fixed effects) are too pessimistic about the labor market; for example, workers at the 24th percentile of the firm AKM effect distribution, underestimate their outside option by about 10ppt. Similar patterns emerge for the external wage distribution: workers in low-wage firms underestimate the wage changes of coworkers moving to other firms, and the median wage in their occupation, and overestimate their rank in their occupation’s wage distribution. These patterns could plausibly be caused by misperceptions of outside options as worker beliefs are correlated with intended search and bargaining behavior.

To causally identify the anchoring mechanism and explore its effects on labor market behavior, we implement an online information experiment in Germany. We provide a random subset of respondents with information about the average wage of workers with similar characteristics in the same labor market. We find that treated workers use this information to correct not only their beliefs about the wages of similar workers, but also their beliefs about their own outside options. We then document that this updating of beliefs causes them to adjust their job search and wage negotiation intentions. A 10ppt increase in beliefs about the wage at the outside option raises the probability of quitting the current job by 2.6ppt (SE 0.87).

This estimate suggests that correcting the misperceptions of workers at the 24th percentile of the AKM firm effect distribution would cause about 2.6ppt—or 11%—increase in quits out of those firms. We caution that this experiment implements a light-touch treatment and studies effects on planned behaviors declared at the end of the online survey. While our experiment thus leaves the question of longer-term effects to future research, the causal effects of the information treatment do point to misperceptions as a source of labor market imperfections.

To explore aggregate consequences of anchoring, we build a simple equilibrium model of the labor market that is consistent with our empirical findings. In the model, one worker type holds accurate beliefs. The other type exhibits anchoring: that worker type holds imprecise beliefs about the wage distribution, and hence uses wages of current employers to form beliefs about outside options—and to decide whether to search. Workers with anchored beliefs therefore stay put in low-wage firms because they underestimate their outside options. Firms anticipate and can exploit these misperceptions. Anchoring acts as a source of labor market imperfections that the model would otherwise rationalize through standard search costs: anchoring can lead to unraveling of the competitive, single-wage equilibrium and give rise to a segmented labor market equilibrium with a high- and a low-wage sector. But it generates those patterns through an informational mechanism uniquely consistent with our empirical evidence and distinct from standard switching costs: workers who underestimate their outside options are concentrated in the low-wage sector, and would update beliefs and switching behavior when correcting their beliefs.

Several pieces of evidence in the literature on worker beliefs are consistent with imperfect knowledge about outside options and anchoring on current wages. First, unemployed job seekers set their reservation wages close to their own pre-job-loss wage ([Feldstein and Poterba 1984](#); [Krueger and Mueller 2016](#); [Le Barbanchon, Rathelot, and Roulet 2019](#)), hold wrong beliefs about the expected duration of unemployment ([Spinnewijn 2015](#); [Mueller, Spinnewijn, and Topa 2021](#); [Mueller and Spinnewijn 2023](#)), update their expectations about job offers when receiving offers ([Conlon et al. 2018](#)), and broaden their search horizon when informed about alternative occupations ([Belot, Kircher, and Muller 2019](#)). Second, workers appear to be imperfectly informed about the wage distribution within their own firm ([Card et al. 2012](#); [Cullen and Perez-Truglia 2022](#); [Cullen and Perez-Truglia 2023](#); [Hvidberg, Kreiner, and Stantcheva 2023](#)) or sector ([Hvidberg, Kreiner, and Stantcheva 2023](#)). Third, our findings are consistent with Reynolds’s qualitative survey of about 1,000 manual workers in New Haven between 1946 and 1948, which documented that “very few [workers] knew [...] how much they could expect to earn per week [at other plants], or what the nonwage

conditions of employment were like” (p. 84). Relative to the existing literature, our main contributions lie in directly measuring beliefs about outside options, in comparing these beliefs with objective benchmarks to document anchoring, in demonstrating that information about the external wage distribution changes workers’ labor market beliefs and intended behavior, and in theoretically and empirically exploring equilibrium implications of anchoring.

[Section II](#) compares beliefs about outside options to objective benchmarks and documents anchoring. [Section III](#) provides correlational evidence on the labor market consequences of anchoring. [Section IV](#) presents the information experiment. [Section V](#) sketches a simple equilibrium model with anchoring. [Section VI](#) concludes.

II. Anchored Beliefs About Outside Options: Descriptive Evidence

In this section, we compare workers’ beliefs about their outside options to proxies for their actual outside options. Workers appear to anchor their beliefs about their outside option on their current jobs’ wages, potentially using it as a signal about the external labor market. We document the associated misperceptions for a variety of measures.

II.A. Research Design and Hypotheses

Our goal is to assess the accuracy of workers’ beliefs about the wage they would earn if forced to move to their outside option. Conceptually, we define an outside option as the job a worker would expect to obtain if their current job were to disappear. For instance, in a [McCall \(1970\)](#) search model, the wage at the outside option would correspond to the expected wage arising from jobs above the reservation wage. In a frictionless model with heterogeneity in non-wage amenities of a job (e.g., [Rosen 1986](#); [Card et al. 2018](#); [Berger, Herkenhoff, and Mongey 2022](#); [Lamadon, Mogstad, and Setzler 2022](#)), the outside option would correspond to the second-best option in the worker’s choice set. Hence, wages at the outside option can be larger or smaller than the worker’s current wage.

Throughout the paper, we cast the object of interest as the wage *change* (in percent) the worker would expect if forced to switch to the outside option.

[Figure I](#) illustrates our research design. The x-axis represents the objective wage change if forced to switch to the outside option, whereas the y-axis represents the subjective wage change, i.e., workers’ beliefs.

Accurate Beliefs The canonical benchmark of accurate beliefs about outside options would manifest itself as observations on the 45-degree line in [Figure I](#). Virtually all search and matching models implicitly assume this accuracy benchmark (see, e.g., [Burdett and Mortensen 1998](#); [Mortensen and Pissarides 1999](#)).

Over- or Under-Estimation Deviations from the accuracy benchmark can take two forms. Observations above the 45-degree line correspond to *overestimation*, i.e., workers expect an unrealistically large wage gain. Conversely, observations below the 45-degree line would imply that workers *underestimate* wages elsewhere. For example, if workers systematically and homogeneously underestimate their outside options, observations will trace out a line parallel to but below the full accuracy benchmark, sharing a slope of one.

Anchoring We highlight a specific violation of the benchmark of accurate beliefs that we dub *anchoring*: workers believe their outside option pays a wage closer to their current wage than it actually does, i.e., they *anchor* their belief about their outside option on the current wage. Anchoring would manifest itself as a rotation of the perfect accuracy benchmark around the origin, with slopes closer to zero indicating stronger anchoring.

Potential Sources of Anchoring We refer to anchoring simply to describe beliefs that are, on average, too close to the current wage rather than to describe a specific belief formation process. Such anchoring can arise from a variety of mechanisms. First, it can reflect Bayesian updating. The context would be imperfectly precise information about the statistical properties of the wage distribution. [Online Appendix C](#) presents such a model, where workers do not know the mean of the (normally distributed) wage distribution and use the current wage as a signal about this mean. This model predicts a slope weakly below one, given by the subjective precision of the signal about the mean wage relative to the prior. Second, anchoring could also arise with non-Bayesian belief formation, for example anchoring in the sense of [Tversky and Kahneman \(1973\)](#). Anchoring would also arise in models of assortativity or selection neglect with individuals forming beliefs (e.g., about the external labor market) based on what they observe (e.g., their own wage) without accounting for selection in what they observe ([Enke 2020](#); [Frick, Iijima, and Ishii 2022](#)). Third, anchoring could also reflect sorting, e.g., of underestimators into low-wage firms.

II.B. Data: The German Socio-Economic Panel (SOEP) Merged to Matched Employer-Employee Data (IAB)

SOEP Innovation Sample To elicit beliefs about outside options and the wage distribution, we included a custom survey in the Innovation Sample of the German Socio-Economic Panel (SOEP-IS) in 2019 and 2020 (although our main analyses will only draw on 2019 data). The SOEP-IS is a longitudinal study that surveys a representative sample of the German population on a wide range of topics once a year. The sample design and core fieldwork are identical to that of the SOEP-Core samples (see Richter and Schupp, 2015, Zweck and Glemser, 2020, and Zweck and Rathje, 2021, for details on sampling methods). Our questionnaire was fielded in the samples I1/IE, I2 and I5, and its members had been part of the panel since 2009/2012, 2012, and 2016, respectively.

The SOEP is a probability-based sample with high representativeness and response rates through multi-month recontact strategies. For our questionnaire, face-to-face interviews were conducted in private with each member of a household by trained interviewers (and about 30% of interviews in the 2020 wave were conducted over the phone; [Zweck and Rathje 2021](#)). The face-to-face nature of the interviews results in higher quality of responses by allowing for clarifying questions, and decreasing non-response rates. Our module took on average 5 minutes. The full questionnaire is in [Online Appendix G.1](#) (English translation) and [Online Appendix G.2](#) (original German version).

Administrative Data on Objective Outside Option To construct objective benchmarks for workers' outside options, we rely on administrative matched employer-employee data. Our paper is part of a project linking SOEP data and individual-level administrative labor market data from the Institute for Employment Research (IAB) from 1975 to 2019, containing rich information on earnings, occupations and several other characteristics of all workers at an establishment. As part of the 2018 wave, SOEP respondents were asked for consent to link their SOEP data with IAB data. The linkage procedure used respondents' names, gender, date of birth, and address (see [Antoni, Beckmannshagen, and Grabka 2023](#), for a detailed description). The match rate among consenters was 87.2%, leaving 558 individuals in our matched sample. We use the IAB data to construct proxies for outside options for the SOEP respondents, using wage changes of coworker movers and predictions based on a machine learning procedure, as well as the respondent's actual rank in the occupational wage distribution. We describe these outside option proxies below. We also draw on AKM firm effects to characterize heterogeneity between employers.

Analysis Sample Our sample condition is full-time or part-time employment. Due to availability of the administrative data (which ends in 2019) and the potential shocks to outside options induced by the COVID-19 pandemic, we restrict our analyses to using data from 2019 only (except for measuring the persistence of beliefs about outside options and the external labor market, which also draws on 2020 data). We winsorize all unbounded continuous variables at 2%. [Table I](#) describes the main analysis sample.

II.C. Beliefs about Outside Options

Beliefs About Own Wage Changes Following Involuntary Separation Our main question elicited employed respondents’ expected wage change if forced to switch out of their current job:

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?

For respondents who did not choose “Same pay,” we elicited the size of the expected increase/decrease.³ We then construct the belief about the wage change as the belief about the outside option wage level in logs (own wage plus wage change) minus the log of the own wage (since the benchmarks will be estimated in log differences).

Our baseline formulation results from consultation and iteration with the survey provider and recognizes several real-world features of the empirical setting (job search, mandatory advance notice; we also relax the occupation restriction).

Validation and Measurement Error We validate the belief measure and investigate and address measurement error in several ways. First, our main specification uses beliefs as an outcome variable, so that classical measurement error therein does not lead to attenuation bias. Second, [Online Appendix Figure B.3](#) illustrates that there is significant within-respondent persistence in belief about their outside option, both in the short run within a survey (a slope of 0.980 (SE 0.017)) as well as in the medium run (across one year, using repeat respondents across the SOEP waves, with a slope of 0.290 (SE 0.028)). (This short-run statistic comes from an additional survey we present in [Section IV](#) as part of the information experiment, and draws on the control group observations.) The absence of perfect persistence over a year may reflect

³ The brackets (in EUR) our respondents could choose from are given as follows: [0-50; 50-100; 100-200; 200-300; 300-400; 400-500; 500-750; 750-1000; 1000-1500; 1500-2000; 2000-3000; >3000]. We define the wage change in EUR that the respondent expects to experience at her outside option as the mid-point of each bracket (e.g., 25 for the [0-50] bracket) and 3500 for the >3000 bracket.

aggregate (e.g., pandemic) or idiosyncratic shifts in outside options, or transitory measurement error in the variables. Third, the beliefs variables strongly correlate with questions on intended labor market behavior in the expected direction (see [Section III.A](#) for the full discussion). Fourth, to account for framing effects, we compare distributions from different elicitations and find that they are similar across many alternative question wordings (see [Online Appendix E.2](#) for a detailed exposition of these robustness tests).⁴

Summary Statistics [Figure II](#) reports the summary statistics of our main outcome variable: the difference between a worker’s current wage and their expected wage if they were forced to leave their job (i.e., the wage at their outside option), divided by their current wage. The median (mean) wage difference at the subjective outside option is 0% (-1.2%). The distribution is symmetric around zero, with a large mass at or close to zero. The 10th (90th) percentile is -15.0% (12.2%).

Beliefs About the Wage Distribution In addition to this measure of beliefs about outside options, we collected additional questions regarding beliefs about the external wage distribution. We select those questions to refer to variables plausibly relevant to the respondent’s outside option, but for which we can more directly and precisely construct objective benchmarks. Those variables are: beliefs about (i) wage changes of coworkers leaving the respondent’s current employer, (ii) the respondent’s rank in the wage distribution of their occupation, and (iii) the median wage in the respondent’s occupation. We describe these additional questions in [Section II.F](#) when drawing on them.

II.D. Benchmark: Involuntary Moves of Coworkers

Specifying and quantifying workers’ outside options is notoriously challenging. We propose plausible empirical proxies for these outside options, and show robustness to alternative measures.

Our first benchmark exploits systematic differences across firms in pay premia common to all workers ([Abowd, Kramarz, and Margolis 1999](#); [Card, Mas, Moretti, and Saez 2012](#)). These wage differences may reflect amenities, firm size, rent sharing or other sources. For our purpose, we isolate the systematic differences in wage *changes* workers experience when switching from their current employer, which result from the difference between the current employer’s pay premium and the pay premium at the next

⁴ The different wordings we included in the robustness online survey were: eliciting the wage level at outside option rather than change relative to current wage; omitting the “same pay” category as a response option and forcing respondents to enter a percent wage change (for beliefs about coworker wage changes), varying the duration to find a new job between 3 and 12 months, specifying an unexpected company closure as the cause of the separation, or not specifying that the respondent has to search within their current occupation.

employer. Since this benchmark does not perfectly predict wage changes, which also have idiosyncratic components, this particular test can be viewed as whether workers are aware of variation in outside options that is explained by their current employer and common to all workers.

Identifying Involuntary Moves: EUE Moves We proceed in two steps. First, we attempt to identify plausibly *involuntary* coworker moves as proxies for the outside option (our survey supposed the worker “was forced to leave [their] current job”). To do so, we select employment-unemployment-employment (EUE) moves (in the spirit of [Gibbons and Katz 1992](#), who draw on plant closings): coworker moves to another employer that involve an intervening unemployment spell (see [Online Appendix Table A.2](#) for summary statistics and comparisons to our sample of respondents). Specifically, we require unemployment insurance receipt beginning within 12 weeks of leaving the original employer, and before joining another employer, as German unemployment law offers unemployment insurance after voluntary separations, but only after a 12-week waiting period (§159 *Sozialgesetzbuch III*). We also require full-time work at their original and new employers.

As not all involuntary moves involve unemployment, we expect this benchmark to be more negative, on average, compared to the population of all transitions.⁵ Our sample of worker moves spans 2015 to 2019, the five years preceding and including the survey. We construct moves at the annual level, assigning each individual a main employer every year (as in [Card et al. 2012](#)). In a robustness check, we also consider all coworker moves (rather than involuntary moves only), and restrict the sample to comparable coworkers, to larger firms, to the median rather than mean coworker wage change, and to less distant time horizons from the time of the survey.

Isolating the Systematic Component As a second step of our two-step procedure, we isolate the variation in coworker wage changes that is *systematic*—and hence would apply to the SOEP respondent too if switching to the outside option. Our goal is to strip out spurious variation that would plague raw averages of mean wage changes—which would combine the common component (which we aim to isolate), and the average of idiosyncratic terms (due to match- or worker-specific factors). Our main strategy is an empirical Bayes (EB) correction ([Morris 1983](#); [Chandra et al. 2016](#)). This strategy essentially “shrinks” imprecisely estimated averages to the sample mean. For the EB strategy, the sample is firms with at least two coworkers

⁵ We find an average wage change of 2% (8%) for involuntary (all) moves. This average is slightly more positive than that of displaced workers (see, e.g., [Schmieder, Wachter, and Heining 2023](#)). The gap may be due to that literature’s focus on mass layoffs of higher-tenured workers from larger establishments.

moves. As a complement to the EB approach, we apply a split-sample instrumental variables (IV) strategy (as in [Drenik et al. 2023](#)). This strategy partitions each firm’s movers into two random samples and uses one sample’s wage change as an instrument for the other sample’s wage change. Standard IV methods can then be used to isolate the relationship with an outcome variable (in our case: beliefs). For the IV strategy, we choose a cutoff of four coworker moves, so that we have at least two observations in each partition.⁶

Validation of Benchmark We present two validations illustrating the relevance of coworker wage changes for predicting actual wage changes. First, we track the labor market history of our SOEP sample in the administrative panel data and regress their wage change when leaving *previous* workplaces against an EB-corrected mean log wage changes of involuntary movers out of that previous workplace in the 5 years preceding the SOEP respondent’s exit. [Online Appendix](#) Figure B.4 Panels (a) and (b) report a tightly estimated slope of about one, indicating that, at least in respondent’s past, wage changes of coworkers are highly predictive of the respondent’s own wage change. Second, [Online Appendix](#) Figure B.5 presents the first-stage relevant to the split-sample IV strategy, showing a slope coefficient of 0.616 (SE 0.079). This slope also indicates that a lot of the variation in coworker wage changes is spurious, showing up as significant attenuation bias in a naive, unadjusted OLS strategy—which our two strategies overcome.

Results [Figure III](#) Panel (a) is the empirical analog of the research design we plotted in [Figure I](#) and described in [Section II.A](#). The y-axis remains the same, that is respondents’ belief about the wage change at their outside option, but the x-axis is now the actual wage changes of plausibly involuntary coworker movers. The binned scatterplot in [Figure III](#) Panel (a) presents both EB-shrunk observations (blue solid circles) and the unadjusted data points (yellow hollow triangles). To quantify the degree of anchoring, we estimate a linear regression slope. The EB-corrected slope is 0.107 (SE 0.040), that is, worker beliefs about their wage change when forced to leave are, on average, only 1.07ppt higher in a firm where they are predicted to experience a 10% wage increase, compared to a firm with a zero predicted wage change. This slope is far below the benchmark of 1 and indicates substantial underestimation of outside options at firms with large positive wage changes (and vice versa). As expected, the raw relationship without measurement error correction is quantitatively starker with an even lower slope of 0.028 (SE 0.014). This attenuated slope reflects spurious variation in the benchmark that would not carry over to the respondent, e.g., due to outliers or few observations among coworkers, issues the EB correction addresses. Finally, we also report the split-

⁶ Robustness checks with stricter or looser cutoffs yield similar results; the first stage loses strength with only two coworker moves.

sample IV estimate, which yields a slope of 0.067 (SE 0.036). The slope is significantly different from one and the confidence interval includes the 0.107 slope estimate from our EB procedure.

II.E. Robustness Checks

Machine Learning Benchmark As an alternative benchmark, we draw on a machine learning model to predict SOEP respondents’ wage changes at their outside option, based on a broader sample of movers rather than only on coworkers in the same establishment. This approach allows us to predict wage changes using a rich set of covariates to address potential concerns about differences in characteristics between our respondents and their coworkers who experienced an involuntary move, the proxy we used in [Section II.C](#).

In our overall sample of involuntary (EUE) movers in the administrative data (omitting SOEP respondents), we estimate a Lasso model, which mitigates concerns about overfitting. In the model the dependent variable is the log wage change of the mover. As predictors, we use individual- and firm-level covariates and their interactions.⁷ Calculations of partial R^2 values indicate that the key covariates are the mover’s wage at their initial firm, initial firm’s AKM effect, and gender, occupation, industry, and age \times education. The model based on a random training sample explains 43% of the variance in log wage changes in the remaining evaluation sample. Appendix D presents the full results of the prediction model, including out-of-sample performance and the partial R^2 values of selected covariates.

Panel (b) of [Figure III](#) reports results using this benchmark. We find quantitatively similar results to those using the wage changes of involuntary coworker movers, with a slope of 0.091 (SE 0.021).

Robustness to Different Specifications We implement a number of robustness checks such as changing the set of mover wage changes used to construct the benchmark, omitting respondents who selected the “same wage” (zero wage change) option, or changing the training set for the ML benchmark. [Online Appendix E.1](#) confirms the robustness of our results, with all coefficients far below one.

Robustness Survey We also explore robustness to alternative question wording as elicited in a robustness survey fielded with a convenience sample (not matched to administrative data) and report results in [Online Appendix E.2](#).

⁷ The covariates are workers’ own wage at the initial firm, the firm effect of the initial firm, age (cubic), gender, tenure (cubic), education categories, size of initial firm, separation rate of initial firm, standard deviation of wages at initial firm, employment growth at initial firm, industry (NACE Level 1), state (16), occupation (1-digit), and interactions of age \times education and industry \times region.

II.F. Beliefs About Directly Observable Benchmarks: Coworker Moves and Wages in the Occupation

Even though we draw on a rich set of covariates to construct benchmarks, unobserved differences between movers and respondents may constitute a threat to identification.

As a first step to address such concerns, we also check for anchoring patterns in beliefs about other statistics concerning the wage distribution that are plausibly relevant for outside options and whose accuracy we can assess directly: coworkers' wage changes when moving, respondents' position in the occupational wage ladder, and the median wage in their occupation. In [Section IV](#), we will further probe the anchoring interpretation in an information experiment.

Coworker Wage Changes First, we ask SOEP respondents about the wage changes experienced by typical coworkers moving out of their firm.⁸ For this belief, we can directly calculate the benchmark in the matched survey-administrative data by looking at the wage changes of all movers leaving the SOEP respondent's firm in the past 5 years—our previous outside option proxy, but looking at all moves instead of just involuntary ones. [Figure IV](#) reports the same specification as Panel (a) of [Figure III](#) but with SOEP respondents' beliefs about coworker wage changes as the y-axis variable, and the mean log wage change of all coworker movers as the x-axis variable.

We find similar anchoring patterns. Respondents in firms where coworkers fare well when leaving (i.e., on the right of the graph) underestimate wage increases among movers (and vice versa). The empirical-Bayes-corrected slope is 0.124 (SE 0.050), substantially below the unbiased slope of one; we also find a similar slope using a split-sample IV strategy. The slope is even lower for the unadjusted specification, which may be the right design if the respondent interprets the typical coworker as the average past mover.

Rank Within Occupation We now draw on a question about workers' subjective wage rank within their occupation, and compare this belief to their objective rank.⁹ The histogram in [Figure V](#) Panel (a) reports the distribution of respondents' beliefs (blue solid bars) and the empirical objective benchmark (light red bars).

Once again, we find evidence consistent with workers anchoring their beliefs about the external labor

⁸ The exact question was: "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?" We then give respondents not answering "same pay" specific bins of average wage changes as before.

⁹ The exact question was: "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 these employees receive a [lower pay/same pay/higher pay]?" The objective rank is calculated from the administrative data, at the four-digit occupation level (*Berufsuntergruppe*) using workers' daily wage and a lower bound of minimum wage earnings at 6 hours per work day.

market on the wages of their current employer. In sharp contrast with the nearly uniform empirical distribution (validating the representativeness of the SOEP sample), the beliefs follow a bell-shaped distribution: 51% of respondents see themselves between the 40th and 60th percentiles. In the data, only 20% of workers actually rank in that interval. In the tails, only about 4% of workers believe that they rank in the top or bottom decile, rather than 18% in actuality.

To highlight anchoring, Panel (b) of [Figure V](#) provides a scatterplot of workers' subjective wage rank within their occupation against their objective rank. Rather than a slope of 1 that would be consistent with full accuracy, we find a slope of 0.162 (SE 0.034). That is, an increase in workers' actual wage rank by ten percentile ranks is accompanied by less than a two percentile increase in their perceived rank.

Median Wage in Occupation Finally, we elicit beliefs about the median wage (monthly salary) in a worker's occupation.¹⁰ Again, workers appear to anchor their beliefs about the median wage in their occupation on their current wage. In [Online Appendix Figure B.6](#), we plot workers' residualized beliefs about the median wage in their occupation against the residualized actual median wage in their occupation. Residuals are obtained by separately regressing beliefs about median wage in the occupation and actual median wage in the occupation on own wages. We find a slope of 0.471 (SE 0.042); that is, workers for whom the median is 10% higher than their current wage think that the median is in fact only 4.7% higher than their wage. This result is consistent with anchoring also for more easily observable features of the external wage distribution, with the higher slope for this variable perhaps pointing to more accurate beliefs for occupation-level wage variation compared to worker's idiosyncratic outside options at other employers.

III. Implications of Anchoring: Descriptive Evidence

The evidence for anchoring raises the possibility that misperceptions play a role in the otherwise puzzling prevalence of wage dispersion and willingness of workers to stay put in low-wage jobs, besides conventional search costs or non-wage amenities: workers in low-wage jobs might be overly pessimistic about the external labor market, search less because of those misperceptions, and hence stay put in those jobs. In this section, we provide correlational evidence consistent with these two implications for respondents'

¹⁰ The exact question was: "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 these employees before taxes (in EUR)?" To benchmark these beliefs, we use wage information based on a reference date of December 31, 2018 provided to us by the Federal Employment Agency's Statistics Group based on the universe of full-time employment subject to social security and corresponds to median monthly salaries for five-digit occupations (*KldB 2010*).

intended labor market behavior and beliefs. We will probe the causality from anchoring to behavior in a follow-up information experiment in [Section IV](#). We also formalize these mechanisms in a simple labor market equilibrium model in [Section V](#).

III.A. Anchoring Distorts Behavior: Correlational Evidence

We find that workers’ beliefs—even when controlling for objective benchmarks—strongly predict their intentions to quit, search for a new job, and negotiate their wage.

Intended Labor Market Behaviors Our SOEP-IS module asks respondents about the probability that they will look for a new job at a different company over the next 12 months, and about the reservation pay cut at their current job that would induce them to quit. Additionally, we draw on questions about wage bargaining, the probability that a respondent will ask their boss for a wage raise over the next 12 months, and its magnitude.

[Figure VI](#) shows that respondents’ beliefs about their outside options are strongly predictive of these stated labor market behaviors, while controlling for their *objective* outside options does not change this strong relationship.

Panel (a) of [Figure VI](#) shows that a 10ppt increase in the belief of the wage change if moving to the outside option is associated with a 5.1ppt (SE 1.3) increase in the stated probability of looking for a new job. This relationship barely changes when controlling for objective benchmarks. This figure uses wage changes of coworker movers in [Figure VI](#) as a control variable; [Online Appendix Figure B.7](#) replicates the entire figure while instead controlling for the machine learning benchmark.

We find similar patterns for the other variables. Panels (b) through (d) of [Figure VI](#) document a corresponding 2.8ppt (SE 0.7) decrease in the reservation wage cut to quit, a 7.6ppt (SE 1.9) increase in the probability to ask for a raise, and a 1.9ppt (SE 0.4) higher ask in such a negotiation, all for a 10ppt shift in the beliefs variable.

Do Only Non-Searchers Anchor? The misperceptions would be irrelevant if workers only search sporadically and exogenously, and are *then* well-informed, while only non-searchers exhibit anchoring (but their misperceptions are not allocative in this scenario). In contrast to this view, [Online Appendix Figure B.2](#) documents that workers who are more likely to search or are plausibly more exposed to external labor market information—proxied for with shorter than median tenure (hence, recent search) or in firms with higher

than median turnover (hence, frequent search)—also exhibit anchoring. This figure more broadly illustrates that there is relatively little heterogeneity in the extent of misperceptions by demographic variables, such as education, age, and gender.

III.B. Overly Pessimistic Workers Work in Low-Wage Jobs

We now check for the key implication of anchoring distorting search behavior: workers with more pessimistic beliefs about their outside option will sort into, and be more likely to remain in, low-wage jobs. Indeed, we find that low-wage firms are disproportionately staffed by workers that underestimate their outside options—and a variety of related moments of the external wage distribution. Besides providing a misperception-based rationale of wage dispersion and staying in low-wage jobs, the evidence is also consistent with workers using their current job as a signal about the overall wage distribution.

Definition of High and Low Wage Firms: Firm AKM Effects To classify firms, we draw on [Abowd, Kramarz, and Margolis \(1999\)](#) (AKM) firm effects, a standard measure of firm-specific pay premia; firms with low AKM effects are considered “low-wage” firms, and vice versa for firms with high AKM effects. Importantly, AKM firm effects reflect wages net of worker fixed effects and Mincerian controls, so they serve as a composition-adjusted measure of firms’ wages. As described in the introduction, the large empirical dispersion in AKM firm effects is the key illustration of the departure from the law of one price per skill. In Germany, firm AKM effects are an increasingly important determinant of earnings ([Card, Heining, and Kline 2013](#)), and are a powerful predictor of wage changes after forced displacement ([Schmieder, Wachter, and Heining 2023](#)). For data availability reasons, the AKM effects were calculated for the period from 2010 to 2017, but AKM firm effects appear highly persistent ([Lachowska et al. 2023](#)).

Results [Figure VII](#) Panel (a) plots workers’ beliefs about outside options and objective outside options (as proxied by involuntary coworker moves) against AKM firm effects. While there is a strong linear relationship with a regression slope of -0.525 (SE 0.101) between AKM effects and objective outside options, workers’ beliefs trace out a much flatter slope of -0.157 (SE 0.037). That is, objective outside options vary a lot across the AKM distribution, but beliefs remain relatively constant. Panel (b) of [Figure VII](#) shows analogous patterns for beliefs about coworker wage changes.

[Figure VII](#) Panel (c) presents the misperceptions depicted in Panel (a) in the form of *estimation errors*: the vertical difference between beliefs and the objective benchmark. The figure shows that workers in low-wage

firms strongly underestimate their outside options, while workers at high-wage firms hold more accurate beliefs.¹¹ Panel (d) shows analogous patterns for estimation error of coworker wage changes complementing Panel (b). Panel (e) shows similar patterns for the estimation error about the rank in the occupational wage distribution, which is positive for workers in low-wage firms (i.e., they underestimate their rank) and closer to zero for workers in high-wage firms. Panel (f) shows similar patterns for the estimation error about the median wage in the occupation.

IV. Experimental Evidence from an Information Treatment

To identify causal effects and address remaining measurement concerns (such as unobserved ability and endogenous mobility as in [Gibbons and Katz 1992](#)), we complement our descriptive analysis with an online experiment. We provide workers with information relevant for their outside option: the wage of similar workers in their narrow labor market cell. First, this experiment confirms the informational frictions underlying anchoring: while workers initially anchor their beliefs about outside options on their own wage, they shift their beliefs in response to the information towards the benchmark. Second, the observed shift in beliefs provides an additional validation exercise both for the belief measures and imputed objective benchmarks from the descriptive analysis. Third, we find that treated respondents adjust their intended labor market behaviors, which provides causal evidence that misperceptions distort labor market behaviors, rather than just reflecting search costs or rational inattention.

Information Treatment in SOEP-IS This online experiment refines a simple information treatment we had included in the 2019 SOEP-IS survey. There, legal and technical challenges had restricted us to a relatively coarse labor market information treatment, the *national* median wage in the occupation, and the information treatment was not as salient and visual. We suspect that these limitations led to a weak first stage on outside options beliefs (an F-stat of 1.7) and imprecisely estimated (IV) effects on intended labor market behaviors. We report and discuss those results in [Online Appendix F.3](#).

IV.A. Sample for Information Experiment

To conduct a higher-powered information experiment with more tailored treatments, we collaborate with two survey companies, Bilendi and Dynata. Our data were collected in May, June, and July 2022 in Germany.

¹¹ When using the ML benchmark, we find similar underestimation in low-AKM firms, but instead find overestimation in high-AKM firms.

These providers use opt-in panels, i.e., respondents sign up to participate in opinion surveys in exchange for money or reward points. The providers recruit participants through ads posted in online stores and on social media. While the survey companies tap into a large pool of heterogeneous respondents, the resulting samples are in principle less representative than samples from probability-based surveys such as the one we used for the main descriptive evidence. However, [Online Appendix Table A.4](#) shows similarity for several core descriptive statistics of our experimental sample compared to full-time employed respondents in the SOEP-IS sample. (Participation in our survey is restricted to respondents that are in full-time employment, not self-employed and not employed in the public sector.) [Online Appendix Table A.4](#) also shows balanced covariates across treatment and control groups. 2,468 respondents are in our analysis sample, with 1,211 and 1,257 in the treatment and control groups, respectively.

Inattention Screens To minimize concerns about inattention, only participants that pass two attention screeners are allowed to participate in our survey. [Online Appendix F](#) provides additional details on the sample definition and inclusion criteria. In this survey, about 27% of respondents do not pass the attention check, consistent with the literature on inattention in online surveys (see, e.g. [Peer et al. 2021](#)).

IV.B. Experimental Design

The survey was conducted online. [Online Appendix G.4](#) prints the English translation of the survey. [Online Appendix F](#) provides additional details on the experiment. The analysis was pre-registered on the AsPredicted registry (<https://aspredicted.org/yp8p9.pdf>); see [Online Appendix F.4](#). (Our results reported below exclude a pilot; [Online Appendix Table A.3](#) replicates the results pooling pilot and post-pilot data, which was our pre-specified collection plan to maximize statistical power.)

Pre-Treatment Block First, we replicate our SOEP-IS question about outside options (the expected monthly pre-tax wage if forced to leave one’s current job and find a new job within three months). Second, we additionally ask respondents’ beliefs about the mean of the pre-tax wage of full-time workers with similar characteristics (same occupation, gender, age, labor market region, and education). As an incentive, respondents receive a 1 EUR bonus if their estimate is within 100 EUR of the true value (which we calculated based on administrative data, as we discuss below).

Information Treatment Next, both groups are shown an additional screen, depicted in [Figure VIII](#). The main feature is a bar chart displaying each respondent’s own wage as well as their previously stated belief

about similar workers' wages. A short text accompanies these charts and describes their content. These screens are also preceded by a screen reminding the respondent of the list of own characteristics they reported (gender, age, occupation, labor market region, education level). Compared to the control group (Panel (a)), the treatment group (Panel (b)) sees an additional bar depicting the *actual* wages of similar workers (See [Online Appendix F](#) for details on the prediction model based on administrative data that we use to compute the information on actual wages.). To increase engagement with that information treatment and as an intervention check, we ask the treatment group on the next page whether and by how much they over- or underestimated the wage of similar workers.

Post-Treatment Block After the treatment, we again measure beliefs about similar workers' wages, to gauge whether the information was internalized. We then again ask beliefs about the outside option, in order to check on treatment effects. Finally, we ask both groups about their intended labor market behaviors, as well as a free-form question in which respondents guess our hypothesis (which few respondents appear to do, limiting concerns about experimenter demand effects, see [Online Appendix F.1](#)).

IV.C. Effects on Worker Beliefs

Identification Strategy: Exploiting Heterogeneity in Pre-Treatment Estimation Error [Figure IX](#) illustrates the effects of the information treatment on beliefs in binned scatter plots. The x-axis represents the worker-level *pre-treatment* estimation error regarding the wage level of similar workers. This estimation error is calculated as the difference between the respondent's belief about similar workers' wages and the truth, divided by the truth to express this difference in percentage terms.

Throughout the analysis of the experiment, we fix this sorting of individuals along their pre-treatment estimation error. The idea is that in response to information, respondents that initially underestimated the wage of similar workers (have negative errors) should shift their belief about the wage of similar workers upward, compared to workers with initially positive errors. Importantly, these initial underestimators should also increase their belief about their *personal outside option*, as long as they consider the external wage distribution as informative about it. We leverage this variation in an instrumental variable (IV) setup, instrumenting for beliefs about outside options with a treatment group indicator and its interaction with the continuous pre-treatment estimation error. Below, we illustrate the design graphically, focusing on belief updating.

Intervention Check We investigate whether treated workers used the information to correct their beliefs about similar workers. We implement this test in [Figure IX](#) Panel (a), which plots the post-treatment estimation error on the y-axis against the pre-treatment estimation error on the x-axis, separately for the control and treatment groups. For the control group, the binned scatter plot traces out a linear slope of nearly one (0.888, SE 0.039), implying substantial persistence. By contrast, the treatment group slope shrinks to 0.361 (SE 0.033), far below the persistence benchmark from the control group. Post-treatment estimation errors move substantially closer to zero for all bins of pre-treatment estimation errors—indicating that treated respondents used the information about the actual wage of similar workers to substantially correct their beliefs about this object.

Updating of Outside Option Beliefs: De-Anchoring We now check whether treated respondents used the information about the wages of similar workers to update their belief about their own outside option. This response would be expected if workers do not have accurate beliefs about the external wage distribution, and hence anchor their beliefs about their outside options on their current wage. We formalize this implication in a Bayesian learning model in [Online Appendix C](#). Panel (b) of [Figure IX](#) reports this analysis. As in the intervention check, we sort workers, on the x-axis, by their pre-treatment errors regarding the wages of similar workers, but on the y-axis we now plot the post-treatment belief about their own outside option (i.e., the associated wage change).

The scatter plot for the control group again illustrates the benchmark of no updating. A priori, for the control group, there is no natural relationship between misperceptions about similar workers' wages and one's belief about wage changes. In the data, we find an essentially flat relationship (a slope of 0.042, SE 0.022).

For the treatment group, we would expect a substantially more *negative* slope: workers that initially underestimated the wage of similar workers should update positively about the external wage distribution and hence their outside option. Indeed, we document a substantially negative slope, -0.444 (SE 0.025), for the treatment group: treated respondents that initially underestimated the wages of similar workers now increase their assessment about their personal outside option, and vice versa for overestimators. This evidence is consistent with respondents not having precise beliefs about the external wage distribution and hence anchoring their beliefs on their current wage—and updating their belief about their outside option in response to information about the external labor market. This relationship will form the basis of the first

stage in our IV regression specification.

Implications Our experimental evidence on belief updating has two implications. First, it establishes causal evidence on anchoring: respondents change their beliefs about outside options away from their current wage when exposed to information about the external wage distribution. Therefore, their initial beliefs were imprecise, and too close to their current wage.

Second, this finding provides an experimental validation of our measure of beliefs to begin with, and hence helps validate the findings from our descriptive analysis in the SOEP-IS survey in [Section II](#): if one worried that respondents largely report noise as their subjective outside option, one would have expected a zero effect of information on this measure (a similar slope between treatment and control groups). The strong shift induced by information hence rejects at least the most extreme version of this concern.

IV.D. Effects on Intended Labor Market Behavior

We now study the causal effects of shifting worker beliefs on their intended labor market behavior (mirroring those in the correlational analysis): probability to quit, to look for a new job, to ask for a wage raise and its size, and the reservation wage cut required for the respondent to quit the current job.

IV Specification An instrumental variable (IV) regression permits us to estimate the causal effect of the information treatment on labor market behavior through the channel of shifting workers' beliefs. The endogenous variable is workers' beliefs about their outside option. The instrument is the treatment indicator and its interaction with the initial estimation error, exploiting the heterogeneity in estimation error described above and plotted in [Figure IX](#) Panel (b). Formally, we estimate the following model with 2SLS:

$$OO_i^{\text{Post}} = \beta_0 + \beta_1 \text{EstError}_i^{\text{Pre}} + \beta_2 \text{Treated}_i + \beta_3 \text{Treated}_i \times \text{EstError}_i^{\text{Pre}} + \epsilon_i \quad (2: \text{1st Stage})$$

$$Y_i^{\text{Post}} = \delta_0 + \delta_1 \text{EstError}_i^{\text{Pre}} + \delta_2 \widehat{OO}_i^{\text{Post}} + \nu_i. \quad (3: \text{2nd Stage})$$

We denote variables by pre- and post-treatment timing. OO_i^{Post} denotes individual i 's post-treatment beliefs about outside options. $\text{EstError}_i^{\text{Pre}}$ is the percent estimation error about similar workers' wages. Treated_i is an indicator for the treatment group. Both the first stage and the second stage also control for the estimation error.

In our first stage, the coefficient β_3 captures the effect of the information treatment on outside option

beliefs as a function of respondents' initial estimation error, corresponding to the difference in the slopes in [Figure IX Panel \(b\)](#). A negative value of β_3 means that initial overestimators updated downward (and vice versa for underestimators). A level shift would be captured by the baseline treatment effect β_2 . Our first stage hence exploits the difference in the estimated linear models plotted in [Figure IX Panel \(b\)](#).

Our second stage estimates the effects of outside option beliefs as instrumented by the treatment indicator and its parametric interaction with the estimation error, on intended labor market behavior. The second-stage coefficient δ_2 answers our question of interest: how much does a percentage point shift in beliefs about a workers' outside option causally shift workers' intended labor market behavior elicited post-treatment, i.e., outcome Y_i^{post} ?

Recap: Intervention Check [Table II](#) Column (1) presents the regression estimates corresponding to the intervention check depicted in [Figure IX Panel \(a\)](#), i.e., the effect of the treatment on the post-treatment estimation error about beliefs about the wages of similar workers, $\text{EstError}_i^{\text{Post}}$. While the specification mirrors the first stage equation ([Equation 2: 1st Stage](#)), it is an intermediate step as it does *not* yet study the endogenous variable (i.e., beliefs about outside option). A benchmark of $\beta_3 = -1$ would correspond to an updating of the estimation errors to zero, on average, for each initial error group. We estimate a substantial coefficient of -0.527 (SE 0.057). That is, treated workers that initially underestimated the mean wage in their labor market cell by 10ppt reduce their estimation error by 5.3ppt.

First-Stage: Updating About Personal Outside Option Column (2) of [Table II](#) reports the first stage estimates, i.e., [Equation 2: 1st Stage](#) with post-treatment beliefs about own wage changes, OO_i^{Post} , as the dependent variable. We estimate a β_3 of -0.486 (SE 0.039). That is, workers that initially underestimated similar workers' wages by 10ppt raise their belief about their own wage change if moving to the outside option by 4.9ppt.

IV: Causal Effects on Labor Market Behavior Columns (3) to (8) of [Table II](#) report on the causal effects on labor market behaviors: respondents' expected probability to quit, to look for a new job over the next 12 months and to ask for a wage raise and its size, and the reservation wage cut for quitting. The top panel reports the reduced form effects while the bottom panel reports the IV estimates. We will focus on the bottom panel, as these effects quantify the changes in intended labor market behaviors due to shifts in beliefs about outside options induced by our information treatment.

To provide a quantitative benchmark for the effect sizes, we report the implied effects for a 10ppt increase

in beliefs about wages at the outside option. This shift in beliefs would correspond to the belief change associated with a full belief correction for workers employed at firms at the 24th percentile of the AKM firm effect distribution (Figure VII).

For the quit probability (Column (3)), we estimate an IV coefficient of 0.261 (SE 0.087), which implies that a 10ppt increase in respondents' beliefs about wages at their outside option would cause a 2.6ppt increase in their quit probability (or an 11% increase relative to the control group mean of 0.233).

For the probability of job search (Column (4)), we estimate a 0.217 (SE 0.088) IV effect, comparable to the quit effect. That is, a 10ppt increase in beliefs translates into a 2.2ppt increase in the job search probability or an 10% increase relative to the control group mean.

Columns (5) through (7) report effects on intended wage negotiations. A 10ppt increase in beliefs about wages at the outside option causes a 4.0ppt (SE 1.0) increase in the probability to negotiate a wage increase, and a 1 to 1.2ppt increase in the requested wage increase, depending on whether we count zero negotiation probability observations as asking for a zero wage increase or as missing.

Lastly, we estimate non-significant reduced-form and IV effects close to zero on the reservation wage cut in Column (8).

Implications First, the additional results on labor market behaviors establish a causal interpretation *from* beliefs *to* intended behavior. The correlational evidence in Figure III discussed in Section III.A had left open the possibility of reverse causality or an underlying third factor. Inherently immobile workers may also just not gather information out of rational inattention, may not encounter such information, or underestimate their outside option to reduce cognitive dissonance. Our experimental evidence rules out this view as a complete explanation of our main descriptive evidence on anchoring and misperceptions.

Second, more broadly, our experimental evidence supports a class of models of the labor markets in which anchoring and misperceptions about the external wage distribution play a role in the labor market phenomena that motivated our study. In standard models, e.g., those building on search costs, workers hold accurate beliefs about the statistical properties of the external wage distribution. In such models, providing information about, e.g., mean wages in the labor market would hence not affect behavior (or lead to an updating of beliefs). Of course, our evidence is not inconsistent with an important role of search costs. Below, in Section V, we present a model that features both search costs and anchoring to display their independent effects and their interaction.

Third, the IV estimates of the causal effect of beliefs on intended labor market behavior suggest room for quantitatively significant consequences of the misperceptions we document. For instance, in [Figure VII](#), we documented that workers at the bottom of the firm wage distribution (the 24th percentile of the AKM firm effect distribution) on average underestimate the wages at their outside option by about 10ppt. Our experiment suggests that correcting those misperceptions would cause about a 2.6ppt—or 11%—increase in quits out of those firms.

For quantitative intuition, this increase in quits could shrink the size of those low-wage firms significantly, by about 11%. This number is implied by a back-of-the-envelope calculation that draws on a simple wage posting model in which a firm hires $H(w)$ workers per period and its workers quit at rate $s(w)$ so that steady-state firm size is given by $L(w) = H(w)/s(w)$.

V. Equilibrium Implications of Anchoring: A Simple Model

We now propose a simple equilibrium model that organizes the three key facts we have demonstrated, and highlights the potential equilibrium consequences of workers’ anchored beliefs. First, the model replicates the anchoring patterns documented in [Section II](#) as workers (potentially) use their current job as a signal about the competitive wage. Second, in our model, workers’ beliefs drive their search behavior and specifically their reservation wage, consistent with the correlational and causal evidence in [Sections III.A](#) and [IV](#). Third, the empirical sorting of most pessimistic workers into low-paying firms (documented in [Section III.B](#)) emerges as an equilibrium outcome: workers that stay put in low-wage firms are those that wrongly believe that external wage is lower than it actually is, a fact that firms exploit in setting wages.

Hence, workers’ misperceptions about outside options generate wage dispersion and a departure from the competitive equilibrium. Misperceptions thus are a monopsony source distinct from the standard frictions existing models draw on to generate these outcomes, such as idiosyncratic tastes among workers for firm-specific amenities ([Card, Cardoso, Heining, and Kline 2018](#)), or search or mobility frictions ([Burdett and Mortensen 1998](#)). In those search models, as in all models in the tradition of [Stigler \(1961\)](#), workers have unbiased beliefs about the wage distribution in the external labor market.¹²

¹² Similarly, even a standard rational inattention model taken to the labor market would not generate anchoring as it would assume accurate and precise beliefs about the wage *distribution*, even though the underlying noisy signals about specific jobs’ wages (rather than the overall wage distribution) can generate market power (as in the product market model of [Matějka and McKay 2015](#)).

V.A. Preview of Assumptions, Mechanisms, and Implications

In our model, firms set wages competing for workers who may misperceive the wage distribution. Specifically, workers form beliefs about their outside option based on the wage at their current employer—generating the kind of anchoring we document in the data. When search is costless, a competitive equilibrium with a single wage emerges, as firms deviating from the competitive wage cannot hire any workers. However, when search is costly for a substantial share of workers, firms can mark down wages, trading off the benefits from lower wages and the cost of losing workers not subject to the search cost. At a high level, our model can therefore be viewed as adapting the [Salop and Stiglitz \(1977\)](#) model of monopolistic competition in product markets (which features two types of *consumers* with different information acquisition costs) to the labor market (e.g., with standard labor demand and supply curves) and augmenting it to allow for biased beliefs. Crucially, workers’ beliefs about the competitive wage (the outside option) determine their reservation wages. This in turn governs the wage that deviating firms optimally set, and hence the degree of wage dispersion, wage markdowns and the size of the low-wage sector. A segmented, or dual, labor market emerges, with a competitive high-wage sector and a low-wage sector in which low-wage firms employ uninformed workers who underestimate their outside option—consistent with the evidence in [Section III.B](#). Misperceptions in the form of anchoring on the current wage act similarly to a search cost in aggravating wage markdowns, wage dispersion, misallocation, and the size of the low-wage sector.

V.B. Setup

Environment The timing of our model is as follows. First, N homogeneous firms enter the labor market and decide what wage to post. We take the firm count N as given. Second, L workers are randomly assigned to firms and supply labor inelastically (but may switch firms), learn the wage w_j paid by their initial firm j , and potentially update their beliefs about the external wage distribution. Third, workers choose whether to stay at their current firm, or pay an information acquisition cost c (which differs across otherwise homogeneous workers) to perfectly learn the wages paid by other firms and move to the highest paying firm, which pays w^{\max} . Finally, production occurs and wages are paid.

Workers and Search Each of L risk-neutral workers is initially randomly assigned to one of N firms. A worker assigned to firm j observes its wage w_j , and decides whether to search for a new job or stay put in their initial job.

Workers can pay a cost c_τ to gather full information about the labor market. Informed workers can switch to their outside option, in this case to the highest paying firm. If multiple firms pay the highest wage, searchers distribute themselves equally among them. A share α of workers are experts ($\tau = E$): they can learn about the labor market at no cost, i.e., $c_E = 0$. The remaining share $1 - \alpha$ are amateurs ($\tau = A$), facing a positive cost $c_A > 0$.

Experts always become informed and move to the highest-paying firm. Amateurs' information decision depends on their belief about the benefit of searching, i.e., the difference between their current wage and their belief about the highest wage, denoted $\tilde{w}^{\max}(w_j, \mathbf{w}_{-j})$. Amateurs search if:

$$\tilde{w}^{\max}(w_j, \mathbf{w}_{-j}) - w_j > c_A. \quad (4)$$

The dependence of \tilde{w}^{\max} on w_j captures the fact that workers' own wage can influence their belief about other wages on offer in the market (even if amateurs do not accurately perceive that wage), including the anchoring we document (or belief updating more broadly).

Beliefs We specify beliefs in a simple form that nests accurate beliefs and misperceptions—in particular the kind of anchoring our evidence reveals. ([Online Appendix C](#) presents an updating model.) Specifically, a worker at a firm paying wage w_j perceives the highest wage to be a weighted average of the actual highest wage and the worker's current wage:

$$\tilde{w}^{\max} = \delta + \gamma \cdot w_j + (1 - \gamma) \cdot w^{\max}. \quad (5)$$

Beliefs are accurate if $\gamma = \delta = 0$. δ is an intercept. $\gamma \in [0, 1]$ captures the degree of anchoring on the current wage. For $\gamma = 0$, beliefs are insensitive to w_j ; $\gamma = 1$ implies full anchoring. Expressing beliefs and the outside option (highest wage) relative to the current wage highlights the link to our estimating equation in the research design.¹³

$$\tilde{w}^{\max} - w_j = \delta + (1 - \gamma) \cdot (w^{\max} - w_j). \quad (6)$$

¹³ Our empirical specification (in percent) would simply set δ in percent of the current wage. Hence, estimating our empirical model in this setting recovers a regression coefficient that identifies $1 - \gamma$ in the sample of amateurs in an equilibrium where they do not become informed; a pooled regression across types will require scaling up the resulting coefficient by $\frac{1}{1-\alpha}$ to recover γ .

Our theoretical framework remains qualitative. Below, we consider the case of $\delta = 0$ to isolate the role of anchoring ($\delta = 0$ is quite consistent with our empirical findings).

Firms and Wage Setting Firms produce a homogeneous good using a decreasing-returns production function $f(\ell) = \ell(w)^\eta$, with decreasing returns parameter $\eta \in (0, 1]$. A firm's employment $\ell(w_j|\mathbf{w}_{-j})$ depends on the wage it pays along with those paid by other firms; the shape of this firm-specific labor supply curve will govern firms' wage setting. Given its own wage w_j and the external wage structure of other firms \mathbf{w}_{-j} , firm j 's profits are

$$\pi(w_j|\mathbf{w}_{-j}) = \ell(w_j|\mathbf{w}_{-j})^\eta - w_j \ell(w_j|\mathbf{w}_{-j}). \quad (7)$$

Firm count N is fixed for exposition, so equilibrium profits are positive.

V.C. Competitive (Single-Wage) Equilibrium

Expert workers, who become informed at no cost, support a competitive equilibrium. Intuitively, if their share is $\alpha = 1$, the model follows the standard competitive equilibrium logic: aggregate labor supply is inelastic, and labor demand is downward sloping (with fixed N given $\eta < 1$). The competitive wage w^* then clears the market subject to the standard profit-maximizing condition, that the marginal product of labor equal the wage:

$$\eta(\ell^*)^{\eta-1} = w^*. \quad (8)$$

Moreover, labor market clearing pins down equilibrium firm size ℓ^* (with labor optimally spread equally across the N homogeneous, decreasing-returns firms):

$$N \cdot \ell^* = L \Leftrightarrow \ell^* = \frac{L}{N}. \quad (9)$$

V.D. Conditions for Competitive Equilibrium

A competitive equilibrium obtains if and only if no individual firm wants to deviate from paying the competitive wage w^* . Deviating to a higher wage $w' > w^*$ is surely unprofitable. This leaves $w' < w^*$ as the only feasible strategy. By offering a lower wage, a deviant firm immediately loses its expert workers. If

its amateur workers also search, employment and profits fall to zero. Hence, a profitable deviation requires wage below w^* but high enough to retain a firm's stock of amateur workers (We assume that indifferent amateurs stay put.). The most profitable deviation is therefore to exactly pay the amateur's reservation wage to not become informed, $w^r(w_j, \mathbf{w}_{-j}, c_A)$, which is defined by Condition 4 holding with equality. Using $w' = w^r(w', \mathbf{w}^*, c_A)$, the specification of worker beliefs in Equation 6 and maintaining $\delta = 0$ gives:

$$w' = w^* - \frac{c_A}{1 - \gamma}. \quad (10)$$

For intuition, consider $\gamma = 0$, i.e., accurate beliefs. Here, the deviant's wage pushes the amateur to their reservation wage, determined by search cost c_A . Now consider the role of anchored beliefs, i.e., $\gamma > 0$. The search cost c_A again enables the deviant to mark down the wage while retaining amateur workers. However, anchoring implies that workers facing a marked down wage become endogenously more pessimistic about the benefits of search. This further depresses workers' reservation wage, as reflected in Equation 10.

Deviants' profits also depend on scale, given by their amateur employment only:

$$\ell(w') = (1 - \alpha) \frac{L}{N}. \quad (11)$$

Given the deviants' scale and optimal wage in Equations 11 and 10, their profit is:

$$\pi(w') = \left((1 - \alpha) \frac{L}{N} \right)^\eta - \left(w^* - \frac{c_A}{1 - \gamma} \right) (1 - \alpha) \frac{L}{N}. \quad (12)$$

The competitive equilibrium obtains when deviation is unprofitable, i.e., when employing ℓ^* workers at wage w^* yields higher profits than the best deviation $\pi(w')$:

$$\left(\frac{L}{N} \right)^\eta - \eta \left(\frac{L}{N} \right)^\eta > \left((1 - \alpha) \frac{L}{N} \right)^\eta - \left(\eta \left(\frac{L}{N} \right)^{\eta-1} - \frac{c_A}{1 - \gamma} \right) (1 - \alpha) \frac{L}{N} \quad (13)$$

$$\Leftrightarrow \frac{c_A}{1 - \gamma} < \frac{1 - \alpha\eta - (1 - \alpha)^\eta}{1 - \alpha} \left(\frac{N}{L} \right)^{1-\eta}. \quad (14)$$

V.E. Segmented (Two-Wage) Equilibrium

When search costs c_A or the degree of anchoring γ are sufficiently large to violate Condition 14 (holding the amateur share fixed), a two-wage, or segmented, labor market equilibrium emerges. As Condition 14

is violated, some firms find it profitable to deviate to a low wage w_l . As more firms deviate, more experts flock to the remaining high wage firms. The equilibrium share of high-wage firms, denoted β , requires equal profits in both sectors. (Because there are only two types of workers, there can be no alternative non-competitive equilibria with more than two wages. A firm paying any wage $w \in (w_l, w_h)$ would employ the same number of workers as if paying w_l but earn lower profits. Paying more than w_h means lower profits than paying w_h , which, we explain below, equals the MPL at high-wage firms.)

Firm Size and Turnover by Wage Low-wage firms lose their expert workers (who costlessly move to high-wage firms), but retain their amateurs. High wage firms employ their original amateurs and all experts (those initially placed in the high-wage firm plus those separating from the low-wage firms, spread equally across the high-wage firms). Hence, the equilibrium employment levels for low- and high-wage firms are:

$$\ell_l = (1 - \alpha) \frac{L}{N} \quad \ell_h = \left(1 - \alpha + \frac{\alpha}{\beta}\right) \frac{L}{N}. \quad (15)$$

That is, the model features more turnover in the low-wage sector, consistent with evidence that workers in low-paying industries or firms search and quit more ([Krueger and Summers 1988](#); [Bassier, Dube, and Naidu 2022](#); [Drenik et al. 2023](#); [Faberman et al. 2022](#)).

The Wage in the High-Wage Sector *Within* the high wage sector, a sectoral competitive equilibrium emerges: the sector's wage w_h equals the MPL at employment ℓ_h . The reason is that high wage firms' marginal labor unit is an informed, expert worker, with costless search. Hence, the high wage, given firm-level employment from [Equation 15](#), is

$$w_h = \eta \left(\left(1 - \alpha + \frac{\alpha}{\beta}\right) \frac{L}{N} \right)^{\eta-1}. \quad (16)$$

The more firms are in the low-wage sector (i.e., the lower β), the more experts separate from that sector, search, and get spread across the β high-wage firms, pushing down their marginal product and hence the wage they pay, w_h .

The Wage in the Low-Wage Sector By contrast, non-competitive forces shape the low-wage sector. Here, as in the discussion of deviation from the competitive equilibrium above, firms simply pay the reservation

wage that fulfills workers' participation constraints (now against a maximum wage of w_h rather than w^*):

$$w_l = w_h - \frac{c_A}{1 - \gamma}. \quad (17)$$

Plugging in the high wage w_h from Equation 16 gives the level of the low wage.

The Size of the Low-Wage Sector The equilibrium conditions remain conditional on the share of high-wage firms, β . We pin down β through an indifference condition: the marginal firm—due to ex-ante homogeneity, each individual firm—must be indifferent between entering as a low- or as a high-wage firm, trading off wage savings against loss in scale. Intuitively, β governs the relative profitability of high wage firms by affecting the number of searching workers each high wage firm stands to gain from the low wage sector. The more firms enter the low-wage sector, the more (expert) workers flow into the high-wage sector, scaling up production at each high-wage firm, and raising profits there.¹⁴ With β in hand from the equal-profit condition, the share of jobs (rather than firms) in the low wage sector is given by:

$$S_l = \frac{(1 - \beta)\ell_l}{\beta\ell_h} = \frac{1 - \beta}{\alpha/(1 - \alpha) + \beta}. \quad (18)$$

V.F. Misperceptions in the Low-Wage Sector and Monopsony

Figure X illustrates the role of anchoring in amplifying labor market segmentation. It plots the share of workers in the low-wage sector as well as the wages paid in each sector as a function of the degree of anchoring, γ . For low γ , the competitive labor market equilibrium obtains. Here, misperceptions are irrelevant: the competitive equilibrium is sustained by the subset of expert workers, who are informed, and discipline firms' ability to take advantage of amateurs. However, the higher γ , the larger the temptation to deviate and rip off amateur workers with a lower wage, as their reservation wage falls in γ .

There exists a threshold level γ^* after which the equilibrium becomes segmented, for a given set of other parameters η , c_A , and α , defined in the profitable-deviation Condition 14. For higher values of γ , a two-wage, segmented equilibrium emerges. The share of workers in the low wage sector becomes positive. As γ rises, more firms choose to pay a low wage (β falls) and each high wage firm gains a larger number of

¹⁴ Concretely, profits in the low-wage and high-wage sectors are $\pi(w_l) = ((1 - \alpha)\frac{L}{N})^\eta - w_l(1 - \alpha)\frac{L}{N}$ and $\pi(w_h) = ((1 - \alpha + \frac{\alpha}{\beta})\frac{L}{N})^\eta - w_h(1 - \alpha + \frac{\alpha}{\beta})\frac{L}{N}$. Profit equalization, $\pi(w_l) = \pi(w_h)$, then implies $1 - \eta = \left(\frac{1 - \alpha}{1 - \alpha + \frac{\alpha}{\beta}}\right)^\eta \left[\frac{c_A(1 - \alpha)^{1 - \eta}}{1 - \gamma} \left(\frac{L}{N}\right)^{1 - \eta} + 1\right] - \eta \left(\frac{1 - \alpha}{1 - \alpha + \frac{\alpha}{\beta}}\right)$, which implicitly gives β as a function of model parameters. In fact, this equation has a solution whenever Condition 14 is violated, i.e., a competitive single-wage equilibrium cannot obtain.

experts exiting the low wage sector as a result. The high wage then falls to match the declining marginal product of labor. The low wage declines more rapidly however, with the gap between the high and low wage increasing in γ according to [Equation 17](#).

V.G. The Interaction of Standard Frictions and Misperceptions

The left-hand side of [Condition 14](#) clarifies an important interaction between search costs c_A and misperceptions γ in generating labor market segmentation and monopsony: misperceptions require some search costs (otherwise no worker stays put and misinformed), and search costs are amplified by misperceptions (which facilitate firms' gouging of immobile workers). Illustrating this interaction, [Online Appendix Figure B.8](#) replicates [Figure X](#), but as a function of amateurs' search cost c_A , for two economies: a no-anchoring economy ($\gamma = 0$) and an anchored one ($\gamma = 0.9$). In both cases, there is a cutoff level of c_A for segmentation given by [Condition 14](#). However, this cutoff falls dramatically, by 90%, for $\gamma = 0.9$ rather than $\gamma = 0$. Hence, in our model economy, an economist ignoring anchoring and estimating a model with standard search/information costs c only, would dramatically overestimate the level of c_A required to explain the amount of wage dispersion.

VI. Conclusion

We have measured workers' beliefs about wages at their outside options and compared them with proxies for their objective outside options. Workers believe that wages at their outside option are much closer to their current wage than they actually are. These beliefs, in turn, are correlated with intended labor market behaviors, even after controlling for proxies of actual outside options. Objectively low-paying firms employ workers that systematically underestimate their outside options. To causally examine the role of information frictions, we conduct an experiment in which we inform some respondents about the average wage of similar workers. Treated workers use the information not only to correct their beliefs about the wages of similar workers, but also revise their beliefs about their own outside options. This updating of beliefs also leads them to adjust their job search and wage negotiation intentions. Using an equilibrium model, we show that such anchoring of beliefs about outside options can give employers monopsony power and lead to labor market segmentation with a high- and a low-wage sector. Our paper leaves a quantification of the relative contribution of anchoring to labor market imperfections, besides and in tandem with conventional sources

such as search costs or preference heterogeneity for specific employers, to future research.

Our findings suggest anchoring and misperceptions about the wage distribution as a source of labor market imperfections. While such a misperception-based friction may result in similar phenomena (such as finitely elastic labor supply curves) as conventional frictions, it has distinctive predictions. For instance, in standard models with amenity differentiation or search frictions, workers are assumed to have perfect information about the wage distribution, their position therein, and hence their outside options; in those models, giving workers accurate information about the statistical properties of the wage distribution would change neither beliefs nor behavior. Both predictions are rejected by our evidence.

The presence of misperceptions also gives rise to distinct policy remedies, such as pay transparency mandates. Consistent with our findings, a growing body of evidence suggests that increases in between-firm pay transparency can redirect worker flows to higher-wage employers ([Cullen 2023](#)). Besides pay transparency mandates, other labor market institutions, e.g., minimum wages or sectoral bargaining, may also reduce misperceptions. Our experimental evidence suggests that providing wage information about fine-grained labor market cells could serve as a promising tool to debias workers' beliefs about outside options.

Why might the biases we document persist? On the worker side, perhaps privacy norms keep workers from sharing their wage information ([Cullen and Perez-Truglia 2023](#)). On the employer side, firms may avoid advertising high entry wages (e.g., in the presence of fairness concerns between colleagues [Dube, Giuliano, and Leonard 2019](#)) to avoid antagonizing some incumbent workers or generate wage pressure. [Ellison and Wolitzky \(2012\)](#) describe a model in which oligopsonistic firms may have an incentive to obfuscate their prices (wages). Relatedly, a large literature in behavioral industrial organization documents and analyzes the consequences of consumers persistently misperceiving prices and often failing to choose the best option (see [Ellison 2006](#); [Grubb 2015](#); [Heidhues and Kőszegi 2018](#), for overviews). Our evidence for similar patterns among workers choosing between firms raises the possibility that broader lessons from behavioral industrial organization may carry over to labor markets and highlights the importance of work investigating the extent to which firms may exploit workers' biases or may themselves be subject to imperfect information ([Cullen, Li, and Perez-Truglia 2023](#)).

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References

- Cullen, Zoë, and Ricardo Perez-Truglia. 2022. “How Much Does Your Boss Make? The Effects of Salary Comparisons.” *Journal of Political Economy* 130 (3): 766–822.
- Abowd, John, Francis Kramarz, and David Margolis. 1999. “High Wage Workers and High Wage Firms.” *Econometrica* 67 (2): 251–333.
- Antoni, Manfred, Mattis Beckmannshagen, and Markus M. Grabka. 2023. “SOEP Survey Data Linked to Administrative Data of the IAB (SOEP-ADIAB 7520).” *FDZ-Datenreport, Nuremberg*.
- Bassier, Ihsaan, Arindrajit Dube, and Suresh Naidu. 2022. “Monopsony in Movers the Elasticity of Labor Supply to Firm Wage Policies.” *Journal of Human Resources* 57 (S): S50–S86.
- Belot, Michele, Philipp Kircher, and Paul Muller. 2019. “Providing Advice to Jobseekers at Low Cost: An Experimental Study on Online Advice.” *Review of Economic Studies* 86 (4): 1411–1447.
- Berger, David, Kyle Herkenhoff, and Simon Mongey. 2022. “Labor Market Power.” *American Economic Review* 112 (4): 1147–93.
- Bonhomme, Stéphane, Kerstin Holzheu, Thibaut Lamadon, Elena Manresa, Magne Mogstad, and Bradley Setzler. 2023. “How Much Should We Trust Estimates of Firm Effects and Worker Sorting?” *Journal of Labor Economics* 41 (2): 291–322.
- Burdett, Kenneth, and Dale Mortensen. 1998. “Wage Differentials, Employer Size, and Unemployment.” *International Economic Review* 39 (2): 257–273.
- Cahuc, Pierre, Fabien Postel-Vinay, and Jean-Marc Robin. 2006. “Wage Bargaining with On-the-Job Search: Theory and Evidence.” *Econometrica* 74 (2): 323–364.

- Caldwell, Sydnee, and Oren Danieli. 2022. “Outside Options in the Labor Market.” *Working Paper*.
- Caldwell, Sydnee, and Nikolaj Harmon. 2019. “Outside Options, Wages, and Bargaining: Evidence from Coworker Networks.” *Working Paper*.
- Card, David, Ana Rute Cardoso, Jörg Heining, and Patrick Kline. 2018. “Firms and Labor Market Inequality: Evidence and Some Theory.” *Journal of Labor Economics* 36 (S1): S13–S70.
- Card, David, Jörg Heining, and Patrick Kline. 2013. “Workplace Heterogeneity and the Rise of West German Wage Inequality.” *The Quarterly Journal of Economics* 128 (3): 967–1015.
- Card, David, Alexandre Mas, Enrico Moretti, and Emmanuel Saez. 2012. “Inequality at Work: The Effect of Peer Salaries on Job Satisfaction.” *American Economic Review* 102 (6): 2981–3003.
- Chandra, Amitabh, Amy Finkelstein, Adam Sacarny, and Chad Syverson. 2016. “Health Care Exceptionalism? Performance and Allocation in the US Health Care Sector.” *American Economic Review* 106 (8): 2110–44.
- Conlon, John, Laura Pilossoph, Matthew Wiswall, and Basit Zafar. 2018. “Labor Market Search With Imperfect Information and Learning.” *NBER Working Paper*.
- Cullen, Zoë. 2023. “Is Pay Transparency Good?” *NBER Working Paper*.
- Cullen, Zoë, Shengwu Li, and Ricardo Perez-Truglia. 2023. “What’s My Employee Worth? The Effects of Salary Benchmarking.” *NBER Working Paper*.
- Cullen, Zoë, and Ricardo Perez-Truglia. 2023. “The salary taboo privacy norms and the diffusion of information.” *Journal of Public Economics* 222:104890.
- Di Addario, Sabrina, Patrick Kline, Raffaele Saggio, and Mikkel Sølvesten. 2022. “It Ain’t Where You’re From, It’s Where You’re At: Hiring Origins, Firm Heterogeneity, and Wages.” *Journal of Econometrics* 233 (2): 340–374.
- Drenik, Andres, Simon Jäger, Pascual Plotkin, and Benjamin Schoefer. 2023. “Paying Outsourced Labor: Direct Evidence From Linked Temp Agency-Worker-Client Data.” *Review of Economics and Statistics* 105 (1): 206–216.

- Dube, Arindrajit, Laura Giuliano, and Jonathan Leonard. 2019. "Fairness and Frictions: The Impact of Unequal Raises on Quit Behavior." *American Economic Review* 109 (2): 620–63.
- Ellison, Glenn. 2006. "Bounded Rationality in Industrial Organization." In *Advances in Economics and Econometrics: Theory and Applications*, 2:142–174. Cambridge University Press.
- Ellison, Glenn, and Alexander Wolitzky. 2012. "A Search Cost Model of Obfuscation." *The RAND Journal of Economics* 43 (3): 417–441.
- Enke, Benjamin. 2020. "What You See Is All There Is." *The Quarterly Journal of Economics* 135 (3): 1363–1398.
- Faberman, R Jason, Andreas Mueller, Ayşegül Şahin, and Giorgio Topa. 2022. "Job Search Behavior Among the Employed and Non-Employed." *Econometrica* 90 (4): 1743–1779.
- Feldstein, Martin, and James Poterba. 1984. "Unemployment Insurance and Reservation Wages." *Journal of Public Economics* 23 (1-2): 141–167.
- Frick, Mira, Ryota Iijima, and Yuhta Ishii. 2022. "Dispersed Behavior and Perceptions in Assortative Societies." *American Economic Review* 112 (9): 3063–3105.
- Gibbons, Robert, and Lawrence Katz. 1992. "Does Unmeasured Ability Explain Inter-Industry Wage Differentials?" *Review of Economic Studies* 59 (3): 515–535.
- Grubb, Michael. 2015. "Failing to Choose the Best Price: Theory, Evidence, and Policy." *Review of Industrial Organization* 47 (3): 303–340.
- Heidhues, Paul, and Botond Köszegi. 2018. "Behavioral Industrial Organization." *Handbook of Behavioral Economics: Applications and Foundations* 1:517–612.
- Hornstein, Andreas, Per Krusell, and Giovanni Violante. 2011. "Frictional Wage Dispersion in Search Models: A Quantitative Assessment." *American Economic Review* 101 (7): 2873–98.
- Hvidberg, Kristoffer B, Claus T Kreiner, and Stefanie Stantcheva. 2023. "Social Positions and Fairness Views on Inequality." *The Review of Economic Studies* 90 (6): 3083–3118.
- Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. 1993. "Earnings Losses of Displaced Workers." *American Economic Review* 83 (4): 685–709.

- Jäger, Simon, Benjamin Schoefer, Samuel Young, and Josef Zweimüller. 2020. “Wages and the Value of Nonemployment.” *The Quarterly Journal of Economics* 135 (4): 1905–1963.
- Jäger, Simon, Benjamin Schoefer, and Josef Zweimüller. 2023. “Marginal Jobs and Job Surplus: a Test of the Efficiency of Separations.” *The Review of Economic Studies* 90 (3): 1265–1303.
- Krueger, Alan, and Andreas Mueller. 2016. “A Contribution to the Empirics of Reservation Wages.” *American Economic Journal: Economic Policy* 8 (1): 142–179.
- Krueger, Alan, and Lawrence Summers. 1988. “Efficiency Wages and the Inter-industry Wage Structure.” *Econometrica: Journal of the Econometric Society* 56 (2): 259–293.
- Lachowska, Marta. 2016. “Outside Options and Wages: What Can We Learn from Subjective Assessments?” *Empirical Economics* 52 (1): 79–121.
- Lachowska, Marta, Alexandre Mas, Raffaele Saggio, and Stephen Woodbury. 2023. “Do Firm Effects Drift? Evidence from Washington Administrative Data.” *Journal of Econometrics* 233 (2): 375–395.
- Lachowska, Marta, Alexandre Mas, and Stephen Woodbury. 2020. “Sources of Displaced Workers’ Long-Term Earnings Losses.” *American Economic Review* 110 (10): 3231–66.
- Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler. 2022. “Imperfect Competition, Compensating Differentials and Rent Sharing in the US Labor Market.” *American Economic Review* 112 (1): 169–212.
- Le Barbanchon, Thomas, Roland Rathelot, and Alexandra Roulet. 2019. “Unemployment Insurance and Reservation Wages: Evidence from Administrative Data.” *Journal of Public Economics* 171 (1): 1–17.
- Manning, Alan. 2011. “Imperfect Competition in the Labor Market.” In *Handbook of Labor Economics*, 4:973–1041. Elsevier.
- Matějka, Filip, and Alisdair McKay. 2015. “Rational Inattention to Discrete Choices: A New Foundation for the Multinomial Logit Model.” *American Economic Review* 105 (1): 272–98.
- McCall, John Joseph. 1970. “Economics of Information and Job Search.” *The Quarterly Journal of Economics* 84 (1): 113–126.

- Morris, Carl. 1983. "Parametric Empirical Bayes Inference: Theory and Applications." *Journal of the American statistical Association* 78 (381): 47–55.
- Mortensen, Dale, and Christopher Pissarides. 1999. "New Developments in Models of Search in the Labor Market." *Handbook of Labor Economics* 3B:2567–2627.
- Mueller, Andreas, and Johannes Spinnewijn. 2023. "Expectations Data, Labor Market and Job Search." *Handbook of Economic Expectations* Chapter 22:677–713.
- Mueller, Andreas, Johannes Spinnewijn, and Giorgio Topa. 2021. "Job Seekers' Perceptions and Employment Prospects: Heterogeneity, Duration Dependence, and Bias." *American Economic Review* 111 (1): 324–63.
- Peer, Eyal, David Rothschild, Andrew Gordon, Zak Evernden, and Ekaterina Damer. 2021. "Data Quality of Platforms and Panels for Online Behavioral Research." *Behavior Research Methods* 54:1643–1662.
- Reynolds, Lloyd. 1951. *The Structure of Labor Markets: Wages and Labor Mobility in Theory and Practice*. Westport, Conn: Greenwood Press.
- Richter, David, and Jürgen Schupp. 2015. "The SOEP Innovation Sample (SOEP IS)." *Journal of Contextual Economics – Schmollers Jahrbuch* 135:389–399.
- Robinson, Joan. 1933. *The Economics of Imperfect Competition*. Macmillan.
- Rosen, Sherwin. 1986. "The Theory of Equalizing Differences." *Handbook of Labor Economics* 1:641–692.
- Salop, Steven, and Joseph Stiglitz. 1977. "Bargains and Ripoffs: A Model of Monopolistically Competitive Price Dispersion." *Review of Economic Studies* 44 (3): 493–510.
- Schmieder, Johannes F., Till von Wachter, and Jörg Heining. 2023. "The Costs of Job Displacement over the Business Cycle and Its Sources: Evidence from Germany." *American Economic Review* 113 (5): 1208–54.
- Schubert, Gregor, Anna Stansbury, and Bledi Taska. 2023. "Employer Concentration and Outside Options." *Working Paper*.
- Slichter, Sumner. 1950. "Notes on the Structure of Wages." *Review of Economics and Statistics* 32 (1): 80–91.

- Spinnewijn, Johannes. 2015. “Unemployed but Optimistic: Optimal Insurance Design with Biased Beliefs.” *Journal of the European Economic Association* 13 (1): 130–167.
- Stigler, George. 1961. “The Economics of Information.” *Journal of Political Economy* 69 (3): 213–225.
- Tversky, Amos, and Daniel Kahneman. 1973. “Availability: A Heuristic for Judging Frequency and Probability.” *Cognitive Psychology* 5 (2): 207–232.
- Zweck, Bettina, and Axel Glemser. 2020. “SOEP-IS 2019: Survey Report on the 2019 SOEP Innovation Sample.” *SOEP Survey Papers*.
- Zweck, Bettina, and Martin Rathje. 2021. “SOEP-IS 2020: Survey Report on the 2020 SOEP Innovation Sample.” *SOEP Survey Papers*.

Tables

Table I: Summary Statistics (SOEP-IAB Sample)

	Mean	SD	P10	P25	Median	P75	P90	Share 0	
Panel A: Demographics and Labor Market Characteristics									
Age in Years	44.6	11.4	29.0	35.0	45.0	55.0	60.0	0.000	514
Wage (in EUR, per Year)	39,222	21,168	16,644	24,000	35,100	48,000	69,600	0.000	514
Tenure in Years	11.2	10.8	0.0	2.0	7.0	18.0	29.0	0.101	514
Share of Women	0.482	0.500	0.000	0.000	0.000	1.000	1.000	0.518	514
Full-time Employed	0.718	0.450	0.000	0.000	1.000	1.000	1.000	0.282	514
Part-time Employed	0.272	0.446	0.000	0.000	0.000	1.000	1.000	0.728	514
Panel B: Beliefs									
Own Wage Change as % of Wage	-1.2	11.0	-15.0	-7.4	0.0	0.0	12.2	0.406	498
Coworker Wage Change as % of Wage	1.3	10.3	-13.4	0.0	0.0	7.2	16.1	0.397	499
Own Wage Rank in Same Occupation	51.8	18.1	30.0	45.0	50.0	60.0	75.0	0.000	504
Median Wage in Occupation (in EUR, per Year)	41,219	18,508	22,800	28,800	36,000	48,000	66,000	0.000	492
Panel C: Estimation Errors									
Belief (Own Wage Change) Versus Coworker Wage Changes (%)	-6.3	33.7	-50.4	-23.0	-3.4	13.9	34.0	0.006	329
Belief (Coworker Wage Change) Versus Coworker Wage Changes (%)	-4.5	32.6	-47.5	-18.9	0.0	14.6	32.7	0.006	334
Belief (Median Wage) Versus Actual Median Wage (%)	-4.6	27.6	-35.7	-23.3	-7.0	9.6	28.1	0.000	405
Belief (Own Wage Rank in Occupation) Minus Actual Wage Rank (ppt/rank)	1.5	29.4	-37.5	-17.5	2.5	22.5	37.5	0.008	397
Belief (Own Wage Change) Versus ML Prediction (%)	5.5	28.7	-34.3	-9.6	9.8	24.9	37.7	0.000	417

Note: This table reports summary statistics for our analysis sample, a match of the 2019 SOEP respondents in our questionnaire and the IAB data. Panel A reports demographic and labor market characteristics. Panel B reports summary statistics of labor market beliefs. “Own Wage Change as % of Wage” is calculated based on responses to a question about respondents’ expected wage change if forced to leave their job relative to their current wage. “Coworker Wage Change as % of Wage” is calculated based on responses to a question about the wage change experienced by a typical coworker leaving their job. Both percentage shares are approximated by log differences. “Own Wage Rank in the Same Occupation” is based on a question asking respondents about the fraction of other workers who receive a lower wage. Panel C reports estimation errors which are defined as the respective belief minus an objective benchmark: logs for the belief about own outside option and the belief about coworker wage change, rank units for the wage percentile, and percent for the belief about the median wage. For the estimation error of the respondents’ own outside option, we follow the sample definitions of [Figure III Panel \(a\)](#) and [Figure IV](#). In this table, all continuous variables are winsorized at the 2% level.

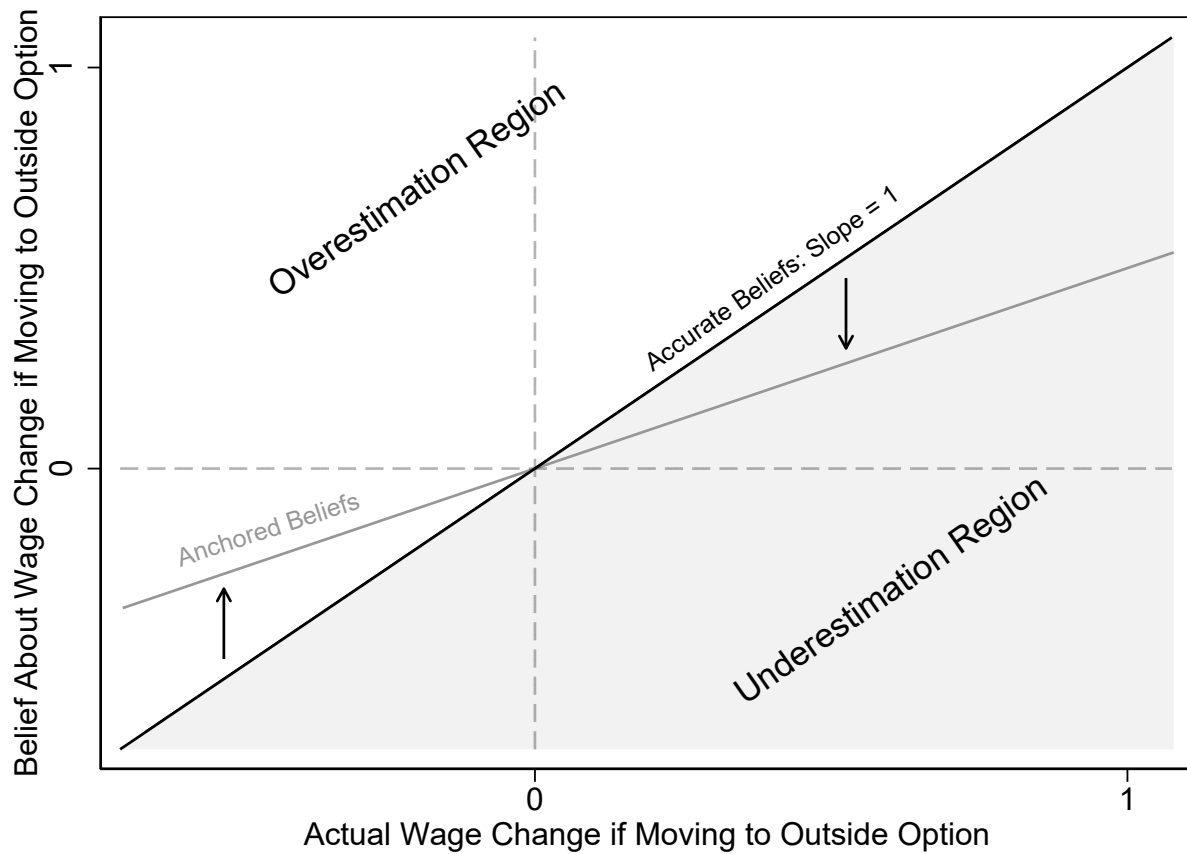
Table II: Information Experiment

	(1) Post-Treat Estimation Error	(2) Belief About Outside Option (Wage Change)	(3) Intended Quit Probability	(4) Intended Search Probability	(5) Intended Negotiation Probability	(6) Intended Neg Magnitude (No Neg = 0)	(7) Intended Neg Magnitude (No Neg = Msg)	(8) Reservation Wage Cut
Treated \times Pre-Treat Estimation Error	-0.527*** (0.057)	-0.486*** (0.039)	-0.142*** (0.052)	-0.086 (0.053)	-0.208*** (0.059)	-0.048*** (0.009)	-0.060*** (0.009)	0.000 (0.016)
Treated	-0.008 (0.014)	0.037*** (0.008)	0.003 (0.013)	0.017 (0.013)	0.007 (0.015)	0.004* (0.002)	0.004* (0.002)	-0.003 (0.004)
Pre-Treat Estimation Error	0.888*** (0.043)	0.042 (0.026)	-0.021 (0.039)	-0.034 (0.037)	0.102** (0.043)	0.019*** (0.006)	0.019*** (0.006)	0.004 (0.012)
Constant	0.032*** (0.010)	0.043*** (0.006)	0.230*** (0.009)	0.244*** (0.009)	0.392*** (0.011)	0.057*** (0.001)	0.072*** (0.001)	0.090*** (0.003)
IV: Endogenous Variable:			0.261*** (0.087)	0.217** (0.088)	0.395*** (0.103)	0.100*** (0.015)	0.117*** (0.015)	-0.012 (0.024)
Belief About Outside Option (Wage Change)			0.215*** (0.008)	0.239*** (0.008)	0.371*** (0.010)	0.053*** (0.001)	0.066*** (0.002)	0.090*** (0.002)
Constant								
Control Group Mean	-0.078	0.040	0.231	0.247	0.385	0.056	0.071	0.090
First-Stage F-Stat			150.511	150.511	150.511	150.511	129.722	150.511
N	2,468	2,468	2,468	2,468	2,468	2,468	1,969	2,468

Note: This table reports results of the information experiment in a 2022 online survey. It reports regressions of each outcome variable on the respondent's pre-treatment estimation error about the mean wage of similar workers (in logs), a treatment indicator, and an interaction between the treatment indicator and pre-treatment estimation error. We also report IV specifications, using respondents' beliefs about their outside option as the endogenous variable (see [Section IV.D](#) for details on the IV specification). In Column (1), the outcome is a post-treatment version of the estimation error, i.e., beliefs about wages of similar workers. In Column (2) the outcome is the respondent's post-treatment belief about the wage change at their outside option. Columns (3)-(8) report results on intended labor market behaviors: probability of quitting, probability of finding another job, probability of negotiating for a raise, the expected magnitude of the raise asked (with no negotiations planned coded as a zero-magnitude raise or as missing), and the reservation wage cut as a percent of their current wage.

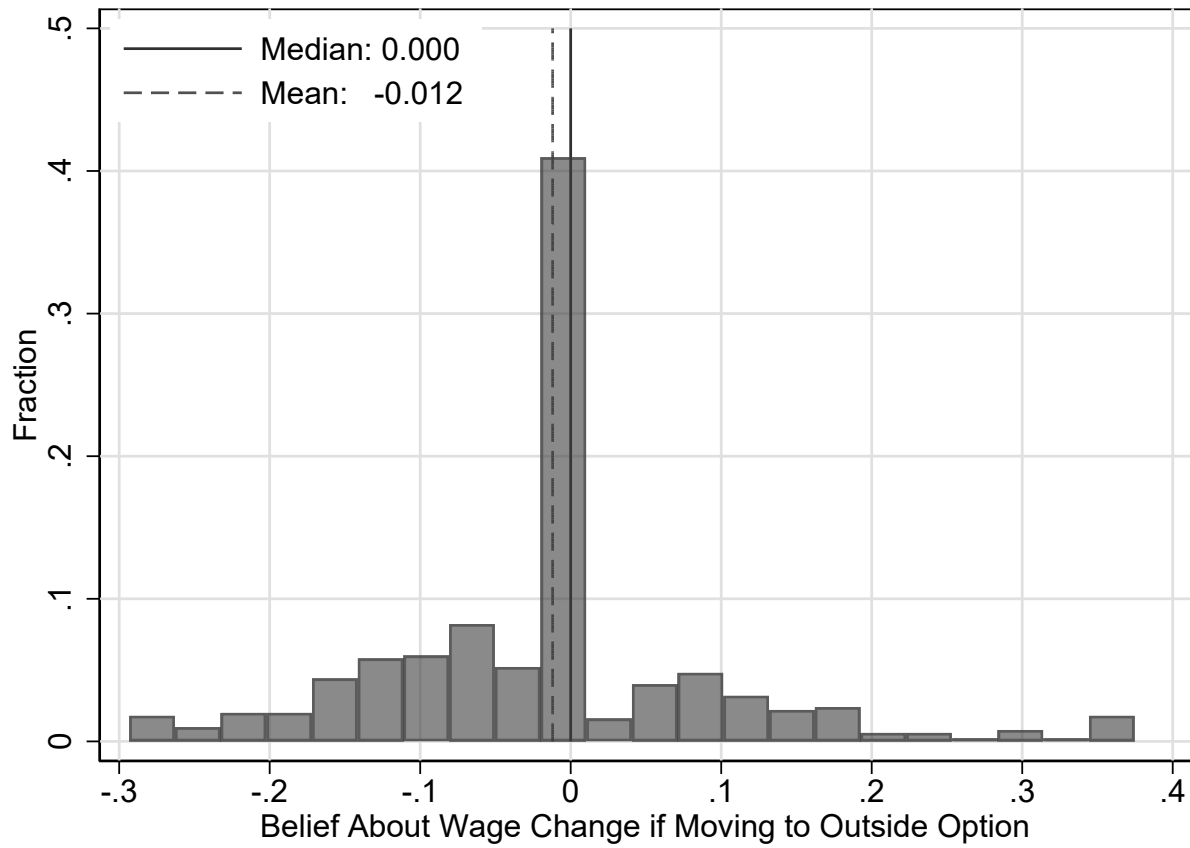
Figures

Figure I: Research Design



Note: This figure illustrates our research design. The y-axis depicts beliefs about wage changes if moving to the outside option, while the x-axis shows actual wage changes if moving. The black line illustrates the baseline case where workers hold beliefs that are accurate. Workers above (below) that line overestimate (underestimate) their outside option. The orange line has a slope that is less than 1, as would emerge if workers anchor their beliefs about their outside option on their current wages.

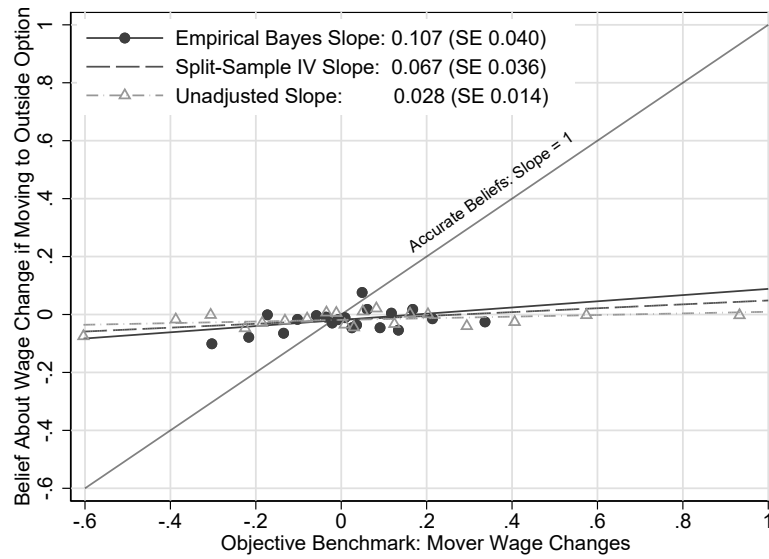
Figure II: Distribution of Beliefs About Wage Change if Moving to Outside Option



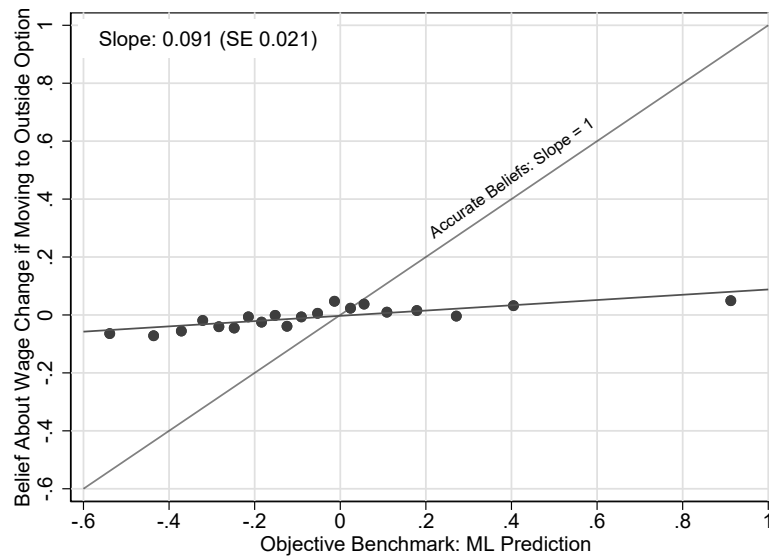
Note: This figure presents a histogram of workers' beliefs about their own wage change when forced to leave their job as a percent of workers' current wages (approximated by the log difference). The data are winsorized at the 2% level. The data stems from the 2019 wave of the German Socio-Economic Panel (see [Table I](#) for summary statistics). The sample size is 498.

Figure III: Beliefs About Wage Change if Moving to Outside Option vs. Objective Benchmarks

(a) Benchmark: Wage Changes of Coworkers Involuntarily Leaving Firm

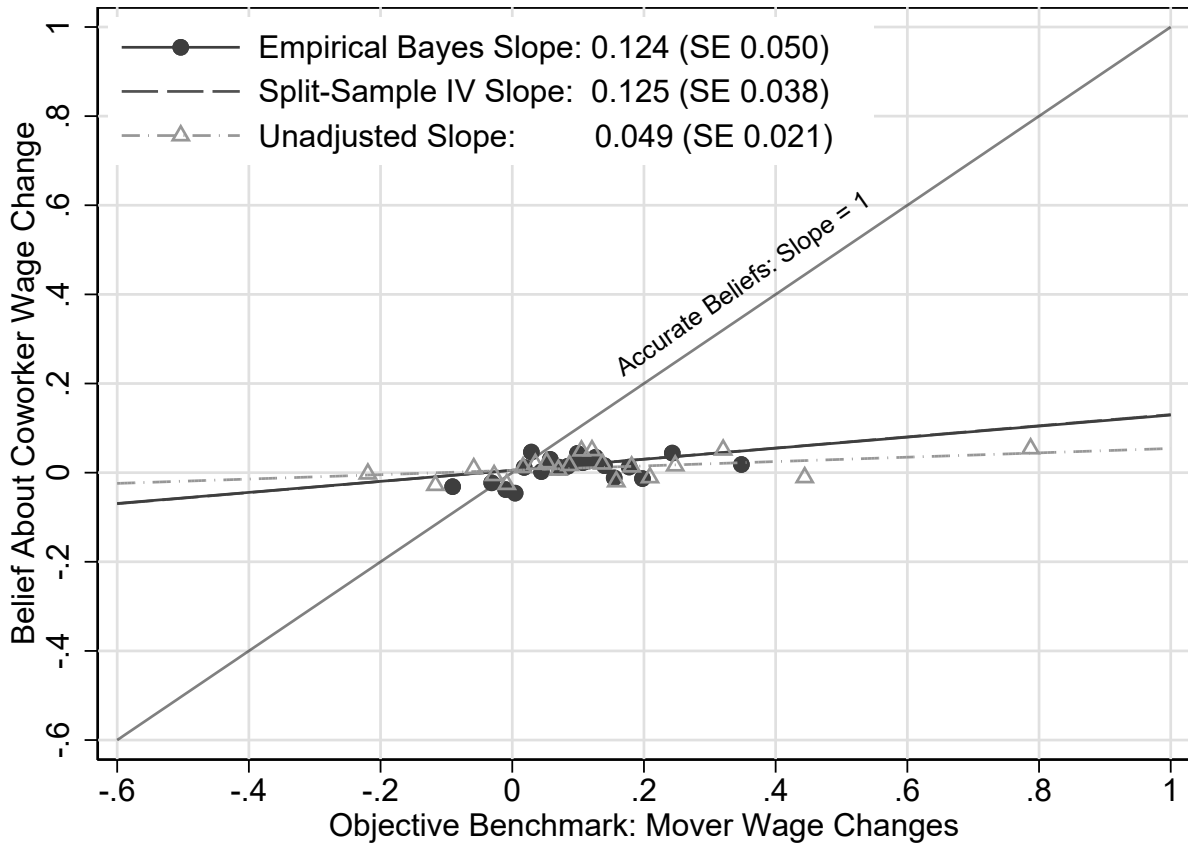


(b) Benchmark: Machine Learning Prediction



Note: This figure presents binned scatter plots of SOEP 2019 respondents' beliefs about their own wage change if forced to leave their firm against two objective benchmarks for the actual wage changes they would experience. In Panel (a), the benchmark is the mean log wage changes experienced by workers who left the SOEP respondent's firm in the past 5 years (between 2015 and 2019). We restrict to movers working full-time both before and after the move, and to movers who experience an intermediate unemployment spell before finding their next job, to narrow our attention to "involuntary" separations. In Panel (b), the benchmark is based on machine learning for the wage changes SOEP respondents would experience if leaving their firm, with a model trained on the universe of "involuntary" moves in the German labor market ("involuntary" defined as above). The machine learning methodology is fully described in [Online Appendix D](#). The sample size in Panel (a) is 310 observations for the unadjusted line, and 206 observations for the Empirical Bayes line, and 132 for the split-sample IV line. The sample size in Panel (b) is 419 observations.

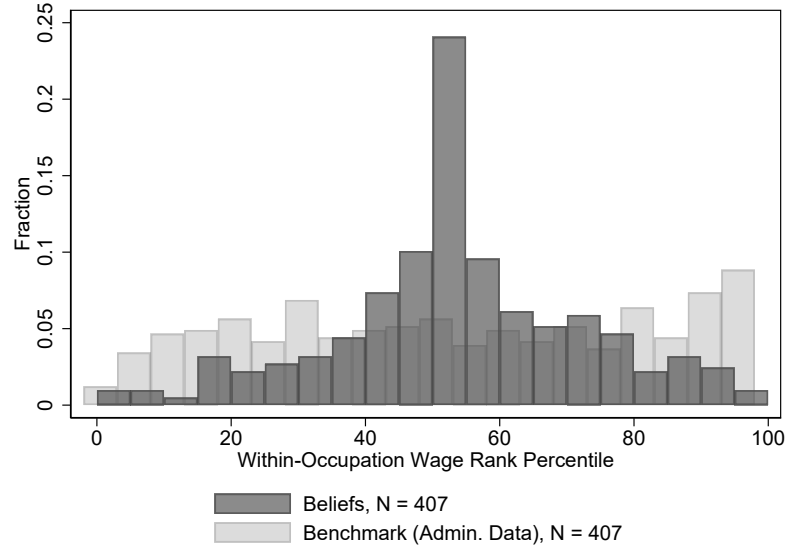
Figure IV: Beliefs About Mover Wage Changes vs. Actual Mover Wage Changes



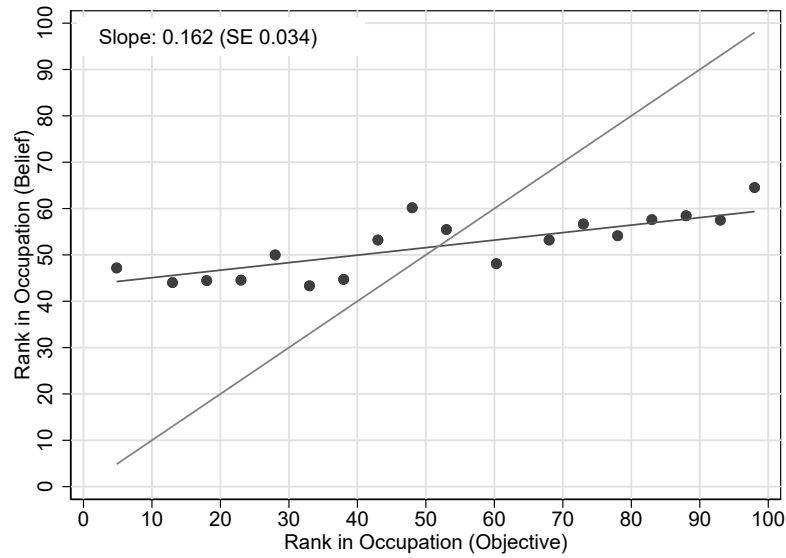
Note: This figure presents binned scatter plots of SOEP 2019 respondents' beliefs about the typical wage change of coworkers who leave their firm, against the actual wage changes of coworkers who left their firm between 2015 and 2019. It is analogous to [Figure III Panel \(a\)](#), except that the y-axis reports beliefs about the typical wage change of coworkers (irrespective of whether voluntary or involuntary), and the x-axis is the corresponding objective benchmark (but now calculated from all coworker moves rather involuntary ones only, consistent with this survey question). The sample size is 473 observations for the unadjusted line, and 442 for the Empirical Bayes line, and 382 split-sample IV line.

Figure V: Beliefs About Own Wage Rank in Occupation

(a) Histogram of Own Wage Rank in Occupation (Beliefs and Objective Benchmark)

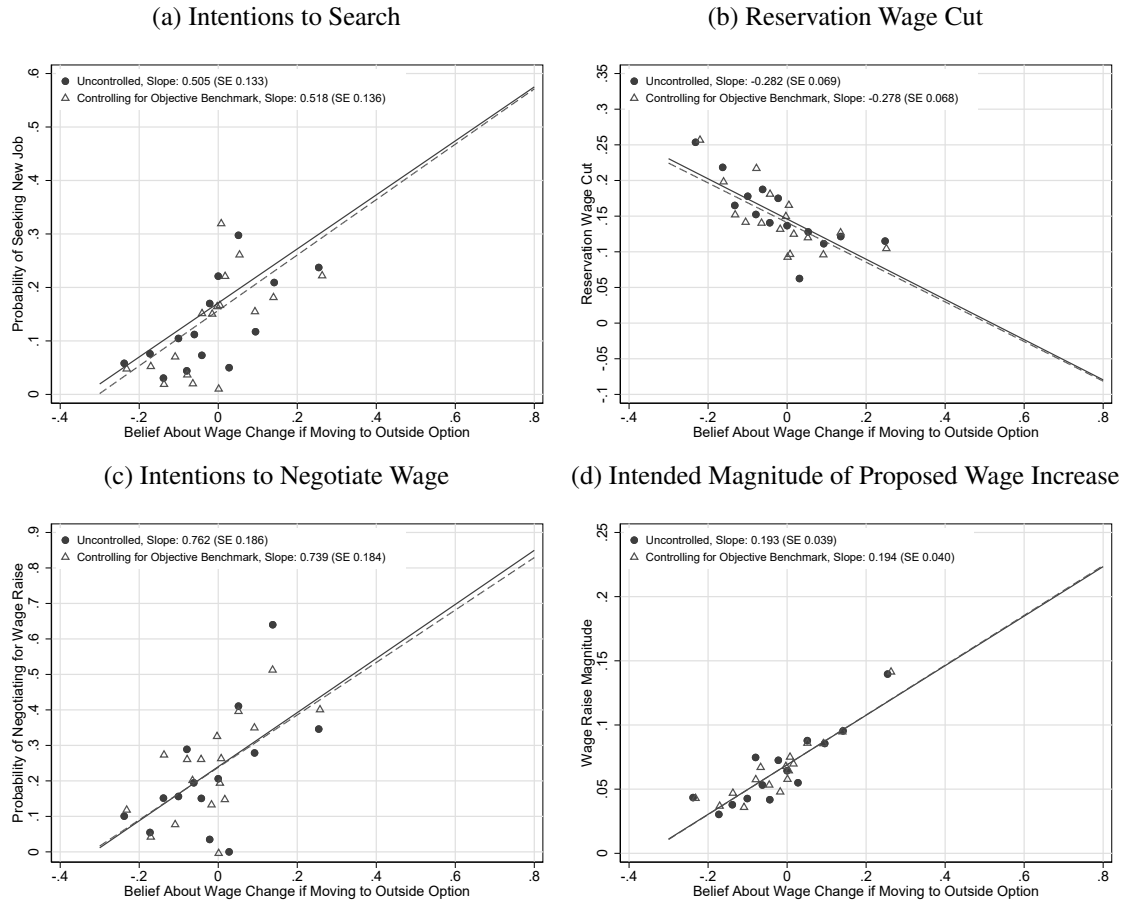


(b) Beliefs About Wage Rank in Occupation Against Objective Benchmark



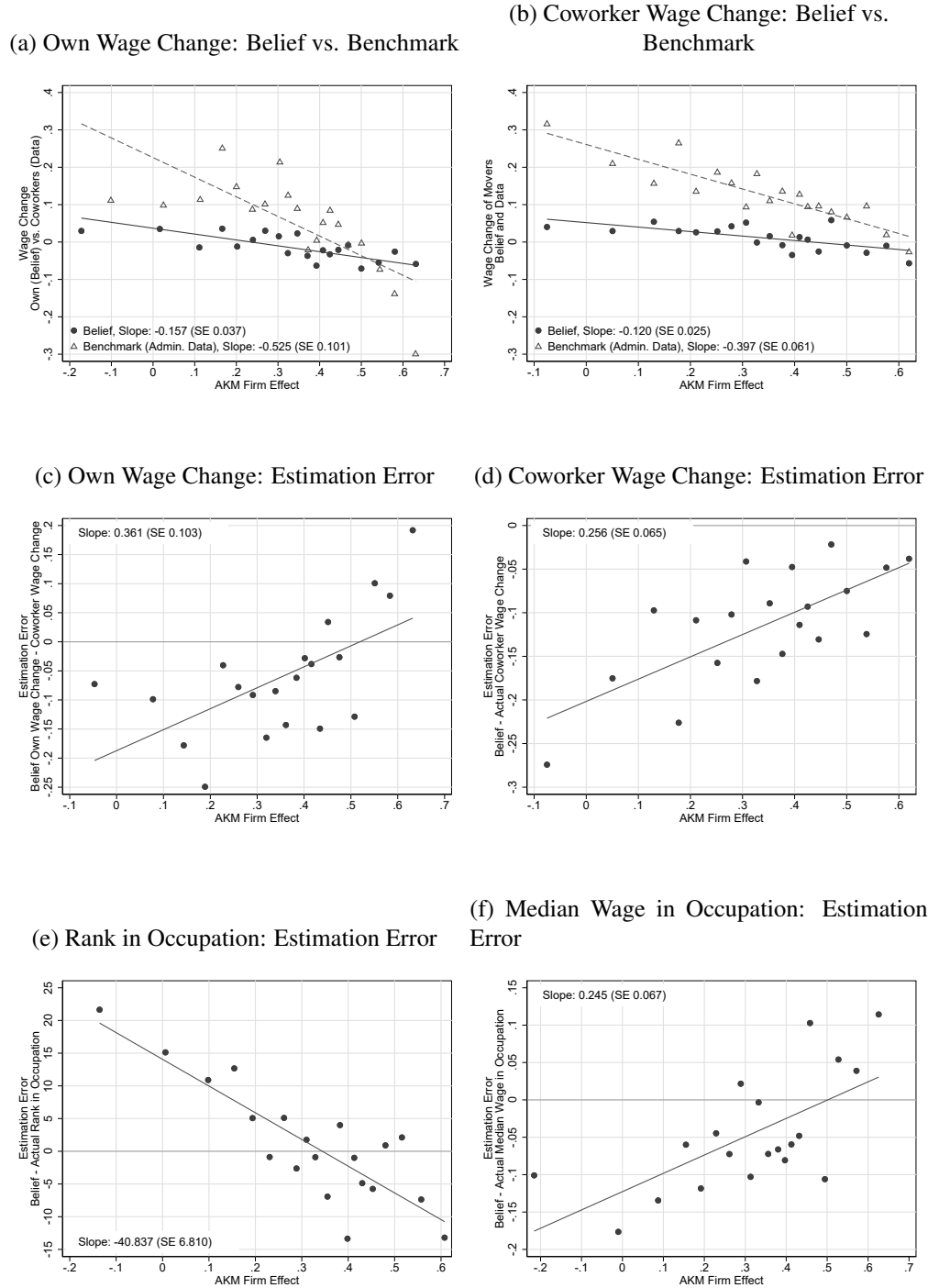
Note: This figure tests the accuracy of 2019 SOEP respondents' beliefs about their wage rank within their occupation (compared to workers in other firms). Panel (a) shows a histogram of beliefs as well as the actual ranks of our respondents (the latter calculated at the 4-digit occupation level in our administrative data sample in 2019). Panel (b) shows a binned scatter plot of beliefs against actual rank, along with a regression line. The sample size in each of the panels is 407.

Figure VI: Intended Labor Market Behavior and Beliefs about Outside Options



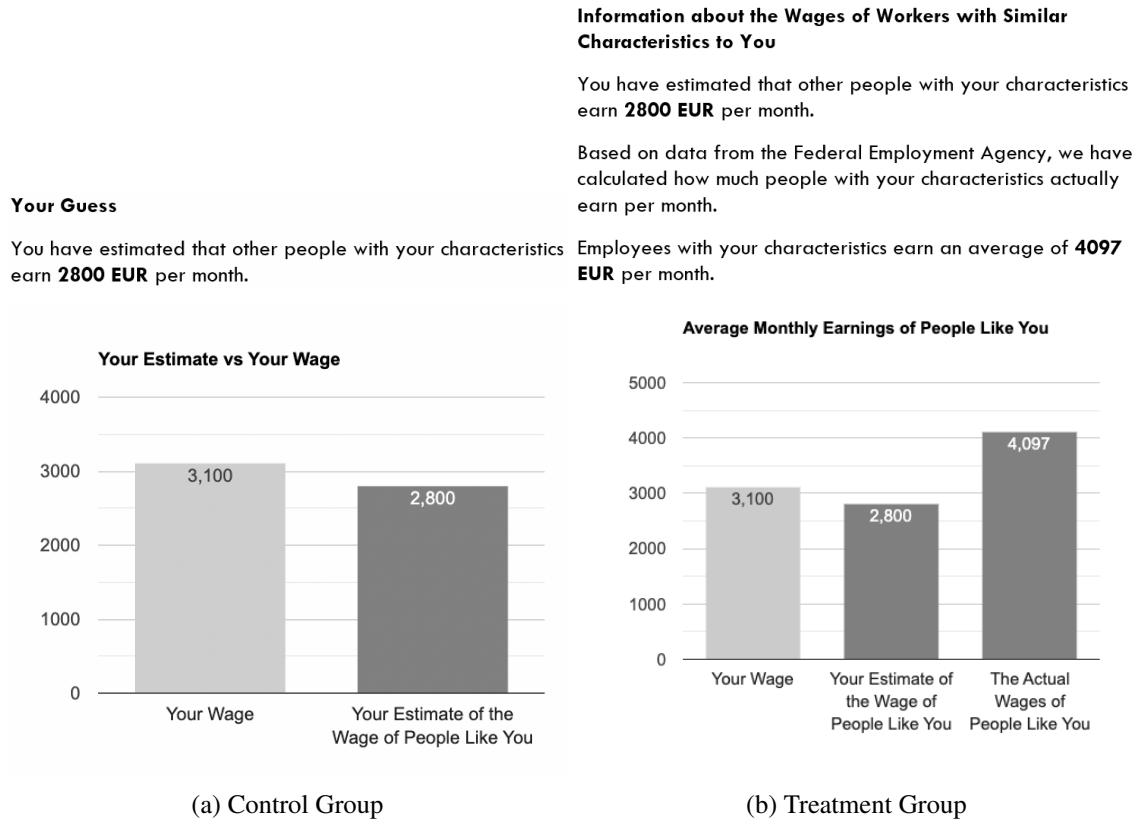
Note: The figure presents binned scatter plots of respondents' intended labor market behaviors against their beliefs about their own wage change if forced to leave their firm. The variables are: the probability of searching for a new job in the next 12 months (Panel (a)), the minimum pay cut at their current job that would induce them to quit (Panel (b)), the probability of asking for a wage raise in the next 12 months (Panel (c)), and the magnitude of the raise one would suggest in a salary negotiation (Panel (d)). We report two specifications: without controls (blue solid circles and blue solid regression line) and with coworker wage changes as a control (red hollow triangles and red dashed regression line), the objective benchmark for the wage change they would experience. The sample sizes are 310, 291, 310 and 306 in Panels (a) to (d), respectively.

Figure VII: Beliefs and Misperceptions Across the Firm Wage Distribution



Note: Panels (a) and (b) present binned scatter plots of beliefs about outside options and objective benchmarks for outside options against firm AKM effects, as a measure of composition-adjusted firm wage premia. Panel (a) presents beliefs about own wage changes and actual wage changes of involuntary movers, while Panel (b) presents beliefs about coworker wage changes and actual wage changes of involuntary movers. The Panels (c) to (f) present binned scatter plots of misperception measures against firm AKM effects. Estimation errors are defined as the belief minus the objective benchmark: logs in Panels (c) and (d), rank units in Panel (e), and percent in Panel (f). See [Table I](#) Panel C for summary statistics of the estimation errors. The sample sizes are 310, 471, 310, 471, 405 and 413 in Panels (a) to (f).

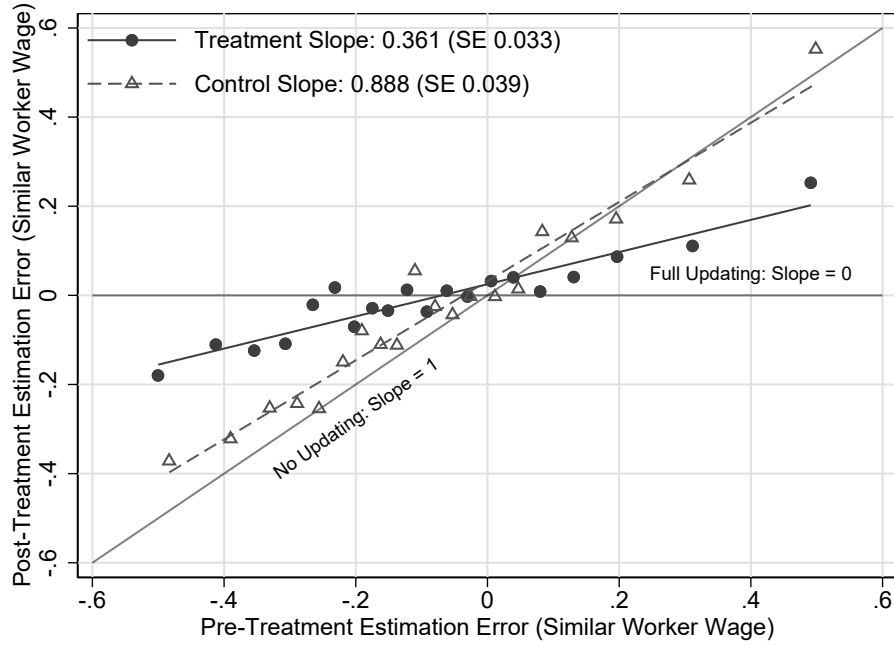
Figure VIII: Experiment: Information Treatment Screen



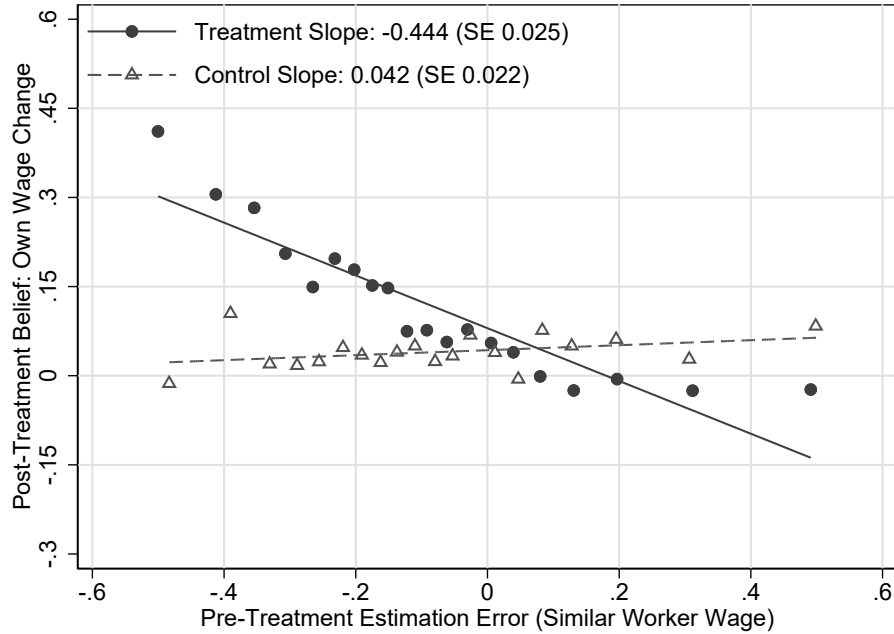
Note: These panels display (a translated version of) the information screen for a respondent with the same characteristics, in either the control (Panel (a)) or the treatment group (Panel (b)). The respondent reports a monthly wage of 3,100 EUR and estimates that other people with their characteristics earn 2,800 EUR a month on average. These screens are preceded by a screen reminding the respondent of the list of characteristics they reported (gender, age, occupation, labor market region, education level, and so on) to explicitly identify the characteristics being held fixed. For the treatment group, additionally the actual average wage is displayed (see [Section IV](#) for details on its calculation).

Figure IX: Effects of Information Treatment

(a) Intervention Check: Beliefs about Wages of Similar Workers

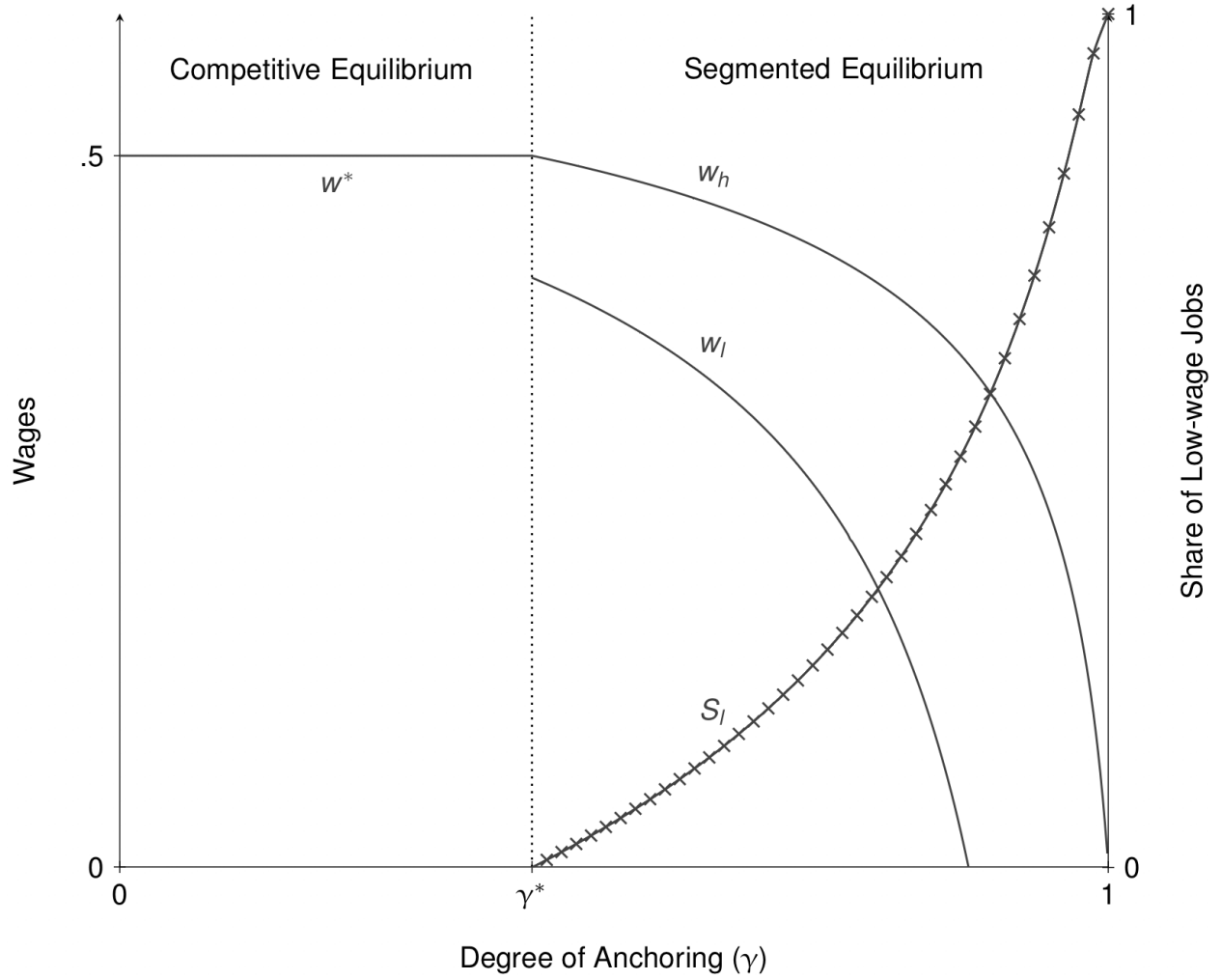


(b) First Stage: Beliefs about Outside Option



Note: The figure presents binned scatter plots using data from our 2022 information experiment, in which the treatment group received information in the form of the average wage of workers with similar characteristics from the same labor market (see [Section IV](#) for details on its calculation). As an intervention check, Panel (a) plots the post-treatment estimation error about that wage against the pre-treatment one, separately for the treatment and control groups. The estimation error is defined as the percentage difference between beliefs and the actual wage. Panel (b) plots participants' beliefs about their outside option (wage change) against the pre-treatment estimation error.

Figure X: Equilibrium Implications of Anchoring



Note: The figure plots equilibrium wages and the share of low-wage jobs as a function of the degree of anchoring (i.e., the weight workers put on their current wage when forming beliefs about their outside option). The dotted vertical line marks the cutoff value of anchoring that induces a switch from a competitive to a segmented labor market, with a high and low wage sector. The other parameters are set as follows: search cost $c_A = .05$, decreasing returns $\eta = 1/2$, share of amateur workers $\alpha = 1/2$, and the number of workers per firm $L/N = 1$. See [Online Appendix Figure B.8](#) for the analogous figure illustrating the effects of information costs on equilibrium outcomes, with or without anchoring.

Online Appendix of: WORKER BELIEFS ABOUT OUTSIDE OPTIONS

Simon Jäger, Christopher Roth, Nina Roussille, Benjamin Schoefer

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A. Appendix Tables

Table A.1: Overview of Data Collections

Data collection	Sample	Timing
SOEP IS Wave 1 (N=1,068)	In-person interviews with full-time and part-time employed workers in Germany as part of SOEP-IS	2019, September – December
SOEP IS Wave 2 (N=828)	In-person and telephone interviews with full-time and part-time employed workers in Germany as part of SOEP-IS	2020, September – December
Robustness Survey (N=907)	Online surveys with full-time and part-time employed workers in Germany with Dynata	2021, July
Information Provision Experiment (N=2,468, with pilot N=3,231)	Online surveys with full-time employed workers in Germany with Dynata and Bilendi	2022, May – July

Table A.2: Characteristics of SOEP Respondents vs. "Involuntary" Coworker Movers vs. Other Coworkers

Variable	Mean SOEP	Mean Movers	Mean Nonmovers	SOEP vs. Movers	SOEP vs. Nonmovers
Log Wage	4.383	4.307	4.231	0.157	0.007
Age in Years	40.704	35.559	37.190	0.000	0.000
Tenure in Years	6.835	3.488	2.151	0.000	0.000
Share of Women	0.435	0.291	0.309	0.000	0.001
No Qualifications	0.065	0.168	0.096	0.000	0.100
Vocational Qualification	0.474	0.428	0.496	0.241	0.567
University Qualification	0.222	0.158	0.162	0.052	0.063
Missing Qualifications	0.239	0.247	0.246	0.836	0.852
Agriculture & Forestry	0.009	0.018	0.013	0.345	0.654
Mining, Industry, & Manufacturing	0.265	0.288	0.264	0.558	0.971
Construction & Infrastructure	0.035	0.034	0.040	0.955	0.742
Academic & Technical	0.057	0.056	0.040	0.980	0.336
Transportation, Logistics, & Cleaning	0.159	0.173	0.193	0.646	0.283
Sales	0.078	0.074	0.088	0.835	0.677
Managerial	0.180	0.166	0.175	0.659	0.860
Medical, Childcare, & Educational	0.174	0.143	0.148	0.336	0.424
Marketing, Artistic, & Athletic	0.043	0.048	0.040	0.774	0.843

Note: This table relies on the same sample definition as our preferred Empirical Bayes bias correction in [Figure III Panel \(a\)](#). The sample size of the SOEP-mover column is 232. This table compares the characteristics of SOEP respondents to the characteristics of their coworkers who moved "involuntarily" out of their firm sometime between 2015 and 2019 and the characteristics of their other coworkers. The first three columns present the means of each variable for the SOEP respondents, the movers, and the non-movers of the same firm as the SOEP respondents. The columns "SOEP vs. Movers" and "SOEP vs. Nonmovers" report the p-value obtained from either a t-test or a proportion test comparing the two groups. In this table, all continuous variables are winsorized at the 2% level.

Table A.3: Information Experiment: Pooling Pilot and Post-Pilot

	(1) Post-Treat Estimation Error	(2) Belief About Outside Option (Wage Change)	(3) Intended Quit Probability	(4) Intended Search Probability	(5) Intended Negotiation Probability	(6) Intended Neg Magnitude (No Neg = 0)	(7) Intended Neg Magnitude (No Neg = Msg)	(8) Reservation Wage Cut
Treated \times Pre-Treat Estimation Error	-0.525*** (0.050)	-0.450*** (0.034)	-0.125*** (0.043)	-0.069 (0.044)	-0.194*** (0.048)	-0.037*** (0.007)	-0.045*** (0.007)	-0.000 (0.013)
Treated	-0.016 (0.012)	0.042*** (0.007)	0.014 (0.011)	0.026** (0.011)	0.011 (0.013)	0.004** (0.002)	0.005*** (0.002)	-0.003 (0.003)
Pre-Treat Estimation Error	0.901*** (0.037)	0.023 (0.022)	-0.036 (0.031)	-0.057* (0.030)	0.088** (0.034)	0.013*** (0.005)	0.010** (0.005)	0.007 (0.009)
Constant	0.041*** (0.009)	0.040*** (0.005)	0.227*** (0.008)	0.241*** (0.008)	0.389*** (0.009)	0.053*** (0.001)	0.066*** (0.001)	0.089*** (0.002)
IV: Endogenous Variable:			0.285*** (0.078)	0.233*** (0.078)	0.400*** (0.092)	0.084*** (0.012)	0.104*** (0.013)	-0.012 (0.021)
Belief About Outside Option (Wage Change)			0.217*** (0.007)	0.240*** (0.007)	0.371*** (0.008)	0.050*** (0.001)	0.062*** (0.001)	0.089*** (0.002)
Constant								
Control Group Mean	-0.069	0.038	0.229	0.245	0.384	0.053	0.066	0.089
First-Stage F-Stat			172.912	172.912	172.912	172.912	146.238	172.961
N	3,231	3,231	3,231	3,231	3,231	3,231	2,584	3,230

Note: This table replicates [Table II](#) using the pre-specified sample (pooling pilot and post-pilot). See [Table II](#) for additional information.

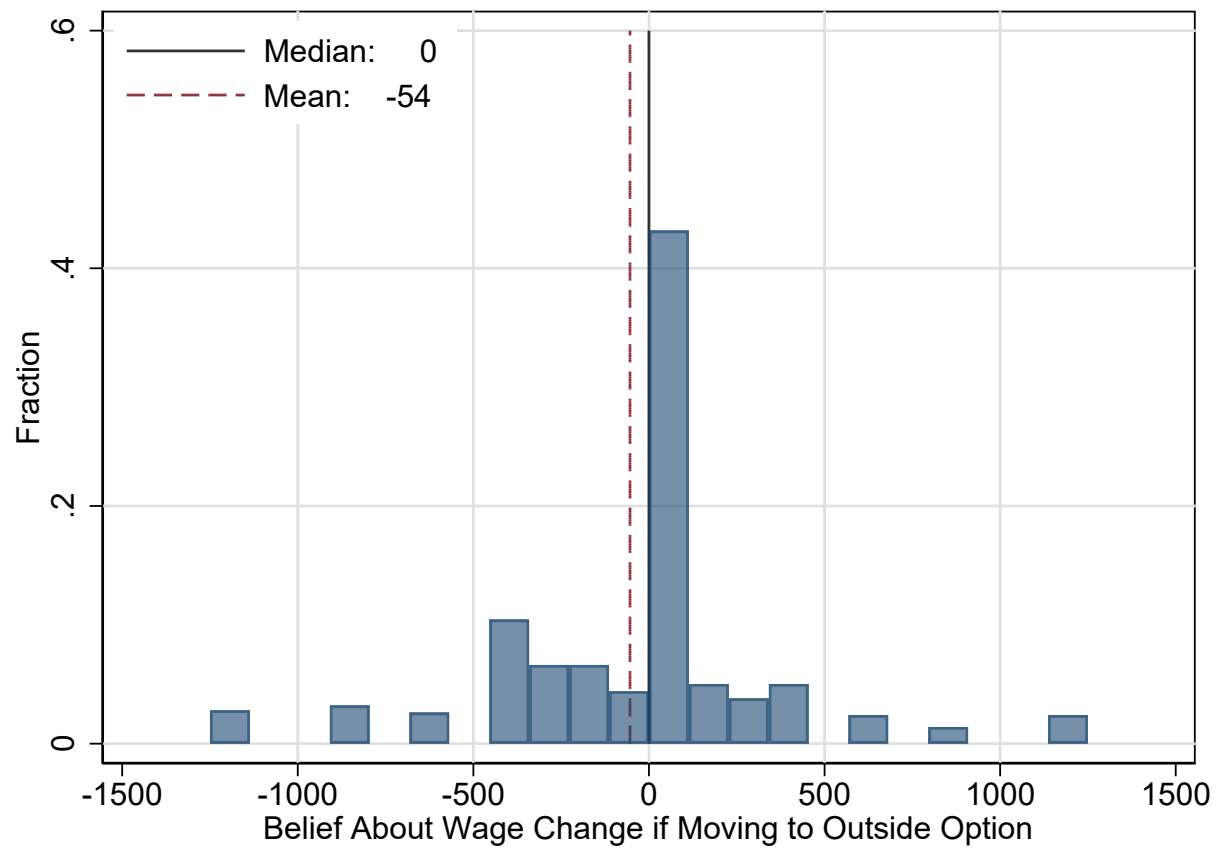
Table A.4: Balance in Online Experiment Groups

	SOEP-IAB Mean	SOEP-IAB Mean FT	Online Survey Mean	Online Control Mean	Online Treatment Mean
General Stats					
Number of Respondents	514	369	2,468	1,257	1,211
Share of Women	0.482	0.328	0.414	0.413	0.415
Age in Years	44.6	44.6	44.7	44.4	45.0
Pre-Tax Wage (in EUR, per Month)	3,268	3,807	3,885	3,892	3,877
Tenure in Years	11.2	11.8	15.0	15.0	15.0
Full-time Employed	0.718	1.000	1.000	1.000	1.000
Beliefs					
Pretreatment Beliefs: Wage Change (in %)	-1.211	-1.560	0.037	0.036	0.039

Note: This table compares characteristics in the SOEP-IAB sample and in the online experiment. Columns (1) and (2), respectively, show demographic characteristics of the SOEP-IAB sample, restricting to full-time in Column (2). Columns (3) to (5) use the same sample as in [Table II](#) and report characteristics over control and treated groups. In this table, all continuous variables are winsorized at the 2% level.

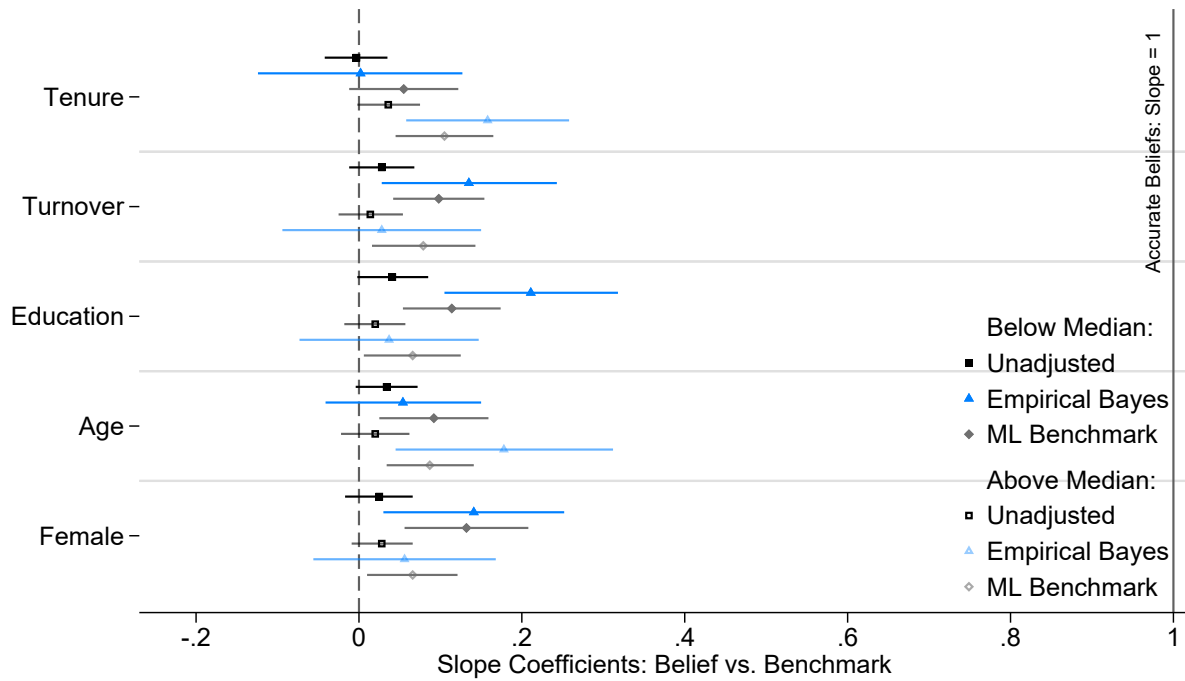
B. Appendix Figures

Figure B.1: Distributions of Beliefs About Own Wage Change in EUR



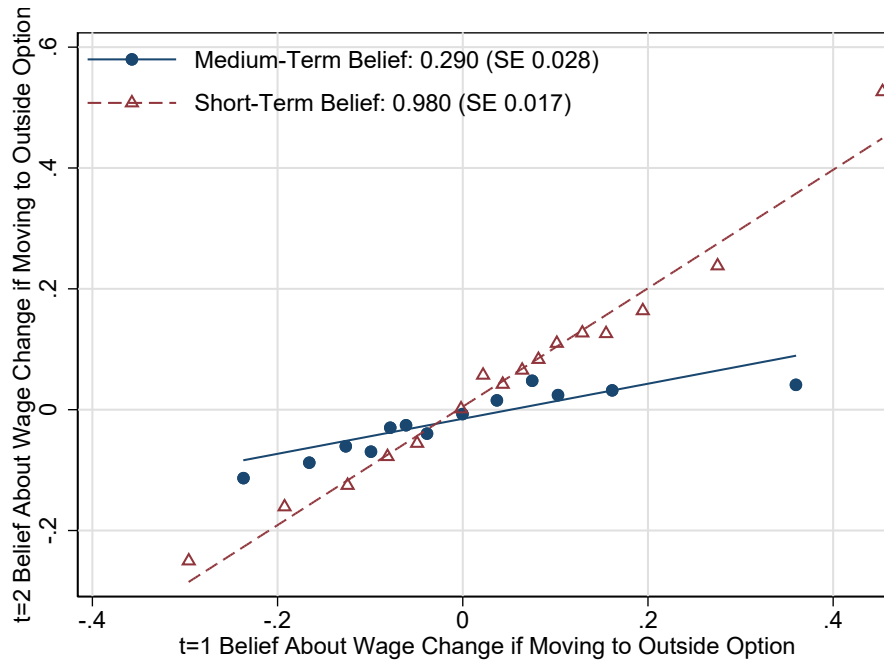
Note: This figure replicates [Figure II](#), but presents beliefs in absolute monetary amounts (EUR) instead of percent changes. This variable is not winsorized as it is bounded (unlike beliefs about own wage change in percent (i.e., divided by own wage)).

Figure B.2: Heterogeneity by Covariates



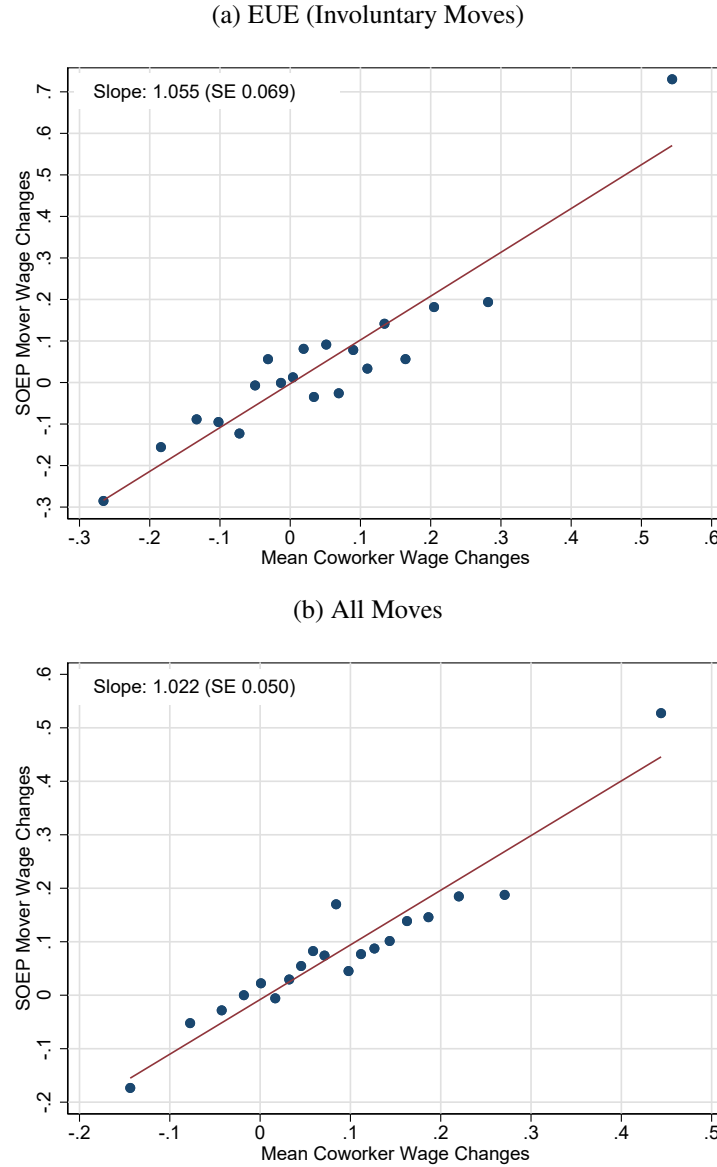
Note: This figure reports the slope coefficients between outside option beliefs and an objective benchmark using subsamples used in Figure III, cutting the sample by median of tenure, of the annual coworker separation rate (turnover), of education in years, and of age in years, and by gender.

Figure B.3: Persistence of Belief About Outside Option



Note: This figure documents the persistence of respondent's belief over two different timelines. The medium-term belief draws on the panel dimension of the SOEP and regresses the beliefs about outside options in 2020 ($t=2$) on beliefs in 2019 ($t=1$) using only respondents who did not change their job between the panel waves. The short-term belief was calculated within the control group of the information experiment who received the same question twice in the time-span of a few minutes within the same survey. All measures are in percent of the respondent's own wage. The sample sizes are 650 and 1,257 in the SOEP and control group of the information experiment, respectively.

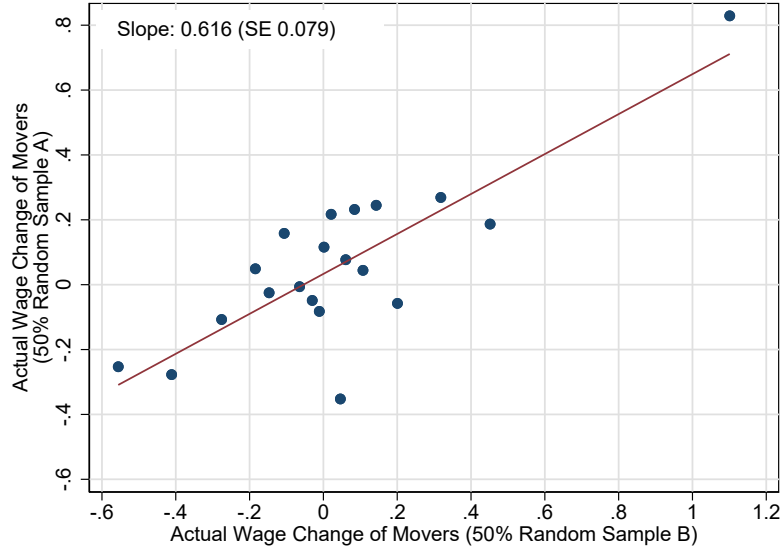
Figure B.4: Predictiveness of Mover Wage Changes for SOEP Sample



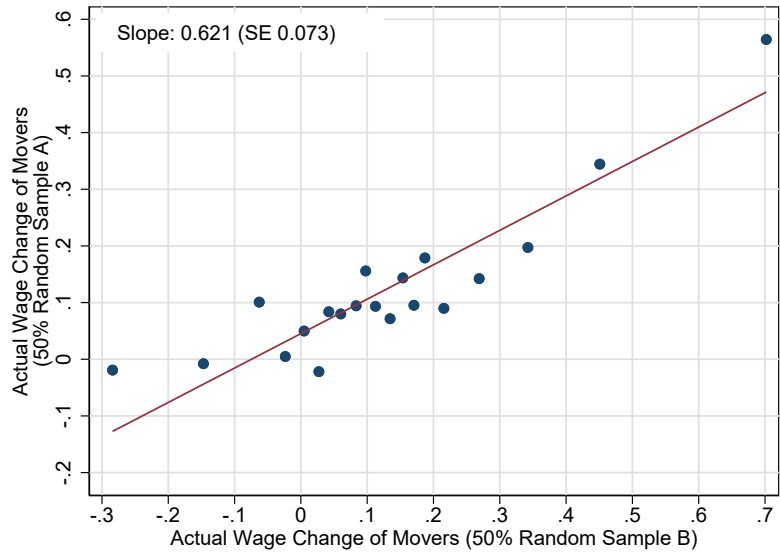
Note: This figure tests the predictiveness of past coworker mover wage changes for the wage changes that SOEP respondents experienced when leaving those workplaces by tracking SOEP respondents back to their previous workplace. Specifically, it plots the SOEP respondent's wage change when leaving this workplace against an Empirical Bayes correction of coworker wage changes (computed as the mean wage change of coworkers who left this workplace in the 5 years preceding the SOEP respondent's exit). Panel (a) restricts to EUE moves (both SOEP and coworker) to approximate "involuntary" moves, and Panel (b) considers all moves. The sample sizes are 1,876 for Panel (a) and 4,348 for Panel (b).

Figure B.5: Split Sample IV First Stage

(a) EUE (Involuntary Moves)

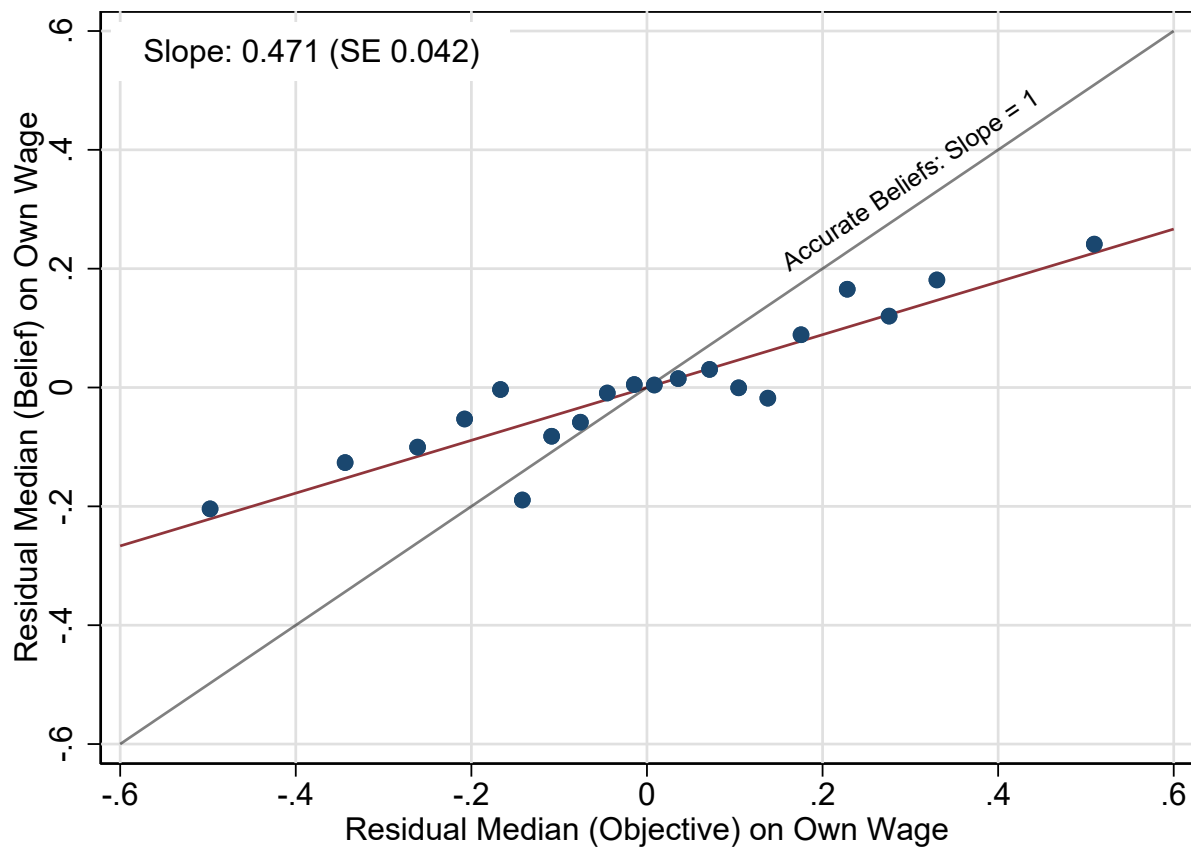


(b) All Moves



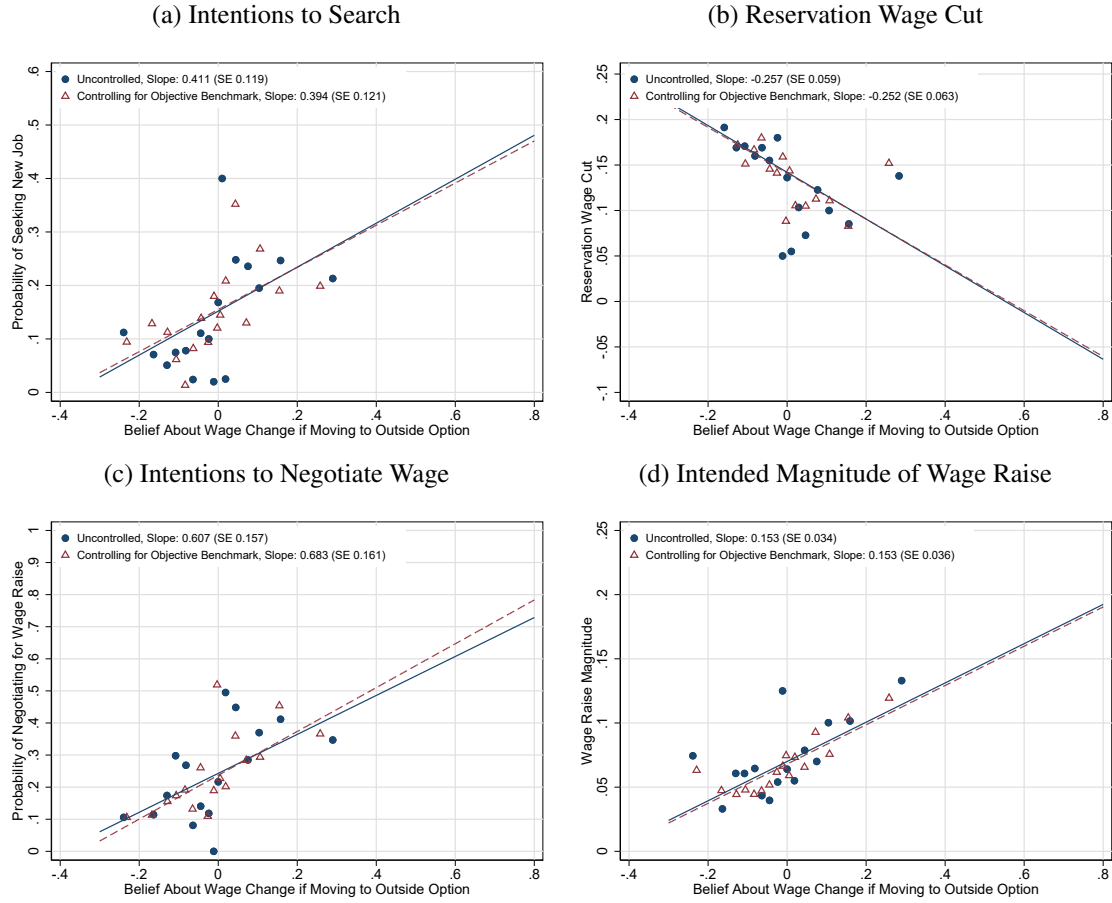
Note: The figure displays binned scatter plots of the first stages of the split-sample IV procedures we use to correct for errors in measurement of coworker wage changes. The estimated coefficients and standard errors from the second stages are reported in [Figure III](#) Panel (a) and [Figure IV](#) as the dashed red lines. The procedures split each worker's set of coworker movers into two 50% random samples; these panels scatterplot their mean wage changes across the two random samples by firm. Panel (a) does so for EUE movers (corresponding to [Figure III](#) Panel (a)), and Panel (b) does so all movers (corresponding to [Figure IV](#)). The sample size in Panel (a) is 132, the sample size in Panel (b) is 359.

Figure B.6: Beliefs About Median Wage in Occupation



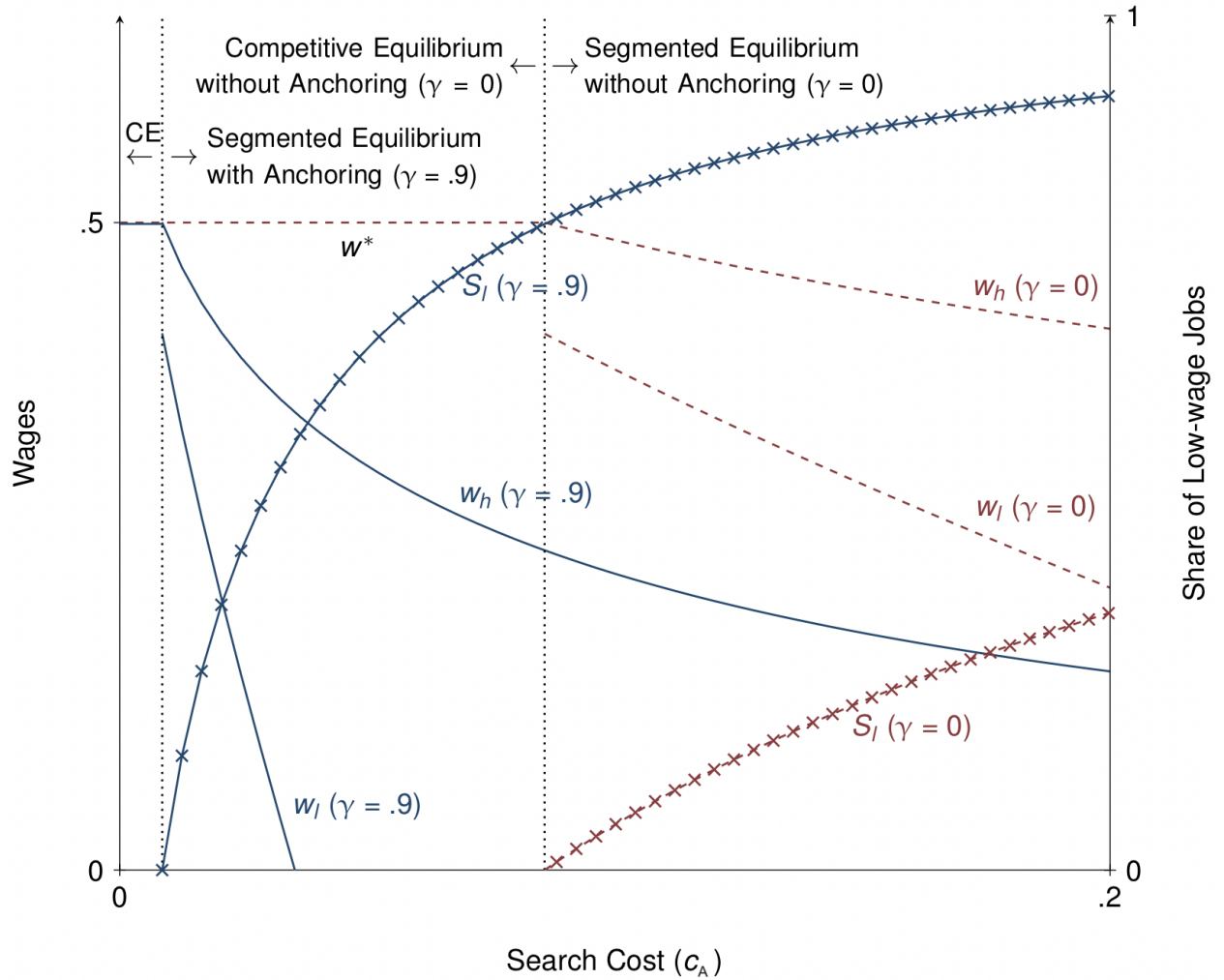
Note: This figure shows a binned scatterplot of the residuals of beliefs about median wage in the occupation (y-axis) and residuals of the actual median wage in the occupation. Residuals are obtained by separately regressing beliefs about median wage in the occupation and actual median wage in the occupation on own wages. We only include the full-time employed workers from our 2019 SOEP questionnaire. The sample size is 650.

Figure B.7: Worker Beliefs, Machine Learning Prediction, and Intentions to Search, Bargain, or Quit



Note: This figure replicates Figure VI but uses the benchmark from the machine learning (ML) prediction as a control. See Figure VI for additional information. The sample sizes are 417, 393, 417, and 410 in Panels (a) to (d) respectively.

Figure B.8: Equilibrium Implications of Information Costs, With and Without Anchoring



Note: The figure plots the same outcomes as Figure X (equilibrium wages and the share of low-wage jobs), but does so as a function of the search cost c_A , without anchoring ($\gamma = 0$, dashed red lines), and with anchoring ($\gamma = 0.9$, solid navy lines). The dotted vertical line marks the cutoff value of search costs that induces a switch from a competitive to a segmented labor market, with a high and low wage sector. The other parameters are decreasing returns $\eta = 1/2$, share of amateur workers $\alpha = 1/2$, and the number of workers per firm $L/N = 1$.

C. Conceptual Framework: Anchoring in a Learning Model

In this section, we offer a simple model of belief formation that gives one potential way to interpret our patterns structurally. Our model assumptions depart from standard search models in that workers do not know the shape of the wage distribution and therefore have to form beliefs about it using as a signal the wage they receive at their current employer. We derive an expression for workers' subjective beliefs about the expected wage change when moving to the outside option. This expression consists of a linear function of their objective wage premium, with the addition of two potential misperceptions.

C.1. Model

Environment There are N firms, with firm wage policies given by a normal distribution $N(\theta, 1/\pi)$ with mean θ and precision (inverse variance) π . Workers do not know these firm wage policies, instead they hold a subjective prior over θ given by $N(\mu, 1/\tau)$, while π is common knowledge. Wages are independent conditional on θ . In summary, the worker's beliefs about wages at firm j are given by

$$w_j|\theta \sim N(\theta, 1/\pi) \quad \forall j \in N \quad (\text{A1})$$

$$\theta \sim N(\mu, 1/\tau) \quad (\text{A2})$$

Belief Formation A worker hired by firm j observes the wage w_j . This provides a costless signal about the wage distribution. We first want to understand how the worker's posterior expectation about θ changes as a function of w_j , i.e., $\theta|w_j$. Bayesian updating implies:

$$\theta|w_j \sim N\left(\frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{1}{\pi + \tau}\right). \quad (\text{A3})$$

Intuitively, the posterior mean of $\theta|w_j$ is a precision-weighted average of the prior mean μ and the received wage w_j . So long as w_j is informative about wages, i.e. π is non-zero, the posterior belief about θ will be increasing in the received wage w_j . Footnote 1 elaborates.¹ Similarly, Bayesian updating about wages at

¹ To see this, note that the marginal posterior for θ is given by integrating over the wage w_k :

$$\begin{aligned} f(\theta|w_j) &= \int f(w_k, \theta|w_j) dw_k \\ &\propto \int f(w_j|\theta) f(w_k|\theta) f(\theta) dw_k \\ &= f(w_j|\theta) f(\theta) \int f(w_k|\theta) dw_k \\ &= f(w_j|\theta) f(\theta) \\ &= \phi(w_j; \theta, 1/\pi) \phi(\theta; \mu, 1/\tau) \\ &= \phi(\theta; w_j, 1/\pi) \phi(\theta; \mu, 1/\tau) \end{aligned}$$

where the last step follows from symmetry of the normal distribution. We next rely on the fact that the product of two normal pdfs is proportional to a normal pdf whose mean is a precision weighted average of the original means, and whose precision is equal to the sum of the original precisions. Specifically,

$$\phi(x; \mu_1, \tau_1) \phi(x; \mu_2, \tau_2) = \underbrace{\phi(\mu_1; \mu_2, \tau_1^{-1} + \tau_2^{-1})}_{\text{constant w.r.t. } x} \phi\left(x; \frac{\mu_1\tau_1 + \mu_2\tau_2}{\tau_1 + \tau_2}, \frac{1}{\tau_1 + \tau_2}\right).$$

another firm k implies:²

$$w_k|w_j \sim N\left(\frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{2\pi + \tau}{\pi(\pi + \tau)}\right). \quad (\text{A4})$$

Since the conditional belief in Equation A1 is a normal distribution centered at θ , the posterior belief about w_k is centered at the same point as the posterior belief about θ . Therefore, so long as $\pi > 0$, the posterior mean of $w_k|w_j$ is increasing in w_j : workers earning higher wages will have more optimistic posteriors about wages at other firms. However, the w_k posterior is less precise than the θ posterior whenever there is dispersion in wages, i.e., π is finite. Indeed:

$$\frac{\pi(\pi + \tau)}{2\pi + \tau} < \pi + \tau \quad (\text{A5})$$

Intuitively, this is because the posterior $w_k|w_j$ incorporates both uncertainty in θ and uncertainty in the wage conditional on θ .

Belief About Outside Options Our empirical design elicits a worker's subjective expectation about the wage change accompanying an involuntary move to their outside option. The essence of our research design is that workers form expectations about their outside option on the basis of their beliefs about the wage distribution. In the current setup, workers form beliefs about the expected wage. To formalize the link between the wage change in our model and our empirical design, suppose that, with probability x , the worker finds a job paying the same wage as their current employer; with (complementary) probability $1 - x$ the worker takes a random draw from the wage distribution, and hence in expectation receives the average expected wage. As a result, the wage change the worker would experience if transitioning to their outside option is given by:

$$\Delta_j = (1 - x) (\mu_j^0 - w_j), \quad (\text{A6})$$

Applying this to $f(\theta|w_j)$ implies:

$$\theta|w_j \sim N\left(\frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{1}{\pi + \tau}\right).$$

² To see this, note that we can write the marginal over w_k (for $k \neq j$) as:

$$\begin{aligned} f(w_k|w_j) &= \int f(w_k, \theta|w_j) d\theta = \int f(w_k|\theta) f(\theta|w_j) d\theta \\ &= \int \phi(w_k; \theta, 1/\pi) \phi\left(\theta; \frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{1}{\pi + \tau}\right) d\theta \\ &= \int \phi(\theta; w_k, \pi) \phi\left(\theta; \frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{1}{\pi + \tau}\right) d\theta \\ &= \phi\left(w_k; \frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{2\pi + \tau}{\pi(\pi + \tau)}\right) \int \phi(\theta; \cdot, \cdot) d\theta \\ &= \phi\left(w_k; \frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{2\pi + \tau}{\pi(\pi + \tau)}\right), \\ &\Leftrightarrow w_k|w_j \sim N\left(\frac{w_j\pi + \mu\tau}{\pi + \tau}, \frac{2\pi + \tau}{\pi(\pi + \tau)}\right). \end{aligned}$$

where μ_j^0 is the average wage at other firms, that is $\mu_j^0 = \frac{1}{N} \sum_{k \neq j} w_k$. Assuming x is common knowledge, the worker's subjective *belief* about the wage difference, $\tilde{\Delta}_j$, is given by:

$$\begin{aligned}\tilde{\Delta}_j &= (1 - x) (E_j[w_k|w_j] - w_j) \\ &= (1 - x) \left(\frac{w_j\pi + \mu\tau}{\pi + \tau} - w_j \right)\end{aligned}\tag{A7}$$

where we get Equation A7 by replacing $E_j[w_k|w_j]$ with the mean of the distribution of $w_k|w_j$ from Equation A4.

Biased Belief About Outside Options In order to measure potential biases in beliefs about outside options, we need to compare the worker's subjective belief about their outside option with an objective benchmark. Our empirical strategy to measure this objective benchmark is described in Section II.D. Here, we assume that we have access to the true wage change the worker would experience at their outside option. The worker's bias is then defined as the difference between the worker's subjective wage change and the true wage:

$$B_j = \tilde{\Delta}_j - \Delta_j \tag{A8}$$

$$= (1 - x) \left(\frac{\pi w_j + \tau \mu}{\pi + \tau} - \mu_j^0 \right), \tag{A9}$$

where Equation A9 is obtained by replacing Δ_j using Equation A6 and $\tilde{\Delta}_j$ using Equation A7.

It follows that workers will underestimate outside options, i.e., $B_j < 0$, if:

$$w_j < \mu_j^0 + \frac{\tau}{\pi} (\mu_j^0 - \mu) \tag{A10}$$

The direction of the inequality reflects the fact that workers paid lower wages are led to believe the external wage distribution is less favorable. The cutoff wage at which workers start to underestimate outside options relative to the truth depends on the prior mean μ . The lower the prior mean relative to the empirical average, the more workers will underestimate, and vice versa. In the special case when priors are correctly centered, $\mu = \mu_j^0$, Equation A10 reduces to $w_j > \mu_j^0$: Workers with above average wages will overestimate wages at their outside options, and those with below average wages will underestimate wages at their outside options. Further, the impact of the relative precision of the signal $\frac{\pi}{\tau}$ depends on the sign of $\mu_j^0 - \mu$. Intuitively, the relative precision of the signal governs the anchoring to priors relative to the adjustment to current wage: if the prior is below the true mean and anchoring is strong (i.e. τ is high relative to π), a high w_j is needed for the adjustment to lead to overestimation of outside options. Conversely, if the prior is above the true mean and anchoring is strong, a low w_j is needed for the adjustment to lead to underestimation of outside options.

C.2. Correspondence to Empirical Strategy

Equations A6 and A7 allow us to express the coefficient in the regression of subjective beliefs ($\tilde{\Delta}_j$) on objective beliefs (Δ_j) in terms of the model parameters:

$$\tilde{\Delta}_j = \alpha + \beta \Delta_j + \epsilon_j \tag{A11}$$

Slope β The coefficient of interest can then be written as:

$$\begin{aligned}
\beta &= \frac{\text{Cov}(\tilde{\Delta}_j, \Delta_j)}{\text{Var}(\Delta_j)} \\
&= (1-x)^2 \frac{\text{Cov}((\frac{w_j\pi + \mu\tau}{\pi + \tau} - w_j), (\mu_j^0 - w_j))}{\text{Var}(\Delta_j)} \\
&= (1-x)^2 \frac{\tau}{\pi + \tau} \frac{\text{Cov}((\mu - w_j), (\mu_j^0 - w_j))}{\text{Var}(\Delta_j)} \\
&= (1-x)^2 \frac{\tau}{\pi + \tau} \frac{(1 - (N-1)^{-1})\text{Var}(w_j)}{\text{Var}(\Delta_j)} \\
&= \frac{N-2}{N-1} \frac{\tau}{\pi + \tau}, \tag{A12}
\end{aligned}$$

where the last line follows from the fact that $\text{Var}(\Delta_j) = (1-x)^2\text{Var}(w_j)$.³ When N is large,

$$\beta \approx \frac{\tau}{\pi + \tau}. \tag{A13}$$

When θ is uninformative about wages, i.e., when wage dispersion is high and π is low relative to τ , current wages do not generate differential posterior over- or under-estimation and the slope approaches one. Meanwhile, when θ and wages are tightly linked (π is high relative to τ), overall sentiment about the wage distribution is highly sensitive to the current wage. Workers underestimate the magnitude of wage changes, leading to a lower β .

Intercept α The intercept is the subjective wage change for a worker at the average firm ($w_j = \mu_j^0$), and is given by

$$\begin{aligned}
\alpha &= \bar{\tilde{\Delta}}_j - \beta \bar{\Delta}_j \\
&= (1-x) \left(\frac{\bar{w}\pi + \mu\tau}{\pi + \tau} - \bar{w} \right) - \frac{\tau}{\pi + \tau} (1-x)(\mu_j^0 - \bar{w}) \\
&= \frac{\tau}{\pi + \tau} (1-x)(\mu - \mu_j^0), \tag{A14}
\end{aligned}$$

where \bar{w} is the sample mean of w_j , which may differ from μ_j^0 when the SOEP sample is not perfectly representative. Equation A14 shows that the intercept is proportional to the difference between the posterior and population means $\mu - \mu_j^0$. When this difference is non-zero, the intercept induces a homogenous shift in subjective wage changes.

³ The coefficient $\frac{N-2}{N-1}$ arises due to the mechanical negative correlation between w_j and μ_j^0 . This attenuates the positive correlation between subjective and objective wage changes.

D. Machine Learning Prediction

In this appendix, we describe the methodology used to produce our machine learning wage change predictions.

We begin by taking the universe of annual employment spells between 2015 and 2019 in the IAB data. For each person, we narrow down to that person’s “main spell” within each year by taking the spell with the highest earnings that year. A “firm-to-firm transition” is defined as a case where person i ’s main spell is in firm j_1 during year t and in firm $j_2 \neq j_1$ in year $t + 1$. Using this definition, we restrict our attention to the full set of firm-to-firm transitions occurring between 2015 and 2019 in which the person worked full-time both at their origin firm and their destination firm, and experienced an intermediate spell of unemployment insurance receipt beginning within 12 weeks after the termination of the original job. We omit firm-to-firm transitions corresponding to SOEP respondents.

For each firm-to-firm transition, we calculate the log wage change associated with that transition as the difference between the log daily earnings associated with firm j_2 in year $t + 1$ minus the log daily earnings associated with firm j_1 in year $t + 1$. We also calculate a comprehensive set of covariates for the person-transition observation, with all covariates calculated during the person’s last spell at the origin firm—so firm-level characteristics are characteristics of the *origin* firm, and age, education, etc., are calculated during the last spell at that firm. The full set of covariates is listed in [Table D.1](#).

We then run a lasso regression at the person-transition level where the dependent variable is the log wage change associated with the transition and the independent variables are the covariates listed in [Table D.1](#). We use the Stata command `elasticregress` ([Townsend 2017](#)), as the administrative data environment we worked in did not have newer versions of Stata with built-in machine learning packages.

Once the lasso regression selects a set of covariates and estimates coefficients for them, we use those covariates and coefficients to generate a predicted wage change for each SOEP respondent. We do this by matching the SOEP respondent IDs into the 2019 administrative IAB data and calculating the values of each covariate for the SOEP respondents using the IAB data.

The lasso regression selects all of the covariates we include, with the exception of some of the dummies within the sets of region/industry dummies and interactions. [Table D.1](#) presents estimated coefficients, and partial R^2 values, for each selected coefficient. Partial R^2 values are calculated by regressing the “transition wage change” variable on the relevant covariate, with all of the other covariates partialled out; the R^2 value from this regression is the relevant covariate’s partial R^2 value.

We test the fit of the lasso model by estimating the model on a randomly selected 50% sample of firm-to-firm transitions, using the estimated coefficients to generate predictions for the remaining 50% of observations, and then regressing the true wage changes for those observations on the predicted wage changes. This latter “evaluation” regression results in a coefficient of 0.995 (SE 0.006) on the “predicted wage change” dependent variable and an R^2 value of 0.43.

Table D.1: Machine Learning Predictors

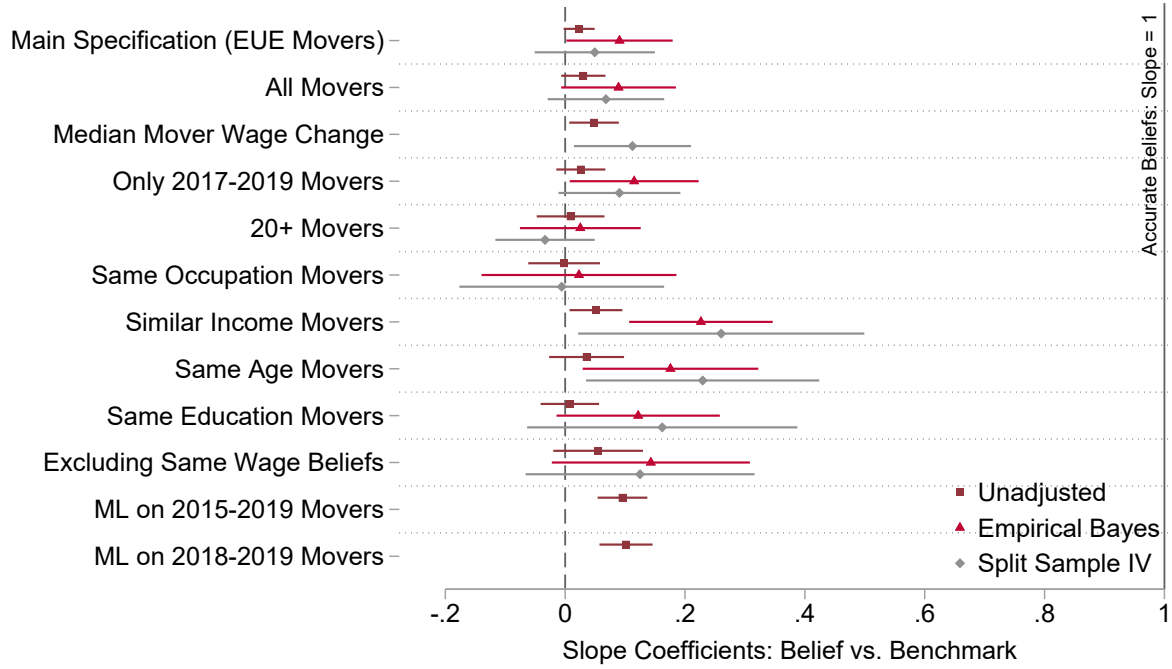
Variable	Description	Coefficient	Partial R^2
Wage	Mover's Log Wage at Initial Firm.	-0.678	0.235
Firm Effect	AKM Fixed Effect of Initial Firm.	0.151	0.002
Age in Years	Cubic in Mover's Age (Linear Coef. Reported).	0.008	0.000
Tenure in Years	Cubic in Mover's Number of Years Spent at Initial Firm (Linear Coef. Reported).	0.000	0.001
Gender	Female Dummy.	-0.048	0.005
Firm Size	Cubic in Number of Employees at Initial firm (Coef. on Cubic, the Only Included Dummy, Reported).	0.000	0.000
Turnover	Annual Separation rate at Initial Firm.	0.000	0.000
Wage Dispersion	SD of Wages at Initial Firm.	0.048	0.000
Employment Growth	Annual Growth Rate in Number of Employees at Initial Firm.	0.018	0.000
Education	Dummies for: No Education, Vocational Education, University Education, Omitted = Missing Education. Coef on University Education Reported, the Other Two Are Very Close to Zero.	0.198	0.000
Region	16 <i>Bundesländer</i> (German States).	NA	0.000
Occupation	1-Digit Occupation Categories.	NA	0.106
Industry	NACE Level 1 Codes.	NA	0.000
Industry \times Region	Industry Dummies Interacted with Region Dummies.	NA	0.015
Age \times Education	Cubic in Age Interacted with Education Dummies.	NA	0.001

E. Additional Robustness Checks

E.1. Robustness Check: Alternative Specifications

We implement a number of robustness checks, all summarized in [Figure E.1](#). First, this figure displays the slope coefficients from the main specification (Panel (a) of [Figure III](#)) to provide a reference. Second, it shows a very similar slope coefficient when using all movers instead of only EUE movers. Besides showing robustness to a broader mover definition, this specification serves as a bridge to subsequent robustness checks that rely on this population for sample size reasons to consider coworkers with similar observables. Third, it reports robustness to calculating mover wage changes using the median rather than the mean, or over a shorter horizon (2017 to 2019). Fourth, it reports analogous results if constructing the benchmark using all coworker moves (rather than restricting to plausibly involuntary, EUE ones). Fifth, results are also robust to requiring at least 20 such coworker moves. Sixth, we restrict the sample of coworker movers to those that are similar to the SOEP respondent: within the same occupation, earnings quintile, age band, or education band. Some slopes are meaningfully higher (up to about 0.321 for similar income movers), but still far and statistically different from one. However, for those more granular cuts, the coworker-based design hits its limits, as we shrink the sample of movers to construct the benchmark; as a result, confidence intervals widen substantially. Seventh, [Figure E.1](#) reports robustness to dropping respondents selecting the “same wage” (zero wage change) option, suggesting that the qualitative-quantitative elicitation sequence does not drive the results and that rounding to zero does not explain the low slope. Finally, [Figure E.1](#) also shows that the slope for the ML benchmark remains virtually identical (0.101 (SE 0.022)) if trained only on the most recent EUE wage changes from 2018-2019 instead of 2015-2019.

Figure E.1: Robustness to Alternative Specifications



Note: This figure reports the slope coefficients between outside option beliefs and an objective benchmark, varying the definition of the benchmark. For all specifications except the ones relying on machine learning, we report the unadjusted slope coefficient as well as estimates based on Empirical Bayes and split sample IV corrections. The main specification reports the specifications from Figure III Panel (a) which relies on EUE moves. All other specifications except for the ones involving machine learning benchmarks instead use *all* coworker moves. We consider the following alternative benchmarks (from top to bottom): all coworker movers (instead of only EUE movers); median (instead of mean) coworker wage changes; restricting coworker wage changes to the years 2017 to 2019; restricting to SOEP respondents with at least 20 coworker movers; restricting to movers in the same occupation as the SOEP respondent who remain within the same occupation when moving; restricting to movers in the same wage quintile (wage quintiles are calculated in the overall labor market dataset); restricting to movers within the same age category (age categories are {20, 20-29, 30-39, 40-49, 50-59, 60-69, 70+}); restricting to movers within the same education category (education categories are no education, vocational training, university degree, or missing education); restricting to SOEP respondents who do not answer “same wage” to the question about what wage they would earn at their outside option. Finally, the machine learning (ML) benchmarks compare the belief about the outside option against the same ML algorithm as in Figure III Panel (b), which is based on EUE moves between 2015 to 2019; as a robustness check, we add a specification trained on EUE movers from 2018 to 2019.

E.2. Robustness Check: Survey with Alternative Elicitations

To verify that our main descriptive results are not driven by the particular wording of our survey questions, we examine robustness to alternative wordings by running an online survey using a sample of 907 workers broadly representative of the German population in full-time and part-time employment in terms of age, wage, education, gender, and region (see Table E.1). The data collection took place in July 2021 and was conducted with Dynata, a professional survey company frequently used in the social sciences (Haaland, Roth, and Wohlfart 2023). We randomly assigned respondents to either the original wording from our main survey or an alternative elicitation (or an incentive payment). Since this convenience sample cannot be linked to administrative data, we do not check for biases; instead, we compare the distribution of wage-change responses across different elicitations.

Sample Definition and Data Quality In what follows, we describe how the dataset from the robustness survey was cleaned. We only consider respondents who completed all of our survey questions. Out of 1,173 respondents who qualified for and started our study, 177 (or 15%) did not complete the full survey, which is a common attrition rate in online surveys. This leaves us with a sample of 996 respondents.

At the start of the survey, we elicited people's pre-tax earnings using both a question with categorical responses and open-ended responses. We exclude 65 respondents who gave inconsistent or implausible responses (monthly wage larger than 25,000 EUR or lower than 170 EUR) to the initial wage questions, which may be a reflection of inattention in online surveys. Moreover, we asked all of our respondents about their outside option in case of a job loss, and removed those that either state that their outside option pays less than 100 EUR monthly wage or more than 25,000 EUR monthly wage (24 respondents). This leaves us with a sample of 907 respondents. All of our results from the robustness survey are robust to including these 89 dropped respondents. The median response time in the survey is approximately 10 minutes.

Winsorization Some of our response scales more naturally give rise to outliers than others. Since we want to compare responses across response scales, we winsorize our outcomes to make our comparisons less sensitive to outliers:

- For the question on outside options, we winsorize responses at a 3500 wage increase or decrease (as this is the maximum implied by our categorical response scale). This affects 5 responses.
- For the question on coworker wage changes, we winsorize responses at a 62.5% wage increase or decrease (as this is in practice the maximum categorical response scale chosen by respondents). This affects 15 responses.
- For all of our variables on wage changes as a fraction of wage, based on the question on outside options, we further winsorize responses at -100% and +100% of wage. This affects 8 responses for our “generally framed” main outside option question and 12 responses for the outside option question framed in terms of a mass layoff.

Results Our online survey confirms qualitative robustness to the following alternative question wordings: eliciting the wage level at outside option rather than change relative to current wage; omitting the “same pay” category as a response option and forcing respondents to enter a percentage wage change; varying the duration to find a new job between 3 and 12 months; specifying that an unexpected company closure is what forces the respondent to find a new job; specifying that the respondent has to search within their current occupation; not specifying that the belief about own wage rank is conditional on occupation; and adding 5-EUR prediction incentives for the question about median pay in one's occupation.

Results are reported in [Figure E.2](#). Some of the alternative wordings, especially the omission of the “same pay” option, result in less compressed distributions of beliefs about outside options, though all alternative wordings replicate our qualitative finding of strong clustering around zero subjective wage change, and most of the alternative wordings have virtually no effect.

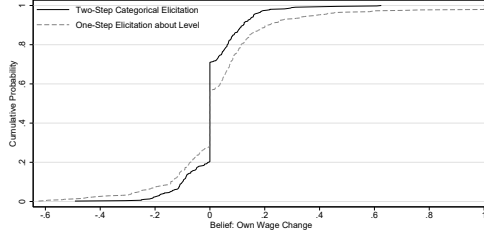
Table E.1: Summary Statistics: Robustness Survey

	Mean	SD	P25	Median	P75	N
Panel A: Demographics and Labor Market Characteristics						
East	0.201	0.401	0.000	0.000	0.000	907
University Degree	0.362	0.481	0.000	0.000	1.000	907
Age in Years	48.7	11.8	40.0	51.0	58.0	907
Female	0.442	0.497	0.000	0.000	1.000	907
Pre-Tax Wage (in EUR, per Month)	3,597	2,149	2,280	3,200	4,500	907
Full-time Employed	0.777	0.416	1.000	1.000	1.000	907
Panel B: Beliefs						
Own Wage Change: Firm Closure Framing	-0.004	0.231	-0.091	0.000	0.061	907
Own Wage Change: Two-Step Categorical Elicitation	0.011	0.100	0.000	0.000	0.043	462
Own Wage Change: One-Step Elicitation About Level	0.039	0.221	-0.036	0.000	0.091	445
Own Wage Change: Conditioning on Occupation	0.020	0.175	-0.001	0.000	0.061	442
Own Wage Change: Not Conditioning on Occupation	0.029	0.167	0.000	0.000	0.076	465
Own Wage Change: 3 Months to Find a Job	0.017	0.161	0.000	0.000	0.060	459
Own Wage Change: 12 Months to Find a Job	0.033	0.180	0.000	0.000	0.083	448
Wage Change of Coworkers: Same Pay Option + Categorical Elicitation	0.060	0.209	-0.050	0.050	0.100	445
Wage Change of Coworkers: No Same Pay Option + Open Elicitation	0.010	0.089	0.000	0.000	0.035	462

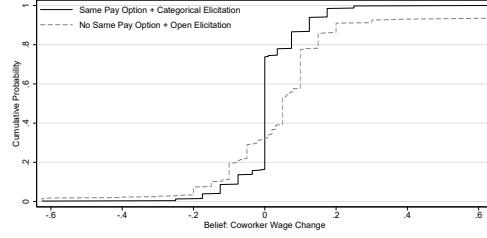
Note: This table reports summary statistics from the robustness survey conducted in July 2021. “Own Wage Change: Firm Closure Framing” is the subjective wage change for an alternative framing, which explicitly states that the separation is due to an unexpected company closure. “Own Wage Change: Two-Step Categorical Elicitation” replicates the SOEP main elicitation. “Own Wage Change: One-Step Elicitation About Level” alternatively constructs the wage change from a direct question about the wage level at the outside option. “Own Wage Change: Conditioning on Occupation” features a restriction for the new job to be in the same occupation. “Own Wage Change as % of Wage: Not Conditioning on Occupation” does not restrict the new job to be in the same occupation. “Own Wage Change as % of Wage: 3 Months to Find a Job” posits a 3-month time horizon to find a new job. “Own Wage Change: 12 Months to Find a Job” extends this window to 12 months. “Wage Change of Coworkers: Same Pay Option + Categorical Elicitation” is the belief about coworkers wage changes for the main elicitation (which we employed in our main surveys from SOEP). “Wage Change of Coworkers: No Same Pay Option + Categorical Elicitation” is the belief about coworkers wage changes for an alternative elicitation which did not offer the “same pay” option and was open-ended in the second step of the elicitation.

Figure E.2: Robustness of Beliefs About Outside Option to Various Design Features

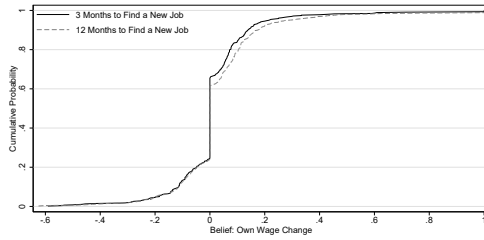
(a) One- vs. Two-Step Elicitation



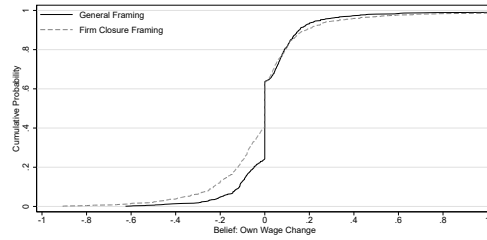
(b) Same Pay vs. No Same Pay Option (Beliefs About Coworker Wage Changes)



(c) 3 vs. 12 Months Horizon for Search



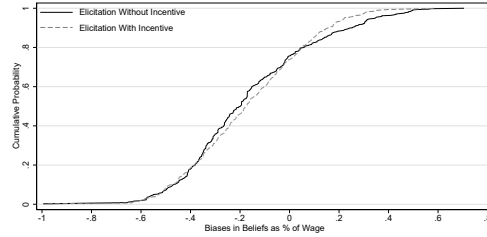
(d) General vs. Firm-Closure Framing of Separation



(e) Conditioning on Occupation vs. No Conditioning



(f) 5 EUR Incentive and Unincentivized Elicitation: Estimation Error about Occupational Median Wage (% of Wage)



Note: Panel (a) reports the cumulative distribution function (cdf) of beliefs about outside options (wage change) separately for the elicitation which we employed in our main surveys from SOEP and an alternative elicitation which directly elicited beliefs in one step. Panel (b) reports cdfs of beliefs about coworkers' wage changes separately for the main elicitation and an alternative elicitation which did not offer the "same pay" option and was open-ended in the second step of the elicitation. Panel (c) reports the cdf separately for a 3 month and 12 month time horizon to find a new job. Panel (d) compares the cdf to that elicited in an alternative framing, which explicitly states that the separation is due to an unexpected firm closure. Panel (e) reports the cdf separately for elicitations conditioning on workers staying in the same occupation or not. Panel (f) reports on the cdf of estimation errors about the median pay (in percent of wage) in one's occupation separately for respondents in the 5 EUR incentive group and the no-incentive elicitation group.

F. Information Provision Experiment

Ethical Considerations In this section, we briefly discuss relevant ethical considerations in the context of our experiment for which we received ethics approval from the University of Cologne and which was deemed exempt by MIT. Providing respondents with information about their outside options raises several ethical questions: could the information we provide our respondents with be misleading for them? Might they misunderstand the information provided?

We aimed to minimize ethical concerns in a number of ways. First, we offered respondents in the control group to receive information about outside options at the end of the survey. A large fraction (80%) of respondents chose to receive the information suggesting a large demand for the information. Second, we provided all of our respondents with a debrief clarifying some details on how we calculated the data on outside options. We also cautioned our respondents to consider that those were average values and that those averages shroud important heterogeneities. Thereby, we wanted to minimize the risk of respondents misinterpreting the provided information.

Sample Definition and Data Quality 9,225 respondents started the survey. Below, we describe, step-by-step, the sample size reductions for each data cleaning step.

- Initially, 9,225 were eligible to take the survey.
- 188 (2%) do not consent. 9,037 remain.
- 763 (8% out of the remaining sample) report an IP address's duplicates. 8,274 remain.
- 249 (3%) ID duplicates are dropped. 8,025 unique individuals remain.
- 1,330 (17%) fail the first attention check and are removed from the sample. 6,695 remain.
- 961 (14%) not full-time employed are removed. 5,734 remain.
- 470 civil servants, and 373 are self-employed (15%) are removed. 4,891 remain.
- We removed 636 individuals that reported that the occupations shown to them did not describe their occupation reasonably well. This represented 13% of that remaining sample. 4,255 remain.
- 514 (12%) respondents who did not finish the survey were removed. 3,741 remain.
- We drop individuals with implausible earnings reports. Across the four earning variables in EUR (pre-tax wage, pre-treatment outside option, belief about mean wage of similar workers, post-treatment outside option), 231 (6%) gave a response that is either invalid (e.g., a range like "3000-5000") or a wage that is $< 20\%$ or $> 300\%$ the mean wage in their observable cell. After this screen, 3,510 remain in sample.
- Finally, from the respondents left, we removed those who failed the occupation attention check (re-selecting the occupation they selected earlier, from a list of 10 occupations). 279 individuals were dropped in this final screen, which represents 8% of the remaining sample. 3,231 respondents remain.
- Of these 3,231 respondents, 763 come from the pilot. In the pooled sample, 1,579 are treated and 1,652 are controls. In the post-pilot sample of 2,468 respondents, 1,211 are treated and 1,257 are controls.

Table F.1: Descriptive Statistics in Experiment

	Mean	SD	P10	Median	P90	Control (Mean)	Treatment (Mean)	P-Value
General Stats								
Number of Respondents	2,468					1,257	1,211	
Share of Women	0.414					0.413	0.415	0.934
Age in Years	44.7	10.4	31.0	45.0	59.0	44.4	45.0	0.188
Pre-Tax Wage (in EUR, per Month)	3,885	1,656	2,200	3,500	6,000	3,892	3,877	0.829
No Qualifications	0.019					0.019	0.020	0.896
Vocational Qualification	0.604					0.609	0.600	0.644
University Qualification	0.376					0.372	0.381	0.668
Share in Nordrhein-Westfalen	0.493					0.489	0.497	0.697
Share in Bavaria	0.202					0.209	0.194	0.348
Share in Baden-Wuerttemberg	0.136					0.134	0.138	0.802
Job Specific Stats								
Wage according to CBA	0.112					0.111	0.112	0.942
Weekly Working Hours	38.401	4.033	33.000	38.000	43.000	38.438	38.363	0.641
Size of Employer	4,510	16,284	20	260	6,000	3,981	5,060	0.100
Tenure in Years	15.003	9.828	5.000	13.000	30.000	15.018	14.988	0.940
Number of Previous Employer	6.973	2.440	4.000	7.000	10.000	6.933	7.014	0.411
Number of Wage Investigations	1.341	2.462	0.000	0.000	4.000	1.534	1.140	0.000
Experiment Specific Stats								
Average Bias (in Euro)	-368.185	1,001.053	-1,659.000	-385.000	920.000	-353.516	-383.411	0.458
Average Bias (in %)	-0.078	0.238	-0.374	-0.103	0.251	-0.073	-0.083	0.317
Pretreatment Beliefs: Wage Change (in Euro)	90.294	585.536	-589.000	0.000	750.000	87.961	92.715	0.840
Pretreatment Beliefs: Wage Change (in %)	0.037	0.153	-0.143	0.000	0.212	0.036	0.039	0.637

Note: This Table reports data from the information provision experiment conducted between May and July 2022. The p-values are obtained from a two-sided hypothesis test with a H0 of no difference in mean (proportion) between control and treatment group. We compare the group means (proportion) of the continuous (dummy) variables with a t-test (proportions test).

Calculation of Wages of Similar Worker in Same Local Labor Market To calculate the average wages of observably similar workers, we draw on the German administrative data for 2019 and run a regression of log daily wages on a female dummy, 5-digit occupation dummies, labor market region dummies, education dummies, an age cubic, and education interacted with the age cubic. We extract the coefficients from the administrative data environment and program them into our survey. Our survey uses those coefficients to predict the mean wage of workers with the respondent's covariates. Since the predictions are from 2019, we inflation-adjust using mean nominal wage growth between 2019 and the end of 2021. To test the validity of this technique, we run our "prediction" methodology on 2017 wage data and generate inflation-adjusted predictions for 2019, then regress actual 2019 wages on predicted 2019 wages in the administrative data. This results in a regression coefficient of 0.96.

F.1. Beliefs About the Study Hypothesis

As with information provision experiments in general, one concern is that participants may adjust their responses to align with researchers' expectations (Haaland, Roth, and Wohlfart 2023), in our case, the effect of information on worker beliefs and on labor market behavior. To address this concern, we examine the potential importance of these effects by asking respondents to state their beliefs about the study's hypothesis using an open-ended question. This data was hand-coded by a team of research assistants. We find that respondents have relatively crude and dispersed beliefs about the study's hypothesis.

Consistent with the small share of correct guesses, treatment effects are almost identical when we restrict our main specification to respondents who do not correctly guess the hypothesis of the experiment (see Table F.2). This finding is consistent with previous research, which suggests that demand effects may not have a significant quantitative impact (De Quidt, Haushofer, and Roth 2018).

Design At the end of the experiment, respondents were asked the following open-ended question: "Which hypothesis do you think the researchers try to test with this survey?"

Coding Manual Based on hand-coding of 200 responses, we came up with a coding scheme to capture the most predominant beliefs about the study purpose.

- **The Causal Effect of Information/Beliefs:** People correctly guessing the study's hypothesis about the relationship between beliefs and labor market intentions, i.e., that respondents' intended labor market behaviors are affected by the information provided in the experiment. Example responses: "Whether workers switch employers because of wages."; "whether people think they earn more wages when they are shown a supposed average wage, and how much money can influence them to stay with a company or not"; "Knowing or not knowing the general average wage of our job changes the subjective perception of the value of our job."
- **Beliefs:** Responses mentioning beliefs about the labor market or beliefs about wages about similar workers. Example responses: "Subjective beliefs about the labor market"; "You are trying to find out how each respondent assesses their wage compared to similar other people."
- **Wages:** Responses mentioning wages or wage comparisons. Example response: "The extent to which the wage affects my job"; "wage comparisons."
- **Labor Market:** Generic responses about labor market behaviors. Example response: "Willingness to switch."
- **Attention:** responses indicating that the study tries to test respondent's attention. Example response: "Cognitive abilities, concentration, attention."; "How attentively people read surveys."
- **Junk:** Nonsensical responses.
- **Don't Know:** People expressing that they don't know. Example response: "I don't know."
- **Other:** Responses that do not fit into any of these categories.

Results Only a small fraction of respondents correctly guess that we are interested in the causal effect of information and beliefs (7%), while a relatively large fraction of respondents express not knowing the hypothesis of interest (31%). Most of the other responses reveal that respondents do not have very precise hypotheses about the study. 7% think that the study hypothesis concerns labor markets, 5% think that the study tries to test people's attention, 19% think that the study is about understanding wages in the labor market, 14% think that the study is about understanding labor market perceptions. Only 2% of responses fall into the junk category, indicating a high data quality. 14% of responses cannot be classified in any of these categories.

Table F.2: Information Experiment: Respondents not Guessing the Hypothesis

	(1) Post-Treat Estimation Error	(2) Belief About Outside Option (Wage Change)	(3) Intended Quit Probability	(4) Intended Search Probability	(5) Intended Negotiation Probability	(6) Intended Neg Magnitude (No Neg = 0)	(7) Intended Neg Magnitude (No Neg = Msg)	(8) Reservation Wage Cut
Treated \times Pre-Treat Estimation Error	-0.514*** (0.060)	-0.476*** (0.041)	-0.124** (0.053)	-0.088 (0.055)	-0.192*** (0.061)	-0.044*** (0.009)	-0.057*** (0.010)	-0.005 (0.016)
Treated	-0.007 (0.014)	0.033*** (0.009)	0.005 (0.013)	0.018 (0.013)	0.010 (0.016)	0.004* (0.002)	0.004* (0.002)	-0.004 (0.004)
Pre-Treat Estimation Error	0.887*** (0.045)	0.039 (0.027)	-0.026 (0.040)	-0.030 (0.039)	0.095** (0.044)	0.017*** (0.006)	0.018*** (0.006)	0.006 (0.012)
Constant	0.034*** (0.011)	0.044*** (0.006)	0.227*** (0.009)	0.244*** (0.009)	0.386*** (0.011)	0.057*** (0.001)	0.072*** (0.001)	0.092*** (0.003)
IV: Endogenous Variable:			0.245*** (0.093)	0.231** (0.095)	0.391*** (0.110)	0.097*** (0.016)	0.117*** (0.016)	-0.006 (0.026)
Belief About Outside Option (Wage Change)			0.214*** (0.009)	0.238*** (0.009)	0.367*** (0.010)	0.053*** (0.001)	0.066*** (0.002)	0.090*** (0.002)
Constant								
Control Group Mean	-0.076	0.041	0.229	0.246	0.379	0.056	0.071	0.091
First-Stage F-Stat			129.162	129.162	129.162	129.162	112.745	129.162
N	2,284	2,284	2,284	2,284	2,284	2,284	1,826	2,284

Note: This table replicates Table II for the subsample of respondents who did not correctly guess the hypothesis of the experiment. We only collected this data on hypothesis guessing in the post-pilot sample.

F.2. Discussion: Revealed-Preference Outcomes

A challenge in this literature may be that it is hard to shift beliefs persistently and thereby affect longer-run behavior. We have experimented with studying realized revealed-preference outcomes rather than planned behaviors as outcomes, specifically studying WTP for vouchers for job search help (consultation about application material preparation) and wage negotiation training. In pilots, we did not find significant effects on those outcomes, and aborted because of logistical and financial complications associated with this outcome. One explanation for this null result could be that debiasing underestimators (overestimators) may lead them to update that job search is easy (hard), and hence make help with applications less (more) useful; similarly, our information treatment may facilitate wage negotiations itself, reducing rather than increasing the WTP for negotiations training.

F.3. Comparison to SOEP-IS Information Experiment

We had planned a simple information treatment in the SOEP-IS, informing workers about their outside options in the 2019 wave of our survey. Due to legal and technical challenges we were only able to give information about the median wage in the occupation (but not about the other, more granular benchmarks that are plausibly stronger signals informing the worker’s own outside option). The survey randomly chose 50% of respondents to receive accurate information about the median wage in their occupation after they reported their belief. Our core descriptive beliefs about coworker wage changes after a switch, median wage in occupation, and perceived wage rank were all elicited before the information intervention. We aimed to study effects on beliefs about outside options and intended search and bargaining behavior.

Table F.3 shows results from the information treatment, leveraging the same empirical strategy as in Section IV. The table shows treatment effects in the expected direction for post-treatment beliefs about wage changes—but that are statistically insignificant, yielding a first stage of 1.7. Reduced-form effects on intended labor market behaviors are also insignificant. In an IV framework, we find coefficients that go in the expected direction—meaning that workers that update their beliefs about wages at their outside options also state they intend to search more, negotiate their wage, increase the ask of the wage increase, and lower their reservation wage cut of quitting their current job. These IV effects are, however, also statistically insignificant, with very wide confidence intervals.

We suspect that the weak first stage in the SOEP-IS experiments can likely be explained by the following two factors, which motivated our follow-up experiment in 2022 with a redesign of the information treatment, which yielded a stronger first stage and significant IV effects:

1. To shift outside options, we provided respondents with the **national median wage** in their occupation, rather than more targeted information matching participants’ characteristics.
2. We could only briefly report the numeric information about the median wage, rather than, e.g., visualizing the information.

As a result of the weak experimental effects, our main SOEP results pool treated and control groups (also for post-treatment analyses).

Table F.3: SOEP Information Experiment

	(1) Post-Treat: Outside Option (Wage Change)	(2) Intended Search Probability	(3) Intended Negotiation Probability	(4) Intended Neg. Magnitude (No Neg. = 0)	(5) Intended Neg. Magnitude (No Neg. = Msg.)	(6) Reservation Wage Cut
Treated × Pre-Treat Estimation Error	-0.038 (0.032)	0.006 (0.061)	0.016 (0.080)	0.001 (0.003)	0.001 (0.003)	0.004 (0.025)
Treated	0.010 (0.009)	0.014 (0.021)	0.017 (0.026)	0.001 (0.001)	0.001 (0.001)	-0.009 (0.008)
Pre-Treat Estimation Error	0.024 (0.017)	-0.025 (0.029)	-0.001 (0.035)	0.001 (0.002)	0.001 (0.002)	-0.009 (0.017)
Constant	-0.006 (0.007)	0.150*** (0.015)	0.213*** (0.018)	0.034*** (0.001)	0.035*** (0.001)	0.149*** (0.006)
IV: Endogenous Variable		0.410	0.284	0.020	0.007	-0.365
Belief About Outside Option (Wage Change)		(1.256)	(1.531)	(0.061)	(0.059)	(0.553)
Constant		0.158*** (0.010)	0.222*** (0.013)	0.034*** (0.001)	0.035*** (0.000)	0.145*** (0.004)
Control Group Mean	-.002	0.154	0.211	0.033	0.034	0.151
First-Stage F-Stat		1.737	1.703	1.712	1.782	1.712
N	738	734	734	738	725	738

Note: This table reports results following the strategy from [Table II](#) for the 2019 information treatment about the median wage in the occupation, which we had integrated in the SOEP-IS.

F.4. Pre-Registration

Worker Beliefs about Outside Options (#101803)

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1) Have any data been collected for this study already?

It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

2) What's the main question being asked or hypothesis being tested in this study?

Providing respondents with information about the wages of similar workers affects their beliefs about their personal outside options and, as a result, their intended labor market behaviors.

3) Describe the key dependent variable(s) specifying how they will be measured.

1) Beliefs about peer salaries (as percent of own salary); 2) Bias about peer salaries (as percent of true peer salary); 3) Beliefs personal outside options (in percent difference from current wage); 4) Intended quit probability (in percent); 5) Intended search probability (in percent); 6) Intended negotiation probability (in percent); 7) Intended negotiation magnitude (measured on a Likert scale and setting no negotiation as zero); 8) Intended negotiation magnitude (measured on a Likert scale and setting no negotiation as missing).

4) How many and which conditions will participants be assigned to?

Two treatment conditions.

Treatment group: Receives information about the wages of similar workers before the main outcomes are measured.

Control group: Does not receive information about the wages of similar workers before the main outcomes are measured.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

We estimate the following specification with OLS:

$$Y_i = \alpha + \beta_1 \text{EstimationError}_i + \beta_2 \text{InformationTreatment}_i + \gamma \text{InformationTreatment}_i \times \text{EstimationError}_i + \epsilon_i$$

Y_i is the outcome(s) of interest, listed in our response to question 3

$\text{InformationTreatment}_i$ takes value 1 for respondents in the treatment group that receives information about the wages of similar workers before the main outcomes are measured and value zero otherwise.

EstimationError_i is the difference between respondent i 's pre-treatment belief about the wages of similar workers and the benchmark value we calculate based on administrative data.

The coefficient of interest is γ , which measures the effect of the information treatment as a function of respondents' initial estimation error.

We will also re-estimate the above equation replacing EstimationError_i with Overestimator_i a dummy variable taking value 1 for respondents that overestimate the wages of similar workers.

We also report results based on IV specifications. The endogenous independent variable is the post-treatment belief about the personal outside option (in percent difference from current wage). The IV specification regresses intended labor market behaviors on post-treatment personal outside option beliefs, instrumented with an interaction between $\text{InformationTreatment}_i$ and EstimationError_i .

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

We only include participants in our study that pass a basic attention screener at the start of the survey and that give consistent responses to a question eliciting the respondent's occupation.

We exclude respondents who, for any of the following questions -- (i) own wage, (ii) own outside option (both pre and post treatment) or (iii) Belief about peer wage -- give a response that is <20% or >300% the mean wage of observably similar peers.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

We plan to recruit 3000 to 4000 full-time employed workers that are not self-employed, do not work for the public sector and live and work in Germany. We conduct this recruitment with the survey provider Bilendi (previously Respondi). The exact number of participants will depend on the exact response rate of panelists invited to our study. Our target sample size is based on the provider's best estimate. We hope to complete the whole collection in July 2022.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

We collected some pilot data (n=1,117) already with Dynata and Bilendi (previously Respondi), which we plan to pool with the pre-registered data collection as a way to increase statistical power. Yet, we will transparently show our results separately for the pilot and the pre-registered collection in an Appendix.

G. Questionnaires

G.1. Questionnaire: Innovation Sample (2019 Wave)

Beliefs About Ranking in the Wage Distribution 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

(Please note: these numbers need to add up to 100%).

lower pay __%

same pay __%

higher pay __%

Beliefs About Ranking in Terms of Non-Pecuniary Benefits We will now ask you a question about your working conditions. By working conditions we mean: work climate, relationship to colleagues, flexibility regarding work hours and work place, educational opportunities and family-friendly work conditions. Important: do not include the pay in your considerations.

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 have....

(Please note: these numbers need to add up to 100%).

worse working conditions __%

similar working conditions __%

better working conditions __%

Beliefs About Firm Pay Think of the typical employee with work experience that switches from another employer to your 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 10% and 15%

Between 15% and 20%

Between 20% and 30%

Between 30% and 50%

Between 50% and 75%

More than 75% (in data normalized to 87.5%)

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 10% and 15%

Between 15% and 20%

Between 20% and 30%

Between 30% and 50%

Between 50% and 75%

More than 75% (in data normalized to 87.5%)

Beliefs About Median Wage Within Occupation 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 EUR)?

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.

How confident are you about this estimate? (Very unsure; unsure; neither unsure nor sure; sure; very sure)

Information Treatment You think the typical monthly pay of full-time employees in Germany that work in the same occupation [ParticipantOccupation] as you is Y dollars. According to official statistics of the Federal Employment Agency, we calculated the monthly wage of such employees. The typical monthly pay in your occupation is X EUR.

Intended Labor Market Behaviors We now have a series of questions about your labor market behavior.

Over the next 12 months, what is the probability that you will look for a new job at a different company? (scale 0 to 100)

Over the next 12 months, what is the probability that you will ask your boss for a wage raise? (scale 0 to 100)

[Asked even if previous answer is 0] Imagine that you negotiated your wage with your boss for the next year. Which wage raise would you suggest to your boss?

Between 0-2%

Between 2-5%

Between 5-10%

Between 10-15%

More than 15% (in data normalized to 17.5%)

Reservation Wage 1 Imagine that you considered switching to a different employer. What do you think: how much more would your current employer be willing to pay you to prevent that you switch to a different employer?

My current employer would be willing to pay me up to ___% more to prevent that I switch to a different employer.

Outside Offer Imagine that you received a job offer with a 30% higher wage from another employer and that the job is otherwise identical to your current job. Do you think you could use this outside offer in your wage negotiations with your current employer? (Y/N)

Frictions for Switching to Better-Paying Employer You told us that you think that X% of employees in Germany that are employed at a different employer, but work in the same occupation as you receive a higher wage. What are the main reasons for why you are currently (still) employed at your current employer even though other employers may offer you a higher wage?

- I would not want to lose the colleagues of my current employer.
- I do not like change.
- I would not want to learn the ropes in a new job.
- I like the working environment at my current employer.
- I like the regulation of working hours at my current employer.
- I have a very safe job at my current employer. If I start at a different company the risk of losing the job would be higher.
- I feel obliged to stay with my current employer.
- I would have difficulties finding a job that would pay a higher wage.
- I would have to move to another city or region for this.
- Other -----

Reservation Wage 2 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 ___%.

Reservation Wage 3 Imagine that you received a job offer from a different employer in your labor market region that would provide you with a comparable work environment. What wage would this other employer have to offer to you to ensure that you would leave your current employer?

This other employer would have to offer me a ___% higher wage for me to leave my current employer.

Posterior About Outside Option: Point Belief 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.⁴ 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 EUR

Between 50 and 100 EUR

Between 100 and 200 EUR

⁴ The original German version of this question used the following wording in German. “Stellen Sie sich vor, Sie müssten Ihre derzeitige Stelle kündigen und hätten drei Monate Zeit, eine Stelle bei einem anderen Arbeitgeber im selben Beruf zu finden.” In German it is clear that the separation that workers should imagine is exogenous.

Between 200 and 300 EUR
Between 300 and 400 EUR
Between 400 and 500 EUR
Between 500 and 750 EUR
Between 750 and 1000 EUR
Between 1000 and 1500 EUR
Between 1500 and 2000 EUR
Between 2000 and 3000 EUR
More than 3000 EUR (in data normalized to 3500 EUR)

Posterior About Outside Option: Probabilistic Belief What do you think is the likelihood that you would earn...

- more than in your current job __%
- as much as in your current job __%
- less in your current job. __%

(Please note: these numbers need to add up to 100%).

G.2. Questionnaire: Original German Version

Beliefs About Ranking in the Wage Distribution Denken Sie an alle Erwerbstätigen in Deutschland, die bei einem anderen Arbeitgeber beschäftigt sind, aber im gleichen Beruf wie Sie arbeiten.

Was glauben Sie: Wie viel Prozent dieser Erwerbstätigen haben...

(Bitte beachten Sie: die Zahlen müssen sich auf 100% aufsummieren).

einen niedrigeren Lohn als Sie __%

einen ähnlichen Lohn wie Sie __%

einen höheren Lohn als Sie __%

Beliefs About Ranking in Terms of Non-Pecuniary Benefits Wir stellen ihnen nun eine Frage zu Ihrem Arbeitsumfeld. Mit Arbeitsumfeld meinen wir die folgenden Dinge: Arbeitsklima, Verhältnis zu Kollegen, Flexibilität bezüglich Arbeitszeiten und Arbeitsort, Möglichkeiten für Fortbildungen und familienfreundliche Arbeitsbedingungen. Wichtig: Das Gehalt bitten wir Sie hier jedoch nicht einzubeziehen. Denken Sie an alle Erwerbstätigen in Deutschland, die bei einem anderen Arbeitgeber beschäftigt sind, aber im gleichen Beruf wie Sie arbeiten. Was glauben Sie: Wie viel Prozent dieser Erwerbstätigen arbeiten bei einem Arbeitgeber, der...

(Bitte beachten Sie: die Zahlen müssen sich auf 100% aufsummieren).

ein schlechteres Arbeitsumfeld bietet als Ihr Arbeitgeber __%

ein ähnliches Arbeitsumfeld bietet wie Ihr Arbeitgeber __%

ein besseres Arbeitsumfeld bietet als Ihr Arbeitgeber __%

Beliefs About Firm Pay Denken Sie an einen typischen Erwerbstätigen, der mit Berufserfahrung von einem anderen Arbeitgeber zu Ihrem Arbeitgeber wechselt. Würde dieser Erwerbstätige nach dem Stellenwechseln bei Ihrem Arbeitgeber im Durchschnitt einen niedrigeren, höheren oder den gleichen Lohn erhalten als bei seinem vorherigen Arbeitgeber?

- Einen niedrigeren Lohn
- Den gleichen Lohn
- Einen höheren Lohn
- Keine Angabe

[Asked only if previous answer is not "Den gleichen Lohn"] Wie viel niedriger/ höher wäre der monatliche Bruttolohn (d.h. vor Steuerabzug) dieses Erwerbstätigen nach dem Stellenwechsel im Vergleich zu seinem vorherigen Arbeitgeber im Durchschnitt in Prozent?

Zwischen 0% und 2%

Zwischen 2% und 5%

Zwischen 5% und 10%

Zwischen 10% und 15%

Zwischen 15% und 20%

Zwischen 20% und 30%

Zwischen 30% und 50%

Zwischen 50% und 75%

Mehr als 75% [in data normalized to 87.5%]

Denken Sie an den typischen Erwerbstätigen, der von Ihrem Arbeitgeber zu einem anderen Arbeitgeber wechselt. Würde dieser Erwerbstätige bei seinem nächsten Arbeitgeber im Durchschnitt einen niedrigeren, höheren oder den gleichen Lohn erhalten?

- Einen niedrigeren Lohn

- Den gleichen Lohn
- Einen höheren Lohn

[Asked only if previous answer is not “Den gleichen Lohn”] Wie viel niedriger/ höher wäre der monatliche Bruttolohn (d.h. vor Steuerabzug) im Durchschnitt in Prozent beim neuen Arbeitgeber? Zwischen 0% und 2%

Zwischen 2% und 5%

Zwischen 5% und 10%

Zwischen 10% und 15%

Zwischen 15% und 20%

Zwischen 20% und 30%

Zwischen 30% und 50%

Zwischen 50% und 75%

Mehr als 75% [in data normalized to 87.5%]

Beliefs About Median Wage Within Occupation Denken Sie an alle Erwerbstätigen in Deutschland, die im gleichen Beruf wie Sie arbeiten. Was, glauben Sie, ist der typische Monatsverdienst von Vollzeitbeschäftigten in Ihrem Beruf vor Steuerabzug (in EUR)?

Wie sicher sind Sie sich mit Ihrer vorherigen Schätzung? (Sehr unsicher; unsicher; weder unsicher noch sicher; sicher; sehr sicher)

Information Treatment Sie glauben, dass der typische Monatsverdienst von Vollzeiterwerbstätigen in Deutschland, die im gleichen Beruf wie Sie arbeiten, [participant’s belief] EUR sind. Basierend auf offiziellen Statistiken der Bundesagentur für Arbeit haben wir berechnet, wie hoch der typische Monatsverdienst tatsächlich ist. Vor Steuern beträgt der typische Monatsverdienst in Ihrem Beruf [true amount] EUR.

Intended Labor Market Behaviors In den folgenden Fragen schätzen Sie die Wahrscheinlichkeit ein, dass ein bestimmtes Ereignis in der Zukunft eintreten wird. Ihre Antworten können zwischen 0% und 100% liegen, wobei 0% bedeutet, dass etwas definitiv nicht passieren wird, und 100% bedeutet, dass es absolut sicher ist.

Zum Beispiel eine Prozentangabe wie...

...2% oder 5% bedeutet, dass etwas sehr unwahrscheinlich ist.

...18% bedeutet, dass etwas unwahrscheinlich ist.

...47% oder 52% heißt, dass etwas mit ziemlich gleicher Chance eintreten wird oder nicht.

...83% heißt, dass etwas wahrscheinlich ist.

...95% oder 98% heißt, dass etwas fast sicher ist.

Wie wahrscheinlich ist es, dass Sie in den nächsten 12 Monaten einen anderen Job bei einem anderen Unternehmen suchen werden? Bitte geben Sie die Wahrscheinlichkeit in Prozent an.

Wie wahrscheinlich ist es, dass Sie Ihren Chef in den nächsten 12 Monaten nach einer Gehaltserhöhung fragen werden? Bitte geben Sie die Wahrscheinlichkeit in Prozent an.

[Asked even if previous answer is 0] Stellen Sie sich vor, dass Sie mit Ihrem Chef Ihr Gehalt für das nächste Kalenderjahr verhandeln. Welche Gehaltserhöhung würden Sie vorschlagen? Keine Gehaltserhöhung

Gehaltserhöhung zwischen 0% und 2%

Gehaltserhöhung zwischen 2% und 5%.

Gehaltserhöhung zwischen 5% und 10%.

Gehaltserhöhung zwischen 10% und 15%.

Gehaltserhöhung von mehr als 15%. [in data normalized to 17.5%]

Reservation Wage 1 Stellen Sie sich vor, Sie überlegen sich, die Stelle zu wechseln. Was glauben Sie: wieviel mehr wäre Ihr derzeitiger Arbeitgeber bereit, Ihnen zu zahlen, damit Sie nicht die Stelle wechseln?

Mein derzeitiger Arbeitgeber wäre bereit, mir bis zu __% mehr zu zahlen, um mich von dem Wechsel abzuhalten.

Outside Offer Stellen Sie sich vor Sie erhielten ein Angebot mit einer deutlich höheren Bezahlung von einem anderen Arbeitgeber, und die Stelle ist Ihrer derzeitigen sonst praktisch identisch. Könnten Sie dieses Angebot in Gehaltsverhandlungen mit Ihrem Arbeitgeber nutzen, um ein höheres Gehalt auszuhandeln?(Ja/Nein)

Frictions for Switching to Better-Paying Employer Sie haben uns gesagt, dass [XX]% der Erwerbstätigen in Deutschland, die bei einem anderen Arbeitgeber beschäftigt sind, aber im gleichen Beruf wie Sie arbeiten, ein höheres Gehalt als Sie erhalten.

Was sind die Hauptgründe, warum Sie zurzeit (noch) bei Ihrem derzeitigen Arbeitgeber beschäftigt sind, obwohl andere Arbeitgeber Ihnen gegebenenfalls ein höheres Gehalt zahlen würden?

- Ich will meine Kollegen bei meinem derzeitigen Arbeitgeber nicht verlieren.
- Ich mag keine Veränderungen.
- Ich will mich nicht in einen neuen Job einarbeiten.
- Ich mag das Betriebsklima bei meinem derzeitigen Arbeitgeber.
- Ich mag die Arbeitszeitregelung bei meinem derzeitigen Arbeitgeber.
- Ich habe bei meinem derzeitigen Arbeitgeber eine sichere Stelle. Wenn ich bei einer Firma neu anfangen, ist das Risiko, die Stelle wieder zu verlieren, größer.
- Ich fühle mich meinem derzeitigen Arbeitgeber gegenüber verpflichtet zu bleiben.
- Ich würde bei den anderen Arbeitgebern, die ein höheres Gehalt zahlen würden, nur sehr schwer eine Stelle finden.
- Ich müsste hierfür in eine andere Stadt oder Region ziehen.
- Andere -----

Reservation Wage 2 Stellen Sie sich vor, dass bei Ihrem derzeitigen Arbeitgeber die Löhne dauerhaft gekürzt werden. Die Lohnkürzung ist die Folge eines Wechsels in der Unternehmensführung und unabhängig von der wirtschaftlichen Entwicklung in Ihrer Branche. Ab welcher Lohnsenkung würden Sie Ihre Stelle innerhalb eines Jahres kündigen?

Ich würde kündigen, wenn bei meinem derzeitigen Arbeitgeber die Löhne um mehr als ___% gesenkt werden würden.

Reservation Wage 3 Stellen Sie sich vor Sie erhielten ein Angebot von einem anderen Arbeitgeber in Ihrer Arbeitsmarkregion, der Ihnen ein vergleichbares Arbeitsumfeld wie Ihr derzeitiger Arbeitgeber bieten würde. Bezogen auf Ihr monatliches Bruttogehalt: wie viel % müsste Ihnen dieser Arbeitgeber mehr zahlen, damit Sie Ihren derzeitigen Arbeitgeber verlassen würden?

Dieser Arbeitgeber müsste mir ___% im Monat mehr Bruttogehalt zahlen, damit ich meinen derzeitigen Arbeitgeber verlassen würde.

Posterior Personal Outside Option: Point Belief Stellen Sie sich vor, Sie müssten Ihre derzeitige Stelle kündigen und hätten drei Monate Zeit, eine Stelle bei einem anderen Arbeitgeber im selben Beruf zu finden. Glauben Sie, dass Sie im Schnitt monatlich brutto mehr oder weniger verdienen würden als in Ihrem jetzigen Job?

- Mehr als in Ihrem jetzigen Job
- Gleich viel wie in Ihrem jetzigen Job
- Weniger als in Ihrem jetzigen Job

[Asked only if previous answer is not “Same pay”] Was glauben Sie: wie viel mehr / weniger würden Sie wahrscheinlich monatlich brutto verdienen als in Ihrem jetzigen Job?

Zwischen 0 und 50 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 50 und 100 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 100 und 200 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 200 und 300 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 300 und 400 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 400 und 500 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 500 und 750 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 750 und 1000 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 1000 und 1500 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 1500 und 2000 EUR mehr / weniger verdienen als in meinem jetzigen Job

Zwischen 2000 und 3000 EUR mehr verdienen als in meinem jetzigen Job

Mehr als 3000 EUR mehr verdienen als in meinem jetzigen Job [in data normalized to 3500 EUR]

Posterior About Outside Option: Probabilistic Belief Was ist die Wahrscheinlichkeit, dass Sie... (Bitte beachten Sie: die Zahlen müssen sich auf 100% aufsummieren).

- mehr verdienen als in Ihrem jetzigen Job ___%
- gleich viel verdienen wie in Ihrem jetzigen Job ___%
- weniger verdienen als in Ihrem jetzigen Job ___%

G.3. Questionnaire: Robustness Check Survey (July 2021)

Belief About Outside Option: SOEP Elicitation (50% of sample) Imagine that you were forced to leave your current job and that you had 3 months⁵ to find a job at another employer in the same occupation.⁶ 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 EUR

Between 50 and 100 EUR

Between 100 and 200 EUR

Between 200 and 300 EUR

Between 300 and 400 EUR

Between 400 and 500 EUR

Between 500 and 750 EUR

Between 750 and 1000 EUR

Between 1000 and 1500 EUR

Between 1500 and 2000 EUR

Between 2000 and 3000 EUR

More than 3000 EUR (in data normalized to 3500 EUR)

How confident are you in your previous estimate? (very certain, certain, uncertain, very uncertain)

Belief About Outside Option: Alternative Elicitation (50% of Sample) Imagine you were forced to leave your current job and had 3 months⁷ to find a job with another employer in the same occupation.⁸

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

[Only if randomised to “reminder treatment”] Reminder: Your current gross monthly income is [amount answered before] EUR.

How confident are you in your previous estimate? (very certain, certain, uncertain, very uncertain)

Beliefs Coworker Wage Changes: SOEP Elicitation (50% of Sample) Think of the typical employee with work experience that switches from another employer to your 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%

⁵ For 50% of respondents the time horizon is instead 12 months.

⁶ For 50% of respondents the instructions do not condition on occupation and are instead given as follows: [...] months to find a job at another employer.

⁷ For 50% of respondents the time horizon is instead 12 months.

⁸ For 50% of respondents the instructions do not condition on occupation and are instead given as follows: [...] months to find a job at another employer.

Between 5% and 10%
 Between 10% and 15%
 Between 15% and 20%
 Between 20% and 30%
 Between 30% and 50%
 Between 50% and 75%
 More than 75% (in data normalized to 87.5%)

Think of the typical employee 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 10% and 15%
 Between 15% and 20%
 Between 20% and 30%
 Between 30% and 50%
 Between 50% and 75%
 More than 75% (in data normalized to 87.5%)

Beliefs Coworker Wage Changes: Alternative Elicitation (50% of Sample) Consider a typical employed person with work experience who switches from another employer to your employer. After switching jobs, would this worker receive, on average, a lower or higher wage at your employer than at her previous employer?

- a higher wage
- a lower wage

How much lower / higher would this worker’s gross monthly wage (i.e., before taxes) be, on average, as a percentage, after the job change compared to her previous employer? ___%

Consider a typical employed person with work experience who switches from your employer to another employer. After switching jobs, would this worker receive, on average, a lower or higher wage at another employer than at your employer?

- a higher wage
- a lower wage

How much lower / higher would this worker’s gross monthly wage (i.e., before taxes) be, on average, as a percentage, after the job change compared to her previous employer? ___%

Reservation Wage 1 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? ___%

Reservation Wage 2 Imagine that you considered switching to a different employer. What do you think: how much more would your current employer be willing to pay you to prevent that you switch to a different

employer? ___%

Reservation Wage 3 Imagine that your current employer laid you off because your company closes unexpectedly. The company closing is independent of the economic development in your industry. How many months would you expect to remain unemployed until you found a new job? ___ months

Outside Option in Response to Mass Layoff Imagine that your current employer laid you off because your company closed unexpectedly and you had to find a job with another employer within 3 months.

In the job with another employer, how much would you receive monthly as gross employment income in EUR? ___EUR

General Beliefs About Outside Option 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 do you think these other workers earn on average per month before taxes (in EUR)?

[Only if randomised to “incentive treatment” (50% of respondents) If your estimate does not differ from the actual value by more than 5%, then you will receive a bonus of 5 EUR in panel points.
___ EUR

Beliefs About Ranking in the Wage Distribution Think of all employees in Germany that work in the same occupation as you, but work at a different employer.⁹ What do you think: what percent of those employees receive a

(Please note: these numbers need to add up to 100%).

lower pay __%

same pay __%

higher pay __%

⁹ 50% of our respondents were instead shown the following introductory sentence to this question without conditioning on occupation: Think of all employees in Germany that work that work at a different employer.

G.4. Questionnaire: Information Provision Experiment (May-July 2022)

First Attention Check The next question addresses the following problem. In surveys like this one, there are sometimes participants who don't read the questions carefully and just "click" through the questionnaire quickly. As a result, there are many random answers that falsify the results of the study. In order to show that you read our questions carefully, we ask you to indicate 333 as the answer to the next question.

What's your favorite number? __

Demographics Which of the following categories best describes you?

Full-time employed

Part-time employed

Unemployed

I am a student

I am retired

Housewife/houseman

Are you a civil servant? Yes/No

Are you self-employed? Yes/No

What device are you taking this survey on? [Desktop or Laptop/Tablet/Mobile]

How old are you (in years)?

What is your sex? male/female

Where do you work?

Federal state: [dropdown]

District: [dropdown]

This means that you are assigned to the following labor market region:

What is your highest professional qualification?

No completed education

Vocational training

University or technical college degree

Occupation Now we're going to ask you a few questions about your occupation.

What occupation do you work in? [open-text]

Which of the following categories best describes your professional activity? [drop-down]

Which of the following categories best describes your professional activity? Please enter your activity using the keyboard.[search interface with drop-down]

If you cannot find a suitable occupation in this list, we ask you to return to the previous pages, where you can answer the questions about the occupational area and the occupational category again. If you made

a mistake in the professional field, you may then be able to find a more suitable job.

How appropriately does the job you have chosen describe your actual job?

Very suitable

Suitable

Not suitable

Not at all suitable

Wage Income How high is your current monthly gross income from work in EUR before taxes? ___ EUR

Beliefs About Personal Outside Option 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 job with another employer, how much would you receive per month as gross employment income in EUR? ___ EUR

Beliefs About the Wages of Similar Workers Imagine people who are very similar to you in some characteristics relevant to the job market.

Imagine people who...

work in your occupation (XXX)

are also employed full-time

are also [male/female]

have your age (XXX)

work in your labor market region (XXX)

and and have your highest educational level (XXX)

Below we ask you questions about what people with your characteristics earn.

Based on data from the Federal Employment Agency, we calculated how much people with your characteristics actually earn on average gross per month. If your estimate is within 100 EUR of the actual value, you will receive a bonus of 1 EUR in panel points.

What do you think: how much do people with your characteristics earn on average monthly gross (in EUR)? ___ EUR

Please explain how you arrived at this estimate. [text-box below]

How confident are you in your previous estimate? (very certain, certain, uncertain, very uncertain)

Control Group

Your Guess

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



Treatment Group

Information about the Wages of Workers with Similar Characteristics to You

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



Did you underestimate or overestimate the pay of people with your characteristics?

I underestimated the wages of people with my characteristics.

I overestimated the wages of people with my characteristics.

Your estimate of the wages of people with your characteristics: XXX EUR Actual wages of people with your characteristics: XXX EUR

By how many EUR did you [underestimate/overestimate] the wages of people with your characteristics? ___ EUR

Main Outcomes

We now have a series of questions about your labor market behavior.

Post-Treatment Beliefs About Wages of Similar Workers Based on data from the Federal Employment Agency, we have calculated what employees with your characteristics actually earn on average gross per month.

What do you think: do employees with your characteristics earn more or less than you on average?

More

Less

What do you think: How much [more/less] do employees with your characteristics earn on average compared to you (in EUR, gross)?
___ EUR

Post-Treatment Beliefs About Personal Outside Option We're going to ask you the same question we asked a few minutes ago. You may have changed your assessment because you had a little more time to think about the 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 job with another employer, how much would you receive per month as gross employment income in EUR? ___ EUR

Probability of Looking for a New Job Over the next 12 months, what is the probability that you will look for a new job at a different company? (scale 0 to 100)

Probability of Asking for a Raise Over the next 12 months, what is the probability that you will ask your boss for a wage raise? (scale 0 to 100)

[Asked even if previous answer is 0] Imagine that you negotiated your wage with your boss for the next year. Which wage raise would you suggest to your boss?

0 %

Between 0-1%

Between 1-2%

Between 2-5%

Between 5-10%

Between 10-15%

Between 15-20%

More than 20% (in data normalized to 25%)
No negotiations planned

Reservation Wage Cut 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 ___%.

Quit Probability If your pay stays the same, how likely are you to quit your current job in the next 12 months? Please indicate the probability in percent.

How likely are you to quit your current job in the next 12 months if your wage decreases by 10% compared to your current wage? Please indicate the probability in percent.

How likely are you to quit your current job in the next 12 months if your wage increases by 10% compared to your current wage? Please indicate the probability in percent.

Additional Characteristics

Second Attention Check The next question addresses the following problem. In surveys like this one, there are sometimes participants who don't read the questions carefully and just "click" through the questionnaire quickly. As a result, there are many random answers that falsify the results of the study. To show that you are reading our questions carefully, we ask that you answer "Very interested" and "Not at all interested" for the next question.

Very interested

Interested

Somewhat interested

Almost not interested

Not at all interested

In the 12 months prior to taking this survey, how often did you look for information about wages from other employers? (Never, once, twice, three times, four times, five times, between 5 and 10 times, more than 10 times)

Imagine you had to find out about other potential employers you could work for. How exhausting would you find it to find out about other potential employers? [Very exhausting, Exhausting, Not exhausting, Not at all exhausting.]

Imagine you had to find out about other potential employers you could work for. How difficult would it be for you to find the relevant information? [Very difficult, difficult, not difficult, not difficult at all]

Are you paid according to a collective bargaining agreement (CBA)? [Yes/No]

How many hours do you work per week? [drop-down list]

Approximately how many employees work in your current company? [open-entry]

How many years have you worked for your current employer?[drop-down list]

How many times have you changed employers in total in your life? [drop-down list]
In which industry do you work? [drop-down list]

Occupation Elicitation The next question addresses the following problem again. In surveys like this one, there are sometimes participants who don't read the questions carefully and just "click" through the questionnaire quickly. As a result, there are many random answers that falsify the results of the study. That's why we ask you to enter the profession below again that you entered a few minutes ago. [List of occupations where one of the occupations corresponds to the occupation the respondent chose at the start of the survey]

Research Hypothesis Guess What hypothesis do you think the researchers are trying to test with this survey? [open text box]

Information Demand (Control Group Only)

Information about wages of employees with their characteristics

A few minutes ago you estimated that other people with your characteristics earn an average of XXX EUR gross per month.

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

Would you like to receive information about the real wages of employees with your characteristics?
Yes/No

[if Yes is selected] Information about wages of employees with your characteristics

Employees with your characteristics actually earn an average of XXXX EUR gross per month.

Debrief

More background information

In this study, you received information about the wages of workers with your characteristics. Below we give you a few details on how we calculated the wages.

To calculate the average wages of similar workers, we use German administrative data for 2019. We estimate a model that accounts for the following variables: gender, occupation, labor market region, education, age, and employment status. Using the model parameters, we then calculate the average wages of employees with your characteristics. As the forecasts are from 2019, we perform an inflation adjustment using average nominal wage growth between 2019 and July 2022.

Further sources: On the following link you can get additional information about salaries of employees with your characteristics: https://www.destatis.de/DE/Service/Statistik-Visualisiert/Gehaltsvergleich/_inhalt.html.

Important: The information regarding wages refers to average wages. These average wages mask a large heterogeneity between individuals. Therefore, the information should be interpreted with caution.

References

- De Quidt, Jonathan, Johannes Haushofer, and Christopher Roth. 2018. “Measuring and Bounding Experiment Demand.” *American Economic Review* 108 (11): 3266–3302.
- Haaland, Ingar, Christopher Roth, and Johannes Wohlfart. 2023. “Designing Information Provision Experiments.” *Journal of Economic Literature* 61 (1): 3–40.
- Townsend, Wilbur. 2017. “ELASTICREGRESS: Stata Module to Perform Elastic Net Regression, Lasso Regression, Ridge Regression.” *Statistical Software Components*.