

Worker Beliefs About Rents and Outside Options*

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Abstract

We measure workers' beliefs about rents and outside options in a representative sample of German workers, and compare these beliefs with proxies for actual outside options. While subjective worker rents are large—14% of salary on average—they do not stem from workers' subjective wage premia at their current firm, but are *entirely* derived from non-wage amenities. When comparing workers' subjective outside options against objective measures of pay premia from matched employer-employee data, we find that many workers mistakenly believe their current wage is representative of the external labor market—objectively low-paid (high-paid) workers are overpessimistic (overoptimistic) about their outside options. If workers had correct beliefs about outside options, 13% of jobs would not be viable at current wages, concentrated in the low-wage segment of the labor market. Finally, we show that in an equilibrium model, misinformation about outside options gives employers monopsony power.

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1 Introduction

Firms differ substantially in the wages they pay otherwise similar workers (Slichter, 1950; Abowd, Kramarz, and Margolis, 1999; Card, Heining, and Kline, 2013). Such wage differences between firms may arise due to heterogeneity in non-wage amenities combined with compensating differentials (Rosen, 1986), or they may reflect rents earned by workers, e.g., due to preferences for working for specific employers (Card et al., 2018; Berger, Herkenhoff, and Mongey, 2019; Lamadon, Mogstad, and Setzler, 2021), search frictions (Burdett and Mortensen, 1998; Manning, 2003), or efficiency wages (Krueger and Summers, 1988). Worker beliefs about these inter-firm wage differences may influence worker flows and consequently the monopsony power of firms, as hypothesized by Robinson (1933).¹ However, it remains an open question whether, and to what degree, workers accurately perceive these differences. Specifically, it remains an open question whether workers accurately perceive the difference between their current wage and the wage they would earn by switching to their next-best employer—their outside option.

To answer this question, we design and implement a representative survey that allows us to measure workers' beliefs about their outside options, and compare these beliefs with empirical proxies for actual outside options. In our survey, we ask each worker about the pay cut required to induce her to quit her current job—giving a nonparametric measure of that worker's rent—as well as about the expected wage change accompanying that switch—giving the worker's subjective wage premium currently earned. Our survey consists of a custom questionnaire integrated into the German Socio-Economic Panel (GSOEP), covering two waves of 1,604 respondents in total, in 2019 and 2020, and linked to respondents' administrative labor market data (SOEP-ADIAB).

We begin by examining our measure of worker rents, defined as the pay cut required to induce a worker to switch to her next-best option, i.e., the gap between the reservation wage and the current wage (Robinson, 1933; Rosen, 1986). Overall, we find that workers derive substantial rents from their jobs, with the median and average worker's rent amounting to 10% and 14% of her salary, respectively. Quantitatively, these results are strikingly in line

¹Robinson (1933), p.296, describes the sources of frictions in the labor market: "There may be a certain number of workers in the immediate neighbourhood and to attract those from further afield it may be necessary to pay a wage equal to what they can earn near home plus their fares to and fro; or there may be workers attached to the firm by preference or custom and to attract others it may be necessary to pay a higher wage. *Or ignorance may prevent workers from moving from one to another in response to differences in the wages offered by the different firms.*" (Our emphasis.) Similarly, Manning (2003), p.4, summarizes the main forces leading to frictions as "ignorance, heterogeneous preferences, and mobility costs".

with structural estimates in Lamadon, Mogstad, and Setzler (2021), who find that workers in the US are, on average, willing to incur a 13% cut to their wages to stay in their current jobs.

When we ask respondents to predict the wage change for a hypothetical move to her outside option, the average worker *believes* her next-best job will pay exactly the same. That is, workers' subjective rents are not derived from perceived wage premia and instead stem largely from non-wage amenities, consistent with the large role of non-wage amenities among job seekers documented in, e.g., Hall and Mueller (2018).² Workers' perceived wage rents only increase moderately with their firm's objective pay premium. Even workers in high-paying firms report receiving only small wage rents, as they believe that their alternative wage would only be slightly lower than their current wage. These beliefs are hard to square with the large body of evidence on substantial between-firm wage differentials (see, e.g., Card et al., 2018; Bonhomme et al., 2020, for overviews of the literature and correction methods). Moreover, these beliefs are also hard to reconcile with the large and heterogeneous wage effects of job loss (Jacobson, LaLonde, and Sullivan, 1993; Schmieder, von Wachter, and Heining, 2018; Lachowska, Mas, and Woodbury, 2020).

Motivated by this tension, we assess the accuracy of workers' beliefs about their outside options. We compare their beliefs to proxies for the wages they would actually be paid at their outside options. Identifying workers' outside options is notoriously challenging.³ To approximate outside options, we construct firm-level proxies that draw on the realized wage changes of respondents' coworkers upon job switching, calculated by merging the GSOEP survey with administrative worker data covering the universe of the German labor market. We use both raw wage changes of coworkers as well as firm pay premia (AKM firm fixed effects) as benchmarks.

Comparing workers' beliefs with their objective outside options reveals systematic bias: objectively low-paid workers are overpessimistic about their outside options, while objectively high-paid workers are overoptimistic. Workers' expectations for their own wage change if they were forced to leave their firm are close to flat across firms, and are close to zero even in firms where coworkers actually experience large positive or negative wage changes when they leave. We estimate a slope of 0.073 (SE 0.032) of predicted own

²Moreover, only 11% of workers in our 2019 data collection report that they would have a difficulty finding a job with higher pay.

³See Lachowska (2016); Caldwell and Harmon (2019); Caldwell and Danieli (2018); Jäger et al. (2020); Schubert, Stansbury, and Taska (2021); and Di Addario et al. (2021) for recent work on the effects of outside options on wages.

wage changes with respect to actual coworker wage changes, where a slope of 1 would have been obtained if workers' beliefs exactly tracked the actual wage changes of movers.

While this estimate is suggestive of misperceptions, it may alternatively reflect the wage changes of movers being an imperfect proxy for the wage change a surveyed worker would receive if they left their current firm. To obtain beliefs with a directly comparable benchmark, we also asked workers to estimate the actual wage changes that coworkers who move out of their firm experience. Here, we strikingly find the same pattern and estimate a slope of 0.056 (SE 0.024) relative to the true benchmark of 1. Our findings stand in contrast to predictions by academic experts in labor economics that we surveyed (following DellaVigna and Pope, 2018) who predicted workers' beliefs to be much more in line with actual mover wage changes, with an implied slope of 0.656.

Mapping movers' wage changes back to firm types, we find that workers in high-AKM firms underestimate the actual wage *declines* of movers, while workers in low-AKM firms underestimate the average wage *gains* that movers out of their firm experience. Both sets of workers believe that the relevant external labor market resembles their own employer more than it actually does.

We provide an additional benchmark for the accuracy of workers' perceptions of the external labor market by measuring worker beliefs about the share of workers in their occupation with higher or lower pay than them. We find that workers have a tendency to believe that their salary ranks roughly in the middle of the occupation-specific wage distribution. Only a small share of workers believe that they are in the top or bottom decile of their occupation's wage distribution. And even the objectively lowest paid workers, measured by their ranking in their occupation's wage distribution or their employer's AKM firm effect, believe that about 20% of workers in their occupation receive lower pay than them. We further show that workers' biases about their rank in the occupational wage distribution correlate with their biases about their own and actual mover wage changes, suggesting that our different bias measures arise from related distortions in workers' perceptions of outside options and the external labor market.

Finally, we also elicit workers' beliefs about the median salary in their occupation in the German labor market. Workers on average underestimate the median salary in their occupation, even in a robustness check with incentivized belief elicitation. However, there is substantial heterogeneity and systematic sorting: workers in high-AKM firms have on average accurate beliefs and underestimators are concentrated among the lowest-paying firms in the labor market.

To further quantify the extent of misperceptions, we implement a back-of-the-envelope calculation that attempts to measure subjective worker surplus in a hypothetical world where workers have accurate beliefs about the wage changes they would experience if they left their firm. To do so, we reassign workers the average wage change of movers out of firms in their AKM-firm-effect ventile in lieu of their own prediction of their wage change when leaving. This partial equilibrium calculation reveals that about 13% of employment relationship would not be viable if workers had accurate beliefs about wage changes they would experience when switching firms. The fraction is substantially larger in the low-wage segment of the labor market: the number increases to 40% among low-wage jobs, those in the bottom quintile in terms of their AKM firm effect (reflecting our finding that workers in low-wage firms are overpessimistic). Our evidence thus suggests that misperceptions may be an important mechanism for understanding the existence of low-wage segments of the labor market.

Our findings raise and substantiate the possibility that workers' biased beliefs about outside options, specifically regarding alternative wages, may help sustain wage mark-downs and wage dispersion in equilibrium. We formalize this mechanism in a simple equilibrium model, applying the inattention model in Matějka and McKay (2012, 2015) to the labor market. Workers' inattention to wages paid by different employers gives rise to a multinomial logit choice model (as in Card et al., 2018) and, effectively, lowers the firm-specific elasticity of labor supply. The biases we detect thus constitute a source of monopsony power in the labor market, supporting the hypothesis in Robinson (1933). In line with our results, the model also predicts that workers with the most inaccurate beliefs are employed in the firms with the lowest pay premia.

Consistent with evidence that workers in low-paying industries or firms search and quit more (Krueger and Summers, 1988; Bassier, Dube, and Naidu, forthcoming; Drenik et al., forthcoming; Faberman et al., 2017), we find that such workers do have lower subjective rents, in particular wage rents. However, our evidence shows that they underestimate their potential outside options and may hence still search too little.

Our evidence is consistent with an anchoring-and-adjustment heuristic (Tversky and Kahneman, 1974): workers anchor their beliefs about the outside labor market on their current employment conditions and insufficiently adjust away from this baseline. Several pieces of existing evidence about worker beliefs are consistent with this view. First, unemployed job seekers anchor their reservation wages on their own pre-job-loss salary (Feldstein and Poterba, 1984; Krueger and Mueller, 2016; Le Barbanchon, Rathelot, and

Roulet, 2019; Koenig, Manning, and Petrongolo, 2020), and insufficiently update their beliefs as their duration of unemployment grows (Spinnewijn, 2015; Mueller and Spinnewijn, 2021), though they sometimes do so in response to wage offers (Conlon et al., 2018).⁴ Second, consistent with systematic misinformation and strong anchoring on one’s own past wages, Roussille (2020) documents that providing information about other candidates’ asking wages affects workers’ own asking wages, eliminating the gender gap in asking wages on an online job platform. Third, workers anchor on their own wage when forming beliefs about the wage distribution in their firm or sector (Cullen and Perez-Truglia, 2018b; Hvidberg, Kreiner, and Stantcheva, 2020). Fourth, the non-zero effects of information treatments regarding the wages of others in the same firm (Card et al., 2012; Cullen and Perez-Truglia, 2018a) or of pay transparency laws (Baker et al., 2019; Perez-Truglia, 2020) suggest the existence of systematic worker misperceptions. Relative to the existing literature, our key novelty lies in directly measuring beliefs about outside options, and comparing those quantitative beliefs with objective benchmarks for actual outside options.

Our study can be viewed as an update of Reynolds’s (1951) important survey of about 1,000 manual workers in New Haven between 1946 and 1948. He concludes 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). Similarly, the typical worker “has no idea of the full range of jobs, wage rates, and working conditions prevailing in the area” (p. 85). Consistent with our finding that workers in low-paying firms believe that a substantial share of employers have yet lower wage policies, Reynolds also finds that, contrary to reality, workers in low-paying firms overwhelmingly believe that their employers’ wages are higher than wages elsewhere.⁵

Section 2 presents our conceptual framework. Section 3 summarizes the data. Section 4 presents the magnitude and distribution of worker rents, and decomposes them into wage and non-wage components. Section 5 compares subjective and objective outside options. Section 6 sketches a simple equilibrium model of inattentive workers and the

⁴See also Skandalis (2018); Altmann et al. (2018); Belot, Kircher, and Muller (2019); DellaVigna et al. (2017, 2020); and Abebe et al. (2020) for evidence on the role of beliefs and information among unemployed job seekers, and Mueller and Spinnewijn (2021) for a survey of the literature.

⁵Reynolds (1951) summarizes: “There is a slight correspondence between workers’ statements about the relative wage level of their company and the actual situation. Thus for companies in the top half of our wage ranking, 95 per cent of the workers said that the plant wage level compared favorably with other plants. For companies in the lower half of the ranking, only 80 per cent of the workers said that the company’s wages were higher than rates elsewhere” (Reynolds, 1951. p. 213–214).

associated monopsony power. Section 7 concludes.

2 Conceptual Framework and Empirical Strategy

We provide a simple conceptual framework for thinking about worker rents and outside options, and present the empirical strategy we use to estimate beliefs about rents and outside options in a survey.

2.1 Conceptual Framework

Worker Rents Workers choose between J firms. Worker $i \in \{1, \dots, I\}$ would earn wage $w_{i,j}$ and amenity level $\epsilon_{i,j}$ at firm (job) $j \in \{1, \dots, J\}$. Assuming additive separability, worker i 's utility from working at firm j is given by:

$$u_i(w_{i,j}, \epsilon_{i,j}) = v_i(w_{i,j}) + \epsilon_{i,j}. \quad (1)$$

Given amenity valuations and wages, worker i chooses to work at the firm that maximizes her utility. We denote this utility-maximizing firm by $\mathbb{1}$:

$$\mathbb{1}(i) = \operatorname{argmax}_{j \in \{1, \dots, J\}} u_i(w_{i,j}, \epsilon_{i,j}). \quad (2)$$

Firm $\mathbb{2}$ is the worker's second preferred option:

$$\mathbb{2}(i) = \operatorname{argmax}_{j \in \{1, \dots, J\} \setminus \mathbb{1}(i)} v_i(w_{i,j}, \epsilon_{i,j}). \quad (3)$$

Worker i 's rent R_i is the compensation earned in excess of what would make her indifferent between working at firm $\mathbb{1}$ or firm $\mathbb{2}$:⁶

$$u_i(w_{i,\mathbb{1}(i)} - R_i, \epsilon_{i,\mathbb{1}(i)}) = u_i(w_{i,\mathbb{2}(i)}, \epsilon_{i,\mathbb{2}(i)}). \quad (4)$$

Decomposition: Wages and Non-Wage Amenities Following Lamadon, Mogstad, and Setzler (2021), we decompose the rent into a wage-based (component of the) rent, R_i^w , and

⁶This formulation of the rent can also be viewed as a reservation wage cut as in Mui and Schoefer (2021), who formulate and elicit a reservation wage cut between employment and nonemployment to construct a nonparametric aggregate labor supply curve at the extensive margin.

a non-wage-based rent from amenities, R_i^a (here using a first-order approximation):

$$\underbrace{R_i}_{\text{Worker's rent}} = \underbrace{w_{i,1(i)} - w_{i,2(i)}}_{\text{Wage-based rent}} + \underbrace{\frac{\epsilon_{i,1(i)} - \epsilon_{i,2(i)}}{v'_i(w_{i,2(i)})}}_{\text{Non-wage-based rent in wage units}} \quad (5)$$

$$= R_i^w + R_i^a \quad (6)$$

The wage-based rent is the salary gain (or loss) of worker i from working at firm 1 rather than firm 2, that is $w_{i,1(i)} - w_{i,2(i)}$. The non-wage-based rent is the gain (or loss) in non-wage value; equivalently, it is the utility difference between the first and second best jobs with a (hypothetical) wage difference (wage-based rent) of zero. We will define the non-wage-based rent in money units.

Beliefs and Biases in Outside Options In Section 4, we measure workers' *beliefs* about outside options—denoting beliefs about the aforementioned rent concepts R by \widetilde{R} . To preview, we will find that workers derive substantial rents R , but that those rents largely derive from the non-wage component R^a . Since this result directly stems from workers' beliefs that they would earn essentially identical wages in their next-best option, we compare those beliefs about the wage-based rent with proxies for the wages of their actual outside options \widehat{R}^w , in Section 5. We construct empirical proxies for the wage-based rent on the basis of actual wage changes of job switchers. We will identify *bias in beliefs* about outside options, ΔR^w , by comparing proxies for objective wage-based rents with beliefs:

$$\Delta R_i^w = \widetilde{R}_i^w - \widehat{R}_i^w \quad (7)$$

$$= \widetilde{w_{i,2(i)}} - \widehat{w_{i,2(i)}} \quad (8)$$

In principle, the bias incorporates both misperceptions about the identity of the next-best option and misperceptions of the wage at the next-best option.

2.2 Strategy

We measure those concepts on the basis of a worker survey. We identify the worker's rent as the percent wage cut c_i^* that would make the worker indifferent between the current

firm (firm 1) and her second best option (firm 2):

$$v_i((1 - c_i^*) \cdot w_{i,1(i)}, \epsilon_{i,1(i)}) = v_i(w_{i,2(i)}, \epsilon_{i,2(i)}), \quad (9)$$

which gives rent R_i as:

$$R_i = c_i^* \cdot w_{i,1(i)}. \quad (10)$$

We also elicit the percent wage cut c_i that the worker's switch from firm 1 to firm 2 would entail:

$$c_i = \frac{w_{i,2(i)} - w_{i,1(i)}}{w_{i,1(i)}}, \quad (11)$$

which gives wage-based (component of the) rent as:

$$R_i^w = w_{i,1(i)} - w_{i,2(i)} \quad (12)$$

$$= c_i \cdot w_{i,1(i)}. \quad (13)$$

The non-wage-based (component of the) rent, due to amenities, R_i^a is the difference between rent R_i and wage-based rent R_i^w :

$$R_i^a = R_i - R_i^w \quad (14)$$

Finally, the elicitation of subjective rents \tilde{R} will be given by our survey implementation, described next in Section 2.3. We delay the description of the construction of proxies for objective, wage-based rents \widehat{R}^w to Section 5.

2.3 Survey Implementation: Worker Beliefs

We measure workers' beliefs about the reservation wage change c_i^* and the actual wage change from switching c_i with tailored questions. We present additional information about the survey and sample in Section 3.

We measure the reservation wage change c_i^* with the following question:

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

your job within one year?

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

Workers specify the wage cut, X , in an open-ended elicitation (rather than intervals), which minimizes concerns about framing effects. To map into our model object, the scenario fixes beliefs about the duration of the wage cut by explicitly stating that the wage cut is permanent. We also fix the time frame within which the respondent would leave their job. We contextualize the wage cut as due to an idiosyncratic, firm-level shock, rather than an aggregate or industry-specific shock.

To measure the anticipated wage change on switching jobs c_i , we design a question on respondents' subjective outside option 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?

- Higher pay
- Same pay
- Lower pay

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

Between 0 and 50 euros

Between 50 and 100 euros

Between 100 and 200 euros

Between 200 and 300 euros

Between 300 and 400 euros

Between 400 and 500 euros

Between 500 and 750 euros

Between 750 and 1000 euros

Between 1000 and 1500 euros

Between 1500 and 2000 euros

Between 2000 and 3000 euros

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

In an additional robustness experiment, we show that our results are robust to using different belief elicitation formats and to different ways of framing the reason for the worker’s separation from their current job (see Section 5.4).

3 Data and Samples

We integrate our questions listed in Section 2.3 into the German Socio-Economic Panel (GSOEP), which we also merge with administrative worker- and establishment-level data from IAB. We now describe the data and the sample. Table A.1 provides an overview of the different datasets used in this paper.

SOEP Innovation Sample We collected data in cooperation with the Innovation Sample of the German Socio-Economic Panel (SOEP-IS). 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.⁷ The GSOEP is a probability-based sample with high representativeness and response rates through multi-month recontact strategies.

Our sample condition is full-time or part-time employment. Our survey was fielded in both the 2019 and the 2020 waves, yielding a sample of 1,604 observations from 1,068 individuals.⁸ Face-to-face interviews were conducted in private with each member of a household by trained interviewers. 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.

Linking Administrative Data: SOEP-ADIAB Our project is part of a project linking GSOEP survey data and individual-level administrative labor market data from IAB. As part of the 2018 wave, GSOEP respondents were asked for consent to link their survey responses with IAB data. The linkage procedure used respondents’ names, gender, date of birth, and address (see Antoni, 2021, for a detailed description). The match rate in the sample of consenters was 87.2%, leaving 542 respondents in our matched sample. For

⁷See Zweck and Glemser (2018) for a discussion of the sampling method. 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.

⁸See Zweck and Glemser (2020) for details of the 2019 Innovation Sample round, which was fielded in September 2019.

the respondents in the matched sample, we therefore have IAB labor market data from 1975 to 2019. We use employer identifiers in the universe of the IAB data to construct outside option proxies on the basis of coworkers wage changes upon job switches and AKM effects; we describe those in Section 5.

Sample and Summary Statistics Table 1 describes the sample, while Appendix Table A.2 describes the matched GSOEP-IAB sample. Panel A of Table 1 reports descriptive statistics for our analysis sample, featuring our respondents from the 2019 and 2020 waves with non-missing salary and reservation wage responses. We also drop 1 observation with negative salary. This leaves us with an analysis sample of 1,604 observations. We winsorize all continuous variables at the bottom 2% and top 2% of the distribution (except for the histograms, which plot the raw data).

Additional Survey Questions Our custom module contained additional questions besides the core ones described in Section 2.3. The full questionnaire is in Appendix F.1; we will describe the questions we draw on along the way.

Expert Survey We conducted an expert survey with leading academic economists in labor economics and in behavioral economics. In total, we invited 479 economists; 151 economists responded to our survey, corresponding to a response rate of 29.9%. Table A.3 provides some summary statistics about the sample: 22% of experts are female, half of the sample are full professors, 63% of the sample are from a U.S. institution, while 16% are from a German institution. The median expert’s h-index is 17.

Our expert survey has two parts. In the first part, we elicited experts’ beliefs about the wage changes of workers who were forced to leave their job within 3 months, for a worker at a typical, high-paying and low-paying firm. In the second part, we randomly assigned our experts into one of three blocks. In the first block, we measured experts’ beliefs about workers’ reservation wage change c_i^* . In the second block, we measured experts’ beliefs about workers’ subjective outside options c_i . In the third block, we asked experts to predict workers’ beliefs about coworkers’ wage changes after switching. In each of these three blocks, we elicited expert predictions about the median respondent, the 25th percentile of the response distribution, the 75th percentile of the response distribution, as well as for the median respondent employed at high-paying or low-paying firms. In the results section, we will contrast expert beliefs with our findings. Appendix Table A.4

summarizes the expert predictions; for a full set of the instructions used, see Appendix F.4.

4 Worker Beliefs About Rents and Outside Options

In this section, we present our results about worker beliefs about the rents they are earning with their current employer, and their beliefs about wages at their outside option.

4.1 Overall Worker Rents

Figure 1 and Table 1 report on the distribution of workers' total rents, derived from the reservation wage cut question.⁹

Rents Panel (a) of Figure 1 reports a histogram of workers' reservation wage cuts as a percentage of their salaries—which corresponds to the worker rent as a fraction of the wage. On average, workers are willing to forego 14.2% of their wage to remain in their current job compared to the next-best alternative. The median rent is 10.0%, consistent with an average expert prediction of the median worker rent of 10.88% (SD 9.12ppt). We also find substantial dispersion, with a standard deviation of 11.9ppt; the 10th percentile is 1.0% and the 90th percentile 30.0%.¹⁰

Measurement Error A potential concern is that part of the survey measures reflect noise or measurement error (see, e.g., Gillen, Snowberg, and Yariv, 2019). We assess this concern by using the panel nature of our survey, with waves in 2019 and 2020. We first calculate the covariance of rents in 2019 and 2020 among workers who did not switch jobs. In a simple model with i.i.d. measurement error, the square root of the stayer covariance corresponds to the standard deviation of the persistent component of rents. This measurement-error corrected standard deviation is 6.3ppt, compared to the uncorrected 11.9ppt. We visualize the adjustment in Appendix Figure A.12.¹¹

⁹In Appendix Section E.2, we provide evidence on firms' rents as derived from reservation wages measured with a survey of HR managers.

¹⁰Appendix Figure A.1 Panel (a) reports a histogram of rents translated into Euros per year.

¹¹We caution that measurement error may be persistent (so that our correction under-adjusts), and that there may be year-to-year variation in true rents (so that it over-corrects).

Validation with Turnover To validate our measure of rents, we investigate whether it is correlated with workers' stated probability of quitting for another employer in the next three months. Appendix Figure A.4 Panel (a) shows that worker rents are negatively associated with intentions to quit ($p < 0.05$). Panel (b) similarly shows a negative association between worker rents and actual separations between the 2019 and 2020 wave of the SOEP ($p < 0.05$).

Heterogeneity by Demographic Characteristics We also examine heterogeneity in the size of worker rents across several observable dimensions. In the top left panel of Figure 2 we show a strong positive relationship between log salary and worker rents as a percent of salary. The top right panel of Figure 2 shows that tenure is positively correlated with a higher worker rent. The slope implies that a ten-year increase in tenure is associated with an increase in worker rent of 1.13 percentage points of salary. The bottom left panel showcases a positive but more muted relationship between age and worker rents, with ten years of age being associated with a 0.47 percentage point increase in worker rents. Finally, the bottom right panel of Figure 2 shows the relationship between education and worker rents; education is not significantly related to worker rents as a percent of salary.

4.2 Decomposition: Wages vs. Amenities

The worker rent can be decomposed into a wage and a non-wage component. Following our strategy in Section 2, we measure the wage component as the difference between a worker's current wage and her expected wage if she were forced to leave her job; the non-wage component is the difference between the total worker rent and its wage component. Panels (b) and (c) of Figure 1 display histograms of wage-based rents and non-wage-based rents as a percentage of salary; the analogous panels of Appendix Figure A.1 report the results in Euros. Table 1 reports summary statistics.

Small Wage-Based Rents Strikingly, workers do not believe their current jobs carry rents attributable to wage premia, as they, equivalently, do not expect wage losses upon switching to the next best employer. Equivalently, workers believe that their second-best option would pay a very similar salary, consistent with a simple anchoring and adjustment heuristic (Tversky and Kahneman, 1974).¹² As a flow of the salary, the median (mean)

¹²This anchoring is consistent with evidence on the beliefs of unemployed job seekers, whose reservation wages are anchored on their own pre-job-loss salary, see for example Böheim, Horvath, and Winter-Ebmer

wage-based rent is 0% (-0.2%), and 0 (€525) in money units at an annual horizon. The distribution is symmetric around zero, with a large mass at or close to zero. The 10th (90th) percentile is -11.9% (13.0%), i.e., where a worker believes she would make 11.9% more (13.0% less) when switching to the next-best employer. On average as well in the extremes, these numbers are small and imply a considerable compression around zero.

Large Non-Wage Rents Correspondingly, Panel (c) of Figure 1, which displays the distribution of the non-wage component, has a large mean, corresponding to 14.44% of the salary, with a median of 10%. In Euros and at an annual horizon, as displayed in Appendix Figure A.1 Panel (c), the mean non-wage component is €5,543 and the median is €3,600. The 10th percentile of the non-wage component is -0.3% while the 90th percentile is 30.0%.¹³

Heterogeneity The small role of subjective wage-based rents is true in most pockets of the labor market. Appendix Figure A.2 scatter plots the wage and non-wage components against total worker rents. Panel (a) does so for rents as a percent of salary; Panel (b) does so for Euros per year. An increase in total worker rents by 1 percentage point of salary is associated with an increase in non-wage-based rents by 0.79 percentage points of salary ($p < 0.01$), and wage-based rents by 0.2 percentage points ($p < 0.01$). An increase in total worker rents by 1000 Euros is associated with an increase in non-wage-based rents by 750 Euros ($p < 0.01$), and wage-based rents by 280 Euros ($p < 0.01$). Appendix Figure A.8 provides further insight into how the share of the aggregate rent that is due to amenities varies across the rent distribution. Panel (a) and (b) show that, aside from the first decile of total worker rent,¹⁴ both the mean and the median non-wage-based shares of aggregate rent are stable at around 100% for all deciles of the worker's rent and salary distributions.

Relationship Between Wage and Non-Wage Components of Worker Rents We next turn to the relationship between the wage and non-wage components of worker rents.

(2011); Drahs, Haywood, and Schiprowski (2018); Le Barbanchon, Rathelot, and Roulet (2019); and Koenig, Manning, and Petrongolo (2020).

¹³Our findings on the importance of non-wage-based rents is consistent with evidence from stated-preference experiments that estimate workers' willingness-to-pay for different job characteristics (Maestas et al., 2018; Mas and Pallais, 2017) and with evidence on the importance of the non-wage value of jobs among job seekers (Hall and Mueller, 2018).

¹⁴The large non-wage share of rent in this decile—about 600%—is driven by outliers: as the denominator (total rent) for the non-wage-based share of rent approaches zero, even a small estimate for the amenity value leads to very large non-wage-based shares of rent.

Figure 3 Panel (a) displays a binned scatter plot, hollow squares, of the non-wage component of worker rents plotted against the wage component as a percent of salary (an analogous plot with rents in Euros is in Appendix Figure A.3). As a percent of salary, the slope is -0.85 (SE 0.03) and in monetary units the slope is -0.56 (SE 0.06). These contrast with a slope of -1 through the origin, a benchmark we depict that corresponds to workers earning no rents and lower wages offsetting higher non-wage rents one-to-one (i.e., perfect compensating differentials; Rosen, 1986).¹⁵

In sum, our data provides support for the idea that there are compensating differentials, but it also firmly rejects the notion of perfect compensating differentials according to which the slope between wage-based rents and non-wage-based rents would be -1.

4.3 Sources of Rents

4.3.1 Subjective Rents and Objective Pay Premia

Drawing on the matched SOEP-ADIAB data, we relate our measures of worker-level rents to more conventional estimates from the administrative data. We estimate the relationship between our measures of worker surplus and AKM pay premia in administrative data, following the methodology from Card, Heining, and Kline (2013) and Abowd, Kramarz, and Margolis (1999) for the period from 2010 to 2017 based on the universe of employment subject to social security data.

In Figure A.10 we document a positive association between total subjective worker rents and establishment-level pay premia. The estimate reveals that a ten percentage point increase in the firm pay premium is associated with a 0.65 percentage point (SE 0.019) increase in the rent. The wage-based rent is negative, at around -0.10, for the lowest AKM ventile and positive around 0.03 in the highest one.

In Panel (b) of Figure 3 we shed light on the association of the rent components with AKM pay premia. The figure highlights that a ten percent increase in the firm pay premium is associated with a 1.2 percentage point increase in the subjective wage-based rent (SE 0.04 ppt), and associated with a 0.3 percentage point decline in the non-wage rent (SE 0.03 ppt). Across the AKM distribution, the non-wage component of rent is sizeable and positive and largely between 10% and 17% of salary.

¹⁵To account for measurement error in the right-hand side variable, we also estimate instrumental variables specifications using closely related questions (following Gillen, Snowberg, and Yariv, 2019), namely, beliefs about colleagues' wage changes as an instrument for own wage changes. The slopes remain broadly robust to this finding, with a slight attenuation. We will introduce this additional survey question in Section 5.

Overall, our evidence shows that workers in high-AKM firms also report enjoying higher rents, driven by increases in subjective wage-based rents. The largely flat relationship between AKM effects and the non-wage component of rents puts bounds on the importance of compensating differentials.¹⁶

Robustness Check: Satisfaction Data As a complementary analysis, we also relate AKM pay premia with measures of satisfaction with personal income, work, and life in general which have been elicited in the GSOEP for decades. In Appendix C, we showcase that measures of objective pay premia are strongly positively correlated with measures of job satisfaction, income satisfaction, and work satisfaction, even conditional on individual fixed effects, inconsistent with the idea of compensating differentials *completely* offsetting wage-based rents.

4.3.2 Reasons for Not Switching to Better-Paid Jobs

To assess the sources of overall workers rents, we also draw on the worker-level survey to shed light on the reasons that keep workers from accepting other better-paying jobs. Only 11% of workers in 2019 and 18% of workers in 2020 (in the midst of the coronavirus recession) report that they would have a difficulty finding a higher-paid job, further indicating that workers believe that jobs with similar (higher) wages are relatively easy to find. Instead, workers claim that non-wage components such as job security and the work atmosphere at their current employer are the reasons that prevent them from switching, rather than wage premia. These results are reported in Appendix Figure A.9.¹⁷

5 Measuring Biases in Beliefs About Outside Options

We now compare workers' beliefs about their outside options to empirical proxies, which permits us to assess potential biases in beliefs about outside options. Our focus is on the wage aspect of outside options, motivated by our finding that workers believe they would easily be able to find similarly paying jobs—in contrast to a large and growing body of evidence that firms pay vastly different wages and involuntary job mobility is associated with large and heterogeneous wage changes. We find that workers employed

¹⁶Sorkin (2018) shows that there are compensating differentials when workers systematically move to lower-paying firms in a way that cannot be accounted for by layoffs or differences in recruiting intensity.

¹⁷In Section 5.4, we show similar results on the importance of non-wage-based rents using an open-ended elicitation.

in objectively high-wage firms are overoptimistic about the wages they would make if they had to switch, while workers in objectively low-wage firms are overpessimistic about their outside option.

5.1 Wage Changes Following Job Switches

We compare worker beliefs about the wage component of rent to several objective benchmarks about wage changes that proxy for the worker's outside option. Specifying and quantifying workers' outside options is notoriously challenging; our analysis is based on plausible available proxies.

Research Design In our main analyses, we plot worker beliefs about the wage at their outside option against (proxies for) the objective wage at their outside option. Figure 4 displays illustrative example plots to build intuition for this strategy. In such a plot, a diagonal line with slope 1 and intercept 0, plotted in Panel (a), represents perfect correspondence (on average) between worker beliefs and actual outside options. A vertical shift of the diagonal line upwards or downwards represents homogeneous underestimation or overestimation of outside options, as is also visualized in Panel (a). The possibility we focus on, visualized in Panel (b), consists of a line with slope strictly less than 1. Such a line represents a systematic bias towards believing that one's outside option pays a wage similar to one's current wage: workers who would actually experience a wage decrease when they leave their firm underestimate the magnitude of this wage decrease, and conversely workers who would actually experience a wage increase underestimate the magnitude of the increase.

Benchmark from Coworker Wage Changes In Figure 5 Panel (a) we plot worker beliefs about their own wage change when forced to leave their current employer against the actual wage changes of movers out of their firm and show an almost flat slope of 0.043 (SE 0.015). That is, worker beliefs about their own wage change when forced to leave are, on average, only 0.43 percentage points higher in a firm where out-movers on average experience a 10% wage increase compared to a firm where out-movers' average wage increase is zero. In firms with very negative wage changes of out-movers, worker beliefs about their own wage change are hence substantially more positive than the mover benchmark. Conversely, in firms where movers experience large wage increases when leaving, worker beliefs are substantially more negative than the mover benchmark. In addition to this

heterogeneity, on average, workers are overly pessimistic about their own wage changes compared to the coworker move benchmark, with an average discrepancy between own expected wage changes and actual mover wage changes of -0.111 (SE 0.015).

For the benchmark in Figure 5 Panel (a), we calculate actual mover wage changes as the mean log wage change of movers out of the firm over the time horizon from 2015 to 2019. A potential concern is that idiosyncratic variation in mover wage changes leads to measurement error and attenuates the results. To circumvent the problem, we implement a simple split-sample procedure (Drenik et al., forthcoming; Schoefer and Ziv, 2021) and partition each firms' movers into two random samples and use mover wage changes in one sample as an instrument for the other sample's wage changes. We report the first stage relationship in Appendix Figure A.13 Panel (a) with a slope coefficient of 0.549. In Figure 5 Panel (a), we also report the resulting instrumental variables estimate with a slope of 0.073 (SE 0.032), thereby leaving our conclusion based on the OLS specification largely unchanged. As an additional robustness check, we also report mover changes calculated over different horizons (2017 to 2019) and using the median rather than the mean (Appendix Figure A.14).

In our expert survey, we had elicited experts' beliefs about the relationship between actual mover wage changes and workers' belief about their own wage changes when forced to leave. We report results in Appendix Figure A.15 and find a slope of 0.747. That is, experts think that worker beliefs covary more strongly with actual mover wage changes than what we observe in our sample.

It is an open question to what extent actual mover wage changes constitute a useful benchmark for worker beliefs about their own wage changes if they were forced to leave their firm, in particular given that movers include both laid-off workers and workers who quit. To create an additional benchmark, we also asked experts about the actual expected wage changes of workers who are forced to leave their firm as a function of observed wage changes of movers in those firms. We report expert beliefs in Appendix Figure A.15 and find an implied slope of 0.656. Thus, workers' beliefs do not covary enough with observed mover wage changes based on a benchmark calculated from expert beliefs.

Wage Changes and AKM Firm Effects Figure 5 Panel (b) plots worker beliefs about their own wage when forced to leave against AKM firm effects—a measure of a firm's wage premium estimated off the wage changes accompanying job switchers (Abowd, Kramarz, and Margolis, 1999). We provide evidence on heterogeneity by firm effects to provide

windows into firms where workers on average see wage increases (low-AKM firms) or decreases (high-AKM firms) when leaving. For worker beliefs plotted against firm effects, we find a slope of -0.109 (SE 0.024) and report a binned scatter plot with blue dots. Workers in high-AKM firms perceive that they earn a small positive wage rent, while workers in low-AKM firms report a small negative wage rent. The estimated slope implies that a 10% increase in the AKM firm effect is associated with a roughly one percentage point decrease in the expected wage when switching or a corresponding increase in the wage-component of rent expressed as a share of the salary.

As a benchmark, to gauge the accuracy of worker beliefs, we again plot actual wage changes of movers who left the firm in solid red circles against the AKM firm effect and find a large negative slope of -0.582 (SE 0.014). To illustrate, workers in a firm with a 10% higher fixed effect compared to another firm on average experience about a 5.8% larger wage decline when separating from their original employer. Of course, that slope reflects the transition matrix of switchers from the origin quantiles in terms of AKM firm effects into destination firms, and indicates that workers in high-wage firms on average move downwards.¹⁸

The precisely estimated slopes permit us to rule out that the two slopes are identical. That is, workers in low-AKM establishments on average experience wage increases when switching and workers in high-AKM establishments experience substantial wage declines when switching employers. Relative to this empirical benchmark, workers in low-AKM firms underestimate wage *increases* when forced to leave their job and workers in high-AKM firms underestimate wage *declines* when forced to leave their job.

Benchmark from Forced Moves: Displacement Events We also consider estimates of wage changes from the job displacement literature as an additional benchmark. For the context of Germany, Schmieder, von Wachter, and Heining (2018) study a large set of job displacements during mass layoff events and relate the concomitant wage changes to the establishment effects of the displaced workers' origin establishments. They find a slope of log wage changes with respect to establishment fixed effects of -0.30 (SE 0.03).¹⁹ Similarly, they find that displaced workers from low-AKM establishments end up working

¹⁸For instance, if raw wage changes were fully explained by AKM firm effects, a slope of -0.58 could emerge if 42% of workers stay within their firm effect bin, and the remaining 58% of workers drop to the average firm or get placed randomly into firms.

¹⁹We are very grateful to Johannes Schmieder for calculating log wage changes of job losers during displacement events as a benchmark for our study. In the most recent subsample of their data, 2001 to 2007, the slope is a bit smaller at -0.20 (SE 0.027) in a specification with only year effects.

at establishments with, on average, higher AKM effects, while displaced workers from high-AKM establishments see substantial declines in the establishment effects at their new employer (the slope of the change in the AKM effect with respect to the origin establishment's AKM effect is -0.35, SE 0.02). Therefore, the comparison of worker beliefs to this alternative benchmark from mass layoffs again reveals that workers' predicted wage changes are less sensitive to their employers' establishment effects than actual wage changes in the data.

However, our use of mass layoffs as a benchmark comes with several caveats. First, the sample of firms and workers in mass layoffs naturally differs from the overall labor market. The difference arises both from a selection of firms into closure or mass layoff and from necessary methodological choices in the literature that skew the sample towards larger firms. These sample differences may account for the overall negative wage effects across the wage distribution in Schmieder, von Wachter, and Heining (2018) (as mass layoff samples tend towards larger and higher-paying firms, see also Gathmann, Helm, and Schönberg, 2020). Taking the level changes in wages as a benchmark at face value would hence lead us to classify almost all workers as overoptimistic about the outside labor market. (To assess the extent to which this conclusion is driven by selection of firms, we could reweight our sample of firms to match the mass layoff sample but have not been able to do so yet due to data access limitations.) Second, mass layoffs may lead to more negative wage effects, e.g., due to congestion in the local labor market (Crépon et al., 2013; Lalive, Landais, and Zweimüller, 2015; Mercan, Schoefer, and Sedláček, 2021) or agglomeration effects (Gathmann, Helm, and Schönberg, 2020), compared to the wage changes of individual workers leaving a firm.²⁰ Such mechanisms would lead us to wrongly classify too many workers as overoptimistic. In conclusion, while the mass layoff benchmark also leads to an undersensitivity of workers' beliefs about outside options as a function of their firm's pay policy, the uncertainty about whether mass layoffs constitute a valid benchmark for wage level changes impedes the reliable classification of workers into overoptimists and overpessimists.

Beliefs About Coworker Wage Changes The challenge in interpreting the accuracy of workers' own hypothetical wage changes is that we can only construct proxies for the actual wage change they would experience. As an additional assessment of bias, we therefore draw on a non-hypothetical question about *coworker* wage changes, which we

²⁰See Gibbons and Katz (1991) for a mechanism operating in the opposite direction.

find to be highly correlated to workers' assessment of their own wage changes if forced to quit. For this belief, we can directly calculate the benchmark in the matched survey-administrative data. Specifically, we ask workers about the wage change of the typical mover out of their establishment. Figure 6 Panel (a) reports the same specification as Figure 5 Panel (a) but with GSOEP respondents' beliefs about non-hypothetical coworker wage changes rather than hypothetical own wage changes as the outcome variable. We find strikingly similar patterns consistent with the bias we found about predicted own wage changes. In the figure, the diagonal line benchmarks unbiased beliefs. Yet in the data, workers in firms where coworkers fare well when leaving (i.e., on the right of the graph) are overpessimistic: their beliefs are substantially below the diagonal. In turn, workers in firms where coworkers fare poorly after leaving are overoptimistic, as their beliefs are substantially higher than the actual wage changes that movers out of their establishment experience. The slope is 0.033 (SE 0.011), a substantial departure from the diagonal, i.e., a slope of 1.²¹

Once again, we correct for measurement error in movers' wage changes with a split-sample procedure and find a slightly larger slope of 0.056 (SE 0.024), which remains an order of magnitude below the slope that would be obtained if workers had correct beliefs about coworker wage changes. We report first-stage results in Appendix Figure A.13 and versions of Panel (a) with mover wage changes measured over shorter horizons or as medians rather than means in Appendix Figure A.16.

We also once again plot beliefs and actual wage changes of movers against AKM firm effects in Panel (b) of Figure 6. We find that workers in low-AKM firms are overpessimistic about the wage changes experienced by their former colleagues who left the establishment, while workers in high-AKM firms are overoptimistic. Concretely, the subjective slope is -0.085 (SE 0.02), compared to a much steeper objective slope of -0.582 (SE 0.01) that is the no-bias benchmark. Hence, workers are not just biased about their own wage changes but are similarly so about their coworkers.

We note a striking similarity of results between biases in beliefs about own wage changes and about wage changes of movers (comparing Figures 5 and 6). In Figure 6 Panel (c), we plot worker beliefs about their own wage changes when forced to leave

²¹While again our focus is on the systematic variation in outside options given by the cross-sectional dispersion of AKM firm effects, we also note evidence for average bias: similar to what we found for benchmarks for own wage changes, workers are on average overly pessimistic about the wage changes of their coworkers, with a mean discrepancy between beliefs and actual wage changes of -0.087 (SE 0.016). However, our evidence points to the existence of both systematic overpessimism and overoptimism in different pockets of the labor market.

the firm against their beliefs about mover wage changes. We find a strong, positive relationship with a slope of 0.424 (SE 0.027), consistent with the idea that worker beliefs about their own potential wage changes when forced to leave and actual mover wage changes are biased in similar ways.

Summary One reading of the patterns we document is that workers' beliefs about the outside labor market are anchored in the wages at their current employer, i.e., they overestimate the degree to which other potential employers' wages resemble that of their current employer, consistent with an anchoring-and-adjustment heuristic (Tversky and Kahneman, 1974).

5.2 Rank Within Occupation and Median Salary in Occupation

To provide additional evidence on potential biases in beliefs, we draw on workers' subjective rank of their current wages, and again compare beliefs against objective benchmarks. Once again, we find evidence consistent with workers anchoring their beliefs about the external labor market in the wages of their current employer.

Rank Within Occupation We report worker beliefs about their rank in their occupation in Figure 7 Panel (a).²² The blue solid bars represent the distribution of respondents' beliefs about their rank in terms of salary (among all workers in their occupation not employed by their current employer). We also compute the empirical objective benchmark: since our GSOEP sample is representatively drawn, we calculate the distribution of workers' actual rank and report its distribution in light red. We calculate the actual rank at the four-digit occupation level (*Berufsuntergruppe*) using workers' daily salary and a lower bound of minimum wage earnings at 6 hours per work day.²³

Studying the beliefs, there is a substantial share of responses, 54%, between the 40th and 60th percentile. By contrast, in the data, only 19% of workers actually rank in that interval. Only 2.3% (3.3%) of workers believe that they rank in the bottom (top) 10% of wages in their occupation, even though the data suggests that 10.3% (7.3%) of workers

²²The 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]?" See Appendix Section F.1 for the full English translation of the question, or Appendix Section F.2 for the original German version.

²³In an additional robustness experiment, we show that we find similar patterns in beliefs about the firms' wage rank when these beliefs are not occupation-specific (see 5.4).

are in those categories.²⁴ In sharp contrast to the bell-shaped distribution of beliefs, the empirical distribution is nearly uniform, i.e., there is substantial mass in the tails and no visible central spike. The missing mass in the tails and the concentration in the center are hard to square with systematically accurate beliefs.

In Panel (b) of Figure 7, we trace out the individual-level relationship between worker beliefs about their pay rank and the objective rank (share of workers in their occupation with lower pay). Again, the 45-degree line traces out the no-bias benchmark. Instead, we find a substantially lower slope of 0.211 (SE 0.033). Strikingly, even the objectively lowest-paid workers in an occupation believe that there are about 20% of workers in their occupation who receive lower pay at other employers.

Panel (c) shows similar results for beliefs about the share of workers with *higher* pay, giving a slope of 0.16 (SE 0.035). Even the best-paid workers in an occupation believe that about 30% of workers in their occupation earn higher pay at other employers. Likewise, workers in the lowest ventile of their within-occupation salary distribution believe that only about 20% of workers in their occupation receive higher salaries (consistent with Reynolds (1951)).

Median Salary in Occupation Finally, we elicit beliefs about an additional objective correlate of outside options: the median salary in a worker's occupation (specifically, before taxes of full-time workers).²⁵ Similar to the question about worker rank in the occupation, it measures beliefs about the wage distribution in the occupation, but is less prone to issues such as central tendency bias that may arise with bounded scales (see also the discussion in Hvidberg, Kreiner, and Stantcheva, 2020).

In our GSOEP survey (see Appendix F.1 for full instructions) we provide a simple explanation of the concept of a median and compare answers to the most recently available information from the Federal Employment Agency.²⁶

In Appendix Figure A.11 Panel (a), we report the histogram of workers' bias, defined as the percent gap between workers' beliefs about the median salary in their occupation and the actual median salary in the occupation. On average, workers are overpessimistic

²⁴Discrepancies may reflect sampling or measurement error.

²⁵The 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 Euro)?" See Appendix Section F.1 for the full English translation of the question, including the definition of "typical" and explanation of the concept of a median, or Appendix Section F.2 for the original German version.

²⁶The SOEP-IS 2019 was fielded in September and October of 2019; the salary information is based on a reference date of December 31, 2018.

about the median salary in their occupation: the mean bias is -3.56% (SE 0.95ppt) and the median bias is -6.98% (SE 1.00ppt), with substantial dispersion (SD of 28.6ppt, while a measurement-error correction of the permanent component of the median salary bias is 21.25ppt). Analogously, we find that the median salary bias is very persistent, with a slope coefficient of 0.61 (SE 0.04) in a regression of the 2020 bias on the 2019 bias measure.

We next investigate the relationship between the median salary bias and establishment fixed effects in Figure 7 Panel (d). Strikingly, we find that workers in low-AKM firms substantially underestimate the median salary in their occupation—suggesting that workers in low-paid employment relationships underestimate wages in the external labor market. By contrast, workers in high-AKM firms have, on average, correct beliefs. The figure reports a slope of 0.22 (SE 0.08) for the median salary bias with respect to the AKM establishment effect. The estimate thus implies that a ten percent increase in the AKM establishment effect is associated with an approximately 2.2ppt reduction in the bias (compared to a mean bias of -3.56ppt).

Relationship Between Our Four Bias Measures We have calculated several measures of worker biases in beliefs about outside options: (i) expected own wage change if forced to separate, (ii) beliefs about mover wage changes among coworker out-movers, (iii) beliefs about rank in the within-occupation wage distribution, and (iv) beliefs about the median salary in the workers’ occupation. Figure 6 Panel (d) already demonstrated that beliefs about (i) and (ii) are correlated.

We further report the correlation between the different bias measures in Table 2. For workers’ own expected wage change, we use coworker wage changes as a benchmark to calculate the bias. As a consequence, our measures of worker biases about own wage changes if forced to separate and actual coworker wage changes are highly positively correlated.

We further find a statistically significant, negative correlation between biases about own and coworker wage changes (i and ii) with workers belief about their rank in the occupation (iii). That is, workers who are too optimistic about the wage changes that movers out of their firm experienced also believe that there is a larger fraction of higher-paid workers in the external labor market than actually exists. In turn, workers who are too pessimistic about the wage changes of movers also believe that there is a smaller fraction of higher-paid workers in the external labor market than actually exists. We find no statistically significant relationship between the bias about the median salary in one’s

occupation and the other bias measures.

The strong (negative) relationship between the biases about hypothetical own and actual mover wage changes and workers' beliefs about their rank in their occupation's wage distribution suggests that the different measures pick up related distortions in workers' perceptions of outside options and the external labor market.²⁷

5.3 Back-of-the-Envelope Calculation: Share of Non-Viable Jobs If Workers Had Accurate Information

To quantify the importance of misperceptions in the labor market, we implement a simple back-of-the-envelope calculation to measure the share of jobs with negative worker rents if workers held accurate beliefs about their outside options. We draw on the decomposition into wage and non-wage rents developed in Section 2. The wage component of the worker rent was derived from workers' expected wage change if they were forced to separate from their employer. As a simple correction, we instead calculate the wage component of the rent by assigning each worker the average wage change of movers out of the firm based on their AKM firm effect ventile, and leave the non-wage component of the rent unaffected. We then calculate the share of employment relationships that would have negative surplus given current wages.

We report results in Figure 8, which shows that a substantial share of low-AKM employment relationships would not be viable with accurate beliefs. The overall share of nonviable jobs is 0.128 (SE 0.016). There is important heterogeneity: all employment relationships in the upper half of the firm effect distribution would still be viable and there is a substantial increase in the share of non-viable jobs going from the median to the lower end of the firm effect distribution. Based on our simple calculation, more than 40% of jobs in the bottom 20% of our sample would not be viable given current wages if workers had accurate beliefs.

²⁷We also implemented a simple experiment with an information treatment in the 2019 wave of our survey, where a randomly chosen 50% of respondents received accurate information about the actual median salary in their occupation after they reported their belief. We aimed to study effects on intended turnover and bargaining behavior, and realized turnover and wage changes. We found some evidence that the treatment affected beliefs. These limited effects go in the direction one would expect: workers in the treatment who initially underestimated the median adjusted downward (by 2 percentage points) their perceived wage rent at the current employer. However, we found no clear effects on bargaining or job search behaviors (perhaps reflecting that this mild treatment did not actually shift respondents' beliefs significantly). We report results in Appendix Table A.5. Our core descriptive beliefs about co-worker wage changes after a switch, median pay in occupation and perceived pay rank were all elicited before the information intervention.

Of course, our calculation is only a coarse, partial equilibrium consideration. First, mover wage changes may be inaccurate proxies for workers' own expected wage changes if forced to separate (although our method averages at the AKM firm effect ventile so the influence of measurement error is reduced). Second, the calculation assumes no changes in the non-wage component of worker rents. Third, jobs that would be non-viable given current wages may still be viable if the joint firm and worker rent remains positive (although there may be limits on efficient renegotiation as in Jäger, Schoefer, and Zweimüller, 2019). Finally, equilibrium wages may adjust if accuracy of worker beliefs increased. Still, our read is that worker misperceptions about wages matter for the existence of the low-wage segment of the German labor market in its current shape.

5.4 Robustness: Survey with Alternative Elicitations

Some of our core findings on worker beliefs could be driven by particular design choices in our survey. We conducted an additional online survey with a sample of 902 workers broadly representative of the German population in full-time and part-time employment in terms of age, income, education, gender and region (see Table A.6). The data collection took place in July 2021 and was conducted with Dynata, a professional survey company widely used in the social sciences (Haaland, Roth, and Wohlfart, 2021).²⁸ For a full set of the instructions used in this robustness experiment, see Appendix F.3.

Own Wage Change We explored robustness to eliciting the wage level rather than the wage change if respondents were to switch to their outside options. We randomized half of our respondents to receive the same belief elicitation as in the GSOEP (wage change); of the other half, we elicited the belief about the level of earnings at the outside option. In this alternative elicitation, we also cross-randomized whether we included a reminder of the current pay. Panel (a) of Figure A.17 and Table A.6 show that the mean and median subjective wage premium are virtually identical. Moreover, the distribution under this alternative elicitation is still highly compressed, though somewhat less compressed compared to the elicitation in the GSOEP. The interquartile range under this alternative elicitation is between -9% and 4%, compared to -4% and 0% under the GSOEP elicitation.

Coworker Changes In the GSOEP survey, we asked our respondents to think of a typical employee with work experience that switches from their current employer to another

²⁸In Section D.1 we discuss details regarding the data.

employer. We asked our respondents whether this employee would receive a lower, higher or the same pay compared to his previous employer. Then, we elicited respondents' beliefs about the increase or decrease using a set of categorical response options. In the alternative elicitation, we did not offer the "Same pay" category, i.e. only allow people to choose either "higher pay" or "lower pay". Then, we did not provide respondents with any response categories, but instead ask them to enter the percentage change. Even though this alternative elicitation deliberately pushes people away from zero by forcing them to express a decrease or an increase, we still find a large mass of data around zero. The interquartile range under this alternative elicitation is between -5% and 10%, though naturally this is far less compressed compared to the original elicitation which offers the "Same pay" option to respondents (see Appendix Panel (b) of Figure A.17).

Time Window Our GSOEP survey specified that the time horizon to find another job for the own wage change question was 3 months. In our robustness survey, we cross-randomized this duration between 3 months or 12 months. Panel (c) of Appendix Figure A.17 shows that whether the time horizon is 3 months or 12 months makes little difference for respondents' subjective outside wage options.

Reason for the Separation Our main question on respondents' personal outside options was intended to convey the idea that the separation from the current employer was exogenous. To keep the framing general we did not specify a particular reason for the exogenous separation, such as a mass layoff. In our robustness survey, we also elicited all of our respondents' subjective outside option in case of an unexpected company closure. Panel (d) of Appendix Figure A.17 highlights that perceived outside options, as measured by the subjective wage premium as fraction of the salary, are virtually identical for our general question framing as well as the specific question framing, which explicitly mentioned the company closure as the reason for the separation.

Perceived Outside Options and Occupation-Specific Search In our GSOEP survey, we elicited respondents' outside options conditional on staying in the same occupation. Our robustness survey cross-randomized this feature, i.e. did not include the condition for some respondents. As illustrated by Panel (e) of Appendix Figure A.17, conditioning on occupation has almost no effects on beliefs.

Perceived Employer Rank and Occupation-Conditioning In our GSOEP survey, we elicited respondents’ beliefs about the fraction of other employees in the same occupation who receive a lower pay, the same pay or a higher pay compared to themselves. Our robustness survey varies whether these beliefs were elicited conditional on occupation, and shows that conditioning on occupation makes no substantive difference (See Panel (f) of Figure A.17).

Robustness to Prediction Incentives To assess the role of effort in response quality, we cross-randomized 5 Euro prediction incentives in the robustness survey for the question about the median pay in the occupation (for which we had an objective benchmark). This prediction incentive makes little difference (Appendix Figure A.18). The finding that incentives do not strongly impact beliefs in non-political contexts is consistent with a large body of existing evidence (see for example Roth and Wohlfart, 2020).

Open-Ended Elicitation of Reasons for Switching In the GSOEP survey question on why workers would not switch to employers that might pay a higher wage, we restricted answers to a structured list of options. In the robustness survey, we instead used an unstructured elicitation using a text box (following work by Stantcheva (2020)), in addition to the same structured elicitation as in the GSOEP. Appendix Figure A.20 shows the distribution of reasons based on both the unstructured open-ended question and the structured question. Both elicitations indicate an overwhelming importance of non-wage motivations in explaining why workers stay put.

6 An Equilibrium Labor Market Model With Biased Workers

In classical models of imperfect competition, workers have unbiased beliefs about wages in the labor market and monopsony usually arises either from search or other mobility frictions (Burdett and Mortensen, 1998), or because of idiosyncratic tastes among workers for amenities (Card et al., 2018). In this section, we explore information frictions relating to the wage distribution as another source of monopsony power. We formalize this result by adapting the framework of Matějka and McKay (2012, 2015) to the labor market.²⁹ This

²⁹Matějka and McKay (2012) study the product market, where workers have imperfect information about the prices, production costs and quality of particular products. Much of the setup of our model involves

model has two main implications in our context. First, we show that the existence of information frictions leads to monopsony in the labor market. In particular, the higher the cost of information acquisition, the higher the wage markdowns. Building a bridge to recent work by Card et al. (2018), the multinomial logit model arises as the functional form of worker choice as a consequence of the Matějka and McKay (2012, 2015) information frictions. Second, we introduce heterogeneity in firms and workers in a simple set up. We assume two types of firms, one high-paying and one low-paying, and two types of workers who only differ in their prior beliefs about the wages at the high paying firm. We show that the more optimistic workers, that is workers with higher priors about the wages at the high-paying firm, are more likely to end up in the higher paying firm. This is coherent with our empirical evidence in Figure 3 that the perceived wage-based rents are larger in high AKM firms as well as with our evidence in Panel (d) of Figure 7 that the estimation error is lower in high AKM firms. Interestingly, the model also yields that the larger the spread in beliefs between the two types, the larger the wage markdown at both firms. The intuition here is that the labor supply elasticity facing the firm decreases when sorting is strong, leading to a larger markdown.

6.1 The Information Structure

Workers face a choice between N firms paying wages w_1, \dots, w_N . Workers would like to choose the firm paying the highest wage, but, crucially, do not observe wages when making the employment decision.³⁰ In particular, workers have an uncertain prior on the probability distribution of wages which we denote $\mathbf{g}(\mathbf{w}) \in \Delta(\mathbb{R}^N)$, where $\mathbf{w} = (w_1, \dots, w_N)'$. The worker can reduce her uncertainty by paying an information cost. Following Matějka and McKay (2015), we assume this cost is proportional to the reduction in the entropy of the agent's beliefs, scaled by λ , the unit cost of information.³¹

relabeling the prices as wages and production cost as productivity. We abstract away from heterogeneity in amenity across firms (the labor market equivalent of quality of the product) so that workers care only about wages (prices). In Matějka and McKay (2012), sellers gain market power due to imperfect information of customers; in our model, employers obtain market power because workers are misinformed about wages.

³⁰Omitting amenities simplifies the exposition of the worker's information problem because the worker treats wages as exogenous. The worker then makes inferences directly about wages. Non-wage amenities provide workers with additional information such that they instead treat wages as endogenous quantities determined in equilibrium. But the framework could easily be extended to include non-wage amenities in this way, following Matějka and McKay (2012).

³¹In particular, Matějka and McKay (2015) model an information processing strategy as a joint distribution between realizations of states \mathbf{w} and noisy signals \mathbf{s} . The information cost of a strategy $\mathbf{f}(\mathbf{w}, \mathbf{s})$ is given by $\lambda(H(\mathbf{g}) - E[H(\mathbf{f}(\cdot|\mathbf{s}))])$, where $\mathbf{f}(\cdot|\mathbf{s})$ is the worker's posterior belief over wage realizations when the worker

The decision problem is to choose an information processing strategy so as to maximize the expected utility of the selected firm less the information processing cost. Matějka and McKay (2015) find that conditional on a realization of \mathbf{w} , the worker's optimal strategy leads them to choose firm $j \in 1, \dots, N$ with probability

$$\mathcal{P}_j(\mathbf{w}) = \frac{\mathcal{P}_j^0 e^{w_j/\lambda}}{\sum_{i=1}^N \mathcal{P}_i^0 e^{w_i/\lambda}}, \quad (15)$$

where $\mathcal{P}_j^0 = \int_{\mathbf{w}} \mathcal{P}_j(\mathbf{w}) \mathbf{g}(\mathbf{w}) d\mathbf{w}$ is the unconditional probability the worker selects firm i when \mathbf{w} is distributed according to $\mathbf{g}(\mathbf{w})$.

6.2 The Firm's Optimization Problem

Firms have constant returns to scale production with per-worker productivity at firm j given by p_j , and post wages $\mathbf{w} = (w_1, \dots, w_N)'$. There is a unit mass of workers in the market who supply labor to the market inelastically. Firm j chooses its wage w_j to maximize expected profit given the wages at other firms \mathbf{w}_{-j} :

$$\max_{w_j} \mathcal{P}_j(w_j, \mathbf{w}_{-j}) \times (p_j - w_j). \quad (16)$$

6.3 The Worker's Optimization Problem

As in Matějka and McKay (2015), we can rewrite equation (15) using the transformation $\alpha_j = \lambda \log(\mathcal{P}_j^0)$:

$$\mathcal{P}_j(\mathbf{w}) = \frac{e^{(\alpha_j + w_j)/\lambda}}{\sum_{i=1}^N e^{(\alpha_i + w_i)/\lambda}}. \quad (17)$$

Following comparative statics for multinomial logit models, we have that:

$$\frac{\partial \mathcal{P}_j(\mathbf{w})}{\partial w_j} = \frac{\mathcal{P}_j(\mathbf{w})(1 - \mathcal{P}_j(\mathbf{w}))}{\lambda} \quad (18)$$

$$\frac{\partial \mathcal{P}_j(\mathbf{w})}{\partial w_i} = -\frac{\mathcal{P}_j(\mathbf{w})\mathcal{P}_i(\mathbf{w})}{\lambda}, \quad (19)$$

observes signal \mathbf{s} and $H(B)$ denotes the entropy of a probability distribution B .

i.e., the higher the information processing cost λ the lower the own and cross-wage elasticity of the conditional choice probabilities.

6.4 Equilibrium Definition

An equilibrium is a vector of unconditional choice probabilities $\{\mathcal{P}_j^0\}_{j=1}^N$, a wage function \mathbf{w} , and conditional choice probabilities $\{\mathcal{P}_j(\mathbf{w}; \{\mathcal{P}_j^0\}_{j=1}^N)\}_{j=1}^N$, such that:

1. $\{\mathcal{P}_j(\mathbf{w}; \{\mathcal{P}_j^0\}_{j=1}^N)\}_{j=1}^N$ and $\{\mathcal{P}_j^0\}_{j=1}^N$ solve the worker's information-constrained choice problem given the prior \mathbf{g} , as described by equation (15).
2. Each wage w_j maximizes the profits of firm j given the vector of wages at other firms \mathbf{w}_{-j} and the worker's conditional choice probabilities.

6.5 Information Frictions and Wage Markdowns

In this section we propose a simplified framework to establish the relationship between information frictions and monopsony in the labor market. We start with two definitions:

Firm A-Priori vs. Ex-Post Symmetry A-priori firm symmetry describes the situation where workers have uniform unconditional choice probabilities across firms $\mathcal{P}_j^0 = 1/N$. Matějka and McKay (2015) show this corresponds to the case where the prior \mathbf{g} is symmetric in the sense of being invariant to permutations of its arguments. Ex-post firm symmetry describes the situation where realized wages at all firms are identical, in which case $\mathcal{P}_j(\mathbf{w}) = 1/N$.

Homogeneous vs. Heterogeneous Workers We say that workers are homogeneous if they all share the same priors about the wage distribution. In Section 6.6 we introduce two types of workers who differ in these priors.

Equilibrium Derivations We assume that there is a-priori firm symmetry and homogeneous workers. In this setting, the conditional choice probabilities reduce to the standard logit form:

$$\mathcal{P}_j(\mathbf{w}) = \frac{e^{w_j/\lambda}}{\sum_{i=1}^N e^{w_i/\lambda}}. \quad (20)$$

Firm j 's profit is given by

$$\pi_j = (p_j - w_j)\mathcal{P}_j(\mathbf{w}). \quad (21)$$

The first order condition (FOC) with respect to the wage is:

$$\frac{\partial \pi_j}{\partial w_j} = (p_j - w_j) \frac{\partial \mathcal{P}_j(\mathbf{w})}{\partial w_j} - \mathcal{P}_j(\mathbf{w}). \quad (22)$$

Setting the FOC to zero and using the results from equation (18), we have that firms solve for the optimum wage as follows:

$$\begin{aligned} 0 &= (p_j - w_j) \frac{\mathcal{P}_j(\mathbf{w})(1 - \mathcal{P}_j(\mathbf{w}))}{\lambda} - \mathcal{P}_j(\mathbf{w}) \\ w_j &= p_j - \frac{\lambda}{1 - \mathcal{P}_j(\mathbf{w})}. \end{aligned} \quad (23)$$

Further assuming ex-post firm symmetry, we can use that $\mathcal{P}_j(\mathbf{w}) = 1/N$ in equation (23) to get:

$$w = p - \lambda \frac{N}{N - 1}. \quad (24)$$

In the absence of information friction, equation (24) yields the competitive equilibrium wage (that is, when $\lambda = 0$, $w_j = p_j$). Once we introduce an information cost ($\lambda > 0$), a direct implication of equation (24) is that wages under imperfect information are lower than the competitive equilibrium wage and (further) decrease with the information cost λ . In other words, information costs are a source of monopsony power for the firm and result in wage markdowns. The intuition behind this result is that competition among firms becomes weaker (and wages lower) as it becomes more costly for workers to learn about the wages on offer (higher λ). In contrast to the Diamond Paradox, that even a small search cost can lead firms to post the monopoly price in equilibrium, the equilibrium wage is continuous in the degree of information friction.

6.6 A Two-by-Two Model with Biased Beliefs (Work in Progress)

In this section we introduce heterogeneity in firms' offered wages and in workers' prior beliefs about them. We show that, in a model with two types of firms (high and low wage)

and two types of workers (optimistic and pessimistic), workers with more optimistic prior beliefs sort into the higher paying firms.

Setup There are two types of workers, whom we refer to as pessimistic and optimistic. A unit mass of optimistic workers have prior beliefs that anticipate high wages while a unit mass of pessimistic workers anticipate low wages. There are also two firms, one of which pays a low wage and one of which pays a high wage. Let o index optimistic workers, p index pessimistic workers, 0 index the low-paying firm and 1 index the high-paying firm. Let $\mathbf{w} = (w_0, w_1)'$ be the vector of wages. Workers of type i have a prior on the distribution of wages denoted $\mathbf{g}_i(\mathbf{w}) \in \Delta(\mathbb{R}^2)$.

Suppose first that the wage paid by the low-wage firm is given by $w_0 = w_0^*$ and is known to workers so that $\mathbf{g}_i(\mathbf{w})$ is zero except where $w_0 = w_0^*$.³² Let $g_i(w_1) = \mathbf{g}_i((w_0^*, w_1)')$ and $G_i(w_1)$ be the CDF of $g_i(w_1)$. Assume workers of type o are more optimistic than workers of type p in a First-order Stochastic Dominance sense:

$$\begin{aligned} G_o(w_1) &\leq G_p(w_1) \quad \forall w_1 \in \mathbb{R}, \\ \text{and } G_o(w_1) &< G_p(w_1) \text{ on a set of positive measure.} \end{aligned} \quad (25)$$

Equilibrium Derivations Proposition 3 from Matějka and McKay (2012) implies that optimistic workers are more likely to choose the higher paying firm in the sense that

$$\mathcal{P}_{o1}^0 > \mathcal{P}_{p1}^0, \quad (26)$$

so long as $\mathcal{P}_{p1}^0 \in (0, 1)$. Recall that the probability a worker of type i chooses to work at firm j conditional on the wage being w_1 at high-wage firms is given by

$$\mathcal{P}_{ij}(w_1) = \frac{\mathcal{P}_{ij}^0 e^{w_j/\lambda}}{\mathcal{P}_{i1}^0 e^{w_1/\lambda} + \mathcal{P}_{i0}^0 e^{w_0^*/\lambda}} \quad (27)$$

Inequality (26) then implies $\mathcal{P}_{o1}(w_1) > \mathcal{P}_{p1}(w_1)$, i.e. more optimistic workers end up at the higher paying firm and vice versa. Intuitively, both types of workers invest in informative signals of the wages on offer. But because it is too costly to learn wages with

³²This could correspond to a scenario in which the low-paying firm pays the minimum wage, for instance. More generally, we take the view that the lowest-paying choice represents an outside option about which workers are well-informed. In a model with unemployment as the outside option, workers may be expected to know the value of unemployment benefits even if market wages are uncertain.

certainty, posterior beliefs remain a function of priors, as evidenced by the presence of the unconditional choice probabilities \mathcal{P}_{ij}^0 in equation (27). Workers with more optimistic prior beliefs about the wages at firm 1 therefore also end up with more optimistic posteriors. In addition, Proposition 3 implies that the extent to which optimistic workers sort into the high-paying firm is increasing in the degree of optimism in their prior beliefs (and likewise for the propensity of pessimistic workers to sort into the low-paying firm).

Condition (25) nests the scenario in which o workers are both more optimistic than p workers and also *overoptimistic* relative to the truth. In particular, let E_i denote the expectation taken over worker i 's prior. We say workers are *ex ante overoptimistic* if $E_i[w_1] - w_1 > 0$. In the optimal information strategy, workers who are *ex-ante overoptimistic* remain overoptimistic after investing in information about the market. Similarly, workers who are *ex ante overpessimistic* will be *ex post overpessimistic*.³³ The result from this simple model that *ex ante overoptimistic* (*pessimistic*) workers sort into the high (low) wage firm is therefore consistent with the empirical evidence documented in Section 5 that workers at high (low) wage firms are more likely to have overoptimistic (*pessimistic*) beliefs even after having made their employment decisions.

³³Consider any signal \mathbf{s} . The worker's posterior bias (conditional on \mathbf{s}) is

$$E_i[w_1|\mathbf{s}] - w_1 = \int (v_1 - w_1)F(v_1|\mathbf{s})dv_1$$

As Matějka and McKay (2015) show, optimality implies $F(\cdot|\mathbf{s})$ is identical for all signals that induce the worker to make the same choice (the agent does not invest in superfluous information). Let $j^* = \arg \max_{j \in 1,2} E_i[w_j|\mathbf{s}]$ denote the worker's choice after observing \mathbf{s} and S_{j^*} denote the set of signals that induce action j^* . Then by Bayes' rule, $F(v|\mathbf{s}) = F(v|S_{j^*}) = \frac{\mathcal{P}_{j^*}(v)g(v)}{\mathcal{P}_{j^*}^0}$. This and equation (27) then lead to the following expression for the worker's posterior bias:

$$\begin{aligned} E_i[w_1|\mathbf{s}] - w_1 &= \int (v_1 - w_1) \frac{\mathcal{P}_{j^*}(v_1)g(v_1)}{\mathcal{P}_{j^*}^0} dv_1 \\ &= \int (v_1 - w_1)g(v_1) \left(\mathcal{P}_1^0 + \mathcal{P}_0^0 e^{(w_0^* - v_1)/\lambda} \right)^{-1} dv_1. \end{aligned}$$

When the worker is *ex ante overoptimistic*, $\int (v_1 - w_1)g(v_1)dv_1 > 0$. Then since $\left(\mathcal{P}_1^0 + \mathcal{P}_0^0 e^{(w_0^* - v_1)/\lambda} \right)^{-1}$ is strictly positive and weakly increasing in v_1 ,

$$E_i[w_1|\mathbf{s}] - w_1 > 0,$$

i.e. the worker remains overoptimistic no matter what stochastic signal they receive. The same proof applies for overpessimistic workers.

To solve for equilibrium wages, we again rewrite (27) as

$$\mathcal{P}_{ij}(w_1) = \frac{e^{\frac{\alpha_{ij}+w_j}{\lambda}}}{e^{\frac{\alpha_{i1}+w_1}{\lambda}} + e^{\frac{\alpha_{i0}+w_0^*}{\lambda}}} \quad (28)$$

where $\alpha_{ij} = \lambda \log(\mathcal{P}_{ij}^0)$. Profits are now given by

$$\pi_j = (p_j - w_j)(\mathcal{P}_{pj} + \mathcal{P}_{oj})$$

By the firm's first order condition,

$$\begin{aligned} 0 &= (p_j - w_j) \left(\frac{\partial \mathcal{P}_{pj}}{\partial w_j} + \frac{\partial \mathcal{P}_{oj}}{\partial w_j} \right) - (\mathcal{P}_{pj} + \mathcal{P}_{oj}) \\ w_j &= p_j - \lambda \frac{\mathcal{P}_{pj} + \mathcal{P}_{oj}}{\mathcal{P}_{o0}\mathcal{P}_{o1} + \mathcal{P}_{p0}\mathcal{P}_{p1}} \end{aligned} \quad (29)$$

As in equation (24), the wage markdown is proportional to the unit information acquisition cost λ and the total size of the firm $\mathcal{P}_{pj} + \mathcal{P}_{oj}$. Meanwhile, the denominator $\mathcal{P}_{o0}\mathcal{P}_{o1} + \mathcal{P}_{p0}\mathcal{P}_{p1}$ implies that markdowns are lower when both types of workers are well represented at each firm. Intuitively, the labor supply elasticity facing the firm decreases when sorting is strong, leading to a larger markdown. Because biased workers sort more strongly, this implies that biased beliefs can exacerbate the wage markdowns faced by both types of workers, even when only some workers are biased.

7 Conclusion

We have measured workers' beliefs about their outside options and compared them with proxies for their actual outside options. While subjective worker rents are large, they do not stem from wage premia, as the typical worker *believes* that her outside option will pay exactly the same as the current job. These beliefs appear biased: objectively low-paid (high-paid) workers are overpessimistic (overoptimistic) about their outside options. Workers' beliefs about the relevant outside options hence appear anchored in the wages of their current employer. As a consequence, biases about outside options may act as a source of monopsony power in the labor market.

Our findings raise the question of why these biases persist among employed work-

ers.³⁴ On the worker side, perhaps privacy norms keep workers from sharing their salary information (Cullen and Perez-Truglia, 2018b). On the firm side, 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.

³⁴We are implementing a survey with German HR managers to shed light on firm-side beliefs, as existing evidence leaves room for misoptimization on the firm side, too (Dube, Manning, and Naidu, 2018). Section E provides evidence from a first survey with HR managers conducted in May 2021.

References

- Abebe, Girum, Stefano Caria, Marcel Fafchamps, Paolo Falco, Simon Franklin, and Simon Quinn. 2020. "Curse of Anonymity or Tyranny of Distance? The Impacts of Job-Search Support in Urban Ethiopia." *Review of Economic Studies* .
- Abowd, John, Francis Kramarz, and David Margolis. 1999. "High Wage Workers and High Wage Firms." *Econometrica* 67 (2):251–333.
- Altmann, Steffen, Armin Falk, Simon Jäger, and Florian Zimmermann. 2018. "Learning about Job Search: A Field Experiment with Job Seekers in Germany." *Journal of Public Economics* 164:33–49.
- Andre, Peter, Carlo Pizzinelli, Christopher Roth, and Johannes Wohlfart. 2021. "Subjective Models of the Macroeconomy: Evidence from Experts and Representative Samples." *Available at SSRN* 3355356 .
- Antoni, Manfred. 2021. "Record Linkage of the German Socio-Economic Panel (SOEP) With Administrative Labour Market Biography Data of the Institute for Employment Research (IAB)." *FDZ-Methodenreport (en), mimeo* .
- Baker, Michael, Yosh Halberstam, Kory Kroft, Alexandre Mas, and Derek Messacar. 2019. "Pay Transparency and the Gender Gap." *NBER Working Paper No. 25834* .
- Bassier, Ihsaan, Arindrajit Dube, and Suresh Naidu. forthcoming. "Monopsony in Movers: The Elasticity of Labor Supply to Firm Wage Policies." *Journal of Human Resources* .
- Belot, Michele, Philipp Kircher, and Paul Muller. 2019. "Providing Advice to Jobseekers at Low Cost: An Experimental Study on Online Advice." *The Review of Economic Studies* 86 (4):1411–1447.
- Berger, David, Kyle Herkenhoff, and Simon Mongey. 2019. "Labor Market Power." *NBER Working Paper* .
- Böheim, René, Gerard Horvath, and Rudolf Winter-Ebmer. 2011. "Great Expectations: Past Wages and Unemployment Durations." *Labour Economics* 18 (6):778–785.
- Bonhomme, Stéphane, Kerstin Holzheu, Thibaut Lamadon, Elena Manresa, Magne Mogstad, and Bradley Setzler. 2020. "How Much Should We Trust Estimates of Firm Effects and Worker Sorting?" *NBER Working Paper* .
- Burdett, Kenneth and Dale Mortensen. 1998. "Wage Differentials, Employer Size, and Unemployment." *International Economic Review* 39 (2):257–273.
- Caldwell, Sydnee and Oren Danieli. 2018. "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.
- Conlon, John, Laura Pilossoph, Matthew Wiswall, and Basit Zafar. 2018. "Labor Market Search With Imperfect Information and Learning." *NBER Working Paper* .
- Crépon, Bruno, Esther Duflo, Marc Gurgand, Roland Rathelot, and Philippe Zamora. 2013. "Do Labor Market Policies have Displacement Effects? Evidence from a Clustered Randomized Experiment." *The Quarterly Journal of Economics* 128 (2):531–580.
- Cullen, Zoë and Bobak Pakzad-Hurson. 2021. "Equilibrium effects of pay transparency." *NBER Working Paper, No. 28903* .
- Cullen, Zoë and Ricardo Perez-Truglia. 2018a. "How Much Does Your Boss Make? The Effects of Salary Comparisons." *NBER Working Paper No. 24841* .
- . 2018b. "The Salary Taboo: Privacy Norms and the Diffusion of Information." *NBER Working Paper No. 25145* .
- DellaVigna, Stefano, Jörg Heining, Johannes Schmieder, and Simon Trenkle. 2020. "Evidence on Job Search Models from a Survey of Unemployed Workers in Germany." *NBER Working Paper* .
- DellaVigna, Stefano, Attila Lindner, Balázs Reizer, and Johannes Schmieder. 2017. "Reference-Dependent Job Search: Evidence from Hungary." *The Quarterly Journal of Economics* 132 (4):1969–2018.
- DellaVigna, Stefano and Devin Pope. 2018. "Predicting experimental results: who knows what?" *Journal of Political Economy* 126 (6):2410–2456.
- Di Addario, Sabrina, Patrick Kline, Raffaele Saggio, and Mikkel Sølvsten. 2021. "It Ain't Where You're From, It's Where You're At: Hiring Origins, Firm Heterogeneity, and Wages." *NBER Working Paper* .

- Drahs, Sascha, Luke Haywood, and Amelie Schiprowski. 2018. "Job Search with Subjective Wage Expectations." *DIW Berlin Discussion Paper* .
- Drenik, Andres, Simon Jäger, Miguel Pascual Plotkin, and Benjamin Schoefer. forthcoming. "Paying Outsourced Labor: Direct Evidence from Linked Temp Agency-Worker-Client Data." *Review of Economics and Statistics* .
- Dube, Arindrajit, Alan Manning, and Suresh Naidu. 2018. "Monopsony and Employer Mis-Optimization Explain Why Wages Bunch at Round Numbers." *NBER Working Paper No. 24991* .
- Ellison, Glenn. 2006. "Bounded Rationality in Industrial Organization." *Econometric Society Monographs* 42:142.
- Ellison, Glenn and Alexander Wolitzky. 2012. "A Search Cost Model of Obfuscation." *The RAND Journal of Economics* 43 (3):417–441.
- Faberman, Jason, Andreas Mueller, Ayşegül Şahin, and Giorgio Topa. 2017. "Job Search Behavior Among the Employed and Non-employed." *NBER Working Paper No. 23731* .
- Feldstein, Martin and James Poterba. 1984. "Unemployment Insurance and Reservation Wages." *Journal of Public Economics* 23 (1-2):141–167.
- Gathmann, Christina, Ines Helm, and Uta Schönberg. 2020. "Spillover Effects of Mass Layoffs." *Journal of the European Economic Association* 18 (1):427–468.
- Gibbons, Robert and Lawrence Katz. 1991. "Layoffs and Lemons." *Journal of Labor Economics* 9 (4):351–380.
- Gillen, Ben, Erik Snowberg, and Leeat Yariv. 2019. "Experimenting with Measurement Error: Techniques with Applications to the Caltech Cohort Study." *Journal of Political Economy* 127 (4):1826–1863.
- Grubb, Michael. 2015. "Failing to Choose the Best Price: Theory, Evidence, and Policy." *Review of Industrial Organization* 47 (3):303–340.
- Haaland, Ingar, Christopher Roth, and Johannes Wohlfart. 2021. "Designing Information Provision Experiments." *Journal of Economic Literature* .
- Hall, Robert and Andreas Mueller. 2018. "Wage Dispersion and Search Behavior: The Importance of Nonwage Job Values." *Journal of Political Economy* 126 (4):1594–1637.
- Heidhues, Paul and Botond Köszegi. 2018. "Behavioral Industrial Organization." *Handbook of Behavioral Economics: Applications and Foundations* 1 1:517–612.
- Hvidberg, Kristoffer, Claus Kreiner, and Stefanie Stantcheva. 2020. "Social Position and Fairness Views." *NBER Working Paper* .

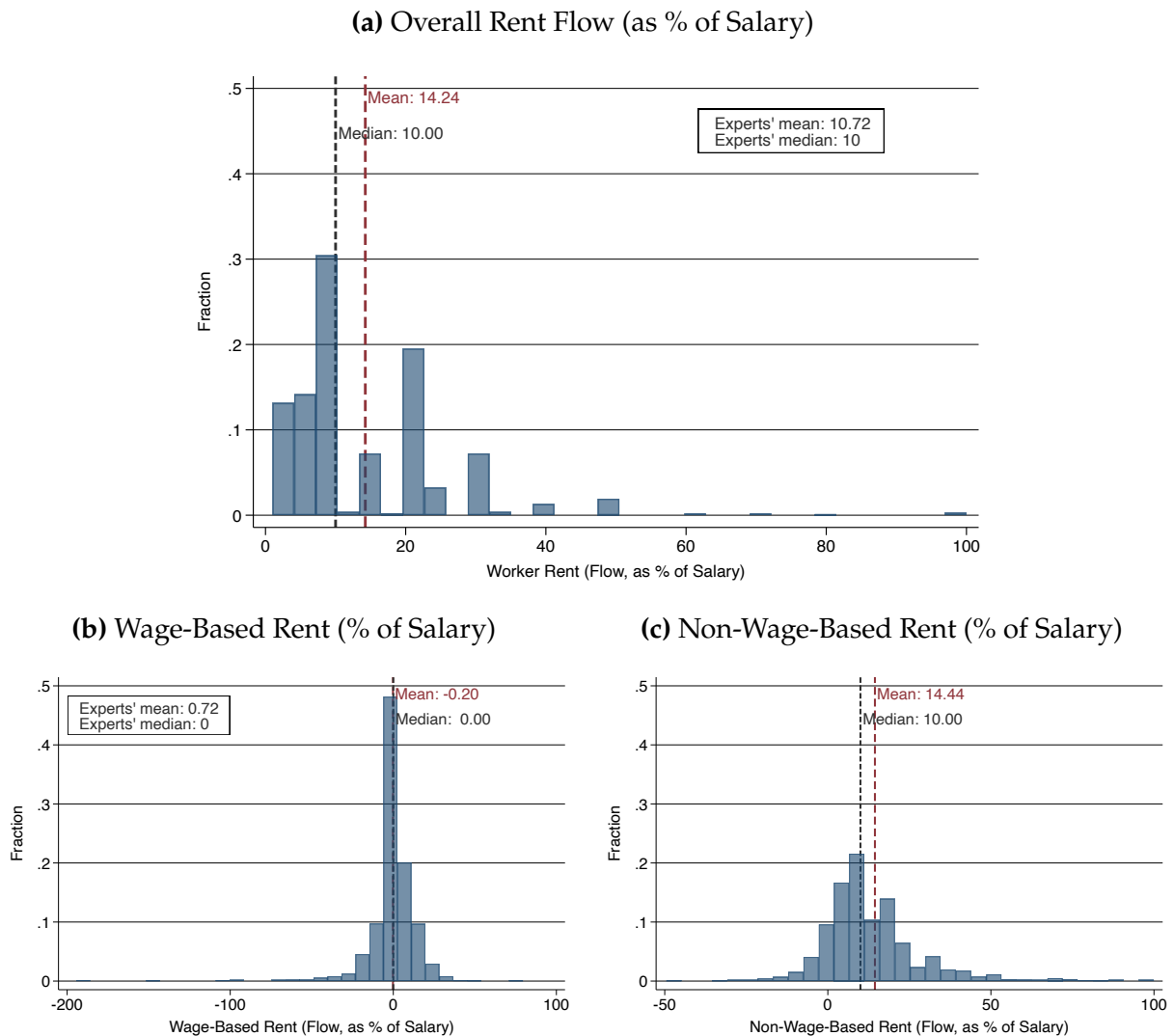
- Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. 1993. "Earnings Losses of Displaced Workers." *American Economic Review* 83 (4):685–709.
- Jäger, Simon, Benjamin Schoefer, Samuel Young, and Josef Zweimüller. 2020. "Wages and the Value of Nonemployment." *The Quarterly Journal of Economics* 135 (4):1905–1963.
- Jäger, Simon, Benjamin Schoefer, and Josef Zweimüller. 2019. "Marginal Jobs and Job Surplus: a Test of the Efficiency of Separations." *NBER Working Paper No. 25492* .
- Koenig, Felix, Alan Manning, and Barbara Petrongolo. 2020. "Reservation Wages and the Wage Flexibility Puzzle." .
- Krueger, Alan and Andreas Mueller. 2016. "A Contribution to the Empirics of Reservation Wages." *American Economic Journal: Economic Policy* 8:142–179.
- Krueger, Alan and Lawrence Summers. 1988. "Efficiency Wages and the Inter-industry Wage Structure." *Econometrica: Journal of the Econometric Society* :259–293.
- Kuziemko, Ilyana, Michael I Norton, Emmanuel Saez, and Stefanie Stantcheva. 2015. "How elastic are preferences for redistribution? Evidence from randomized survey experiments." *American Economic Review* 105 (4):1478–1508.
- Lachowska, Marta. 2016. "Outside Options and Wages: What Can We Learn from Subjective Assessments?" *Empirical Economics* 52 (1):79–121.
- Lachowska, Marta, Alexandre Mas, and Stephen Woodbury. 2020. "Sources of Displaced Workers' Long-Term Earnings Losses." *American Economic Review* 110 (10):3231–66.
- Lalive, Rafael, Camille Landaï, and Josef Zweimüller. 2015. "Market Externalities of Large Unemployment Insurance Extension Programs." *American Economic Review* :3564–3596.
- Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler. 2021. "Imperfect Competition, Compensating Differentials and Rent Sharing in the US Labor Market." *Accepted by the American Economic Review in May 2021* .
- 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.
- Maestas, Nicole, Kathleen Mullen, David Powell, Till von Wachter, and Jeffrey Wenger. 2018. "The Value of Working Conditions in the United States and Implications for the Structure of Wages." *NBER Working Paper* .
- Manning, Alan. 2003. *Monopsony in Motion: Imperfect Competition in Labor Markets*. Princeton University Press.
- Mas, Alexandre and Amanda Pallais. 2017. "Valuing Alternative Work Arrangements." *American Economic Review* 107 (12):3722–3759.

- Matějka, Filip and Alisdair McKay. 2012. "Simple Market Equilibria with Rationally Inattentive Consumers." *American Economic Review* 102 (3):24–29.
- . 2015. "Rational Inattention to Discrete Choices: A New Foundation for the Multinomial Logit Model." *American Economic Review* 105 (1):272–98.
- Mercan, Yusuf, Benjamin Schoefer, and Petr Sedláček. 2021. "A Congestion Theory of Unemployment Fluctuations." *NBER Working Paper* .
- Mueller, Andreas and Johannes Spinnewijn. 2021. "Expectations Data, Labor Market and Job Search." *Handbook Chapter (Draft)* .
- Mui, Preston and Benjamin Schoefer. 2021. "Reservation Raises: The Aggregate Labor Supply Curve at the Extensive Margin." *NBER Working Paper* .
- Perez-Truglia, Ricardo. 2020. "The Effects of Income Transparency on Well-being: Evidence From a Natural Experiment." *American Economic Review* 110 (4):1019–54.
- Reynolds, Lloyd George. 1951. *The Structure of Labor Markets: Wages and Labor Mobility in Theory and Practice*. Westport, Conn: Greenwood Press.
- Robinson, Joan. 1933. *The Economics of Imperfect Competition*. Macmillan.
- Rosen, Sherwin. 1986. "The Theory of Equalizing Differences." *Handbook of Labor Economics* 1:641–692.
- Roth, Christopher and Johannes Wohlfart. 2020. "How do expectations about the macroeconomy affect personal expectations and behavior?" *Review of Economics and Statistics* 102 (4):731–748.
- Roussille, Nina. 2020. "The Central Role of the Ask Gap in Gender Pay Inequality." *Working Paper* .
- Schmieder, Johannes, Till von Wachter, and Jörg Heining. 2018. "The Costs of Job Displacement over the Business Cycle and its Sources: Evidence from Germany." *UCLA Working Paper* .
- Schoefer, Benjamin and Oren Ziv. 2021. "Productivity, Place, and Plants." *NBER Working Paper* .
- Schubert, Gregor, Anna Stansbury, and Bledi Taska. 2021. "Employer Concentration and Outside Options." *Working Paper* .
- Skandalis, Daphné. 2018. "Breaking News: Information About Firms' Hiring Needs Affects the Direction of Job Search." *Working Paper* .
- Slichter, Sumner. 1950. "Notes on the Structure of Wages." *The Review of Economics and Statistics* :80–91.

- Sorkin, Isaac. 2018. "Ranking Firms Using Revealed Preference." *The Quarterly Journal of Economics* 133 (3):1331–1393.
- Spinnewijn, Johannes. 2015. "Unemployed but Optimistic: Optimal Insurance Design with Biased Beliefs." *Journal of the European Economic Association* 13 (1):130–167.
- Stantcheva, Stefanie. 2020. "Understanding Tax Policy: How Do People Reason?" .
- Tversky, Amos and Daniel Kahneman. 1974. "Judgment under Uncertainty: Heuristics and Biases." *Science* 185 (4157):1124–1131.
- Zweck, Bettina and Axel Glemser. 2018. "SOEP-IS 2016-Methodenbericht zum Befragungsjahr 2016 des SOEP-Innovationssamples." *SOEP Survey Papers* .
- . 2020. "SOEP-IS 2019: Survey Report on the 2017 SOEP Innovation Sample." *SOEP Survey Papers* .

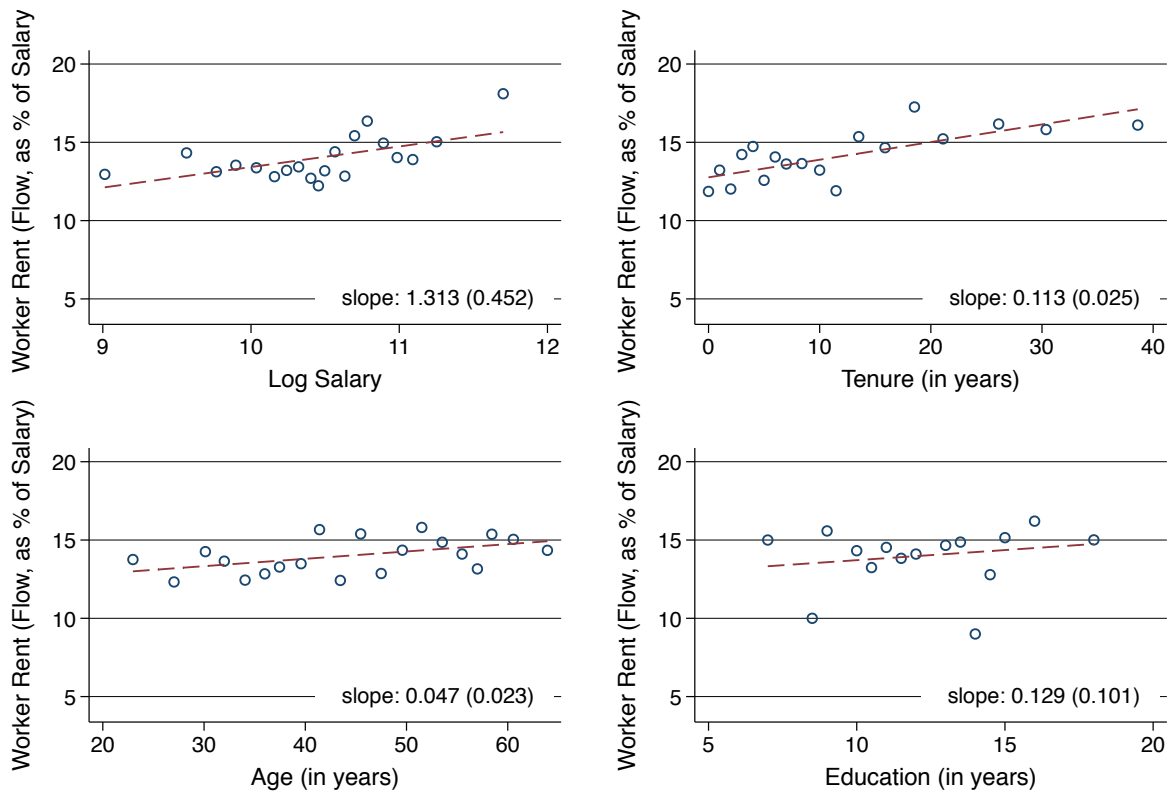
Figures

Figure 1: Distributions of Overall, Wage-Based, and Non-Wage-Based Rents



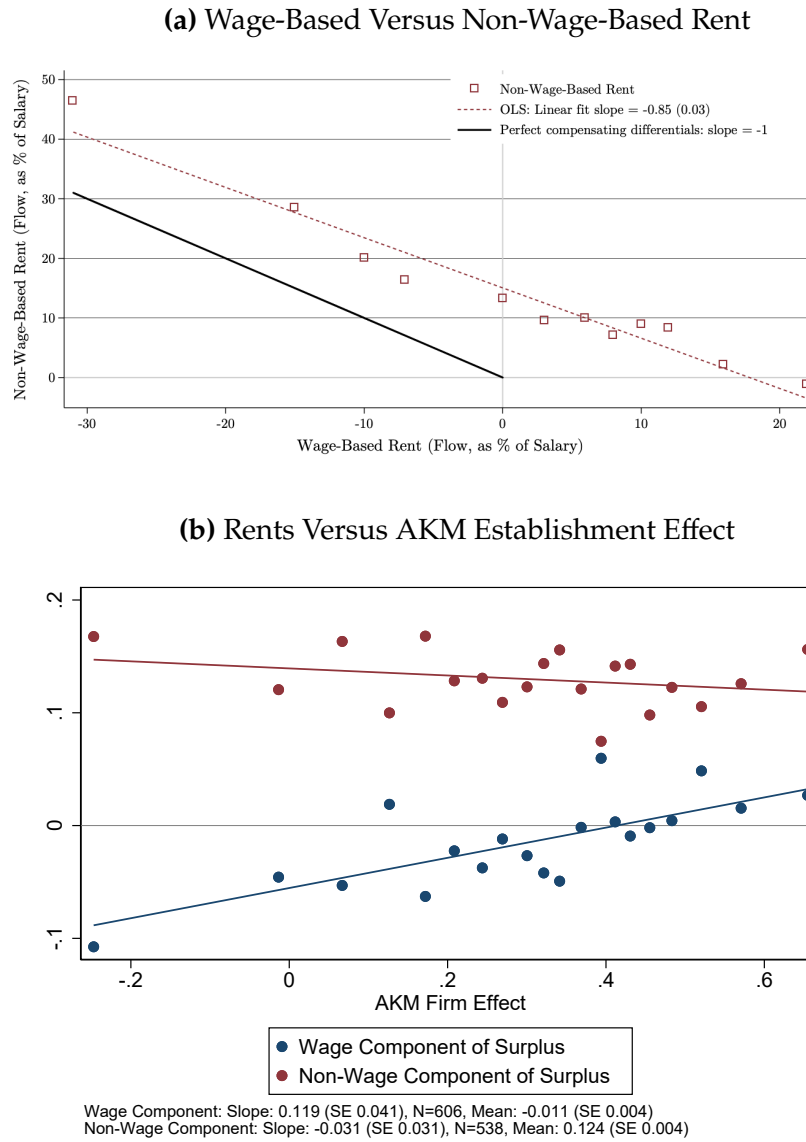
Note: This figure reports data from the 2019 and 2020 waves of the German Socio-Economic Panel. Panel (a) presents a histogram of worker rents as a percent of worker salaries, calculated from workers' responses to the following question: "Imagine that your current employer would permanently cut wages. 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?" A worker's rent is defined as the percentage wage cut they report in response to this question. Panels (b) and (c) plot histograms of the wage-based and non-wage-based components of worker rent. Overall rent is decomposed into wage-based and non-wage-based components based on workers' responses to a question about their expected wage change if forced to leave their job; a worker's wage-based rent is defined as their response to this question, while their non-wage-based rent is the difference between their overall rent and their wage-based rent.

Figure 2: Heterogeneity of Worker Surplus (% of Salary): by Salary, Tenure, Age, and Education



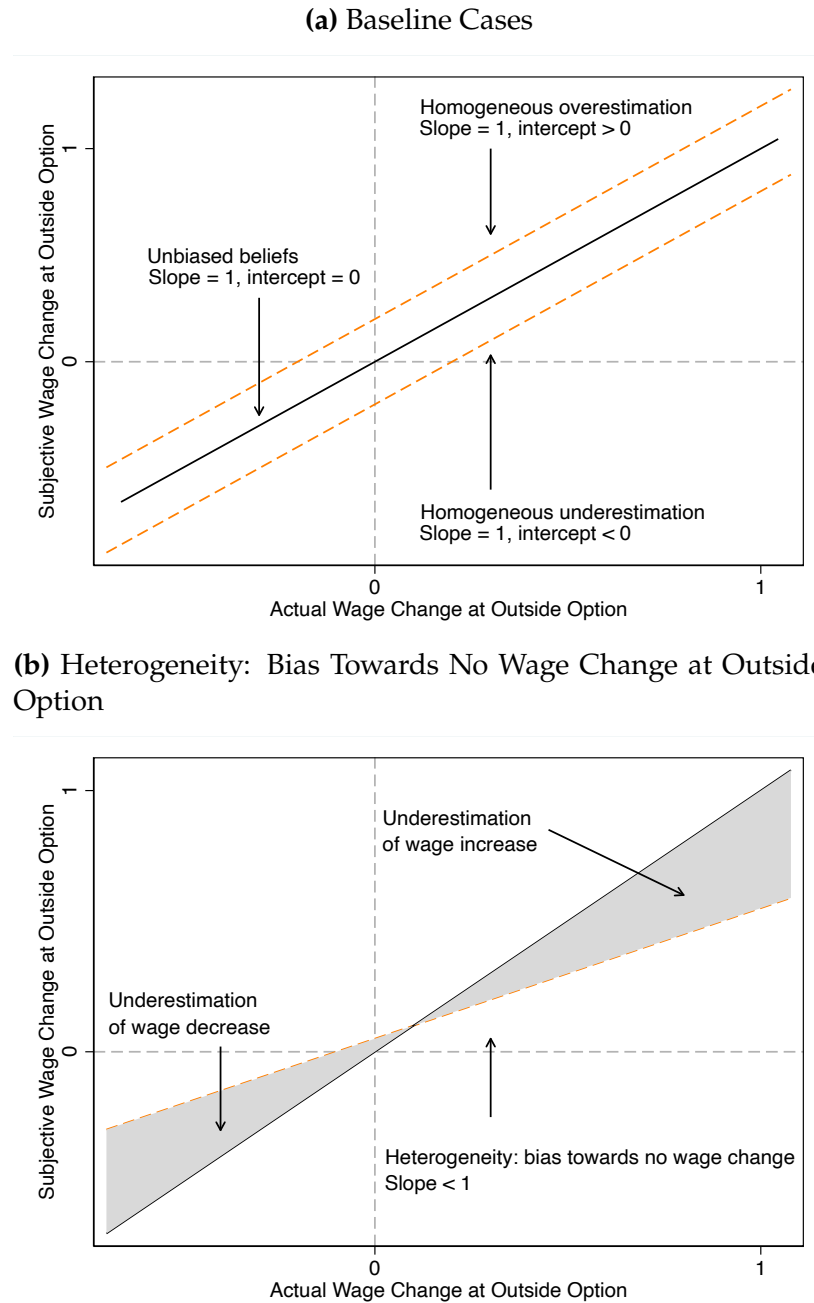
Note: This figure reports data from the 2019 wave of the German Socio-Economic Panel. The figure reports binned scatter plots of the worker rent (as a percent of salary) plotted against log salary, tenure, age, and years of education.

Figure 3: Wage-Based Rents, Non-Wage-Based Rents, and AKM Establishment Effects



Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. Panel (a) depicts the binscatter between non-wage-based rents and wage-based rents. Panel (b) depicts the binscatter between a worker's wage-based/non-wage-based rents (as share of salary) and their AKM establishment effect. The AKM establishment effects are calculated using the SOEP-ADIAB dataset and are the Card, Heining, and Kline (2013) establishment pay premia from the time period 2010 to 2017. An analogous plot of the AKM effects against the overall rent is presented in Appendix Figure A.10.

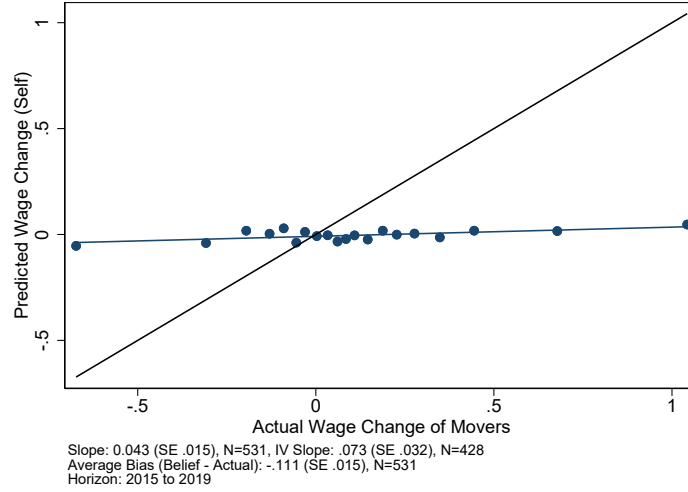
Figure 4: Research Design—Visualizing Bias About Outside Options



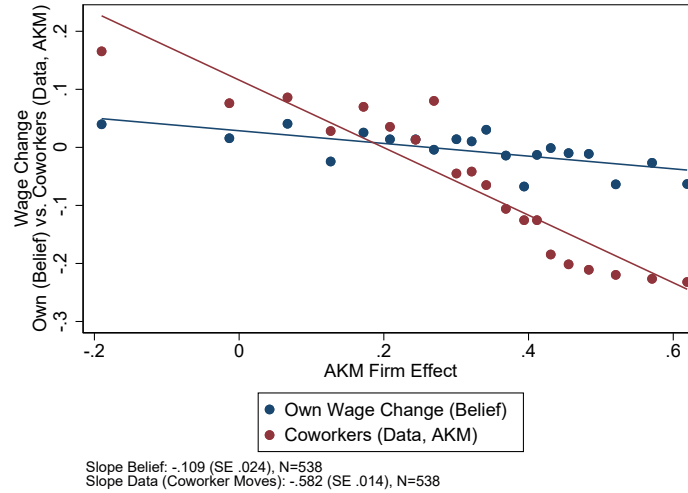
Note: This figure presents example graphs that illustrate our research design of plotting worker beliefs about outside options against (proxies for) their objective outside options. Panel (a) illustrates the baseline case where worker beliefs are (on average) in perfect correspondence with their actual outside options, as well as cases where workers homogeneously overestimate or underestimate wages at their outside options. Panel (b) illustrates the case where the slope is strictly less than 1, showing that it corresponds to workers being systematically biased towards thinking their wage at their outside option is similar to their current wage.

Figure 5: Beliefs About Own Wage Changes

(a) Beliefs About Own Wage Changes Compared to Actual Wage Changes of Coworkers Moving Firms



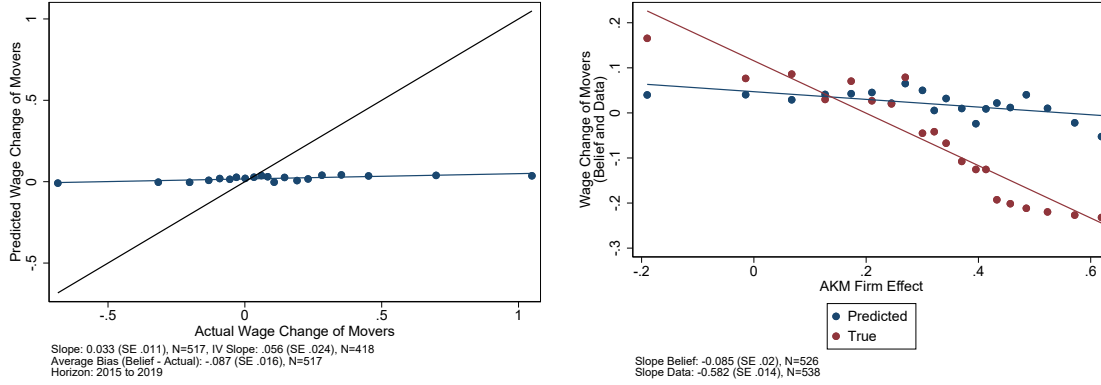
(b) Beliefs About Wage Changes and AKM Effects



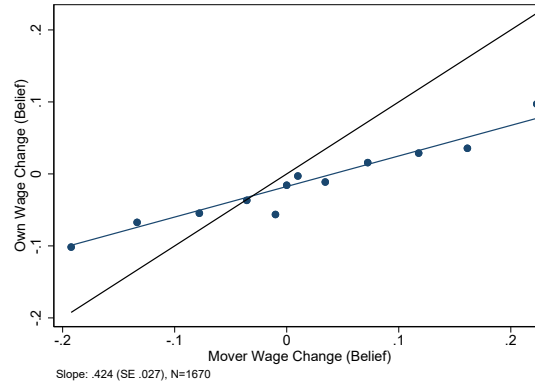
Note: This figure reports worker beliefs about their own wage changes when leaving their firm, as well as the actual wage changes experienced by coworkers who left their firm. Panel (a) shows a binned scatter plots of worker beliefs against the actual wage changes of movers out of their firm. The solid diagonal line denotes the benchmark that would be obtained if workers' beliefs corresponded exactly to the actual wage changes experienced by movers. The figure also reports an IV specification with a split-sample specification to correct measurement error in mover wage changes (see Appendix Figure A.13 for the first stage). Mover wage changes are calculated as the mean log wage change experienced by workers at the respondent's establishment over the horizon 2015 to 2019 (see Appendix Figure A.14 for alternative specifications that use the median instead of the mean, and use the period 2017-2019 instead). Panel (b) reports beliefs about own wage changes when against AKM pay premia (calculated following Card, Heining, and Kline, 2013, for the period 2010 to 2017), as well as actual wage changes of movers against AKM establishment effects as a benchmark slope.

Figure 6: Beliefs About Wage Changes of Coworker Movers

(a) Beliefs About Mover Wage Changes Plot- **(b) Mover Wage Changes (Beliefs and Data)**
ted Against Actual Mover Wage Changes **and AKM Effects**



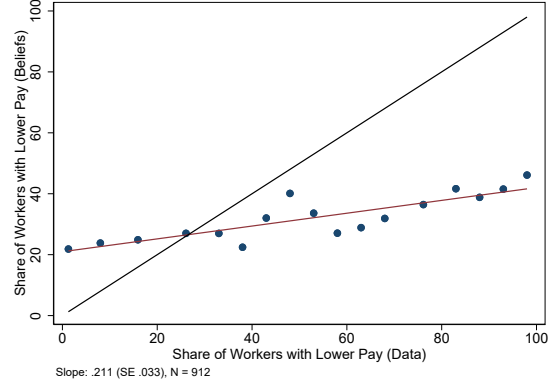
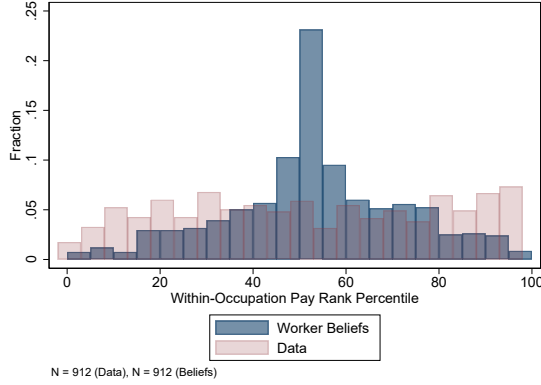
(c) Beliefs About Own and Coworker Wage Changes



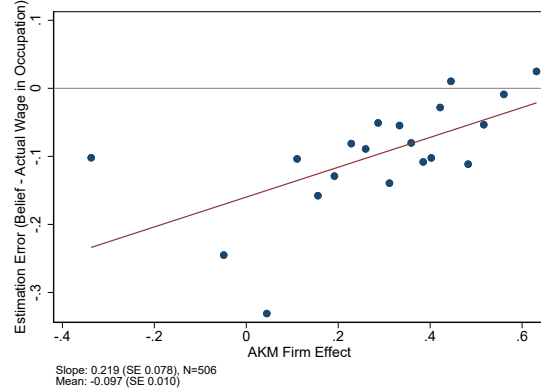
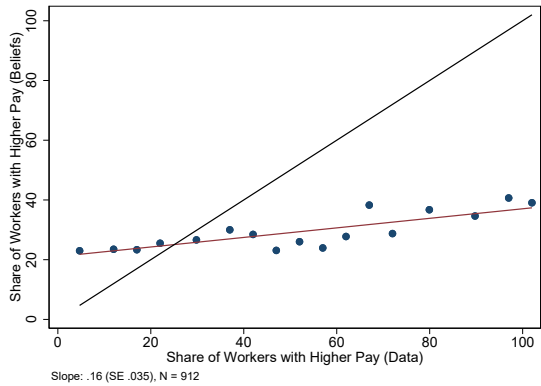
Note: This figure reports worker beliefs about the wage changes of coworkers who leave their firm, as well as the actual wage changes experienced by coworker movers. Panel (a) shows a binned scatter plots of worker beliefs about coworker wage changes against the actual wage changes of movers out of their firm. The solid diagonal line denotes the benchmark that would be obtained if workers' beliefs exactly corresponded to the actual wage changes experienced by movers. The figure also reports an IV specification with a split-sample specification to correct measurement error in mover wage changes (see Appendix Figure A.13 for the first stage). Mover wage changes are calculated as the mean log wage change experienced by workers at the respondent's establishment over the horizon 2015 to 2019 (see Appendix Figure A.16 for alternative specifications). Panel (b) reports beliefs about coworker wage changes against AKM pay premia (calculated following Card, Heining, and Kline, 2013, for the period 2010 to 2017), as well as actual wage changes of movers against AKM pay premia as a benchmark slope. Panel (c) reports the relationship between beliefs about own wage changes and beliefs about coworker wage changes (i.e., the relationship between the variable plotted in Panel (a) of Figure 5 and Panel (a) of this figure).

Figure 7: Beliefs About Median Salary and Own Rank in Occupation

(a) Histogram of Own Rank in Occupation **(b)** Share of Workers in Occupation with Lower Pay (Beliefs and Data)

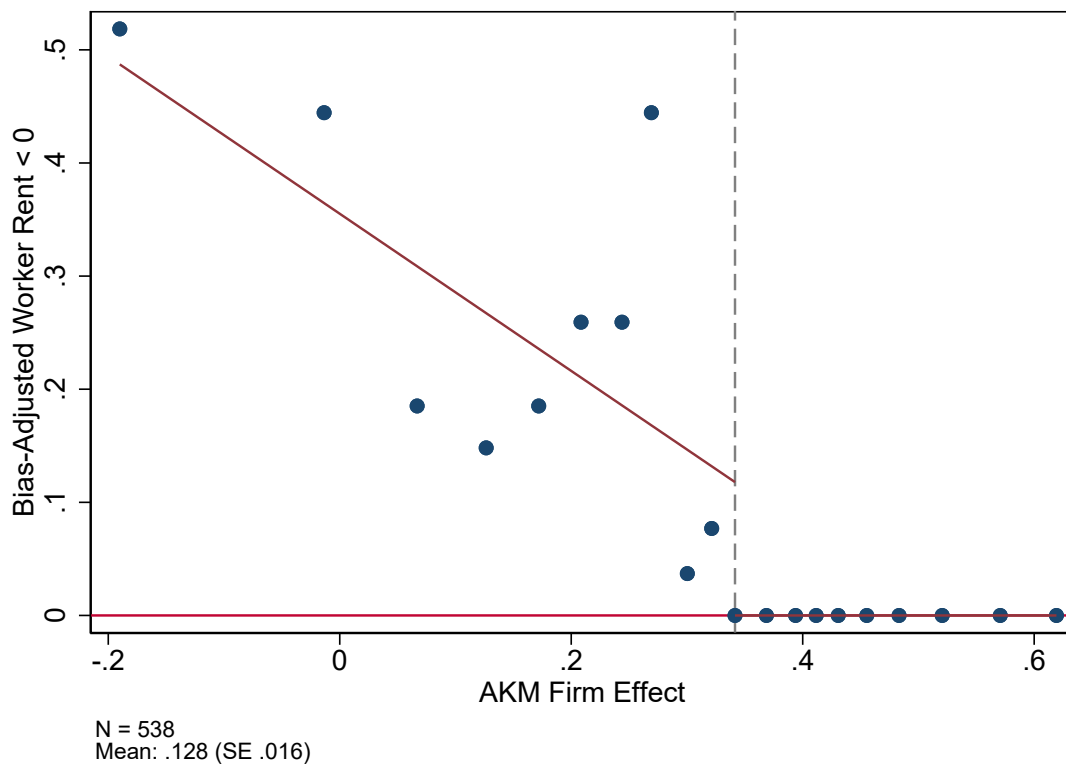


(c) Share of Workers in Occupation with Higher Pay (Beliefs and Data) **(d)** Bias in Beliefs About Median Salary Plotted Against AKM Establishment Effect



Note: This figure reports worker beliefs about their pay rank within their occupation and the median salary in their occupation. Panel (a) shows a histogram of workers' beliefs about their own pay rank in their occupation, compared to workers in other firms within the same occupation. This histogram is overlaid on a histogram displaying the *actual* pay ranks of workers, calculated at the 4-digit occupation level. Panel (b) reports beliefs about the share of workers with *lower* pay plotted against the rank of the worker's AKM establishment pay premium. The diagonal line traces out the benchmark slope if worker beliefs corresponded exactly to their firm's pay rank. Panel (c) repeats the same analysis for the share of workers with *higher* pay (instead of the share with *lower* pay). Panel (d) reports a binned scatterplot of bias in worker beliefs about the median salary in their occupation (relative to the true median salary, based on data from the Federal Employment Agency (log difference)) plotted against the AKM establishment effect. Lower values of the outcome variable indicate that workers believe that the median salary in their occupation is lower than it actually is.

Figure 8: Share of Jobs with Negative Surplus (Imputation)



Note: The figure reports the share of employment relationships with negative estimated surplus against the AKM establishment effect. To calculate worker surplus we add together the subjective non-wage component of surplus plus our estimate of the objective wage component of surplus, calculated by substituting the subjective wage premia of workers with the actual wage changes of coworker movers.

Tables

Table 1: Summary Statistics: Worker Rent and its Components

	Mean	SD	P10	P25	Median	P75	P90	Share 0	Obs.	Nb ind.
Panel A: Demographics										
Age	43.93	11.63	28.00	35.00	44.00	44.00	59.00	0.00	1604	1068
Years of education	13.15	2.71	10.50	11.50	12.00	12.00	18.00	0.00	1517	995
Salary (in Euro, per Year)	40997.86	28001.40	15600.00	24000.00	34800.00	34800.00	69600.00	0.00	1604	1068
Tenure	10.85	10.55	0.00	2.00	7.00	7.00	28.00	0.10	1604	1068
Female	0.47	0.50	0.00	0.00	0.00	0.00	1.00	0.53	1604	1068
Full-time Employed	0.72	0.45	0.00	0.00	1.00	1.00	1.00	0.28	1604	1068
Part-time Employed	0.28	0.45	0.00	0.00	0.00	0.00	1.00	0.72	1604	1068
Panel B: Rents (In Euro, per year)										
Worker Rent	6068.52	7513.49	540.00	1680.00	3840.00	3840.00	13440.00	0.00	1604	1068
Wage-Based Rent	525.75	6262.81	-4200.00	0.00	0.00	0.00	5400.00	0.42	1604	1068
Non-Wage-Based Rent	5542.78	8404.01	-60.00	1200.00	3600.00	3600.00	12600.00	0.00	1604	1068
Panel C: Rents (Flow, as % of Salary)										
Worker Rent	14.24	11.86	1.00	5.00	10.00	10.00	30.00	0.00	1604	1068
Wage-Based Rent	-0.20	17.67	-11.90	0.00	0.00	0.00	13.02	0.42	1604	1068
Non-Wage-Based Rent	14.44	20.89	-0.31	5.00	10.00	10.00	30.00	0.00	1604	1068
Panel D: Relative Size of Wage-Based and Non-Wage Based Rents (as % of Total Rent)										
Non-Wage-Based Share of Surplus	160.34	524.40	-3.09	58.33	100.00	100.00	240.00	0.00	1604	1068
Non-Wage-Based Share of Surplus - Winsorized at 2%	148.94	312.72	-3.09	58.33	100.00	100.00	240.00	0.00	1604	1068

Table 2: Correlation Matrix of Bias Measures

	Bias About Own Wage Change	Bias About Coworker Wage Change	Bias About Rank in Occup	Bias About Median Occup Salary
Bias About Own Wage Change	1 (—)			
Bias About Coworker Wage Change	0.9529*** (0.0000)	1 (—)		
Bias About Rank in Occup	-0.1500*** (0.0029)	-0.1526*** (0.0027)	(—)	1
Bias About Median Occup Salary	-0.0846* (0.0891)	-0.0813 (0.1062)	-0.2186*** (0.0000)	1 (—)

Note: This table reports the correlations between the four bias measures we calculate: bias about (i) expected own wage change if forced to separate, (ii) beliefs about mover wage changes among coworkers that move out of the current establishment, (iii) beliefs about rank in the within-occupation wage distribution, and (iv) beliefs about the median salary in the workers' occupation. P-values are reported in brackets, and stars denote statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Online Appendix: Worker Beliefs about Rents and Outside Options

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A Appendix Tables

Table A.1: Overview of Data Collections

Data collection	Sample	Timing
GSOEP IS Wave 1 (N=908)	In-person interviews with full-time and part-time employed workers as part of GSOEP-IS	September 2019 – December 2019
GSOEP IS Wave 2 (N=696)	In-person interviews with full-time and part-time employed workers as part of GSOEP-IS	September 2020 – December 2020
Robustness Survey (N=902)	Online surveys with full-time and part-time employed workers with Dynata	July 2021
Expert Survey (N=151)	Experts in labor economics and behavioral economics recruited via email invitation	July 2021
HR Manager Survey (N=177)	Online surveys with HR managers recruited with Luc.id	May 2021

Table A.2: Summary Statistics: IAB-GSOEP Sample

	Mean	SD	P10	P25	Median	P75	P90	Share 0
Panel A: Demographics								
Age	43.77	11.43	28.00	34.00	44.00	54.00	59.00	0.00
Salary (in Euro, per Year)	39189.07	21970.94	15600.00	24000.00	34800.00	49200.00	69600.00	0.00
Tenure	10.34	10.24	0.00	2.00	7.00	16.00	27.00	0.10
Female	0.47	0.50	0.00	0.00	0.00	1.00	1.00	0.53
Full-time Employed	0.71	0.45	0.00	0.00	1.00	1.00	1.00	0.29
Part-time Employed	0.29	0.45	0.00	0.00	0.00	1.00	1.00	0.71
Panel B: Rents (In Euro, per year)								
Worker Rent	5568.64	5531.93	504.00	1620.00	3720.00	7680.00	12960.00	0.00
Wage-Based Rent	473.66	4818.98	-4200.00	0.00	0.00	1800.00	5400.00	0.42
Non-Wage-Based Rent	5288.22	6364.93	-40.80	1223.40	3600.00	7560.00	12570.00	0.00
Panel C: Rents (Flow, as % of Salary)								
Worker Rent	13.83	10.52	1.00	5.00	10.00	20.00	30.00	0.00
Wage-Based Rent	0.20	11.15	-12.07	0.00	0.00	6.25	12.50	0.42
Non-Wage-Based Rent	13.99	14.59	-0.16	5.00	10.00	20.00	30.00	0.00
Panel D: Relative Size of Wage-Based and Non-Wage Based Rents (as % of Total Rent)								
Non-Wage-Based Share of Surplus	155.63	314.85	-0.81	61.42	100.00	100.00	256.20	0.00

Table A.3: Summary Statistics: Expert Survey

	Mean	Median	SD	Min	Max	Obs.
Share of Respondents: Female	21.85					151
Share of Respondents: Professor	47.02					151
Share of Respondents: Associate Professor	17.22					151
Share of Respondents: Assistant Professor / Lecturer	24.50					151
Share of Respondents: US based	61.59					151
Share of Respondents: Germany based	16.56					151
Share of Respondents: UK based	9.27					151
Age	42.82	40	9.59	27	80	149
h – index	22.12	21.92	22.32	0	118	151

Note: The table reports summary statistics for respondents' characteristics of the conducted expert survey eliciting the expert beliefs about the beliefs of the participants in the GSOEP survey. The share of respondents are reported as percentages and age is reported in years.

Table A.4: Summary Statistics: Median Expert Predictions

Variable: as % of Salary	Typical Worker	By wage Δ of movers		By firm AKM pctl	
		10% decrease	10% increase	40th pctl	60th pctl
Subjective Total Rent	10%	12%	5%	6%	7%
Belief About Own Wage Δ	0%	-5.5%	7.5%	0%	0%
Belief About Mover Wage Δ	3.5%	-3.5%	12.5%	1%	2.25%
Objective Wage Δ	0%	-7.5%	7.5%	1%	-3.5%

Note: The Table reports results from our survey of experts ($N = 151$). Each cell reports the median expert prediction about a certain quantity. The rows vary the *variable* being predicted, while the columns vary the *population* being asked about. The first row reports expert predictions about workers' subjective rents; the second, about workers' subjective wage change if forced to separate from their current job; the third, about workers' beliefs about the wage changes experienced by coworkers who separate from their firm; and the fourth reports experts belief about the objective wage changes workers would actually experience if they separated from their firm. The first column reports experts' prediction of the relevant value for the typical or median worker in the whole labor market; the second column, for the median worker in a firm where coworker movers experienced on average a 10% pay decrease; the third column, for the median worker in a firm where coworker movers experienced on average a 10% pay increase; the fourth column, for the median worker in a firm at the 40th percentile of AKM firm effects; and the fifth column, for the median worker in a firm at the 60th percentile of AKM firm effects.

Table A.5: Treatment effect on Total Worker rent and its decomposition

	(1)	(2)	(3)	(4)	(5)
	Worker Rent	Wage-Based Rent	Non-Wage-Based Rent	Quit prob.	Nego prob.
Control - overestimate	-1.388 (0.947)	-1.678 (1.121)	0.190 (1.334)	0.547 (2.558)	4.797 (3.440)
Treatment - underestimate	-1.469 (0.949)	-1.925** (0.858)	0.402 (1.167)	2.515 (2.434)	0.333 (2.860)
Treatment - overestimate	-0.829 (0.974)	-0.813 (0.986)	0.137 (1.318)	0.258 (2.597)	0.813 (3.294)
Constant	15.08*** (0.674)	1.958*** (0.598)	13.30*** (0.869)	15.13*** (1.684)	20.55*** (2.149)
Nb. obs	1,241	1,241	1,241	1,236	1,234

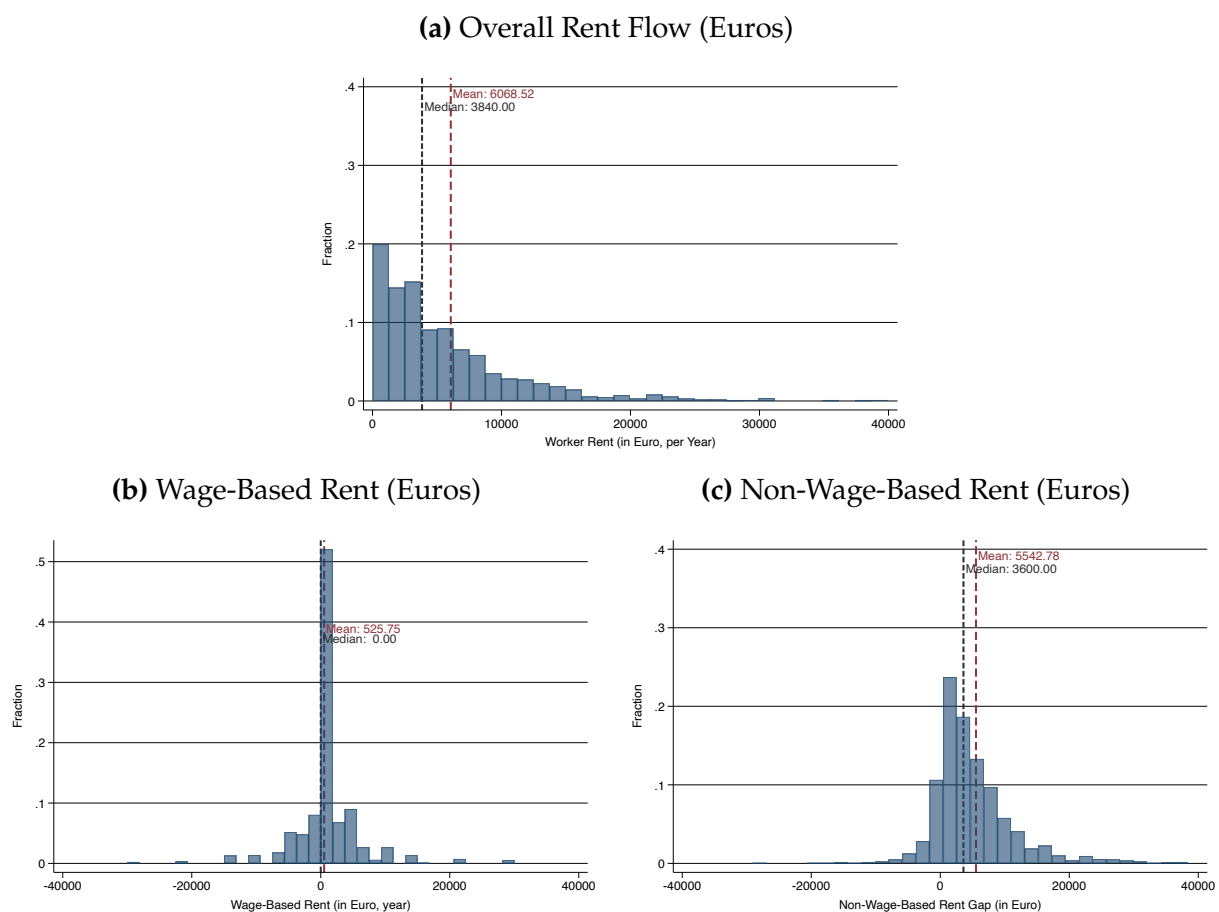
Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents estimates of the effect of our information treatment about the median wage in the occupation (described in F.1) on the perceived rents (total in Col (1), wage component in Col (2) and non-wage component in Col (3)) as well as on the probability to find a job at another firm (Col (4)) or to negotiate the wage at the current firm (Col (5)) in the next 12 months. The rents are all expressed as flow, % of salary. Overestimators are defined as respondent who guess a median salary above the true median salary, and vice-versa for underestimators. The omitted category is "Control - underestimate". Standard errors are clustered at the individual level.

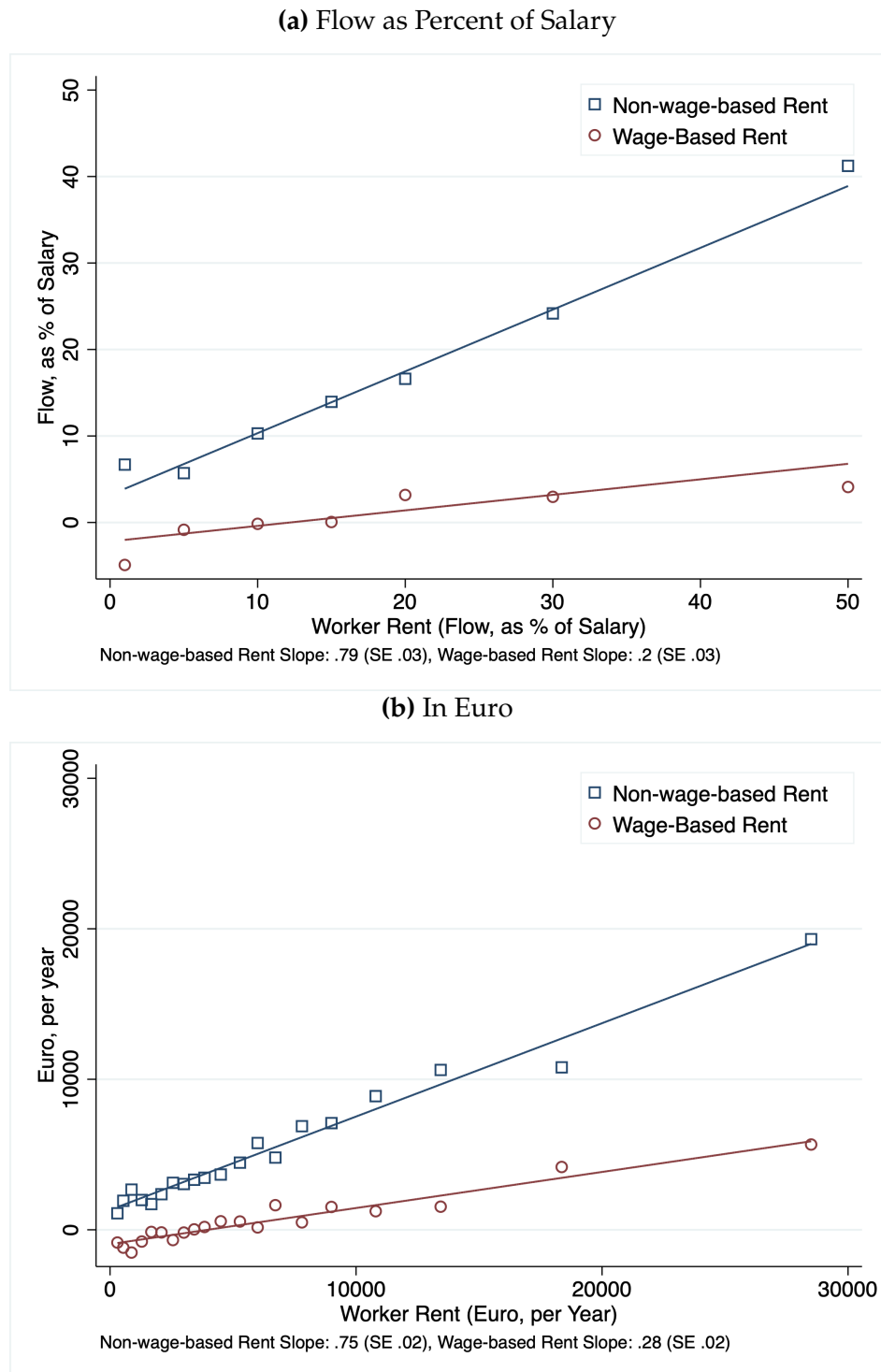
B Appendix Figures

Figure A.1: Distributions of Overall, Wage-Based, and Non-Wage-Based Rents (in Euros)



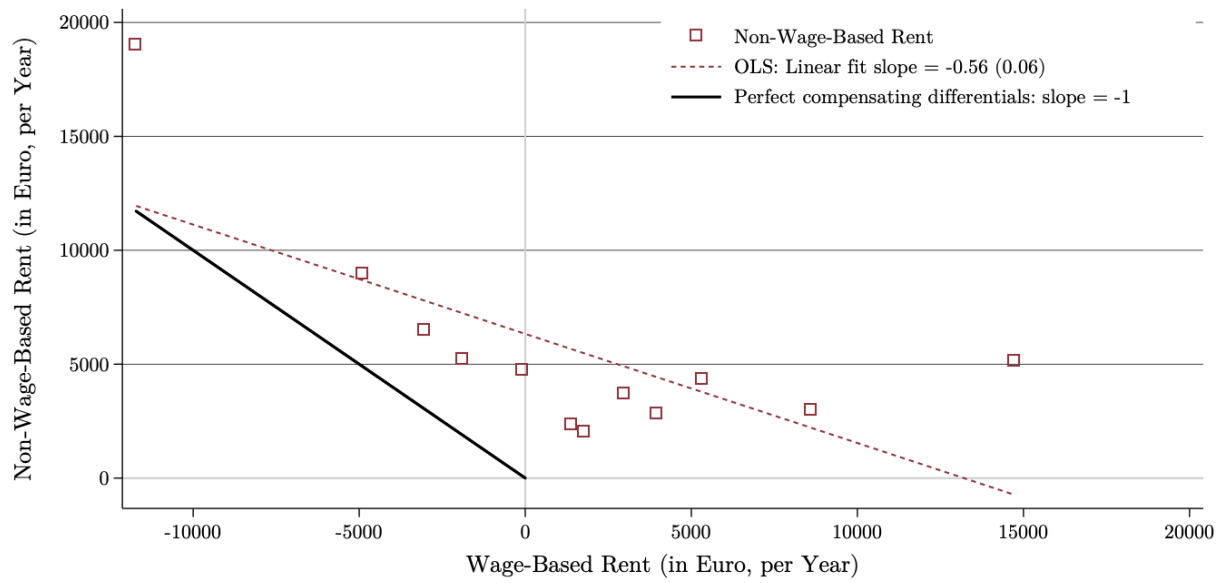
Note: This figure replicates Figure 1, but presents rents in monetary amounts (Euros) instead of as a percentage of workers' salaries.

Figure A.2: Wage and Non-Wage Components of Rents By Total Worker Rent



Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. It depicts the binscatter between total worker rents and both wage-based rents and non-wage-based rents. Panel (a) displays the relationship based on our measure as % of salary, while Panel (b) displays the relationship based on our measure in Euro per year.

Figure A.3: Wage-Based Versus Non-Wage-Based Rent (Euros)



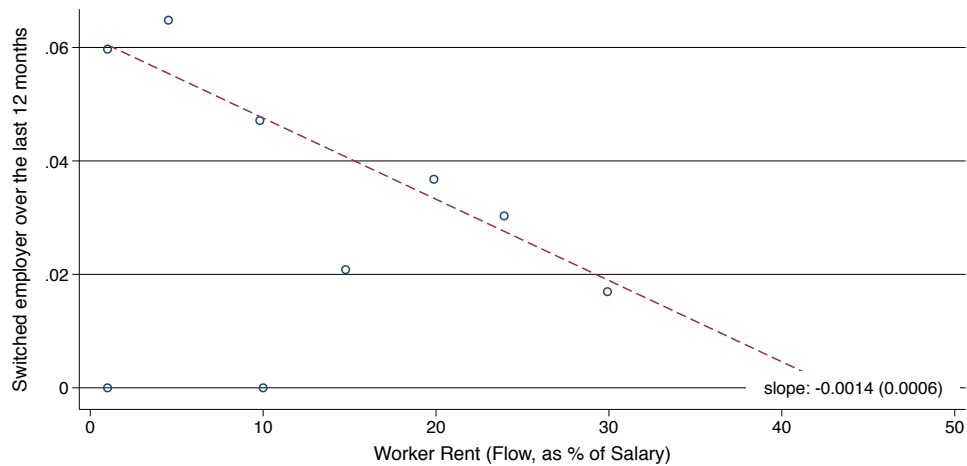
Note: This figure replicates Panel (a) of Figure 3, but reports rents in monetary units (Euro) rather than as a percent of salary.

Figure A.4: Validation Check: Intention to Quit and Worker Surplus as % of Salary

(a) Expected Likelihood of Switching Employer



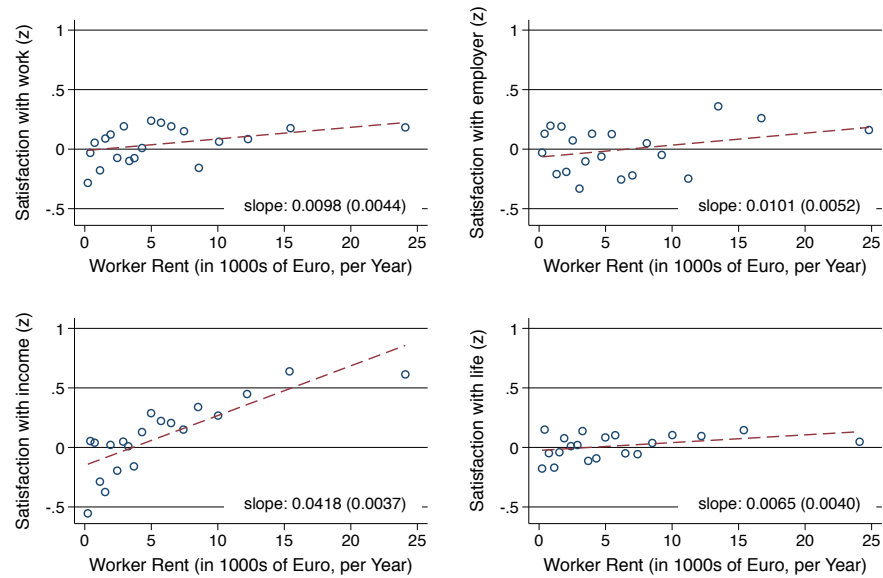
(b) Actual Switching of Employer



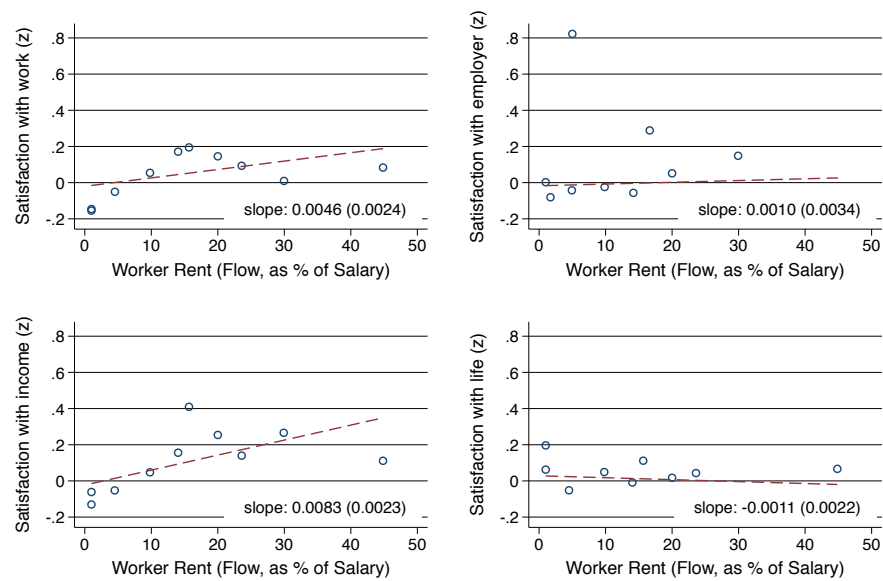
Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. Panel (a) plots the intention to quit for another employer within 12 months against worker surplus. Panel (b) plots actual job switches (based on the GSOEP survey data from 2020) to another employer within 12 months against worker surplus.

Figure A.5: The Relationship Between Worker Satisfaction and Worker Rents

(a) Worker Rents (In Euro, per Year)

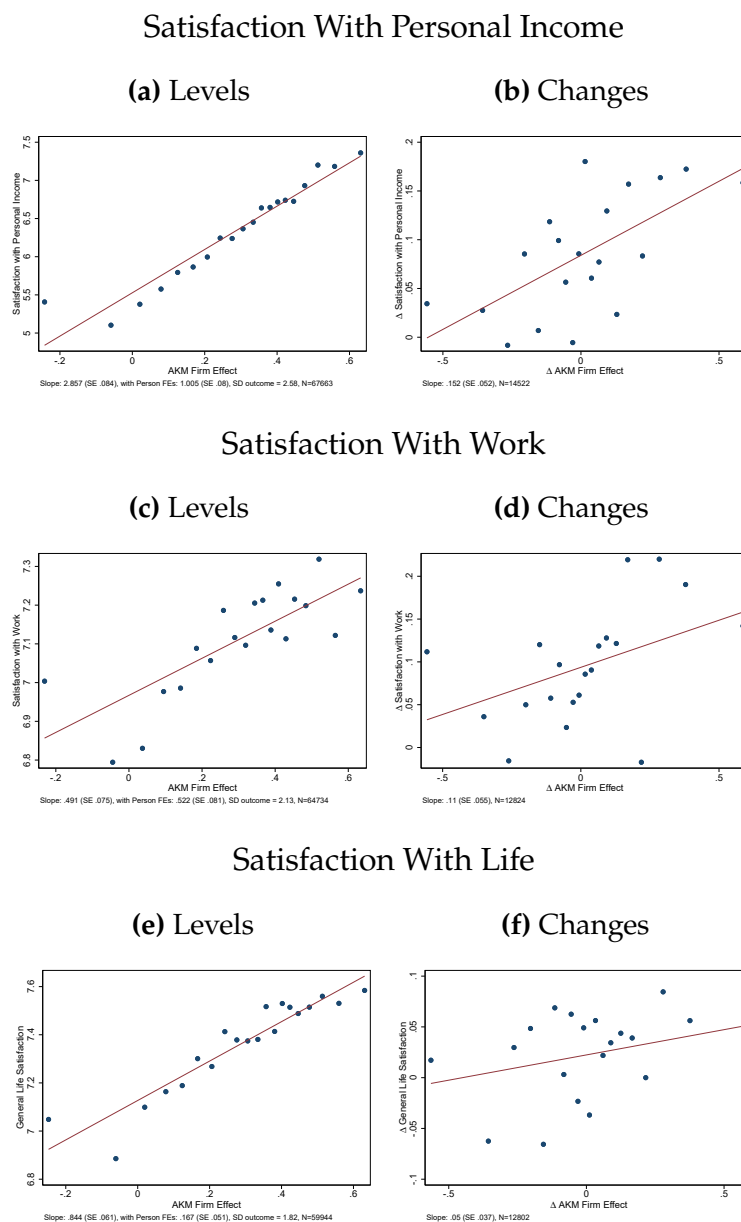


(b) Worker Rents (Flow, as Percent of Salary)



Note: This figure reports binned scatterplots of overall worker rents (in Euros, top panels, and as a % of salary, bottom panels) against four satisfaction measures derived from the GSOEP: satisfaction with work, satisfaction with employer, satisfaction with income, and satisfaction with life. We transform each satisfaction variable into a z-score.

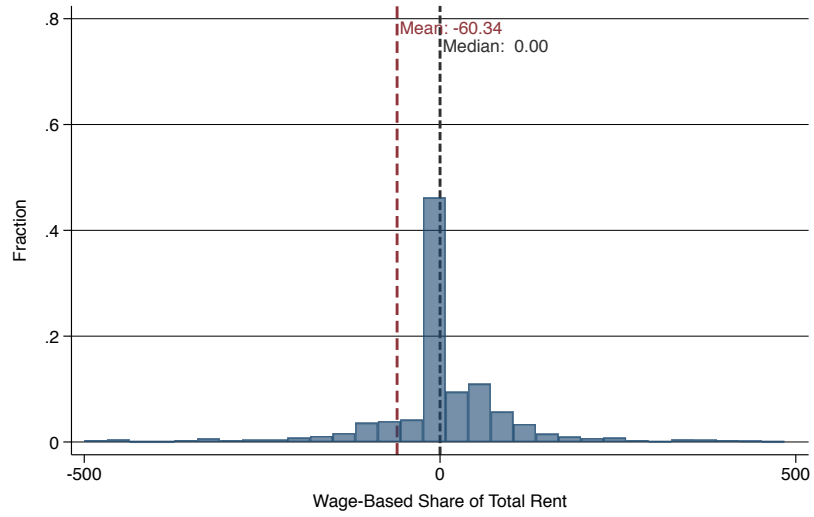
Figure A.6: Satisfaction Measures and AKM Pay Premia



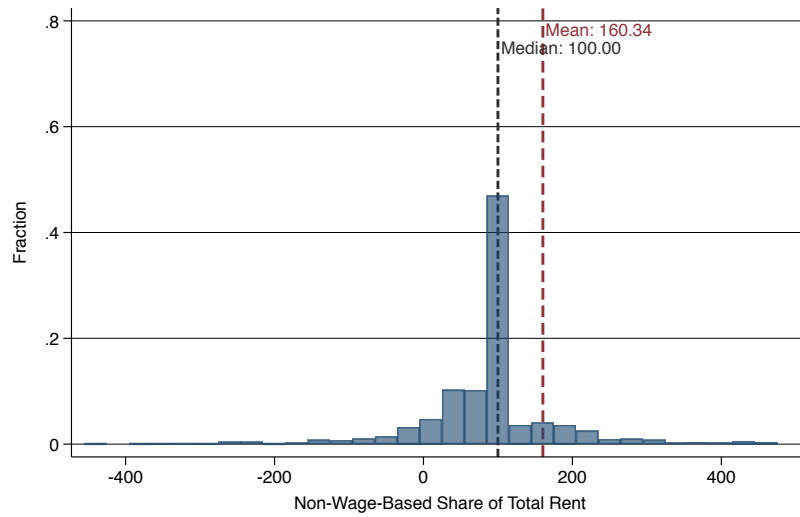
Note: This figure reports measures of satisfaction with personal income, work, and life in general from the GSOEP plotted against AKM establishment effects. The panels report binned scatterplots and draw on the SOEP-ADIAB dataset. The panels on the left report level-on-level specifications and report slope coefficients with and without individual fixed effects. The panels on the right report changes in the respective variables for individuals switching establishments. The AKM establishment effects are the Card, Heining, and Kline (2013) establishment pay premia estimated over three different multi-year horizons (1985 to 1992, 1993 to 1999, 1998 to 2004, 2003 to 2010, and 2010 to 2017). For years for which we have multiple AKM estimates, we take the most recent one. For the specifications with changes (right-hand side), we omit years in which the AKM estimation window changes. The SOEP satisfaction questions range from 1984 (satisfaction with work and with life) and 2004 (satisfaction with personal income) to 2018.

Figure A.7: Share of Rent Components

(a) Wage-Based Share of Total Worker Rent



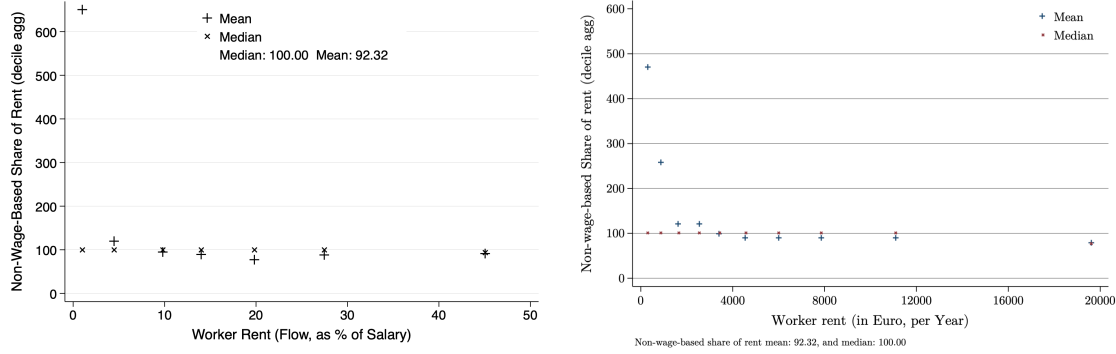
(b) Non-Wage-Based Share of Total Worker Rent



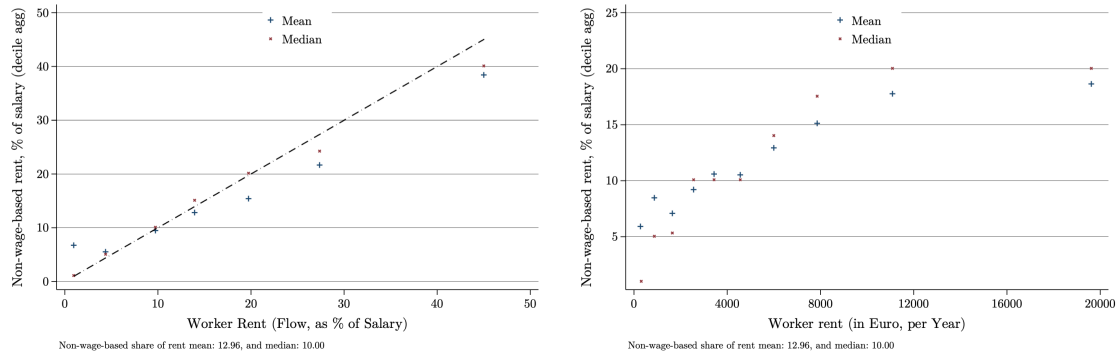
Note: This figure reports data from the 2019 wave of the German Socio-Economic Panel. Panel (a) of this figure reports histograms of the wage-based share of the total surplus. Panel (b) of this figure reports histograms of the amenity share of the total surplus.

Figure A.8: Non-Wage-Based Rent and Share of Rent by Total Worker Rent and Salary

(a) Non-Wage-Based Share of Rent and (b) Non-Wage-Based Share of Rent and Worker Rent

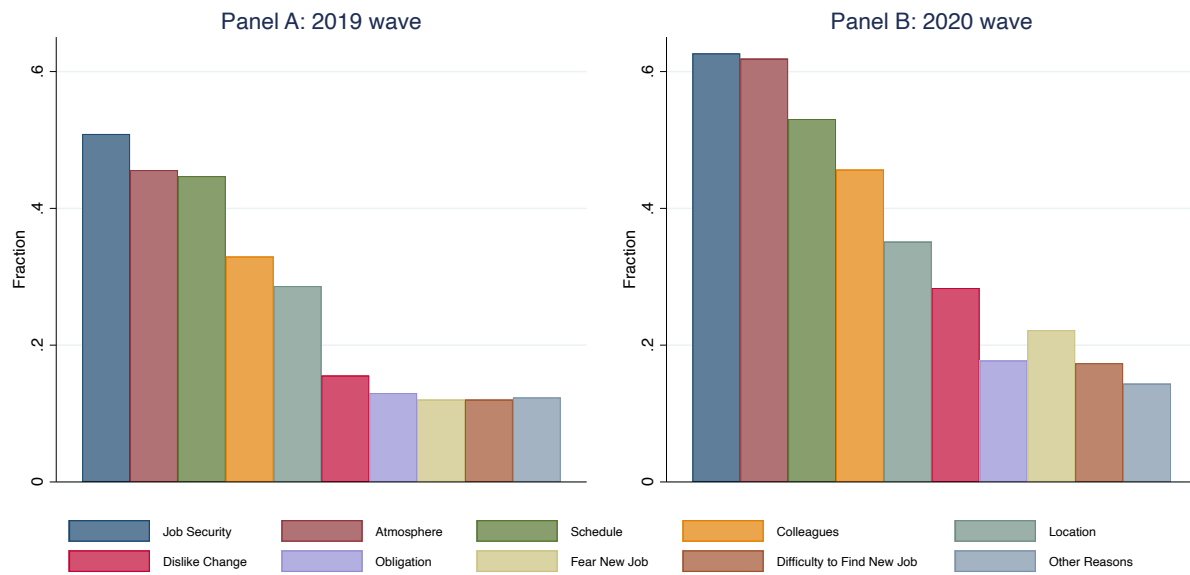


(c) Non-Wage-Based Rent (% of Salary) and (d) Non-Wage-Based Rent (% of Salary) and Worker Rent



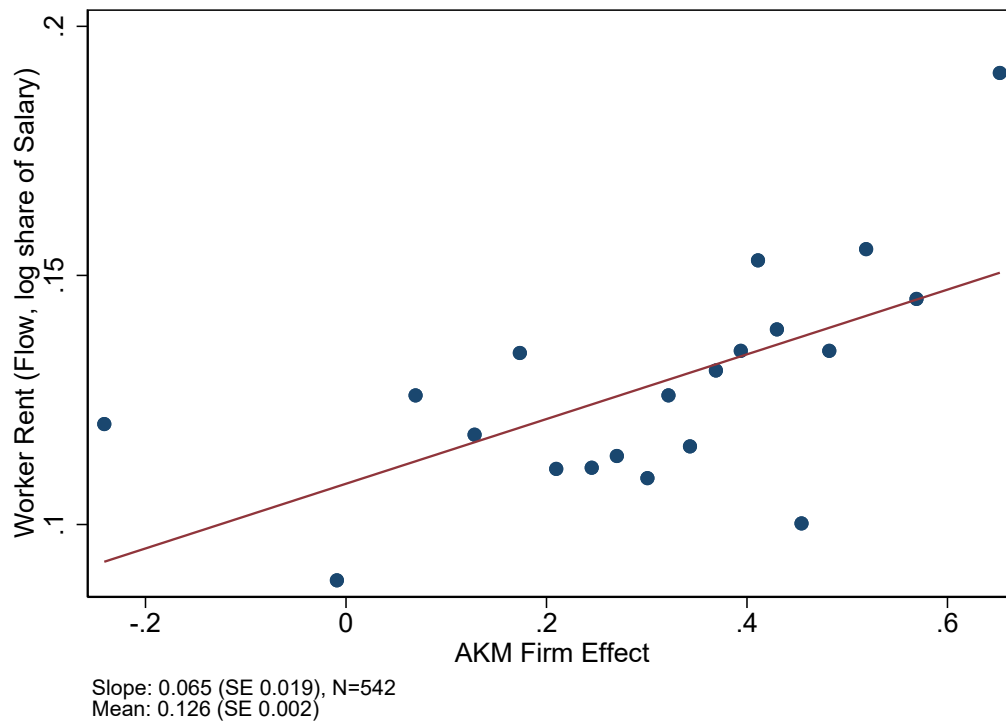
Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. In Panel (a), we show the relationship between the non-wage based share of rent and worker's rent as a % of salary (Panel (b) respectively plots worker's rent in Euros, per year). In Panel (c), we show the relationship between the non-wage based rent (as a % of salary) and worker's rent as a % of salary (Panel (d) respectively plots worker's rent in Euro, per year). In Panel (a) (resp. (b)), the mean of the non-wage based share of rent within a decile of worker's rent (resp. worker's salary) is calculated as the ratio of the total non-wage based rents to the total worker's rent (resp. total salary) across all individuals in that decile, while the median is calculated as the p(50) of the within-individual non-wage based share of rent. A similar method is applied to compute the mean and median by decile for the non-wage based rent (as % of salary) in Panel (c) and (d). The median and mean reported in the graphs are calculated across all deciles with the same method as the one described within each decile. For instance, the mean non-wage based share of rent is the ratio of the full-sample total non-wage based rents to the full-sample total worker's rent. The median non-wage based share of rent is the p(50) in the full sample of within-individual non-wage based share of rent.

Figure A.9: Reasons for Not Switching Employers



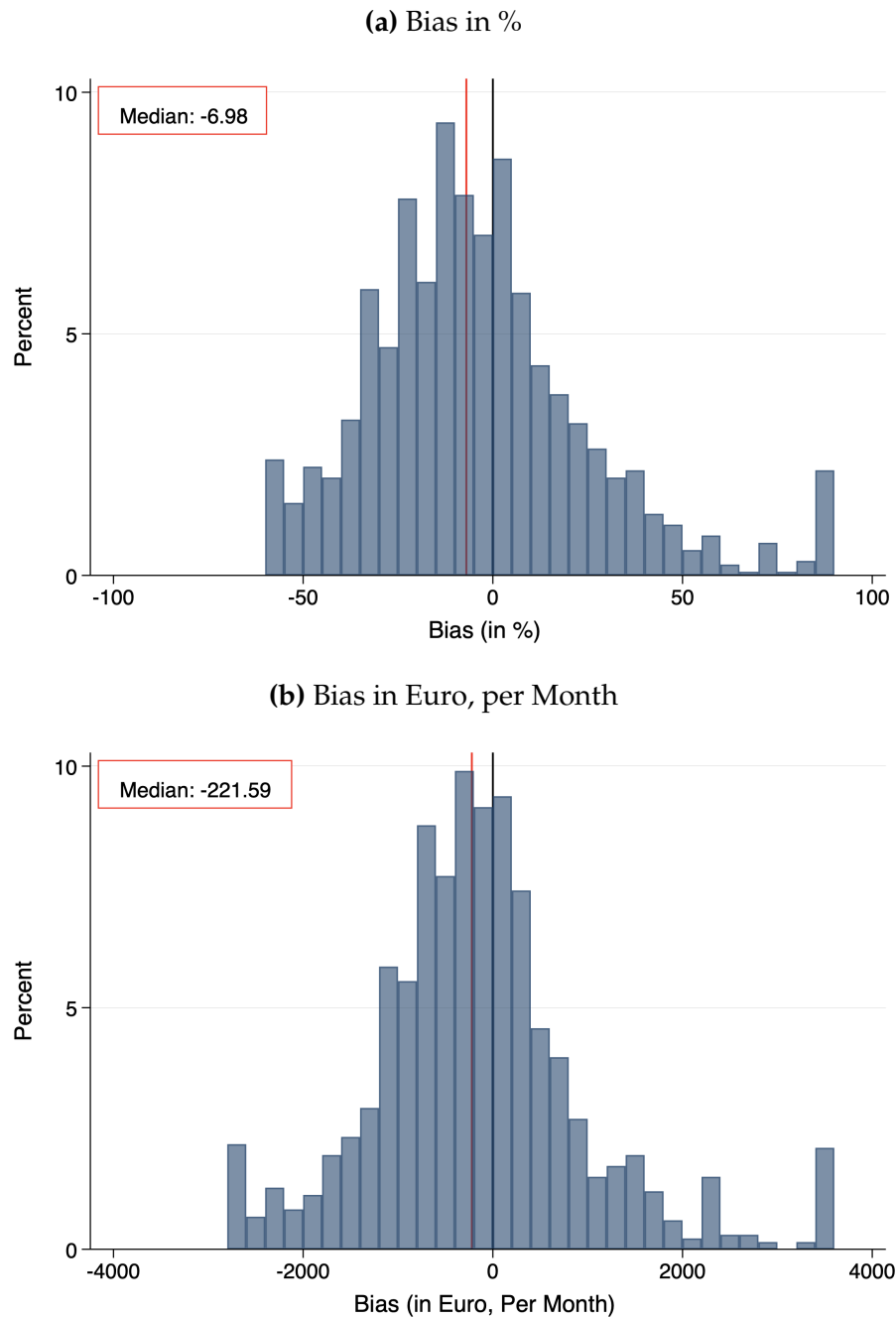
Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. The reports plots the main reasons given for not switching employers, from a predetermined list. Panel (a) shows data from the 2019 wave of the SOEP panel, while Panel (b) shows data from the 2020 of the SOEP panel.

Figure A.10: Overall Rents Versus AKM Establishment Effects



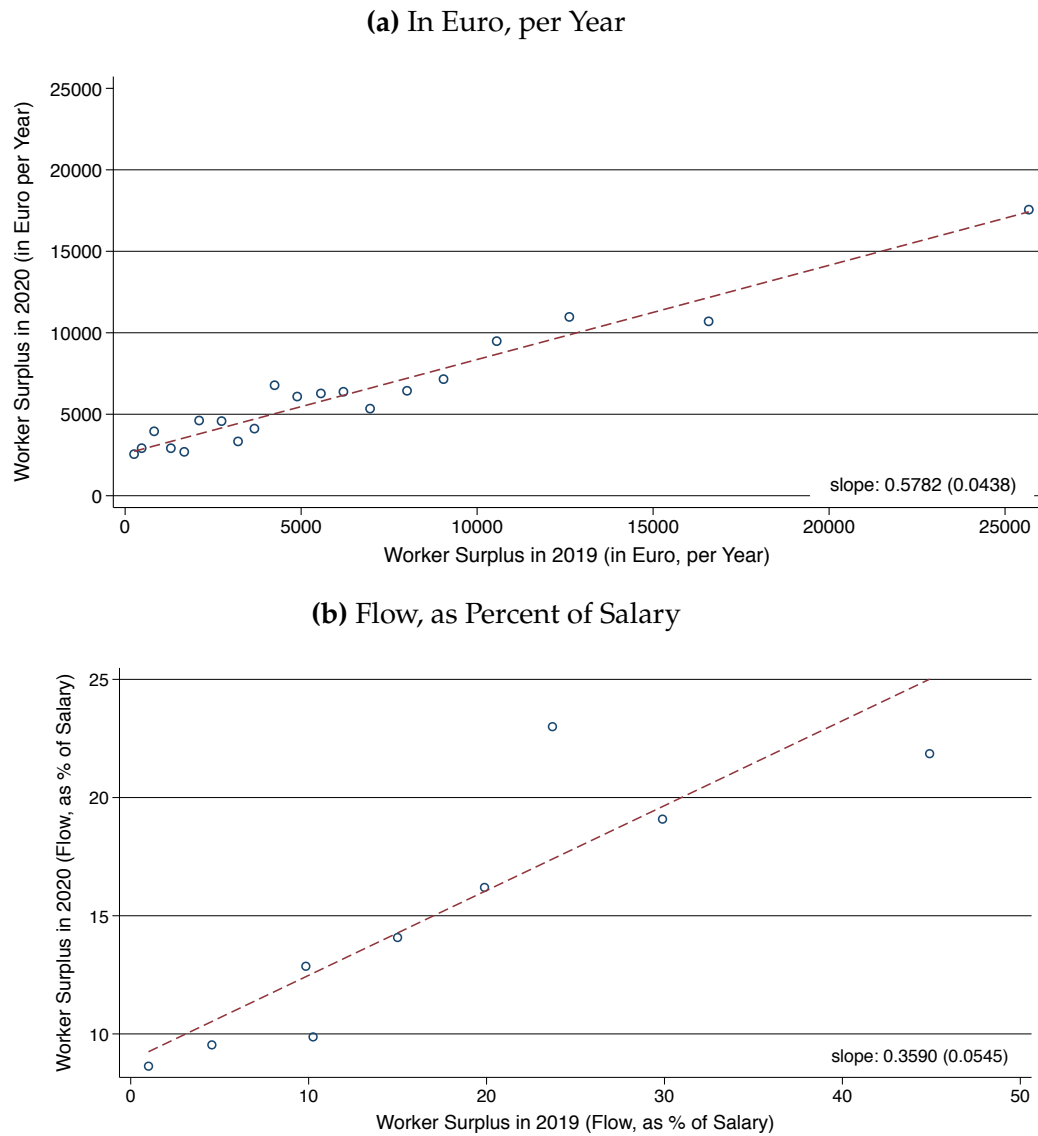
Note: This figure plots a worker's total rent (as a share of salary) against the AKM establishment effect. The figure reports a binned scatterplot and draws on the SOEP-ADIAB dataset. The AKM establishment effects are the Card, Heining, and Kline (2013) establishment pay premia from the time period 2010 to 2017.

Figure A.11: Bias in Beliefs About Outside Options



Note: The figure reports the distribution of the bias in beliefs about the median salary in the respondent's occupation. The data is winsorized at top and bottom 2% of distribution. Panel (a) shows the distribution of the bias (in %), defined as the percentage difference between the respondent's belief about the median salary in his occupation and the true median salary. Panel (b) shows the distribution of the bias (in Euro, per month), defined as the monetary (in Euro) difference between the respondent's belief about the median monthly salary in his occupation and the true median.

Figure A.12: Persistence of Worker Rents



Note: This figure reports data from the 2019 and 2020 wave of the German Socio-Economic Panel. To assess the potential concern that part of the survey measures reflect noise or measurement error (see, e.g., Gillen, Snowberg, and Yariv, 2019) this figure displays the relationships between the worker surplus of rents in the years 2019 and 2020 among workers who did not switch jobs. Panel (a) plots worker surplus in Euros while Panel (b) plots it as a percent of salary.

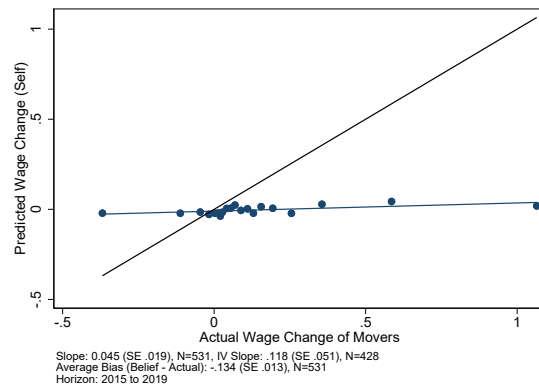
Figure A.13: IV First Stage for Split-Sample Measurement Error Correction



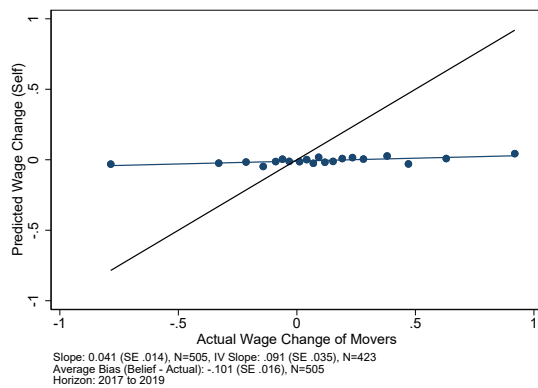
Note: This figure displays the first stage of the split-sample IV procedure used to correct for errors in measurement of coworker wage changes; the estimated coefficient and standard error from the second stage of this procedure are reported in Panel (a) of Figure 5. The procedure splits each worker's set of exiting coworkers into two 50% random samples; this figure displays the correlation between the wage changes of movers in the two random samples, across the workers in our main sample.

Figure A.14: Beliefs About Own Wage Change Versus Actual Coworker Wage Changes: Alternative Specifications

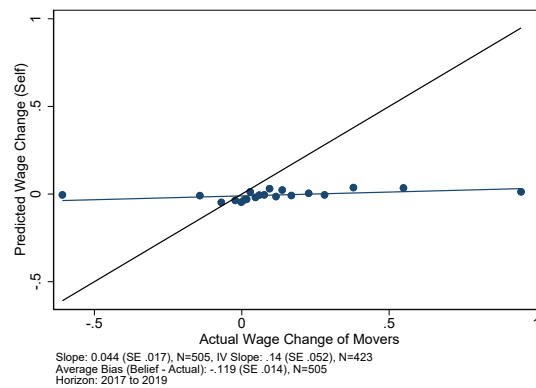
(a) Beliefs Versus Median Coworker Wage Changes (2015-2019)



(b) Beliefs Versus Mean Coworker Wage Changes (2017-2019)



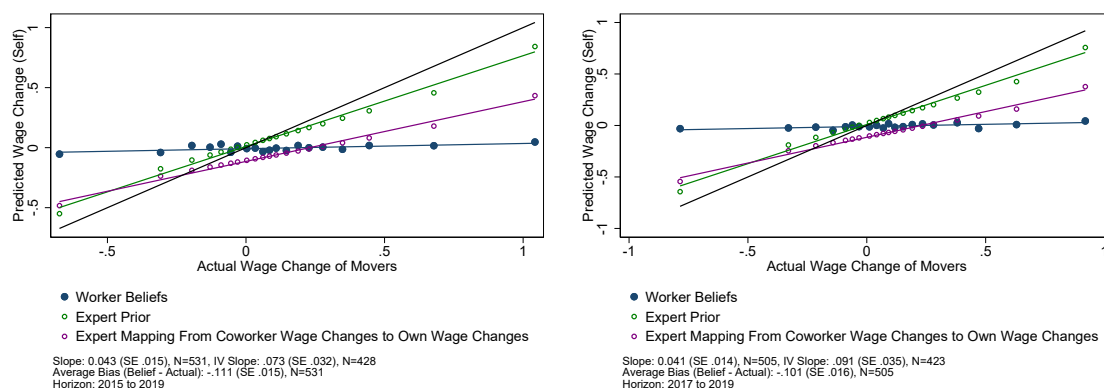
(c) Beliefs Versus Median Coworker Wage Changes (2017-2019)



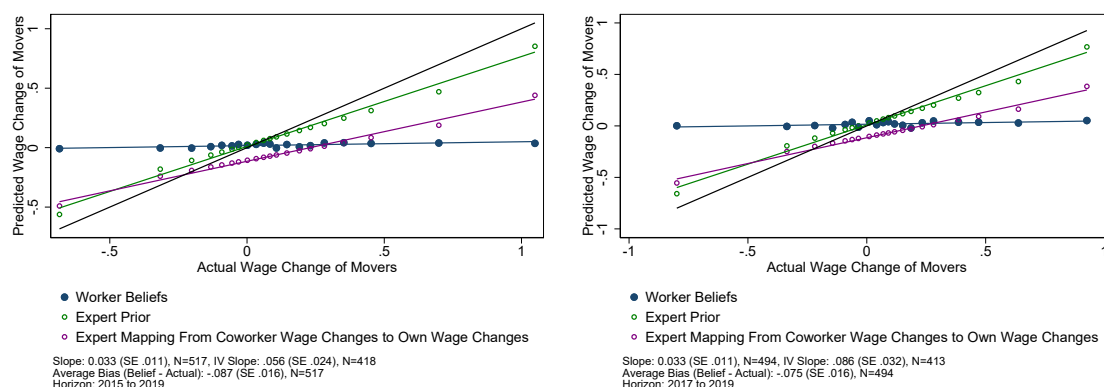
Note: This figure presents alternative versions of Panel (a) of Figure 5. Panel (a) of Figure 5 plots the relationship between a worker's belief about their own wage change if leaving their firm against the *mean* actual log wage changes of movers who moved out of their firm *during the period 2015-2019*. Panel (a) of this figure plots the relationship with the *median* actual log wage changes of coworkers who moved out during the same 2015-2019 period. Panel (b) plots the relationship with the mean actual wage changes of coworkers who moved out *during the period 2017-2019*. Finally, Panel (c) plots the relationship with the *median* actual wage changes of workers who moved out *during the period 2017-2019*.

Figure A.15: Beliefs About Own Wage Change Versus Actual Coworker Wage Changes: Expert Beliefs Benchmark

(a) Beliefs About Own Wage Change Versus Mean Coworker Wage Changes (2015-2019) **(b) Beliefs About Own Wage Change Versus Mean Coworker Wage Changes (2017-2019)**



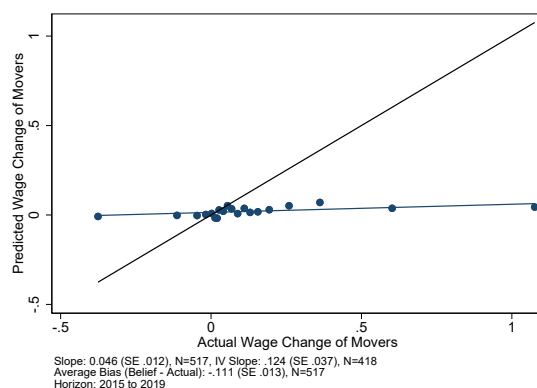
(c) Beliefs About Coworker Wage Change Versus Mean Coworker Wage Changes (2015-2019) **(d) Beliefs About Coworker Wage Changes Versus Mean Coworker Wage Changes (2017-2019)**



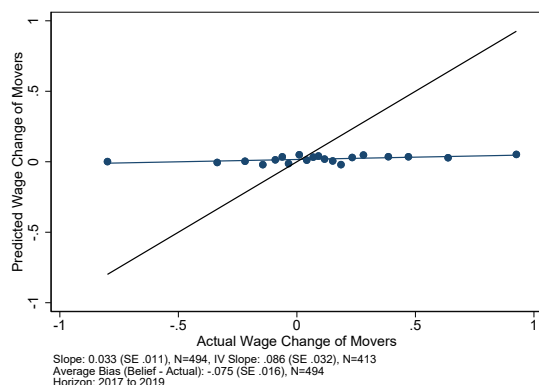
Note: This figure replicates Panel (a) of Figures 5 and 6, as well as Panel (b) of Figures A.14 and A.16, adding in benchmarks from our survey of experts. The green line depicts the experts' predictions about the median worker's expectations, while the purple line shows expert predictions about actual wage premia of workers. The lines are constructed by extrapolating from predictions about the beliefs of workers whose co-workers experience (i) a 10 ppt increase after switching and (ii) a 10 ppt decrease after switching.

Figure A.16: Beliefs About Coworker Wage Changes Versus Actual Coworker Wage Changes: Alternative Specifications

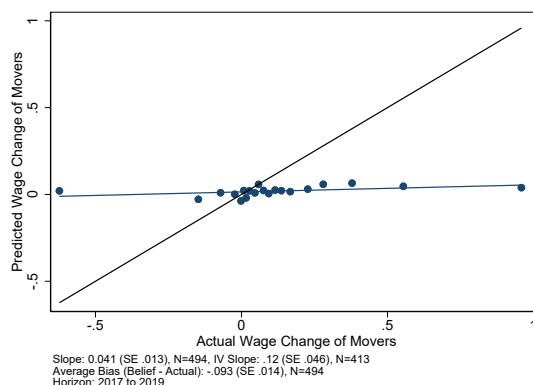
(a) Beliefs Versus Median Coworker Wage Changes (2015-2019)



(b) Beliefs Versus Mean Coworker Wage Changes (2017-2019)



(c) Beliefs Versus Median Coworker Wage Changes (2017-2019)



Note: This figure presents alternative versions of Panel (a) of Figure 6. Panel (a) of Figure 6 plots the relationship between a worker's belief about the wage changes of coworkers who leave their firm against the *mean* actual log wage changes of movers who moved out of their firm *during the period 2015-2019*. Panel (a) of this figure plots the relationship with the *median* actual log wage changes of coworkers who moved out during the same 2015-2019 period. Panel (b) plots the relationship with the *mean* actual wage changes of coworkers who moved out *during the period 2017-2019*. Finally, Panel (c) plots the relationship with the *median* actual wage changes of workers who moved out *during the period 2017-2019*.

C Objective Pay Premia and Worker Satisfaction

As a robustness check, we also relate AKM pay premia with measures of satisfaction with personal income, work, and life in general, measured on an 11-point scale from 0 to 10. They have been elicited in the GSOEP from 1984 (satisfaction with work and with life) and 2004 (satisfaction with personal income) onwards so that we have a substantially higher number of observations in the SOEP-ADIAB data from 49,000 (satisfaction with work) and 60,000 (satisfaction with life).

Appendix Figure A.6 Panel (a) reports the relationship between AKM pay premia and satisfaction with personal income with a slope of 2.857 (SE 0.084) in a specification with year effects and of 1.005 (SE 0.080) when controlling for year and individual fixed effects. While the AKM pay premia are already calculated with individual fixed effects, the inclusion of individual fixed effects in this specification accounts for the possibility that different individuals may report different baseline levels of satisfaction, e.g., with personal income. The point estimate of the specification with individual fixed effects implies that a ten percent increase in the AKM pay premium is associated with a 0.1 point increase in satisfaction with personal income. We also report the specification in changes (Appendix Figure A.6 Panel (b)) and find a point estimate of 0.152 (SE 0.052) for the relationship between changes in AKM establishment effects and ensuing changes in satisfaction with personal income.

Appendix Figure A.6 Panel (c) reports the relationship between AKM pay premia and satisfaction with work with a slope of 0.491 (SE 0.075) in the specification with year effects and, virtually unchanged, of 0.522 (SE 0.81) in the specification with year and individual effects. In Panel (d), we report the specification in changes and find an estimate of 0.110 (SE 0.055).

Lastly, Appendix Figure A.6 Panel (e) reports the relationship between life satisfaction and AKM pay premia. We find a slope of 0.844 (SE 0.061) in the specification with year effects and of 0.167 (SE 0.051) when controlling for year and individual effects. The relationship in changes, panel (f), is more flat with a point estimate of 0.050 (SE 0.037).

Taken together, our data suggests that objective pay premia are strongly correlated with measures of job satisfaction, inconsistent with the idea of compensating differentials offsetting wage-based rents.

D Results from the robustness survey

D.1 Data cleaning

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, 179 (or 15%) did not complete the full survey, which is a common attrition rate in online surveys (see, for example Andre et al. (2021) or Kuziemko et al. (2015)). This leaves us with a sample of 994 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 69 respondents who give inconsistent or implausible responses (monthly labor income larger than 25,000 Euros or lower than 170 Euros) 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 Euros monthly wage or more than 25,000 Euros monthly wage (23 respondents). This leaves us with a sample of 902 respondents. All of our results from the robustness survey are robust to including these 92 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 4 responses.
- For the question on co-worker 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 13 responses.
- For all of our variables on wage premia as a fraction of salary, based on the question on outside options, we further winsorize responses at -100% and +100% of salary. This affects 8 responses for our “generally framed” main outside option question and 11 responses for the outside option question framed in terms of a mass layoff.

D.2 Tables

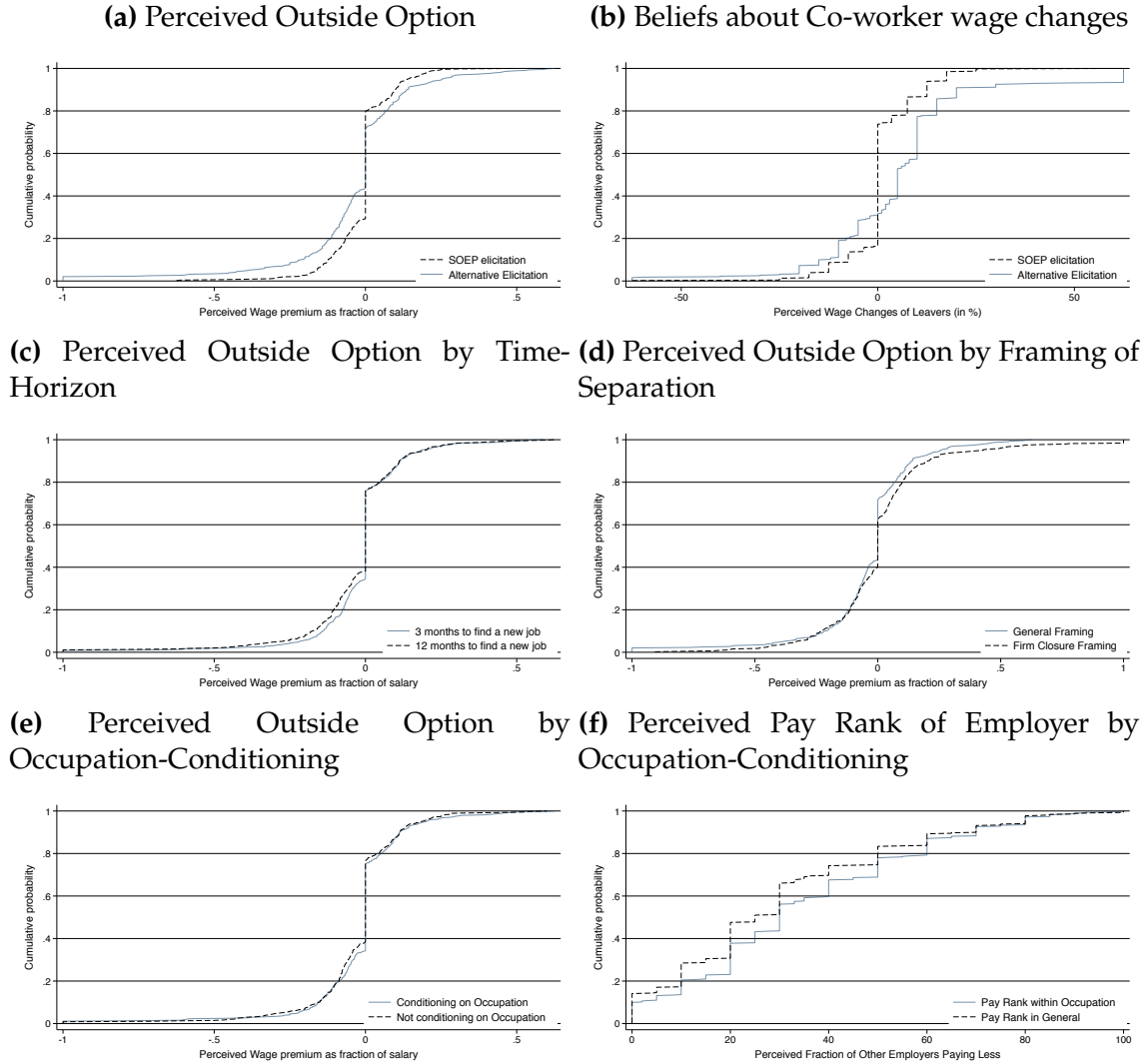
Table A.6: Summary Statistics: Robustness Survey

	Mean	Median	P25	P75	Obs.
East	0.20	0.00	0.00	0.00	902
University Degree	0.36	0.00	0.00	1.00	902
Age	48.70	51.00	40.00	58.00	902
Female	0.44	0.00	0.00	1.00	902
Gross Monthly Labor Income	3566.95	3200.00	2280.00	4450.00	902
Full-time Employed	0.78	1.00	1.00	1.00	902
Pay Change of Leavers: SOEP elic.	0.99	0.00	0.00	3.50	461
Pay Change of Leavers: alt elic.	6.19	5.00	-5.00	10.00	441
Perceived Wage Premium (in Euro): SOEP elic.	-31.13	0.00	-150.00	0.00	461
Perceived Wage Premium (in Euro): alt elic.	-63.90	0.00	-250.00	100.00	441
Perceived Wage Premium (as perc. of salary): SOEP elic.	-0.01	0.00	-0.04	0.00	461
Perceived Wage Premium (as perc. of salary): alt elic.	-0.04	0.00	-0.09	0.04	441

Note: The Table reports data from the robustness experiment conducted in July 2021.

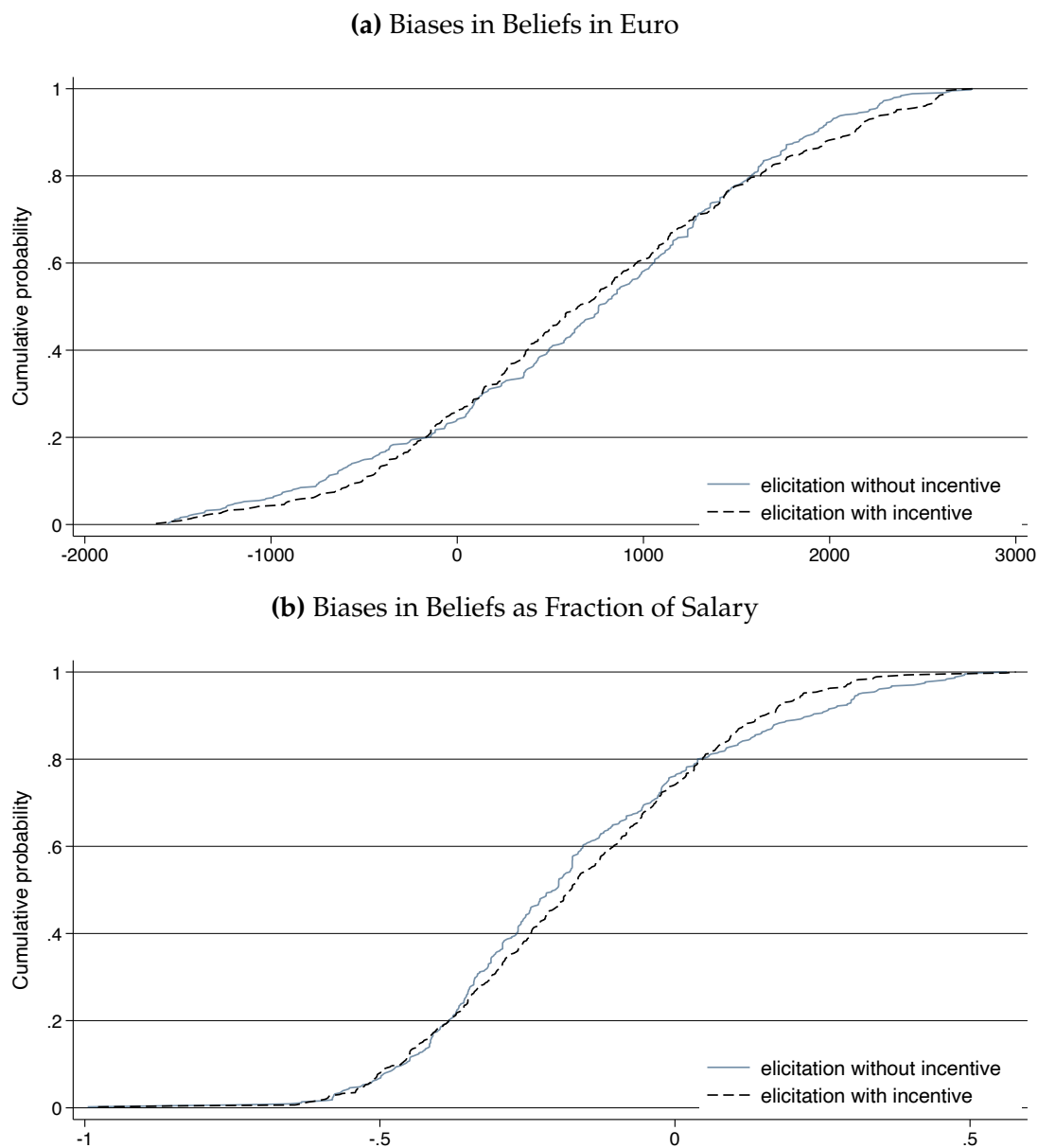
D.3 Figures

Figure A.17: Robustness of Belief Measurement to Various Design Features



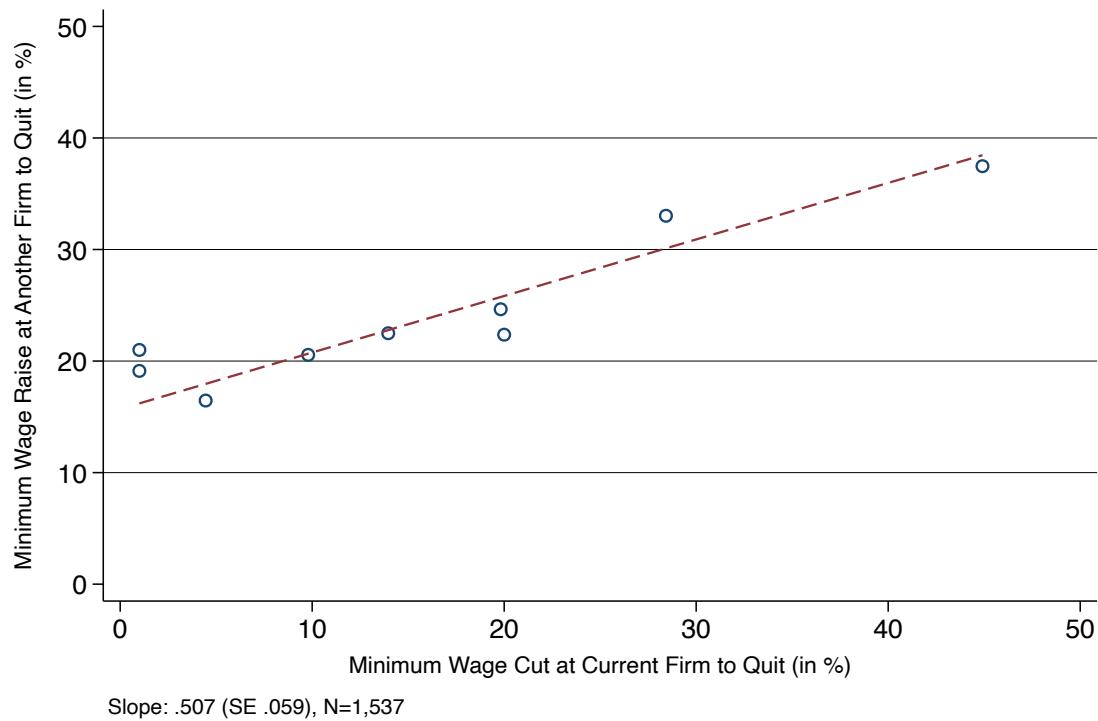
Note: Panel (a) of this figure reports the cumulative distribution function of subjective wage premia (defined as the difference between current wage minus subjective outside option divided by the current wage) separately for the elicitation from SOEP and the alternative elicitation. Panel (b) reports the CDF of beliefs about co-workers wage changes separately for the elicitation from SOEP and the alternative elicitation. Panel (c) reports the CDF of subjective wage premia (defined as the difference between current wage minus subjective outside option, divided by the current wage) separately for elicitation conditioning on people staying in the same occupation or not. Panel (d) reports the CDF of subjective wage premia (difference between current wage minus subjective outside option, divided by the current wage) separately for a 3 month and 12 month time horizon to find a new job. Panel (e) reports the CDF of the subjective wages at the outside option separately for our main question framing and for an alternative framing, which explicitly states that the separation is due to an unexpected company closure. Panel (f) reports the CDF of perceived fraction of other employers paying less than the current employer depending on whether beliefs are conditional on the own occupation or not.

Figure A.18: Biases in Beliefs about Median Wage in Occupation by Incentives



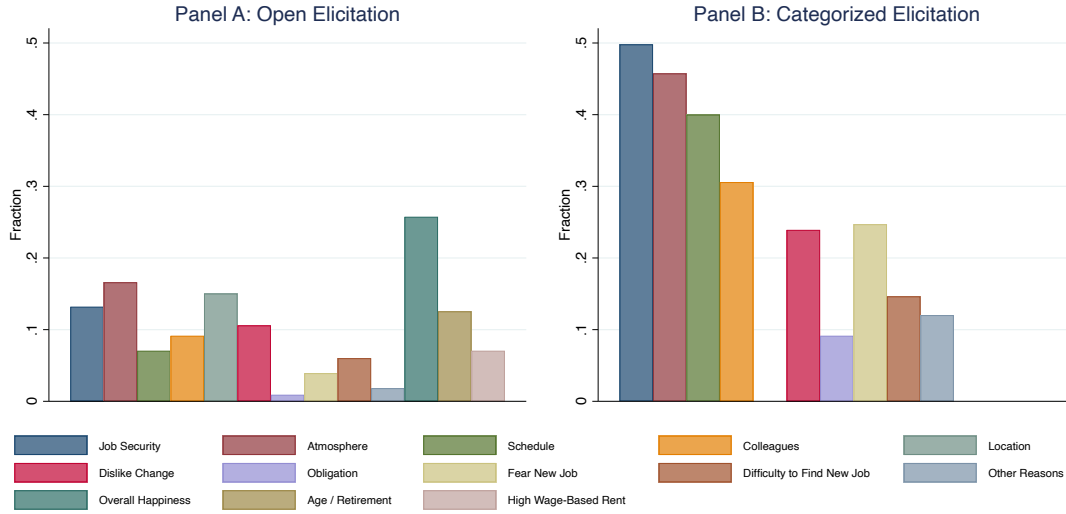
Note: This figure reports the cumulative distribution function of biases in beliefs about the median pay in one's occupation separately for respondents in the incentive and no-incentive elicitation sample.

Figure A.19: Elicitation of Minimum Wage Changes to Switch Employer



Note: This figure reports data from the conducted robustness survey. It plots the relationship between the minimum pay raise at another firm and the minimum pay cut at current their firm that would induce workers to quite their current job.

Figure A.20: Reason for Staying



Note: This figure reports the reasons for staying at the current employer. Panel A shows the reasons based on the open-ended elicitation, while Panel B shows the reasons based on the structured elicitation. The categorization of the reasons in Panel A was done manually—for a description of this categorization see section D.4, and for explanations and examples of the categories see Table A.7

D.4 Description of the Coding Scheme

The open-ended text responses are assigned into those response type categories that are also used in the categorical elicitation: i) "Job Security", capturing responses indicating that they seek security in staying with their current employer ; ii) "Atmosphere", categorizing answers that list the working atmosphere as reason to remain in their job ; iii) "Schedule", denoting flexible working time regulations and home-office options ; iv) "Colleagues", representing an excellent relationship with co-workers ; v) "Dislike Change", including all responses stating convenience or general dislike of change as reasons for staying ; vi) "Obligation", classifying emotional attachment and/or loyalty to the employer. ; vii) "Fear New Job", indicates that participants dislike adapting to new working environments. ; viii) "Difficulty to Find New Job", grouping those participants who indicate that they do not believe in finding a higher paying job for themselves.

Next, four frequently occurring responses that do not fit in any of the initial categories or justify a separate classification are categorized separately: i) "Location", summarizing all responses that list proximity to current workplace as a reason why to stay, as well as family reasons ; ii) "Happiness", categorizing all answers that state a not justified level of happiness at their current job iii) "Age/Retirement", indicating that an advanced age makes switching jobs less attractive iv) "High Wage-Based" Rent, indicating responses which mention high fringe benefits, income, and excellent company pension plans.

Last, all residual reasons are captured by the category “Other Reasons”. Table A.7 summarizes these categories in the order used in Figure A.7 and provides example responses.

Table A.7: Reasons for not switching jobs: Open Elicitation

Category	Explanation	Examples
Job Security	The job at the current employer is secure. Switching jobs will increase the risk of being unemployed.	- <i>At the moment, I am not yet ready to give up the security of my current employment relationship</i> - <i>my job is safe and that is worth a lot</i>
Atmosphere	The working atmosphere at the current employer is enjoyable.	- <i>I like the working atmosphere</i> - <i>Family business</i>
Schedule	The working time regulation at the current employer is flexible. Home-Office is possible.	- <i>good working hours</i> - <i>good work-life balance</i>
Colleagues	Enjoy working alongside my peers.	- <i>Have a great work colleague and I wouldn't want to miss her.</i> - <i>I don't think I would find a team like that again</i>
Location	The location of the employer is close to home / No need to commute / Family prevents participant from moving	- <i>Then I would have to commute</i> - <i>3 children</i> - <i>family reasons, proximity of the workplace</i>
Dislike Change	Being too convenient to apply for new jobs or disliking change in general	- <i>No desire to write applications</i> - <i>The only reason is convenience.</i>
Obligation	Participant feels emotionally obligated to stay at current employer.	- <i>Loyalty</i> - <i>Am loyal to my employer.</i>

Note: see end of the table

Category	Explanation	Examples
Fear New Job	Dislike to adapt to new tasks / colleagues / superiors	<ul style="list-style-type: none"> - It is too cumbersome to take a new job - In addition, I might have to familiarize myself with new topics.
Difficulty to find new Job	Difficulty to find higher paying job.	<ul style="list-style-type: none"> - Am a civil servant - I think it's the same in every nursing home as it is with us
Other Reasons		<ul style="list-style-type: none"> - personal goals, career prospects in current job - Just recently switched
Overall Happiness	Not further justified version of "I am happy in my job"	<ul style="list-style-type: none"> - am completely satisfied - why should i? i am highly satisfied with my current professional situation
Age / Retirement	Being at an age / close to retirement / in retirement so that switching jobs is not worth it	<ul style="list-style-type: none"> - retiring soon - my age, would not like to switch jobs so close to retirement
High Wage-Based Rent	Having high income / fringe benefits / company pension plan	<ul style="list-style-type: none"> - I get the best salary here. At other jobs I get less than here - I am particularly satisfied with the fringe benefits and the company pension plan.

Note: This table provides an overview of the categories, their explanations and examples used in the manual categorisation creating Panel A of Figure A.20.

E Personnel Manager Survey

We conducted a survey with personnel managers to shed light on three distinct questions. First, what are firms' reservation wages for different types of workers? Second, what are firms' beliefs about workers' reservation wages? Third, how elastic is turnover in response to wage hikes or wage cuts? While our HR manager questionnaire features richer information on firms' wage setting, rents, and outside options, we focus only on a small subset of questions in this Appendix Section.

E.1 Sample

As a complement to our worker-level survey, we conducted a survey of German personnel managers with Luc.id, a professional survey company widely used in social science research (Haaland, Roth, and Wohlfart, 2021). In total, 187 personnel managers completed the survey. To ensure high data quality, we dropped respondents in the bottom and top 2% of the response time distribution, leaving us with a sample of 177 personnel managers. Our survey was conducted in May 2021. The mean age of our HR managers is 35. 49% of them are male and 35% of them have a university degree. This data collection will be supplemented with a new data collection covering firm managers' perceptions of rents and outside options of workers, conducted in collaboration with Randstadt and the ifo Institute in Munich this fall.

E.2 Firm Reservation Wages

Design To measure firms' reservation wages for workers, we elicit how firms would adjust the wages of workers who receive outside offers. Since we are interested in the distribution of firms' potential wage adjustments, we elicit the reservation wages on the firm side for three different types of workers. First, we ask our respondents to imagine a typical worker. To fix beliefs and make the questions easier to answer for our respondents, we then elicit beliefs about the characteristics of this typical worker. We subsequently ask them the following question to measure their willingness to increase the worker's wage in response to an outside offer:

Imagine that this typical employee in your company has received an offer to move to another company. Would you be willing to pay this employee more, permanently, so that this employee does not change the position? [Yes/No]

[If yes] How much more (in percent) would your company be willing to pay this typical employee more on a permanent basis so that this employee does not change jobs?

To understand why some firms are not willing to increase the wages of their workers, we follow up with the following question:

Why would you not increase the worker's salary (further) in response to an outside offer? Please select all answers that apply.

- A pay increase would lead to a salary higher than the worker's productivity.
- Other employees would find the salary increase unfair.
- Other employees would also demand salary increases.
- Salaries are regulated by a collective bargaining agreement.
- Other reason: [open ended]

On top of this, we also elicit the same set of questions for different worker types: half of the HR managers receive the analogous reservation wage question for a recent hire in their company, while the remaining HR managers answer the analogous question for an experienced worker in their company.

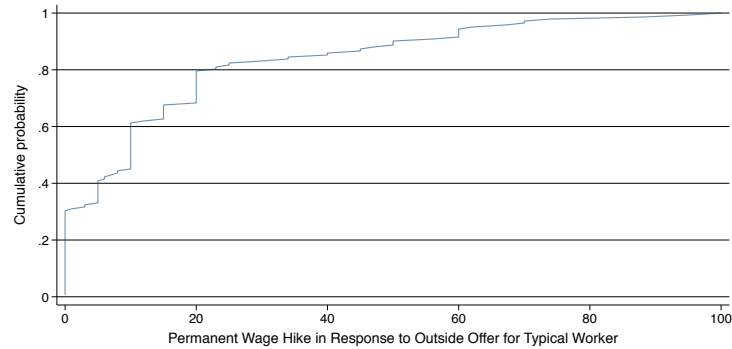
Results Figure A.21 present firm reservation wages for different types of workers. Consistent with the data on worker beliefs about firm reservation wages, we find that firms would not want to increase the wages for a large fraction of workers in their firm in response to an outside offer.¹

Panel (a) of Figure A.21 shows that 30.28% of firms would be unwilling to increase the wages of a typical worker in response to an outside offer. The median firm would be willing to increase the wages by 10% for a typical worker. Panel (b) of Figure A.21 shows that 50% of firms would be unwilling to increase the wages of a recent hire in response to an outside offer. Panel (c) of Figure A.21 shows that 28% of firms would be unwilling to increase the wages of an experienced worker in response to an outside offer. Just as for the typical worker, the median firm would be willing to increase the wages by 10% for the experienced worker. Taken together our evidence highlights that a large fraction of firms are unwilling to increase wages of their workers in response to outside offers.

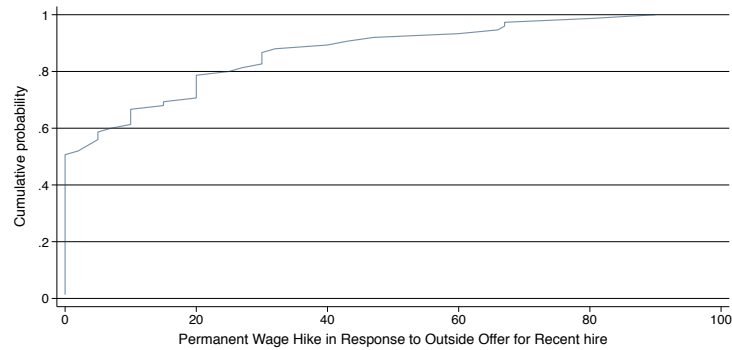
¹For this analysis, we drop 13 respondents who gave non-sensically high estimates of wage increases (above 100).

Figure A.21: Firms' reservation wages for workers

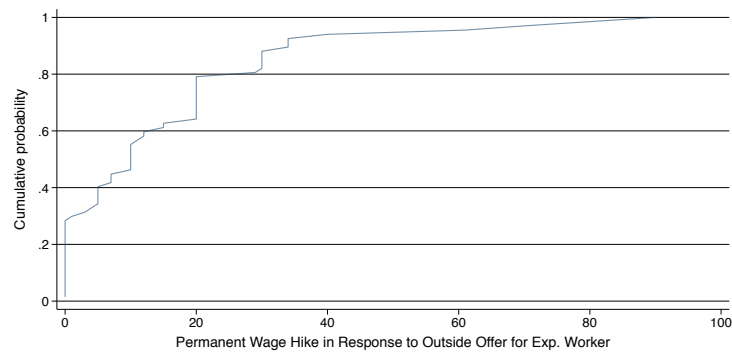
(a) Typical Worker



(b) Recent Hire



(c) Experienced Worker



Note: This figure reports firms' permanent wage hike for different types of workers for a hypothetical scenario in which the worker receives an outside offer. Panel (a) describes this cumulative distribution function for a typical worker, while Panels (b) and (c) depict those of a recent hire and experienced worker respectively.

Motives for not increasing salaries further A large fraction (46%) of HR managers say that it would not be profitable for them to increase the wages (e.g. they would in that case have to hire someone new or leave the position unfilled), or that it would not be profitable for them to pay more to this worker (34%). A very large fraction of HR managers (41%) also mention that other co-workers may perceive the increase in wages as unfair. A similarly large fraction of 31% report that negotiating with individual employees would trigger additional wage negotiations with other employees. Only 21% mention that regulation of wages through CBAs are the reason.

Our evidence is in line with the model in Cullen and Pakzad-Hurson (2021), where employers credibly refuse to pay high wages to any one worker to avoid costly re-negotiations with others, under a pay transparency policy. Thus, while our evidence suggests that firm surplus is relatively close to zero in a significant fraction of matches, the evidence does not suggest that wages equal worker productivity in those cases. Instead, our findings suggest that pay equity constraints and reputation or commitment effects may lead to the small firm surplus, i.e. wages close to firm reservation wages, in individual matches that we established.

E.3 Firms' Beliefs about Workers' Reservation Wages

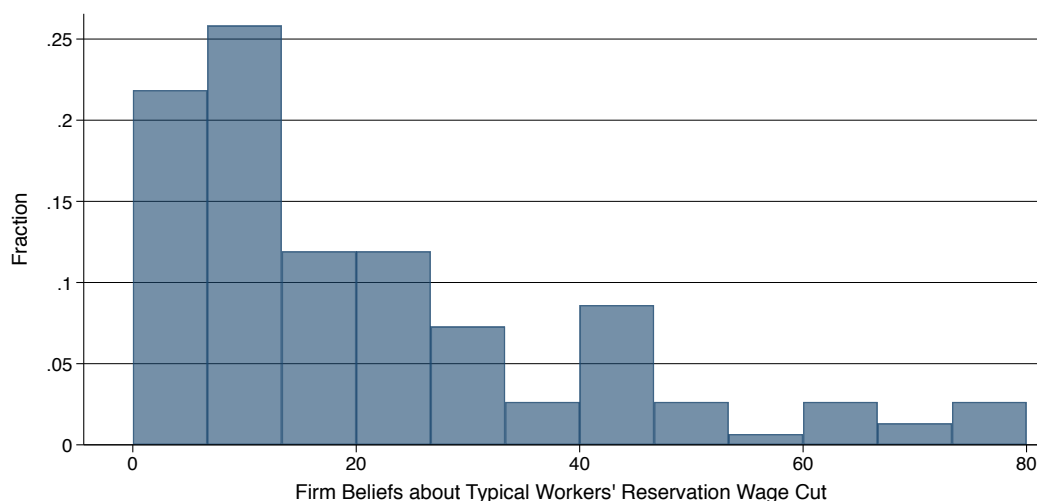
To shed light on firms' beliefs about workers' reservation wages, we also ask managers about hypothetical pay cuts and workers' tendency to quit in response to those. In particular, we leverage the following question:

Imagine that wages at your firm were permanently cut. This wage cut resulted from a change of the CEO in the company and was independent of the economic conditions in your industry. What salary cut would induce the typical employee in your firm to quit?

A typical employee in my firm would quit if salaries were cut by X%.

Our data reveals that firms' beliefs about the typical workers' reservation wages are reasonably well-aligned with our earlier data.² The median HR manager estimates that the typical workers' reservation wage corresponds to 15% of their salary, compared to 10% according to the median worker's response in our survey. The similarity in workers' subjective reservation wages and firms' beliefs about workers' reservation wages increases our confidence in the results.

Figure A.22: Firms' beliefs about typical worker reservation wages



Note: This figure reports firms' beliefs about the typical workers' responses based on the following question: "Imagine that wages at your firm were permanently cut. This wage cut resulted from a change of the CEO in the company and was independent of the economic conditions in your industry. What salary cut would induce the typical employee in your firm to quit? A typical employee in my firm would quit if salaries were cut by X%."

²We drop 13 respondents from this analysis who entered a non-sensical estimate large than 100 percent. Among the remaining responses, we winsorize the top 2% to further deal with outliers.

E.4 Firms' perceived Separation Elasticities

In models of monopsony or wage posting, firms set wages heavily relying on beliefs about turnover. To empirically quantify the relevance of wages for worker turnover (and thus also the importance of the perceived monetary outside option), we elicit firms' beliefs about separation elasticities. For this purpose, we ask several questions related to turnover:

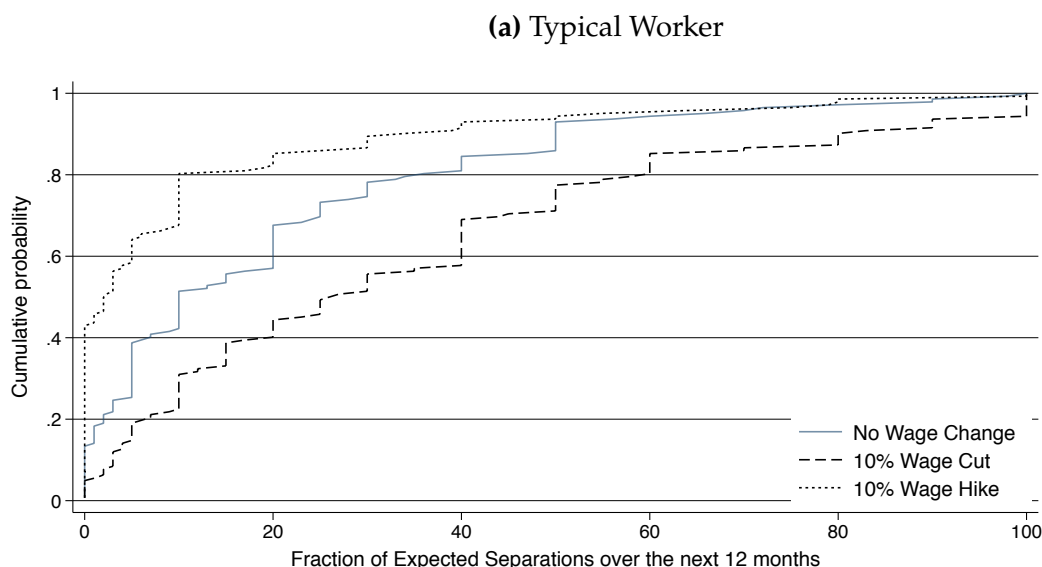
Imagine that wages at your firm remained unchanged. What share of employees would leave your firm within 12 months?

Imagine that wages at your firm were permanently lowered by 10%. What share of employees would leave your firm within 12 months?

Imagine that wages at your firm were permanently increased by 10%. What share of employees would leave your firm within 12 months?

Figure A.23 summarizes HR managers' beliefs about turnover under these 3 different hypothetical scenarios. The figure highlights that HR managers expect relatively high changes in turnover under the different pay policies. Under the no-wage-change scenario, the median HR manager expects 13% of employees to leave the company, compared to 27% under the 10% wage-cut scenario and 2.3% under the 10% wage-hike scenario.

Figure A.23: Firms' Reservation Wages for Workers



Note: This figure reports firms' beliefs about turnover within the next 3 months under three different hypothetical scenarios. In the "No-Wage-Change"-scenario, HR managers are asked to imagine "that wages at your firm remained unchanged". In the "10% Wage Cut"-scenario, HR managers are asked to "imagine that wages at your firm were permanently lowered by 10%". Finally, in the "10% Wage Hike"-scenario, HR managers are asked to "imagine that wages at your firm were permanently increased by 10%"

F Survey Questionnaires:

F.1 Survey Questionnaire: Innovation Sample (2019 Wave)

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 percent of those employees receive a

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

lower pay __%

same pay __%

higher pay __%

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 Euro)?

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

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 agency for work, we calculated the monthly wage of such employees. The typical monthly pay in your occupation is X Euros.

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 pay raise? (scale 0 to 100)

[Asked even if previous answer is 0] Imagine that you negotiate your salary with your boss for the next year. Which pay 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 consider 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 salary 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 salary negotiations with your current employer? (Y/N)

Frictions for Switching to Other Industry 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 salary. 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 salary?

- 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 would 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 receive 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 salary for me to leave my current employer.

Posterior About Personal 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.³ Do you think that you would find a job that would offer you a higher overall pay, the same pay or a lower pay?

- Higher pay
- Same pay
- Lower pay

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

Between 0 and 50 euros

³The 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. In the first version of our expert survey we used a somewhat different translation from German, which may have been somewhat less clear in conveying that the imagined separation should be exogenous. In particular, we used the wording: “Imagine that you had to quit your current job”.

Between 50 and 100 euros
Between 100 and 200 euros
Between 200 and 300 euros
Between 300 and 400 euros
Between 400 and 500 euros
Between 500 and 750 euros
Between 750 and 1000 euros
Between 1000 and 1500 euros
Between 1500 and 2000 euros
Between 2000 and 3000 euros
More than 3000 euros (in data normalized to 3500 euros)

Posterior About Personal 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.

F.2 Survey Questionnaire: Original German Version

General Beliefs About Outside Option 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 __%

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 Euro)?

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] Euro 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] Euro.

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 Other Industry 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 würde, 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 Arbeitsmarktreion, 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 About 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 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 50 und 100 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 100 und 200 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 200 und 300 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 300 und 400 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 400 und 500 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 500 und 750 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 750 und 1000 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 1000 und 1500 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 1500 und 2000 Euro mehr / weniger verdienen als in meinem jetzigen Job
Zwischen 2000 und 3000 Euro mehr verdienen als in meinem jetzigen Job
Mehr als 3000 Euro mehr verdienen als in meinem jetzigen Job [in data normalized to 3500 euros]

Posterior About Personal 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 ____%

F.3 Survey Questionnaire: Robustness Check Survey

Belief About Outside Option: GSOEP elicitation (50% of sample) Imagine that you were forced to leave your current job and that you had 3 months⁴ to find a job at another employer in the same occupation.⁵ Do you think that you would find a job that would offer you a higher overall pay, the same pay or a lower pay?

- Higher pay
- Same pay
- Lower pay

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

Between 0 and 50 euros

Between 50 and 100 euros

Between 100 and 200 euros

Between 200 and 300 euros

Between 300 and 400 euros

Between 400 and 500 euros

Between 500 and 750 euros

Between 750 and 1000 euros

Between 1000 and 1500 euros

Between 1500 and 2000 euros

Between 2000 and 3000 euros

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

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 are forced to leave your current job and had 3 months⁶ to find a job with another employer in the same occupation.⁷

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

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

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

⁴For 50% of respondents the time horizon is instead 12 months.

⁵For 50% of respondents the instructions do not condition on occupation and are instead given as follows: [...] months to find a job at another employer.

⁶For 50% of respondents the time horizon is instead 12 months.

⁷For 50% of respondents the instructions do not condition on occupation and are instead given as follows: [...] months to find a job at another employer.

Beliefs Co-worker Wage Changes: GSOEP 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%

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 Co-worker 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 would 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 consider 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 lays 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 euros? ____Euro

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 Euro)?

[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 Euro in panel points.

____ Euro

Think of all employees in Germany that work in the same occupation as you, but work at a different employer.⁸ 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 ____%

⁸50% 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.

F.4 Survey Questionnaire: Expert Survey

F.4.1 Randomised Sample Including AKM Questions

Expert Belief about Benchmark (AKM) Are you familiar with the estimation of AKM (Abowd, Kramarz, and Margolis, 1999) firm fixed effects on wages? (Y/N)

Abowd, J. M., Kramarz, F., & Margolis, D. N. (1999). High Wage Workers and High Wage Firms. *Econometrica*, 67(2), 251-333.

Part 1: Wage Changes of Switchers

We will now ask you some questions about the actual wage changes workers experience when switching jobs in the context of the German labor market over the years 2015 to 2019.

Beliefs about Wage-Based Rent Consider a typical worker at a typical firm and the following scenario: the worker is forced to leave her current job within three months and is looking to find a job at another employer.⁹ We define wage change as the percentage change between the wage at the next employer and the wage at the original employer.

What wage change would you expect for this worker?

Beliefs about Heterogeneous Wage-Based Rent (AKM) [Asked only if AKM is known] Now consider the same scenario, except that the worker is originally employed not in a typical firm, but in a firm with an AKM firm effect 10% lower / higher than the median firm (i.e. a 0.1 lower / higher firm effect).

Note: Firm effects are estimated by regressing log wages on individual and firm effects and are identified from workers switching across firms (Abowd, Kramarz, and Margolis, 1999). For our implementation in the German administrative data, we use the firm effects estimated following the methodology in Card, Heining, and Kline (2013).

What wage change would you expect for this worker?

[For all questions the answer possibilities are:]

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

Between 50% and 75% increase

Between 30% and 50% increase

Between 20% and 30% increase

Between 15% and 20% increase

Between 10% and 15% increase

Between 5% and 10% increase

Between 2% and 5% increase

Between 0% and 2% increase

⁹Here we cross randomized conditioning on occupation by asking half of respondents the following instead: [...] and is looking to find a job in the same occupation at another employer.

Same pay
Between 0% and 2% decrease
Between 2% and 5% decrease
Between 5% and 10% decrease
Between 10% and 15% decrease
Between 15% and 20% decrease
Between 20% and 30% decrease
Between 30% and 50% decrease
Between 50% and 75% decrease
More than 75% decrease (in data normalized to 87.5%)

F.4.2 Randomised Sample Excluding AKM Questions

Part 1: Wage Changes of Switchers

We will now ask you some questions about the actual wage changes workers experience when switching jobs in the context of the German labor market over the years 2015 to 2019.

Beliefs about Wage-Based Rent (no AKM) Consider a typical worker at a typical firm and the following scenario: the worker is forced to leave her current job within three months and is looking to find a job at another employer.¹⁰ We define wage change as the percentage change between the wage at the next employer and the wage at the original employer.

What wage change would you expect for this worker?

Beliefs about Heterogeneous Wage-Based Rent (no AKM) Now consider the same scenario, except that the worker is originally employed not in a typical firm, but in a firm in which workers who leave the firm, e.g., due to a quit or a layoff, experience on average a 10% wage increase / decrease (comparing wages at the next employer with wages at the original employer).

What wage change would you expect for this worker?

[For all questions the answer possibilities are:]

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

¹⁰Here we cross randomized conditioning on occupation by asking half of respondents the following instead: [...] and is looking to find a job in the same occupation at another employer.

Between 5% and 10% increase
Between 2% and 5% increase
Between 0% and 2% increase
Same pay
Between 0% and 2% decrease
Between 2% and 5% decrease
Between 5% and 10% decrease
Between 10% and 15% decrease
Between 15% and 20% decrease
Between 20% and 30% decrease
Between 30% and 50% decrease
Between 50% and 75% decrease
More than 75% decrease (in data normalized to 87.5%)

Part 2

We are interested in your predictions of workers' perceived rents and outside options in the labor market.

In our original data collection, we measured workers' subjective rents and their perceived outside options in the labor market.

Sample

Our sample is drawn from the German Socio-Economic Panel, which is a probability-based sample of the German population.

Our survey only includes respondents who are either in full-time or part-time employment and is representative of the population of interest.

The main wave of our study was conducted between September 2019 and December 2019.

F.4.3 Reservation Wage Cut

We will now ask you to predict the reservation wages of workers.

We asked the participants in our sample the following question:

Imagine that your current employer would 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 ____%

We will now ask you to make a guess about the 25th percentile, the median, and the 75th percentile of the response distribution. Note that your estimate for the 25th percentile should be smaller or equal to the estimate for the median, which in turn should be smaller or equal to the estimate for the 75th percentile.

Median Wage What do you think was the median respondent's answer? ____%

25th Percentile Wage What do you think was the 25th percentile of the response distribution? ____%

75th Percentile Wage What do you think was the 75th percentile of the response distribution? ____%

Heterogeneity: Rent 10% Wage Change [Only asked if randomised into the sample including AKM question and AKM is known]

What do you think was the median respondent's answer among respondents employed at a firm with an AKM firm effect 10% lower / higher than the median firm (i.e. a 0.1 lower / higher firm effect)? ____%

[Only asked if randomised into the sample excluding AKM question or randomised into the sample including AKM question and AKM is unknown]

What do you think was the median respondent's answer among respondents employed at a firm where workers who left the firm, e.g., due to a quit or a layoff, experienced a ten percent wage decrease / increase at their next job on average? ____%

F.4.4 Expert Belief about Perceived Personal Outside Option

We will now ask you some questions about what you think workers expect about their wage changes when quitting their job.

Belief about Wage Change when Quitting

We asked the participants in our sample the following question:

Imagine that you were forced to leave your current job and that you had 3 months to find a new job at another employer. 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 Euro

Between 50 and 100 Euro

Between 100 and 200 Euro

Between 200 and 300 Euro

Between 300 and 400 Euro

Between 400 and 500 Euro

Between 500 and 750 Euro

Between 750 and 1000 Euro

Between 1000 and 1500 Euro
Between 1500 and 2000 Euro
Between 2000 and 3000 Euro
More than 3000 Euros

Based on the responses to the above question, we construct implied percent wage changes by dividing the expected wage change in Euros (given by the midpoint of the above ranges) by the respondent's current wage.

Median Wage Change What do you think was the median respondent's implied expected percent wage change?

25th Percentile Change What do you think was the 25th percentile of the response distribution (where lower expected wage changes are lower in the distribution, and higher expected wage changes are higher in the distribution)?

75th Percentile Change What do you think was the 75th percentile of the response distribution (where lower expected wage changes are lower in the distribution, and higher expected wage changes are higher in the distribution)?

Heterogeneity: Rent 10% Wage Change [Only asked if randomised into the sample including AKM question and AKM is known]

What do you think was the median respondent's implied expected percent wage change among respondents employed at a firm with an AKM firm effect 10% lower / higher than the median firm (i.e. a 0.1 lower / higher firm effect)?

[Only asked if randomised into the sample excluding AKM question or randomised into the sample including AKM question and AKM is unknown]

What do you think was the median respondent's implied expected percent wage change among respondents employed at a firm where workers who leave the firm, e.g., due to a quit or a layoff, experience a ten percent wage decrease / increase at their next job on average?

[For all questions the answer possibilities are:]
More than 75% increase (in data normalized to 87.5%)
Between 50% and 75% increase
Between 30% and 50% increase
Between 20% and 30% increase
Between 15% and 20% increase
Between 10% and 15% increase
Between 5% and 10% increase
Between 2% and 5% increase

Between 0% and 2% increase
Same pay
Between 0% and 2% decrease
Between 2% and 5% decrease
Between 5% and 10% decrease
Between 10% and 15% decrease
Between 15% and 20% decrease
Between 20% and 30% decrease
Between 30% and 50% decrease
Between 50% and 75% decrease
More than 75% decrease (in data normalized to 87.5%)

F.4.5 Expert Belief about Pay Change of Co-Workers

We will now ask you some questions about what you think workers expect about the wage changes of coworkers switching jobs.

Beliefs about Coworker Pay Changes when Switching Jobs

We asked the participants in our sample the following question:

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

Higher pay

Same pay

Lower pay

[Asked only if previous answer is not "Same pay"] How much lower/higher would the monthly pay before taxes of this employee be (in percent) after the switch compared to his/her prior employer? Between 0% and 2%

Between 2% and 5%

Between 5% and 10%

Between 10% and 15%

Between 15% and 20%

Between 20% and 30%

Between 30% and 50%

Between 50% and 75%

More than 75%

For participants choosing "Same pay" we assume that their answer is zero.

Median Wage Change What do you think was the median respondent's answer?

25th Percentile Change What do you think was the 25th percentile of the response distribution (where lower expected wage changes are lower in the distribution, and higher

expected wage changes are higher in the distribution)?

75th Percentile Change What do you think was the 75th percentile of the response distribution (where lower expected wage changes are lower in the distribution, and higher expected wage changes are higher in the distribution)?

Heterogeneity: Rent 10% Wage Change [Only asked if randomised into the sample including AKM question and AKM is known]

What do you think was the median respondent's implied expected percent wage change among respondents employed at a firm with an AKM firm effect 10% lower / higher than the median firm (i.e. a 0.1 lower / higher firm effect)?

[Only asked if randomised into the sample excluding AKM question or randomised into the sample including AKM question and AKM is unknown]

What do you think was the median respondent's implied expected percent wage change among respondents employed at a firm where workers who leave the firm, e.g., due to a quit or a layoff, experience a ten percent wage decrease / increase at their next job on average?

[For all questions the answer possibilities are:]

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

Between 50% and 75% increase

Between 30% and 50% increase

Between 20% and 30% increase

Between 15% and 20% increase

Between 10% and 15% increase

Between 5% and 10% increase

Between 2% and 5% increase

Between 0% and 2% increase

Same pay

Between 0% and 2% decrease

Between 2% and 5% decrease

Between 5% and 10% decrease

Between 10% and 15% decrease

Between 15% and 20% decrease

Between 20% and 30% decrease

Between 30% and 50% decrease

Between 50% and 75% decrease

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