Firm Beliefs About Wage Setting

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This paper yields new insights into why similar workers are paid differently by surveying a representative sample of Danish firms and linking responses to administrative data. We find that a substantial minority of firms, about 18 percent, have inaccurate beliefs about their position on the wage distribution. Inaccurate beliefs are more likely to occur in smaller firms. We study the implications of firms' inaccurate beliefs by building a simple model with monopsonistic firms. Using our survey, we elicit firms' motives for setting high wages. The dominant motive aligns with wage posting models, i.e., to retain and attract new employees. Compensating for negative job characteristics is the least common motive.

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1. Introduction

Employers offer different wages for identical work. This holds across worker groups, over time, and across countries, making it one of the most important recent findings in labor economics (Kline 2024). Driven by the evidence, recent studies of wage setting reflect the paradigm shift from “markets set wages” to “firms set wages" (Card 2022).

To make progress on the importance of firms in wage inequality, the empirical literature has used high dimensional fixed effects methods.[1] However, this literature does not yet provide solid evidence on whether employers even perceive these differences in wages across firms or their motives for choosing specific wage policies. Understanding whether firms have accurate beliefs about their relative wage levels and their motives for choosing them is important for several reasons. First, firms with inaccurate knowledge about the market wages can be a source of wage dispersion (Cullen, Li and Perez-Truglia 2024). Comparing what firms think to their actual position—whether firms have accurate or inaccurate beliefs—is one way to measure the extent of information frictions on the *firm side* as a factor contributing to wage inequality. There are reasons to believe that frictions on the firm side can be non-negligible. Indeed, in labor market without extensive centralized wage bargaining, where it is illegal for firms to share information regarding their workers’ wages, and where posted wages on job search platforms are rare, firms could have difficulties to have precise knowledge on their own firm wage differences compared to their competitors.[2] Second, eliciting firms’ motives for setting higher or lower wages than competitors is useful, as it allows us to determine whether their subjective motivations align with theoretical frameworks explaining wage dispersion across firms, such as search frictions, compensating differentials, and efficiency wages.

To our knowledge, this paper offers the first large-scale and representative evidence on how employers perceive their wages and their reasoning for setting higher or lower wages than other firms. We do so by designing and implementing a representative survey of firms. We conducted the survey in the Summer of 2021 and use several tests to validate the quality of the data. The sample contains elicited firms’ beliefs for about 2,800 firms. The main question that we use is: "Do you think this company offers lower

[1] See among others, Lachowska, Mas, Saggio and Woodbury (2022, 2023); Di Addario, Kline, Saggio and Sølvsten (2023).

[2] Batra, Michaud and Mongey (2023) document that 6 percent of online job posts contain point wage in the U.S. Caldwell, Haegele and Heining (2025a) estimate that it is about 2 percent. Firm-specific wage information on job ads is also very rare in job posts in Denmark.

or higher wages than competing companies in your industry? Competing companies are other employers that hire people with the same abilities in your region." Firms must respond on a five-point scale (from much lower to much higher). Crucially, we link our survey to administrative data that allows us to benchmark firms' beliefs to objective measures of their wage policy. When firms declare that they pay higher or lower than competitors, we ask why, with the possible answer being in line with different canonical models from labor economics.

The first insight of the paper is that a substantial minority of firms have inaccurate beliefs about their position in the wage distribution. Some firms think they pay higher wages or lower wages than their competitors, whereas the administrative data show the opposite, and some firms believe they pay "About the same" as their competitors even though they are positioned in the tails of the wage distribution. Labeling firms' beliefs as inaccurate necessarily involves a subjective judgment by the researcher. We find similar results when using different objective measures of firm wages. When we vary the definition of the relevant labor market to define competitor firms, the choice of objective wage measure from administrative data, or the threshold for classifying beliefs as inaccurate, the percentage of firms with inaccurate wage beliefs ranges from 15% to 33%. A heterogeneity analysis reveals that a strong predictor of the extent of inaccurate beliefs is the size of firms (number of employees). Small firms are more likely to hold inaccurate beliefs. We develop a simple differentiated demand model of the labor market where we deviate from the literature (see Kline (2025) for a recent review) by assuming that firms hold subjective beliefs about the prevailing market wage. This model predicts, and we find suggestive evidence in the data, that a higher degree of inaccuracy in beliefs in the economy could lead to misallocation of labor and more dispersion in productivity.

The second insight of the paper is that the most common motives for paying high wages are in line with theories emphasizing search frictions, and only a minority do so to compensate for negative job characteristics. Specifically, about 90 percent offer high wages to retain employees and to attract the best candidates. Around two-thirds pay higher wages to increase morale, reduce the need for monitoring, and share rents. About 20 percent state they pay higher wages to compensate for negative job traits. The most common reason (59 percent agree and 16 percent disagree) employers give for offering lower wages than other firms is the inability to pay higher wages due to low demand or high competition in the product market. This is in line with recent empirical evidence that show a "hockey-stick" pattern between wage premiums and firm productivity (e.g.,

Card et al. (2016); Casarico and Lattanzio (2024); Boza and Reizer (2024)). The second most relevant motive (55 percent agree and 19 percent disagree) is the importance of positive job amenities. This finding aligns with recent work investigating the dynamics of wage and non-wage components and amenities provision (discussed below). The lack of competition in the labor market matters less, as less than 15 percent of low-wage employers say they do not need to raise pay because there are few competing employers.

1.1. Contribution to the literature

This paper contributes to the growing theoretical and empirical literature on how firms differ in pay and amenities (e.g., Abowd et al. (1999), Bagger and Lentz (2019), Sorkin (2018), Taber and Vejlin (2020), Morchio and Moser (2023)). An expanding body of evidence indicates that firm-specific wage effects play a significant role in shaping wage inequality (Kline (2024)).

The contribution of amenities to firm-specific wage differentials remains a subject of debate (e.g., Lamadon et al. (2022), Bassier et al. (2022), Caldwell et al. (2025b)). Our findings suggest that the key assumptions of the canonical Burdett–Mortensen model (Mortensen 2003), namely that firms design wage policies to attract new workers and retain existing employees, are the predominant drivers of wage-setting behavior. In contrast, compensating differentials for undesirable job attributes appear to play a more limited role.

The literature on firm wages and inequality has focused on worker-side frictions, such as limited information about labor market conditions (e.g., Jäger et al. (2024a), Miano (2023), Caliendo et al. (2024), Mueller et al. (2021), Menzio (2023), Braun and Figueiredo (2022)). Evidence on firm-side frictions and their role in wage inequality is comparatively scarce.[3] A few studies provide insights into how firms gather and utilize labor market information. Hjort, Li and Sarsons (2020) and Hazell, Patterson, Sarsons and Taska (2024) findings suggest that firms often maintain consistent wage policies that exhibit limited responsiveness to local labor market conditions. Closely related, Cullen, Li and Perez-Truglia (2024) use a natural experiment to show that U.S. firms adjust entry wages when provided with a salary benchmarking tool. By focusing on the firm side, we believe this paper complements worker-level papers showing that workers have inaccurate beliefs about the external wage distribution.

[3] Friedrich and Zator (2024) and Bertheau et al. (2023) present evidence suggesting that firm-side frictions potentially impact firms' hiring difficulties.

2. A Firm Survey Linked To Administrative Datasets

2.1. Wage Setting in the Danish Labor Market

Before presenting our data, we describe the Danish labor market, including the Danish wage bargaining framework, salary benchmarking and transparency practices, and the importance of firm wage effects on wage inequality.

Minimum wage and collective bargaining. There is no national minimum wage in Denmark. Sectoral collective agreements covered 87% of private sector employees in 2017 (DA 2020). This coverage rate is comparable to other Scandinavian countries and approximately ten percentage points higher than in continental Europe (Bhuller, Moene, Mogstad and Vestad 2022). However, for 80% of covered employees, collective agreements establish only centrally bargained wage floors, that tend to be nonbinding, or provide no specific wage guidelines at all. Evidence collected in Jäger, Naidu and Schoefer (2024b) suggest that centrally bargained wage floors tend to be nonbinding in Europe. These wage-setting practices are referred to in Danish as "minimallønssystemet," "mindstebetalingssystemet," and "uden lønsats." [4] For the remaining 20% of the workers, the sectoral level agreements set out all the main terms, including wages ("*normallønssystemet*"). Therefore, as summarized in (Mortensen 2003, page 83), Dahl, Le Maire and Munch (2013) and Labanca and Pozzoli (2022), wages are negotiated mainly at the firm level in Denmark.

Salary benchmarking and salary transparency. As in the US (Cullen 2024), firms are prohibited from sharing information regarding their workers' wages with other firms (Datatilsynet 2023). The employer association Dansk Arbejdsgiverforening (henceforth DA) provides the main salary benchmarking tool based on detailed wage information submitted by its members. Based on discussions with employees at DA, we learned that only a small minority of DA members use the salary benchmarking tool. To our knowledge, DA is the only provider of large-scale salary benchmarking surveys in

[4] This contrasts with some European countries. For instance, Gautier (2017) documents roughly 3,000 collective wage agreements in France. *The General Agreement* sets the framework for collective agreements. The General Agreement is signed between the Danish Confederation of Trade Unions (LO, since 2019 named the Danish Trade Union Confederation "*FH*") and the Danish Employer Confederation (DA). The General Agreement established the rules for issues the labor code would regulate in many other countries.

Denmark.[5] Firms in Denmark must prepare wage statistics and share them with their employees. However, there is no such transparency at the job application level. For instance, it is difficult to find a posted wage in the two most relevant job search platforms in Denmark (Jobindex and Jobnet). Hence, employers cannot learn about the wage policy of their competitors through mandatory wage range posting like, for instance, in Austria (e.g., Frimmel, Schmidpeter, Wiesinger and Winter-Ebmer (2024)).

Wage inequality and firm wage effects. Table A.1 reports that about 6 percent of the variance of wages in Denmark between 2015 and 2021 is explained by firm wage effects, when variance components are estimated using the method developed by Kline et al. (2020). Our estimates are in line with previous estimates (e.g., Sørensen and Vejlin (2013), Lentz, Piyapromdee and Robin (2023) and Morin (2023) reports that firm effects explain about 8% to 14%.). Overall, although still significant, the role of firms in explaining wage inequality is somewhat less important in Denmark compared to other countries (Palladino et al. 2025; Kline 2024).

2.2. Measuring Firm Beliefs About Wage Setting

We now describe our survey, which elicits firms' subjective beliefs about their relative wage level and their motives for choosing a specific wage level.[6]

Population Studied. The target population is private and public limited companies (ApS, *Anpartsselskab* and A/S, *Aktieselskab*) in Denmark that were active in the first quarter of 2021. We did not send the survey to firms in the agricultural and mining sectors or to sole-proprietorship companies (self-employed, *"Enkeltmandsvirksomhed"*).

Implementation. The international consulting company Ramboll conducted the online survey by sending invitations to companies in June 2021, using the official Danish email system *"e-boks"*. Online surveys give respondents more flexibility to complete the survey and are less subject to social desirability bias. The coverage error, the difference between the potential pool of respondents and the target population, should be zero, as firms must be able to receive digital mail from the authorities (e.g., the tax authority). Firms' email addresses (via e-boks) are publicly available at datacvr.dk. As all firms are

[5] The largest companies in Denmark conduct their own surveys, as it has been documented in the US by Bewley (page 92).

[6] When designing the survey, we followed Stantcheva (2023) on how to run a survey.

sampled, the planned sample corresponds to the potential pool of respondents.[7] The survey closing date was at the beginning of August 2021, and a couple of reminders were sent in July 2021 to increase the response rate.

The email included an invitation letter with details about the survey, such as the completion deadline, the incentives for the respondents (i.e., receiving an anonymized benchmark report), and compliance with data protection rules. The letter was designed to recruit as many respondents as possible, minimize selection bias, and appear legitimate and trustworthy. To do so, the actual topic of the survey was kept vague, and simple language was used to minimize selection bias. The University of Copenhagen logo was visible, and we explained that all data generated would be handled in compliance with data protection rules.

Questionnaire. In addition to the questions considered in this paper, the survey also contained questions on firm beliefs about layoffs, wage cuts, and hiring constraints. The answers to these questions are analyzed in Bertheau, Kudlyak, Larsen and Bennedsen (2025) and Bertheau, Larsen and Zhao (2023). The survey also contained questions about the respondent (job function in the company, knowledge of HR policies) and firm characteristics. We use these to ensure that the respondents are in a relevant position and check their answers on firm size or change in revenue against administrative data to ensure that the respondents are knowledgeable about the state of the firm.

2.3. Measures of Firm-level Wages and Firm Characteristics

We link the survey to administrative datasets using the firm-level identifier, the CVR number. This allows us to construct objective counterparts to the beliefs elicited in the survey.[8]

Measuring hourly wages. We use the dataset *IDA ansættelser* (IDAN) dataset to measure workers' annual earnings, hours worked, and occupation codes linked with firm identifiers. It contains information on the worker-firm-year frequency for all workers. Earnings is defined as pre-tax labor earnings subject to labor income taxation. Hours worked include annual paid hours (i.e., contractual and overtime hours).

[7] The only variation coming from the target population to the actual sample is a non-response error. Non-response errors come from respondents ignoring the invitation or answering that they don't want to participate.

[8] The data provider is Statistics Denmark.

Measuring firm characteristics. We focus on firms (not establishments) as this corresponds to the survey's sampling unit. We use the dataset *Generel firmastatistik* (FIRM) to measure firm age, location, industry categories, revenue, and value added (revenue minus expenses for intermediate inputs). Worker characteristics are obtained from several registers (IDAP, IND, UDDA, BFL). We measure workforce characteristics by aggregating worker-level information at the firm level.

2.4. Sample Description

Our dataset is unique as we precisely measure a firm's wage policy with labor market data, firms' output with value-added data, and firms' characteristics coming from workforce characteristics.[9]

Sample selection. We focus on firms that employed at least one worker in 2019, 2020, and 2021. We exclude firms from three small sectors with limited competition. Specifically, we drop observations for mining and quarrying, electricity and gas supply, and water supply (codes B, D, and E in NACE Rev 2). We also drop firms located on Bornholm, a small island. Additionally, we restrict the sample to firms where firm wage effects can be identified following Abowd, Kramarz and Margolis (1999) (AKM). The estimation procedure for firm wage effects is described in Section 3.

From the survey, we include firms that respond to the question about the firm's beliefs about their wages compared to other firms and provide information on the respondent's job function. We also require that they answer a question about the change in revenue from 2019 to 2020. We compare their response to the actual revenue change based on administrative data and exclude observations with the largest absolute differences (top and bottom 1%).[10] In the survey, respondents also report their familiarity with HR practices at the firm. Specifically, they are asked the following question: "In the following questions, we ask about pay and employment practices. How close are you to such decisions?" There are three options. 1." I am responsible for wage and employment conditions." 2. "I am not responsible, but I know about wage and employment conditions" 3. " I know only a little about pay and employment conditions. We focus on respondents who reported options 1 or 2.

[9] For example, all paid hours are recorded, and earnings and hours are not top-coded. We measure labor productivity using value-added per full-time equivalent workers and not sales.

[10] Extremely incorrect responses suggest that the respondent lacks sufficient internal knowledge of the firm, rendering their answers an unreliable indicator of the actual knowledge level among the firm's management.

Overall, these sample restrictions ensure a focus on active firms with a well-defined industry and local labor market over several years, and respondents who are knowledgeable about the firm's HR practices.

Representatitiveness. Table 1 shows that the sample is representative of the population under study. Column 1 reports the number of employees, firm age, industry categories, and other characteristics of the firms in the population under consideration.[11] Column 2 reports the same statistics for surveyed firms. By comparing the number of observations in Columns 1 and 2, we infer that the response rate for the linked survey-administrative data is 9.11% (2802/30,732), which is high for non-mandatory government surveys.

An important statistic to note is that 30.4% of firms in our sample employ between one and ten employees. In comparison, among the 246 companies interviewed by Bewley (1999) between 1992 and 1994 in Connecticut, only 4% had between one and nine employees. Caldwell et al. (2025a) surveyed 772 German firms between 2021 and 2022, of which 8% had between one and nine employees. 91.8% of firms can be linked with value-added information (labeled "With Productivity" in Table 1). The wage distribution of the surveyed sample is representative of the population, as indicated by the mean log wages and the share of firms in the top quartile of the AKM firm wage effects (based on the population distribution and labeled 'AKM Wage Effects (Q4)'). Overall, the sample includes firms of varying sizes, ages, industries, and wage levels.

Correcting for non-response bias. Despite the high degree of representativeness of our surveyed sample, we use an entropy-balancing estimator (Hainmueller and Xu 2013) to reweight observations to perfectly match the population of firms for key firm characteristics: number of employees, age, percentage of firms in different sectors (manufacturing and services), average hourly wage, firm wage premiums (estimated from an AKM model, presented below) and a dummy for being located in Copenhagen. Column 3 reports the characteristics of the weighted sample. The reweighting makes the sample more representative to the population of Danish firms. We use these sampling weights throughout the remainder of the paper.

Table 1 also describes some key variables from our survey. 84% of respondents are managers or owners of the company. Around 8% think they pay lower wages, 75% think

[11] Firms are classified following the NACE Rev 2 classification at the first level of aggregation. Due to the small number of firms in some industries, we combine finance (code K) and real estate (code L). We also combine other services (code S) with arts, entertainment, and recreation (code R).

they pay higher wages, and 17% think they pay higher wages than their competitors.[12]

Survey validation. We compare responses from the survey to administrative data to assess respondents' general level of knowledge about the state of their firm. Specifically, we use the question "How much did revenue change in 2020 compared to 2019?" and compare it with the administrative data on revenue changes in the same period. Figure A.1 shows respondents understand their companies' financial situation well. Less than 10 percent of firms that report revenue growth from 2019 to 2020 have experienced a decrease in revenue.

3. Firms Knowledge About Their Position in the Wage Distribution

In this section, we compare firms' subjective beliefs about their wages to objective benchmarks and assess their accuracy. We also document the predictors of inaccurate beliefs. We begin by describing the subjective and objective firm wage measures.

3.1. Subjective and Objective Measures of Firm Wage Levels

Subjective Wage Measures from Survey data. The survey questionnaire elicits firms' beliefs about their position in the wage distribution using the following question:
"Do you think this firm offers lower or higher wages than competing companies in your industry? Competing companies are other employers that hire people with the same abilities in your region."
Respondents have five options: "Much lower", "Lower", "About the same", "Higher", and "Much higher". The original Danish questionnaire is reported in the Appendix C. With this wording, we focus on a specific aspect (their beliefs about the firm's relative wages) while keeping all other factors as consistent as possible. Specifically, we provide a clear framing for respondents by stating that we are interested in within-industry variations and by defining what constitutes a competitor in a way that can be mapped to administrative data.

Objective Wage Measures from Administrative Data. Our main measure of firm-level wages is the mean hourly wage adjusted for worker composition. Specifically, we regress the mean hourly wage in 2021 on the firm's average workforce characteristics (age and

[12] Appendix Table A.2 shows firm characteristics by firm beliefs about their wages compared to their competitors.

TABLE 1. Characteristics of The Target Population and Surveyed Firms

	Population	Surveyed	Surveyed (Weighted)
Number of Employees (%)			
1-10	36.6	30.4	33.4
11-50	49.8	51.1	51.8
51-200	10.8	14.2	12.0
201+	2.8	4.2	2.8
Firm Age (%)			
1-10	33.9	25.0	32.5
11+	66.1	75.0	67.5
Industry (%)			
Agriculture	1.9	1.7	2.3
Manufacturing	13.7	17.0	13.7
Construction	16.9	14.3	16.1
Trade	25.8	25.7	24.3
Transport	4.8	5.2	5.3
Accomodation and Food Services	7.0	4.0	6.0
Information Services	6.7	8.1	8.6
Finance and Real Estate	3.4	1.9	1.9
Professional Services	8.4	11.5	10.5
Administration Services	5.6	6.4	7.0
Other Services	2.6	2.1	2.5
Health	3.1	2.0	2.0
Other Firm Characteristics			
Log Wages	3.4	3.4	3.4
AKM Wage Effecs (Q4)	25.0	25.4	24.7
With Productivity	87.9	91.8	90.7
Productivity (in Th. EUR)	103.4	111.6	103.9
Copenhagen area (%)	27.5	25.7	27.5
From Our Survey (%)			
Manager respondent		83.5	84.3
Lower wage		8.2	8.6
About the same		74.6	74.5
Higher wage		17.2	16.9
Observations	30,732	2,802	2,802

Note: This table reports the mean characteristics of surveyed firms and the population of firms considered. Column 1: the eligible study population of firms consists of all Danish limited liability companies in the industries listed in the table. Column 2: firms that responded to our survey linked to administrative employer-employee data. Column 3: Weighted sample. See text for details.

education), as well as on average hours, the fraction of females, and the mean worker fixed effects retrieved from an AKM model. We control for these characteristics to ensure that wage measures match the wording of the questionnaire as closely as possible. The survey question defined a competitor firm as a firm within the same industry and region. To define regions and indutries, we use the five administrative regions (corresponding to the five main "local" labor markets), and the 12 industries shown in Table 1.[13] Worker fixed effects (a time-invariant portable component of wage ability), are estimated from an AKM model of the following form

$$Y_{it} = X'_{it}\beta + \alpha_i + \psi_{j(i,t)} + \varepsilon_{it} \tag{1}$$

where Y_{it} are the log hourly wages of worker i in year t, X_{it} are year dummies and quadratic and cubic terms in age fully interacted with four levels of educational attainment.[14] α_i is a worker effect, $\psi_{j(i,t)}$ is a firm effect (a time-invariant firm-specific relative wage premium), and ε_{it} is a time-varying error term capturing shocks to human capital, person-specific job match effects, and other factors.[15]

3.2. Firms' Beliefs About Relative Wages

Figure 1 reports the main findings on firms' beliefs about their position in the wage distribution. The x-axis presents survey responses gathered in three groups. We group "higher" and "much higher" in one category. We do the same for "lower" and "much lower", due to very few extreme answers. The y-axis presents the percentage of firms in quintiles of mean firm wages (adjusted for workforce characteristics).

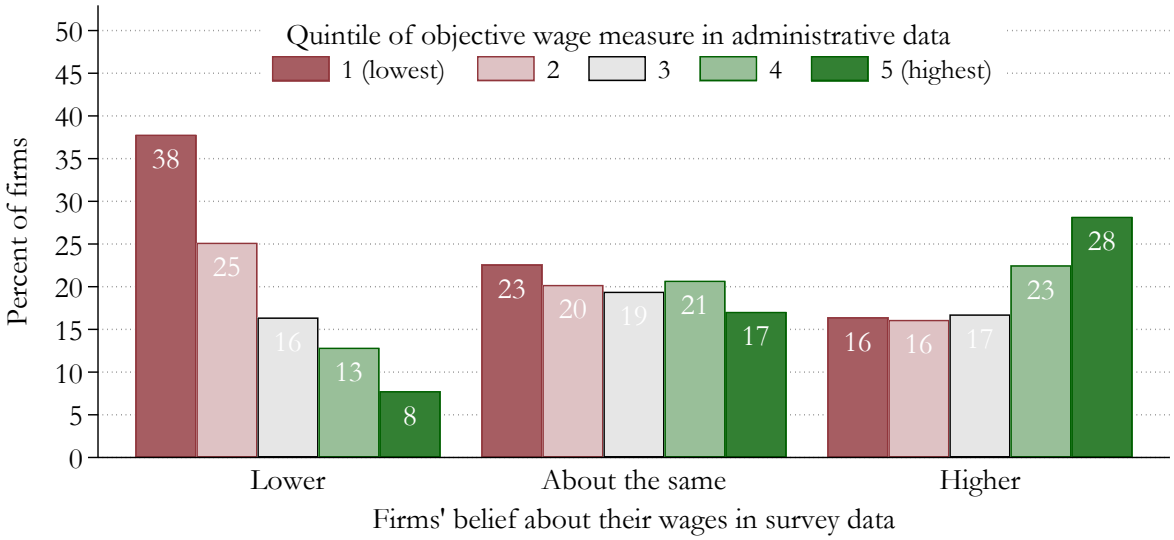
Of the firms that think they pay lower wages than other firms (8.2% of the 2802 observations), 38% are in the lowest quintile of objective wage measure, and only 8% are in the highest quintile. There is a clear relationship between what firms think and their actual rank in the wage distribution for firms that think they pay lower wages than

[13] Public sector-related industries (teaching, public administration), as well as small and specific (utilities, mining) industries, are excluded. Also, we combine some industries (finance with real estate and arts and entertainment with other services).

[14] The four groups are lower secondary, upper secondary and vocational training, bachelor and short-cycle tertiary education, and Master, Ph.D., or equivalents. We focus on individuals between 20 and 60 years of age who are not students. We select the main employer for each person for each year (the main employer is based on the highest annual earnings).

[15] Identification of the model parameters relies on a sample where firms form a connected network. Every firm must have at least one worker who moves to another firm in the sample, ensuring that all firms are linked through a chain of worker moves. To observe enough moves, the sample includes observations from 2015 to 2021.

FIGURE 1. Firms' Beliefs About Their Wages And Objective Wages



Notes: This figure shows the percentage of firms in each quintile of an objective wage measure calculated from administrative data grouped by firms' beliefs about their own wages in survey data. The objective wage measure is the mean average hourly wage, adjusted for workforce composition, quintiles are calculated within industry-local labor market cells (see Section 3.1 for details). 'Lower' indicates firms that believe they pay lower or much lower wages than their competitors, while 'Higher' refers to firms that believe they pay higher or much higher wages. The sample consists of 2,802 firms.

other firms. However, firms reporting paying about the same (74.6% of observations) have less accurate knowledge. Instead of an inverted U-shape pattern, which we would expect if firms have precise knowledge of their wages compared to other firms, we find a flat pattern across the objective wage distribution. 23% of firms that think they pay about the same are ranked in the lowest quintile, and 19% of firms that think they pay about the same are in the third quintile. Finally, the distribution of firms that think they pay higher wages (17.2% of observations) exhibits the pattern we would expect if firms tend to have some knowledge of their position in the wage distribution. 28% of firms are located in the highest quintile and about 16% are located in the lowest quintile.

Figure A.2 plots the three survey responses (lower, about the same, and higher) by deciles of the objective wage measure (constructed as in Figure 1). Splitting into deciles reveals that the aggregation into quintiles does not drive the result in Figure 1.[16]

[16]Table A.3 reports linear probability model controlling for respondent's charactersitics instead of simple percent of firm by decile.

Alternative Objective Wage Measures. Figure A.3 plots the percentage of firms in each quintile of an objective wage measure using four alternative definitions. Panel A is based on firm-level mean wages adjusted for education and age of the workforce (and not additionally adjusted by work hours, gender composition, and the worker fixed effects as in Figure 1). The results are similar, though an even higher proportion of firms reporting lower wages fall into the lowest quintile (46% vs. 38%), and a larger share of firms reporting higher wages fall into the highest quintile (30% vs. 28%). Panel B presents results based on unadjusted firm-level wages. Panels C and D use the estimated AKM firm fixed effects from Equation 1.[17] The results across the alternative measures are consistent with those shown in Figure 1.

3.3. Measuring the Accuracy of Firms' Beliefs

Since our question does not include a quantitative scale, comparing survey responses to objective wage measures is not straightforward. However, despite this limitation, our linked survey-administrative data still provide insights into the extent of inaccurate beliefs about a firm's relative wages, given certain assumptions about the threshold at which divergence between subjective and objective measures constitutes an inaccurate belief. In our main definition, a belief is considered inaccurate if a firm perceives its wages as high (or low) while being in the bottom (or top) quintile of mean wages in the matched employer-employee data. Additionally, when a firm reports its wages as "about the same", the belief is considered inaccurate if it is in either the bottom or top decile. As in Figure 1, the mean wage is the firm-level average hourly wages in 2021 (adjusted for workforce characteristics).

Table 2 reports the extent of inaccurate beliefs. The table indicates that 6.58% of firms underestimate their own wage compared to their competitors', while 11.56% overestimate it. This results in a total of 18.15% of firms holding inaccurate beliefs about how their wages compare to those of other firms. Changing the definition of what constitutes inaccurate beliefs yields a lower estimate of inaccurate beliefs to 16.27% and an upper estimate of 32.99%.

In the second column of Table 2, we assess the robustness of this finding using the estimated firm wage effect as the objective wage measure. Results are very similar, with a total of 17.92% of firms exhibiting inaccurate beliefs (and lower and upper estimates

[17] Firm effects can be noisy due to a lack of worker mobility across firms, we use a common sample restriction in the literature for Panel (D) and restrict the sample to firms with at least 10 movers over the period study (2015-2021) (Morchio and Moser (2023), Palladino et al. (2025), Boza and Reizer (2024)).

TABLE 2. The Extent of Inaccurate Wage Beliefs

	Mean wage	Firm Wage Effects
Baseline		
Underestimate	6.58	7.27
Overestimate	11.56	10.66
Total	18.15	17.92
Alternative 1.		
Underestimate	6.24	6.97
Overestimate	10.03	9.21
Total	16.27	16.19
Alternative 2.		
Underestimate	13.38	15.23
Overestimate	19.62	18.44
Total	32.99	33.67
Observations	2,802	2,802

Note: This table shows the percentage of firms that hold inaccurate beliefs about how their wages compare to those of their competitors. Under the row "Baseline", a belief is considered inaccurate if a firm perceives its wages as high (or low) while being in the bottom (or top) quintile of mean wages in the administrative data. When a firm reports its wages as "about the same", the belief is considered inaccurate if it is in either the bottom or top decile. Mean wage is the average hourly wages in 2021 (adjusted for workforce characteristics) as in Figure 1. The firm wage effect is the estimated AKM firm effects. Under the row "Alternative 1.", the top and bottom deciles (instead of quintiles) are used to determine inaccuracies for firms reporting paying higher or lower wages. The definition of inaccuracies for firms responding "about the same" is unchanged. Under the row "Alternative 2.", the top and bottom quintiles (instead of deciles) are used to determine inaccuracies for firms reporting paying "about the same". The definition for firms reporting paying higher and lower is the same as in the baseline.

of 16.19% and 33.67%, respectively). Table A.4 further examines how the percentage of firms with inaccurate beliefs changes when we refine the labor market definition. Specifically, while quintiles are still calculated within industry-local labor market cells, we increase the number of industry categories from 12 (as in Table 1) to 30. The results remain similar.

Overall, the analysis suggests that, regardless of the definition of the relevant labor market, the choice of wage measure, or the threshold for classifying beliefs as inaccurate, the proportion of firms with inaccurate wage beliefs ranges from 15% to 33%. While the majority of firms appear to have a relatively accurate understanding of the wage distribution (similar to the findings for workers in Jäger et al. (2024a)), imperfect information on the firm side is a prominent feature in the data.

3.4. Predicting Inaccurate Beliefs

Table 3 links the accuracy of firm beliefs and firm size. We use a linear probability model to document how the number of employees in a firm predicts the probability of firms having inaccurate beliefs, using the baseline definition from Table 2. We group firms into different size categories and use 11 to 20 employees as the baseline category.

TABLE 3. Inaccurate Wage Beliefs and Firm Size

	(1)	(2)	(3)
1-5 Employees	16.9***	16.0***	16.0***
	(3.5)	(3.5)	(3.6)
6-10 Employees	6.9***	6.3***	6.0***
	(2.2)	(2.1)	(2.2)
21-50 Employees	-6.2***	-5.7***	-6.2***
	(1.8)	(1.8)	(1.9)
51-200 Employees	-6.4***	-5.1**	-4.8**
	(2.0)	(2.0)	(2.2)
> 200 Employees	-8.0***	-6.1**	-5.5*
	(2.9)	(3.0)	(3.2)
Mean Wage Control	No	Yes	Yes
Additional Controls	No	No	Yes
Mean Dep. Var.	18.15	18.15	18.15
Observations	2,802	2,802	2,802

Notes: The table shows estimates from a linear probability model where the dependent variable is a binary indicator for inaccurate beliefs (as defined in Table 2, baseline). Firm size is measured by the number of employees. (1) includes only firm size indicators, with "11-20 Employees" defined as the baseline. (2) adds the mean wage (adjusted for workforce composition) as a control. (3) further incorporates region-industry fixed effects, firm age fixed effects, and variables reflecting the respondent's knowledge of the firm. Specifically, we control for the deviation between the respondent's reported firm revenue growth (2019–2021) and the actual growth rate from administrative data, the respondent's knowledge of the firm's HR practices, and the respondent's role in the company. Heteroskedasticity-robust standard errors are displayed in parenthesis. * p<0.1 ** p<0.05 *** p<0.01.

Column (1) shows that firms with fewer than 10 employees are more likely to misjudge their wage ranking. Firms with 1–5 employees are 16.9% more likely, and those with 6–10 employees are 6.9% more likely to have inaccurate beliefs compared to the reference group. Conversely, firms with 21–200 employees are about 6% less likely to

hold inaccurate beliefs, with the largest firms (at least 201 employees) exhibiting the lowest likelihood overall. Columns (2) and (3) add additional controls, but except for the largest firms, the results remain very similar.

Tables A.5 and A.6 present estimates from separate models using a binary variable that indicates whether a firm overestimates or underestimates its wage. The results indicate that both forms of misestimation contribute to the findings in Table 3, with the link between overestimation and firm size being the strongest.

3.5. Discussion of Findings

We are unaware of other studies assessing the precision of knowledge about pay. Even if the literature is growing, it is still rare in most cases to link survey data to administrative data. A useful comparison to our findings is the studies by Bewley (1999) and Cullen et al. (2024). Bewley, in his book (Bewley (1999), Chapter 7), reports interviews with approximately 100 to 150 employers about wage-setting in the 'external' labor market (as opposed to wage-setting within organizations)." His interviews led him to conclude that *"Employers' and workers' knowledge of external pay rates was normally vague"*.[18] He finds that the sources of information on competitors' wages vary significantly by firm size. Small firms (0–50 employees) typically rely on informal sources, while medium-sized and large firms (51+ employees) use pay surveys. Cullen et al. (2024) document that the use of salary benchmarking is widespread in the U.S. They find that access to benchmark information reduces salary dispersion by 25%. Interestingly, their sample mostly represents the top quartile of firms in the United States (the mean number of employees is 501). Our results show that small firms are more likely to hold inaccurate beliefs. Hence, access to information is likely to reduce salary dispersion to a greater extent for small and medium-sized firms.

In April 2023, the European Union voted on a directive on pay transparency. EU countries have up to three years to transpose the directive by adapting their national legislation to take account of the new rules. Among other things, the new rules will make it compulsory for employers to inform job seekers about the starting salary or pay range of advertised positions, whether in the vacancy notice or ahead of the interview.[19] In light of our evidence and the existing literature, greater access to and use of information about competitor wages could reduce wage dispersion.

[18] Bewley (1999), page 95.

[19] `https://www.consilium.europa.eu/en/policies/pay-transparency/`

4. A Model of Inaccurate Beliefs About Firm Wages

How can firms' misperceptions about the wages paid by their competitors affect misallocation in the labor market? To examine this, we introduce a differentiated demand model of the labor market as in Card et al. (2018) and Manning (2021), where we incorporate subjective firm beliefs about the general wage level. This section includes the main results; further details are described in Appendix B. The notation follows Manning (2021) closely.

Firm-level labor supply: Each firm posts a single wage, and workers then choose which firm to work for based on the wages posted, w_f, the firm-specific disutility from working, $\tilde{b}_f$, and an idiosyncratic taste shock. Assuming that the taste shock is Type 1 Extreme Value distributed, the choice probabilities for choosing a given firm take on a logit-form. A log-linear approximation of these choice probabilities results in the following firm-specific labor supply curve

$$n_f = \frac{1}{\varepsilon}\left[w_f - \bar{w} - b_f\right] \tag{2}$$

where n_f is log employment at firm f, $\bar{w}$ is the average wage paid in the labor market, i.e. $\bar{w} = \sum_{f'} s_{f'} w_{f'}$, where s_f is the share of total employment at firm f, and b_f is a sum of factors that include the firms own attractiveness and the mean attractiveness in the labor market. Each firm faces an inverse labor supply elasticity of ε.

Production: Firms face perfectly elastic product demand and a production technology of the form

$$y_f = a_f + (1-\eta)n_f - \ln(1-\eta) \tag{3}$$

where y_f is log output and a_f is log firm-level revenue productivity. η reflects the returns to scale in the production function and the elasticity of the product demand curve.

Firm beliefs: Firms do not observe the objective mean wage in the labor market, $\bar{w}$. Instead, each firm has its own subjective belief, $\bar{w}_f^b$, with no subjective uncertainty. For a given posted wage, a firm f therefore expects to employ

$$n_f^b = \frac{1}{\varepsilon}\left[w_f - \bar{w}_f^b - b_f\right] \tag{4}$$

while actual employment is given by Equation 2. The perceived optimal wage, which is also the actual posted wage is

$$w_f = \frac{1}{\varepsilon + \eta}\left[\varepsilon a_f + \eta b_f + \eta \bar{w}_f^b - \varepsilon \ln(1+\varepsilon)\right] \tag{5}$$

Intuitively, a firm that believes its competitors pay a higher wage than they do will post a higher wage to counter job seekers' perceived better outside option. These inaccurate beliefs can contribute to the dispersion in wages between firms. Even if firms face the same fundamentals, differences in beliefs can lead to wage dispersion. Note that we assume this economy is a "one-shot game", and therefore do not allow for firms to update their beliefs, once they know what their actual employment levels are. In the Appendix, we show that the value-added per worker at a firm is given by

$$y_f - n_f = \frac{1}{\varepsilon + \eta}\left[\varepsilon a_f + \eta b_f + \eta \ln(1+\varepsilon) + \eta \bar{w} + \frac{\eta^2}{\varepsilon}\left(\left(w_f - \bar{w}_f^b\right) - \left(w_f - \bar{w}\right)\right)\right] - \ln(1-\eta) \tag{6}$$

Here $w_f - \bar{w}_f^b$ reflects the firm's subjective beliefs about how its posted wage compares to the average wage, while $w_f - \bar{w}$ reflects how the posted wage actually compares to the average wage. If a firm underestimates how its own posted wage compares to the average wage (i.e., the term $\left(\left(w_f - \bar{w}_f^b\right) - \left(w_f - \bar{w}\right)\right)$ is negative), it will tend to have a lower productivity, as marginal productivity is declining in employment and the firm attracts more workers than it expected. From Equation 6, we see that greater labor market competitiveness (i.e., lower ε) results in a larger deviation from optimal employment at the firm for a given degree of inaccuracy in beliefs. Similarly, more pronounced diminishing returns to scale (i.e. higher η) cause suboptimal employment to have a more severe impact on productivity.

As $w_f - \bar{w}_f^b$ directly maps to our survey question of whether a firm thinks it pays a higher or lower wage than its competitors, and $w_f - \bar{w}$ directly maps to our objective measures, the previous statement is a testable prediction. To test it, we restrict the sample to firms that answer "Lower" or "Higher", so that we know that either $w_f - \bar{w}_f^b > 0$ or $w_f - \bar{w}_f^b < 0$. We then regress the (log) value added per total hours of work at the firm on a dummy indicating that $w_f - \bar{w}_f^b > 0$, while including the objective deviation from the mean wage (adjusted for workforce characteristics) in the competitor group, $w_f - \bar{w}$, and fixed effects for each competitor group defined by geography and industry as in

Figure 1. The results are shown in Table 4.

TABLE 4. Firm-level Productivity and Inaccurate Wage Beliefs

	(1)	(2)	(3)
Firm Pays High Wage (Survey)	0.20***	0.15***	0.14***
	(0.04)	(0.04)	(0.04)
Intercept: Firm Pays Low Wage (Survey)	4.37***	4.59***	4.37***
	(0.04)	(0.10)	(0.16)
Mean Wage (Administrative Data)		1.18***	1.14***
		(0.15)	(0.15)
Industry-Region Fixed Effect	No	Yes	Yes
Additional controls	No	No	Yes
Mean Dep. Var.	4.50	4.50	4.50
Observations	641	641	641

Notes: The table reports OLS estimates from a regression of firms' beliefs from the survey on log value added per worker. The sample excludes firms that report paying "About the Same" as their competitors. (1) only includes a binary variable indicating that a firm report paying a higher wage than its competitors. (2) adds controls for the mean wage (adjusted for workforce composition) and industry-region fixed effects. (3) further incorporates firm-size category fixed effects, firm age fixed effects, and variables reflecting the respondent's knowledge of the firm. Specifically, we control for the deviation between the respondent's reported firm revenue growth (2019–2021) and the actual growth rate from administrative data, the respondent's knowledge of the firm's HR practices, and the respondent's role in the company. Heteroskedasticity-robust standard errors are displayed in parenthesis. * p<0.1 ** p<0.05 *** p<0.01

Table 4 shows that the model's predictions are in line with the data: Controlling for how a firm's wage actually compares to that of its competitors, firms that believe they pay a higher wage than their competitors tend to have significantly higher productivity. In the framing of the model, the firm underestimates the average wage paid by its competitors and posts a lower wage than it would otherwise have. This leads to employment being suboptimally low. When a firm's technology exhibits decreasing marginal productivity of labor, a firm with a suboptimally low employment will have a higher productivity. Combined with the model, the results from Table 4 suggest that firms' inaccurate beliefs may contribute to excess dispersion in productivity. Within the framework of Hsieh and Klenow (2009), the inaccurate beliefs result in a firm-specific wedge in the perceived cost of labor input, leading to misallocation.

5. Firms' Wage Setting Motives

In this section we investigate the motives behind firms' decisions to set wages above or below those of their competitors. While there is compelling evidence that firms set wages (e.g., Lachowska et al. (2022), Kline (2024)), their reasons for choosing a particular policy varies across models.

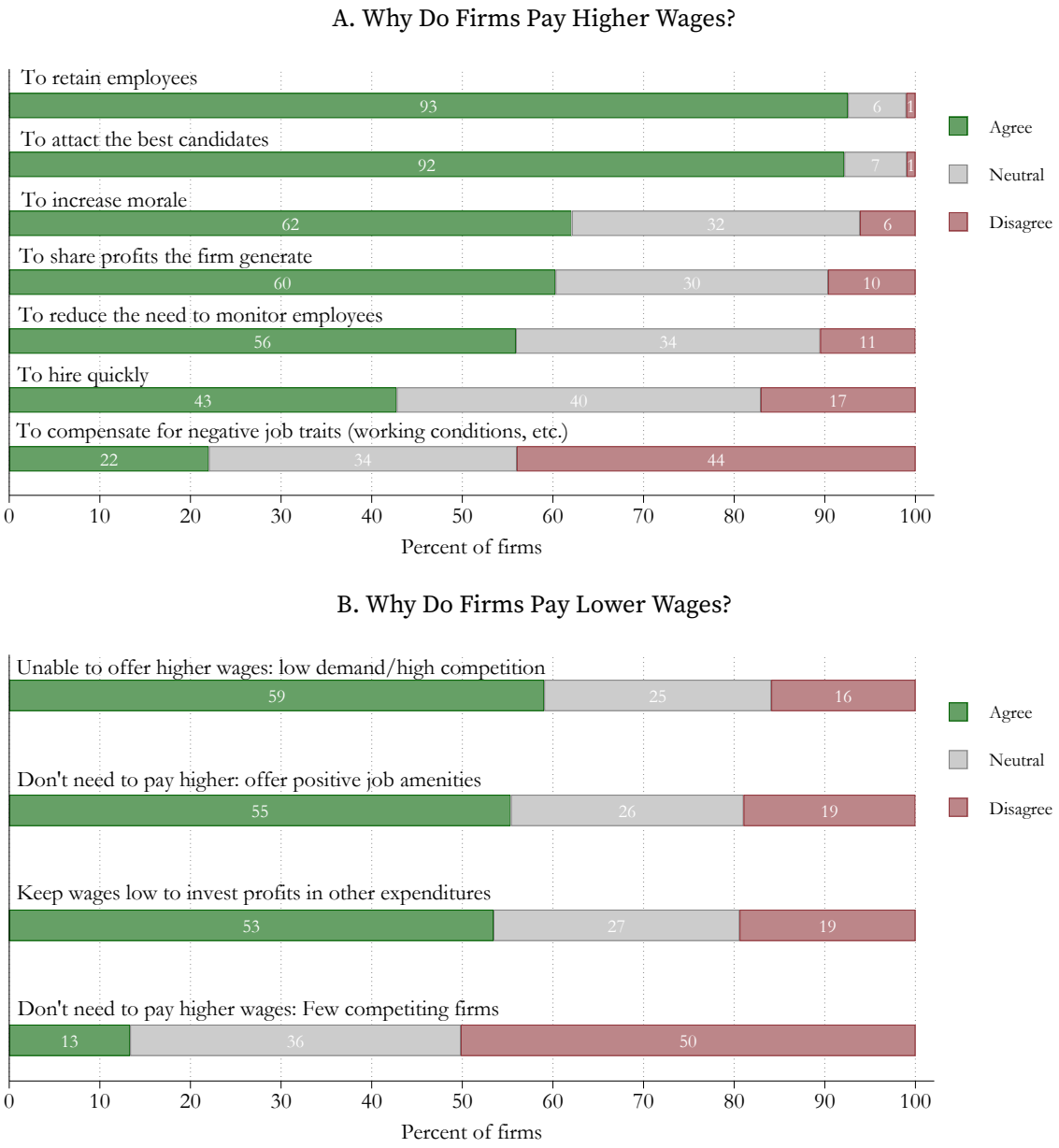
Efficiency wage models (e.g., Katz (1986)) posit that firms deliberately set wages based on the assumption that worker productivity is positively correlated with compensation. Firms offer higher wages to enhance employee motivation or minimize monitoring costs. In wage posting models (e.g., Burdett and Mortensen (1998)), firms use their wage policy to attract new workers and dissuade incumbent workers from leaving to competitors in a frictional labor market. In the Diamond-Mortensen-Pissarides framework (e.g., Pissarides (2000)), wages are determined through post-match bargaining between employers and employees. The negotiated wage depends on the worker's outside options and the firm's surplus (proxied by productivity). Consequently, wage variation across firms is closely linked to differences in surplus. Wage differentials may also reflect compensating wage differentials for negative, unobservable job characteristics (e.g., Rosen (1986)).

5.1. Characterizing Motives For Wage Setting Strategies

Following the assessment of firms' positions within the wage distribution, we surveyed those firms that reported paying "higher" or "much higher" wages than their competitors to determine the motives behind these wage policies. Respondents were asked to indicate their level of agreement with the following statements: *"We want to compensate for negative aspects of the job (job insecurity, working conditions, etc.)", "We want to attract the best candidates", "We want to hire quickly", "We want to ensure reliable employees who do not change jobs often", "We want to increase employee morale"*, "We want to reduce the need to control and monitor employees", *"We want to share the high earnings we generate with the employees"*.

The responses are shown in Figure 2. Over 90 percent of firms reporting higher wages attribute this to their efforts to retain employees and attract candidates, suggesting that they recognize the influence of wages on workers' job search behavior. Almost no firms disagree with those statements. This finding aligns with wage posting models (Burdett and Mortensen 1998), where firms actively use their wage policies to attract new candidates. Also related to workers' job search behavior, 40 percent of firms

FIGURE 2. Motives for Offering Higher or Lower Wages



Notes: Panel A shows the responses to the question: "Why do you offer higher wages than others in your industry? Please state your position on the following statement:" The question is shown to firms that report to pay higher wages than their competitors (see Figure 1). The sample in Panel A consists of 482 firms. Panel B shows the responses to the question: "Why do you offer lower wages than others in your industry? Please state your position on the following statement:" The question is shown to firms that report to pay lower wages than their competitors (see Figure 1). The sample in Panel B consists of 229 firms.

report offering higher wages to hire quickly, and close to 20 percent disagree with this statement. This relatively smaller proportion is consistent with the empirical evidence of Mueller et al. (2023) and contrasts with directed search models where hiring speed is a key determinant of wage policy.

Approximately two-thirds of firms indicate that they pay higher wages to boost employee morale and reduce the need for monitoring, in line with efficiency wage theories (e.g., Katz 1986). Moreover, 60 percent of firms cite a desire to share high profits with their employees as a motivation for higher wages, and about 10 percent disagree. Overall, the evidence is consistent with the new-monopsony model (Card et al. 2018) and the DMP framework, where a firm's wage is directly related to its productivity level.

Similarly, firms that reported paying "lower" or "much lower" wages than their competitors were asked to explain their wage policies. They were asked to agree, be neutral, or disagree with the following statements: *"We cannot pay higher wages (low demand for our products/services or high level of competition)"*, *"We do not need to pay high wages as there are few competing employers"*, *"We do not have to pay too high wages as we can offer a lot of valuable facilities that compensate for higher wages (job security, work environment, etc)"*, *"We need to keep wages low to invest the profit we generate in other strategic priorities (e.g. research and development, marketing)"*.

Overall, there is less clear agreement among firms that declare that they pay lower wages than their competitors.

Over 50 percent of low-wage-paying firms report that they are unable to offer higher wages due to low product demand or intense market competition. However, close to 20 percent of firms disagree with this statement. Conversely, fewer than 15 percent of these firms state that they do not need to raise wages because of limited competition from other employers. More than half of the firms that say they pay lower wages think that paying high wages is unnecessary because they offer positive job amenities. This is consistent with the recent work on amenities and firm wage premiums (e.g., Morchio and Moser (2023)).

6. Conclusion

While an extensive literature demonstrates that firms have some degree of wage-setting power, there remains limited empirical evidence on how this power operates in practice. As Card (2022) notes: "*Once we accept that firms set wages, the analysis of wage setting becomes a part of labor economics, just like the analysis of price setting is a part of IO. Right*

now, much of the practical discussion of wage setting is done by noneconomists." To advance our understanding of why similar workers are paid differently, this paper provides the first large-scale, representative evidence on how employers perceive their wage-setting behavior and the motives behind offering higher or lower wages relative to other firms. We achieve this by designing and implementing a representative survey of firms.

Our findings yield several insights valuable to both theoretical and empirical research on wage determination. First, we find that a significant minority of firms misperceive their position on the wage distribution. Using our preferred measure of inaccurate beliefs, we estimate that approximately 18 percent of firms hold inaccurate beliefs about their relative wage relative to other firms. Second, we identify the primary motivation for paying higher wages as the desire to attract new candidates and retain incumbent employees. In contrast, compensating differentials for unfavorable job amenities emerge as the least common justification for offering higher wages.

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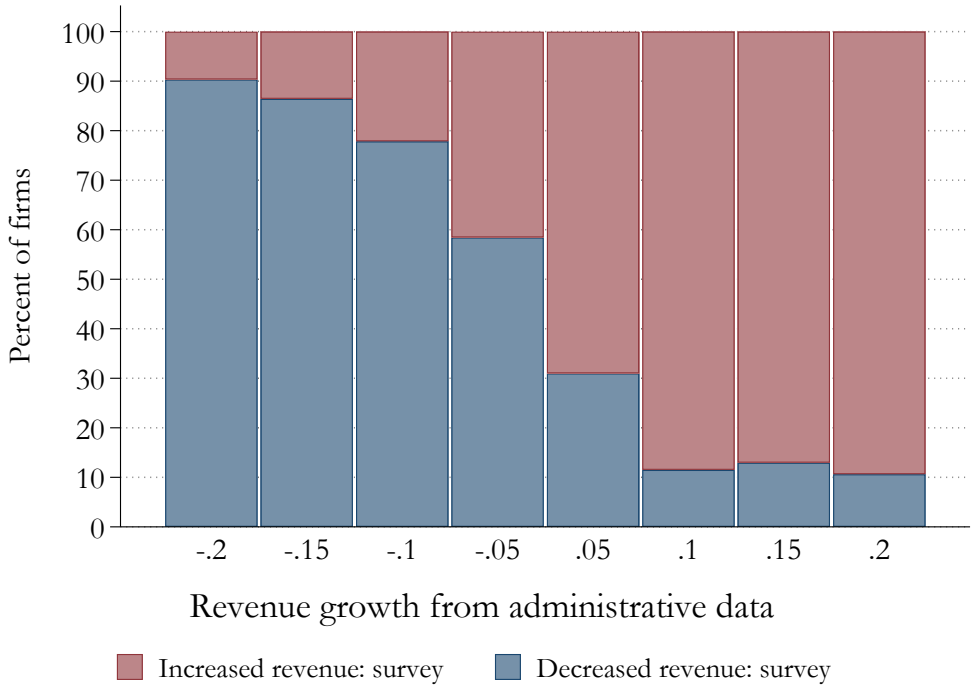
Part I

Appendix

A. Additional Figures and Tables

A.1. Figures

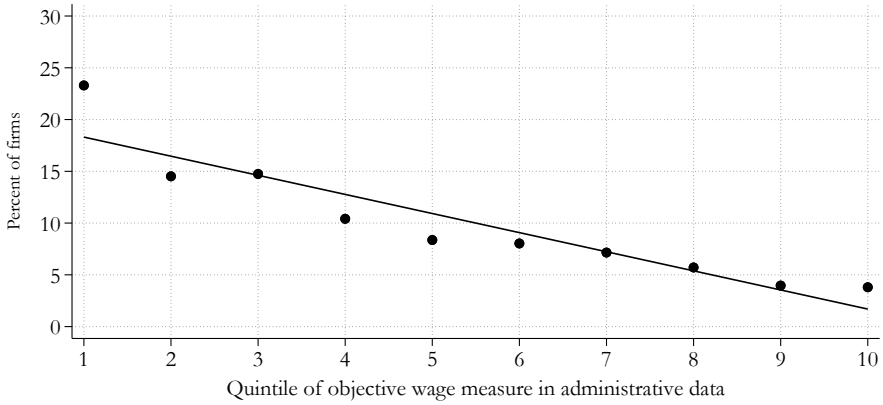
FIGURE A.1. Validating Survey: Revenue Change in the Survey and Administrative Data



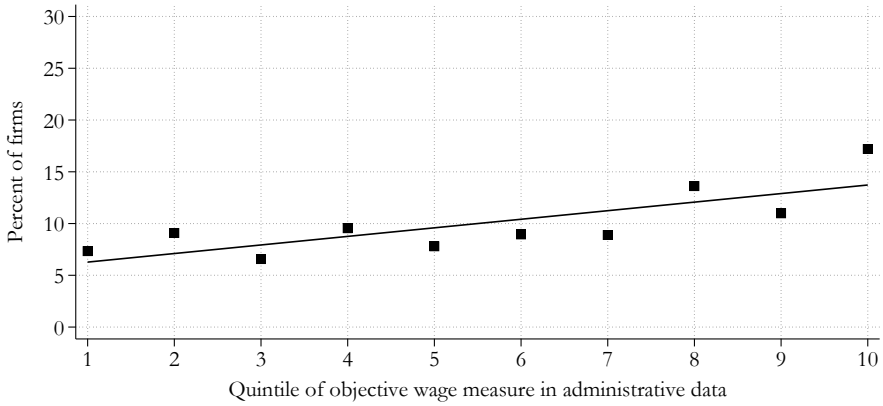
Notes: This figure presents the share of firms reporting revenue increases or decreases from 2019 to 2020 in the survey, grouped into bins based on revenue changes from administrative income statement data (FIRM).

FIGURE A.2. Firm Beliefs About Their Wages And Objective Wages: Deciles

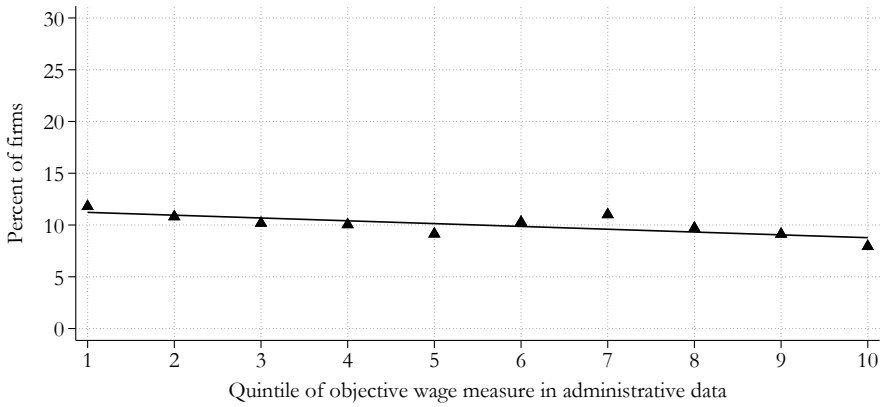
A. Lower wages than competing firms



B. Higher wages than competing firms



C. About the same wages than competing firms



Notes: The panels show the percentage of firms in each decile of an objective wage measure calculated from administrative data grouped by firms' beliefs about their own wages in survey data. The objective wage measure is the mean average hourly wage, adjusted for workforce composition, calculated within industry-local labor market cells (see Section 3.1 for details). Panel A consists of firms that believe they pay lower or much lower wages than their competitors, Panel B consists of firms that they pay about the same as competitors and Panel C consists of firms that believe they pay higher or much higher wages. The sample consists of 2,802 firms.

FIGURE A.3. Alternative Measures of Objective Wages

Notes: The panels show the percentage of firms in each quintile of an objective wage measure calculated from administrative data grouped by firms' beliefs about their own wages in survey data. The objective wage measure is the mean average hourly wage, adjusted for workforce composition, calculated within industry-local labor market cells (see Section 3.1 for details). Panel (A) uses mean hourly wages in 2021 adjusted for the workforce education and age (and not additionally adjusting by mean hours work, gender composition, worker fixed effects as in Figure 1). Panel (B) uses the unadjusted mean wages. Panel (C) and (D) are based on the estimated firm effects from Equation 1. Panel (D) only includes firms with at least 10 movers over 2015-2021.

A.2. Tables

TABLE A.1. AKM Variance Decomposition of Log Hourly Wages

Number of Observations	10,091,229
Number of Firms	116,302
Number of Workers	2,228,146
Firm Switchers (pct.)	0.42
Avg. number of firms	1.60
Log Hourly Wage Distribution	
Std. Dev.	0.378
Std. Dev. (Residual)	0.354
Std. Dev. of Firm Effects	0.093
Std. Dev. of Worker Effects	0.208
Share of Variance Explained by Firm Effects	0.060

Notes: This table reports the estimated variance components after fitting the AKM model in Equation 1 to log hourly wages. Variance components are corrected using the leave-out bias correction of Kline et al. (2020) via leaving a worker–firm match out. The model includes controls for a cubic polynomial in age interacted with education dummies and education by calendar year dummies. "Firm Switchers (pct.)" indicates the percentage of workers who switch to another firm at some point during the sample period. "Avg. number of firms" indicates the average total number of firms at which a worker is employed at some point during the sample period.

TABLE A.2. Firms Characteristics Across Beliefs Distribution

	"Lower"	"About the same"	"Higher"	"Total"
Number of Employees (%)				
1-10	40.2	33.5	29.1	33.4
11-50	45.8	51.0	58.3	51.8
51+	13.9	15.5	12.6	14.8
Other Firm Characteristics				
Log Wages	3.3	3.3	3.4	3.4
AKM Wage Effecs (Q4)	12.8	23.8	32.7	24.3
Manufacturing (%)	14.6	13.2	9.5	12.7
Services(%)	56.4	60.0	69.6	61.4
Other sectors (%)	29.0	26.7	20.9	26.0
Copenhagen area (%)	37.5	25.9	29.8	27.5
Observations	229	2,091	482	2,802

Notes: This table reports the mean of firm characteristics by survey response.

TABLE A.3. Firm Beliefs About Their Wages And Objective Wage Measures

	Firm Wage Effects			Mean Wages		
	(1) Higher	(2) About the same	(3) Lower	(4) Higher	(5) About the same	(6) Lower
Decile 1	2.20	-7.24*	5.04*	-6.25**	-3.41	9.67***
	(3.15)	(4.01)	(3.02)	(3.02)	(3.96)	(2.97)
Decile 2	0.99	-3.91	2.92	-1.35	-2.56	3.90
	(2.97)	(3.80)	(2.79)	(3.13)	(3.83)	(2.62)
Decile 3	3.42	-5.66	2.24	-4.65	-0.50	5.15*
	(3.07)	(3.84)	(2.81)	(3.03)	(3.87)	(2.80)
Decile 4	-1.54	-0.05	1.59	0.68	-1.88	1.21
	(2.89)	(3.79)	(2.85)	(3.21)	(3.79)	(2.45)
Decile 5	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Decile 6	3.13	1.11	-4.25*	-0.10	0.93	-0.83
	(2.94)	(3.51)	(2.28)	(3.13)	(3.67)	(2.33)
Decile 7	6.09**	-4.25	-1.84	-0.09	2.30	-2.21
	(3.09)	(3.70)	(2.48)	(3.08)	(3.57)	(2.17)
Decile 8	6.34**	-0.80	-5.53**	8.71**	-5.26	-3.46
	(3.14)	(3.66)	(2.23)	(3.38)	(3.78)	(2.12)
Decile 9	9.25***	-2.13	-7.12***	6.53*	-1.88	-4.65**
	(3.15)	(3.58)	(2.06)	(3.37)	(3.75)	(2.02)
Decile 10	16.97***	-12.80***	-4.16*	17.24***	-12.61***	-4.62**
	(3.59)	(4.05)	(2.42)	(3.79)	(4.12)	(2.12)
Respondent Info	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	16.90	74.50	8.59	16.90	74.50	8.59
Oberservations	2,802	2,802	2,802	2,802	2,802	2,802

Notes: This table reports linear probability model estimates obtained from regressing firms' beliefs about their wages compared to their competitors' ("higher", "about the same", or "lower") on deciles of objective wage measures based on administrative data, i.e. firm wage effects and mean wages (adjusted for workforce composition, as in Figure 1). All regressions additionally control for the respondent's role, her stated knowledge about the firm's wage policy and her inaccurate beliefs about revenue growth in 2019-2020 (measured as the absolute difference between stated revenue growth and administrative data revenue growth). Heteroskedasticity-robust standard errors are displayed in parenthesis. * p<0.1 ** p<0.05 *** p<0.01

TABLE A.4. The Extent of Inaccurate Wage Beliefs: Alternative Labor Market Definition

	Mean wage	Firm Wage Effects
Baseline		
Underestimate	6.55	7.21
Overestimate	11.35	10.33
Total	17.90	17.53
Alternative 1.		
Underestimate	6.30	6.77
Overestimate	9.96	8.73
Total	16.26	15.50
Alternative 2.		
Underestimate	13.56	15.72
Overestimate	19.04	17.86
Total	32.60	33.58
Observations	2,802	2,802

Note: This table shows the percentage of firms that hold inaccurate beliefs about how their wages compare to those of their competitors. In contrast to Table 2, in this table defines the labor market using more than 30 industry categories (instead of 12 industry categories by 5 regions). Under the row "Baseline", a belief is considered inaccurate if a firm perceives its wages as high (or low) while being in the bottom (or top) quintile of mean wages in the administrative data. When a firm reports its wages as "about the same", the belief is considered inaccurate if it is in either the bottom or top decile. Mean wage is the average hourly wages in 2021 (adjusted for workforce characteristics) as in Figure 1. The firm wage effect is the AKM firm effects. Under the row "Alternative 1.", the top and bottom deciles (instead of quintiles) are used to determine inaccuracies for firms reporting paying higher or lower wages. The definition of inaccuracies for firms responding "about the same" is unchanged. Under the row "Alternative 2.", the top and bottom quintiles (instead of deciles) are used to determine inaccuracies for firms reporting paying "about the same". The definition for firms reporting paying higher and lower is the same as in the baseline.

TABLE A.5. Inaccurate Wage Beliefs and Firm Size: Overestimation

	(1)	(2)	(3)
1-5 Employees	11.5***	7.8***	7.3***
	(3.1)	(2.5)	(2.6)
6-10 Employees	4.9***	2.1	1.7
	(1.9)	(1.5)	(1.6)
21-50 Employees	-7.6***	-5.3***	-5.4***
	(1.4)	(1.2)	(1.2)
51-200 Employees	-9.1***	-3.3***	-3.1**
	(1.4)	(1.2)	(1.3)
> 200 Employees	-11.3***	-2.7**	-2.4
	(1.2)	(1.3)	(1.5)
Mean Wage Control	No	Yes	Yes
Additional Controls	No	No	Yes
Mean Dep. Var.	11.56	11.56	11.56
Observations	2,802	2,802	2,802

Notes: The table presents estimates from a linear probability model where the dependent variable is a binary indicator for a firm overestimating their wage relative to their competitors (as defined in Table 2). Firm size is measured by the number of employees. (1) includes only firm size indicators, with "11-20 Employees" defined as the baseline. (2) adds the mean wage (adjusted for workforce composition) as a control. (3) further incorporates region-industry fixed effects, firm age fixed effects, and variables reflecting the respondent's knowledge of the firm. Specifically, we control for the deviation between the respondent's reported firm revenue growth (2019–2021) and the actual growth rate from administrative data, the respondent's knowledge of the firm's HR practices, and the respondent's role in the company. Reported Std. Errors are Heteroskedasticity-Robust. * p<0.1 ** p<0.05 *** p<0.01.

TABLE A.6. Inaccurate Wage Beliefs and Firm Size: Underestimation

	(1)	(2)	(3)
1-5 Employees	5.3**	8.3***	8.7***
	(2.3)	(1.9)	(2.0)
6-10 Employees	2.0	4.2***	4.3***
	(1.3)	(1.2)	(1.2)
21-50 Employees	1.4	-0.4	-0.8
	(1.2)	(1.1)	(1.2)
51-200 Employees	2.6*	-1.9	-1.7
	(1.6)	(1.4)	(1.5)
> 200 Employees	3.3	-3.4	-3.1
	(2.7)	(2.4)	(2.4)
Mean Wage Control	No	Yes	Yes
Additional Controls	No	No	Yes
Mean Dep. Var.	6.58	6.58	6.58
Observations	2,802	2,802	2,802

Notes: The table presents estimates from a linear probability model where the dependent variable is a binary indicator for a firm underestimating their wage relative to their competitors (as defined in Table 2). Firm size is measured by the number of employees. (1) includes only firm size indicators, with "11-20 Employees" defined as the baseline. (2) adds the mean wage (adjusted for workforce composition) as a control. (3) further incorporates region-industry fixed effects, firm age fixed effects, and variables reflecting the respondent's knowledge of the firm. Specifically, we control for the deviation between the respondent's reported firm revenue growth (2019–2021) and the actual growth rate from administrative data, the respondent's knowledge of the firm's HR practices, and the respondent's role in the company. Reported Std. Errors are Heteroskedasticity-Robust. * p<0.1 ** p<0.05 *** p<0.01.

B. A Differentiated Demand Model with Misperception

This appendix includes derivations for the differentiated demand model introduced in Section 4. The model is an extension of the random utility of the firm-choice model from Card et al. (2018). The notation closely follows the version in Manning (2021).

Firm-Specific Labor Supply: The utility of worker i from working at firm f is given by

$$u_{if} = \frac{1}{\varepsilon}\left[w_f - \tilde{b}_f\right] + \epsilon_{if} \tag{A.1}$$

where w_f is log-wage posted by firm f and $\tilde{b}_f$ is an inverse measure of how attractive it is to work at firm f for all workers. We assume that the taste shock, ϵ_{if}, is Type 1 extreme value distributed. In this case, the firm-specific labor supply is given by

$$N_f = \frac{\exp\left(\frac{1}{\varepsilon}\left[w_f - \tilde{b}_f\right]\right)}{\sum_{f'}\exp\left(\frac{1}{\varepsilon}\left[w_{f'} - \tilde{b}_{f'}\right]\right)} L \tag{A.2}$$

where L is the total labor supply. Log-linearizing results in the following firm-specific labor supply

$$n_f = \frac{1}{\varepsilon}\left[w_f - \tilde{b}_f - \sum_{f'} s_{f'}\left[w_{f'} - \tilde{b}_{f'}\right] + \varepsilon l\right] \tag{A.3}$$

where l is the log of the total labor supply and s_f is the share of the labor force employed at firm f, i.e.

$$s_f = \frac{N_f}{L} = \frac{\exp\left(\frac{1}{\varepsilon}\left[w_f - \tilde{b}_f\right]\right)}{\sum_{f'}\exp\left(\frac{1}{\varepsilon}\left[w_{f'} - \tilde{b}_{f'}\right]\right)} \tag{A.4}$$

Note that

$$\frac{d\ln\left(\sum_{f'}\exp\left(\frac{1}{\varepsilon}\left[w_{f'} - \tilde{b}_{f'}\right]\right)\right)}{d\left[w_f - \tilde{b}_f\right]} = \frac{1}{\varepsilon}\frac{\exp\left(\frac{1}{\varepsilon}\left[w_f - \tilde{b}_f\right]\right)}{\sum_{f'}\exp\left(\frac{1}{\varepsilon}\left[w_{f'} - \tilde{b}_{f'}\right]\right)} = \frac{1}{\varepsilon}s_f \tag{A.5}$$

A.3 can then be rewritten as

$$n_f = \frac{1}{\varepsilon}\left[w_f - \bar{w} - b_f\right] \tag{A.6}$$

where

$$\bar{w} = \sum_{f'} s_{f'} w_{f'} \tag{A.7}$$

and

$$b_f = \tilde{b}_f - \varepsilon l - \sum_{f'} s_{f'} \tilde{b}_{f'} \tag{A.8}$$

Note that Eq. A.6 is the same as Eq. 2 in Section 4.

Misperceptions about competitors' wages: We now deviate from Card et al. (2018) and Manning (2021) by introducing misperceptions about competitors' wages. Let $\bar{w}_f^b$ denote the subjective belief of firm f about the competitors' weighted wages, $\bar{w}$. Note that we assume that each firm is small compared to the market and takes $\bar{w}_f^b$ as given. We also do not model any uncertainty. Firms are certain that their beliefs are correct. For a given posted wage, w_f, firm f expects its employment will be

$$n_f^b = \frac{1}{\varepsilon}\left[w_f - \bar{w}_f^b - b_f\right] \tag{A.9}$$

while actual employment is given by Eq. A.6 ($n_f = \frac{1}{\varepsilon}\left[w_f - \bar{w} - b_f\right]$). Eq. A.9 is same as Eq. 4 in Section 4.

Firm Optimization: We assume that firms face a production technology such that revenue at firm f is given by

$$Y_f = A_f \frac{1}{1-\eta} N_f^{1-\eta} \tag{A.10}$$

where A_f is a firm-level revenue productivity. Firms optimize by posting a wage that ensures that the perceived marginal cost of labor equals the perceived marginal revenue

product of labor

$$MCL_f^b = MRPL_f^b \tag{A.11}$$

Isolating w_f in firm's employment belief equation (A.9), adding n_f^b, exponating, differentiating and taking logs again results in

$$\ln MCL_f^b = \varepsilon n_f^b + \bar{w}_f^b + b_f + \ln(1+\varepsilon) \tag{A.12}$$

A.10 implies that

$$\ln MRPL_f^b = a_f - \eta n_f^b \tag{A.13}$$

where $\ln A_f = a_f$. Inserting A.12 and A.13 into A.10 and rearranging results in

$$n_f^b = \frac{1}{\varepsilon+\eta}\left[a_f - \bar{w}_f^b - b_f - \ln(1+\varepsilon)\right] \tag{A.14}$$

The perceived optimal wage, which is also the actual posted wage, will, therefore be

$$w_f = \frac{1}{\varepsilon+\eta}\left[\varepsilon a_f + \eta b_f + \eta \bar{w}_f^b - \varepsilon \ln(1+\varepsilon)\right] \tag{A.15}$$

which is the same as Eq. 5 in Section 4.

With this posted wage, actual employment will be

$$n_f = \frac{1}{\varepsilon}\left[\left(\frac{1}{\varepsilon+\eta}\left[\varepsilon a_f + \eta b_f + \eta \bar{w}_f^b - \varepsilon \ln(1+\varepsilon)\right]\right) - \bar{w} - b_f\right] \tag{A.16}$$

which reduces to

$$n_f = \frac{1}{\varepsilon+\eta}\left[a_f - b_f - \ln(1+\varepsilon) - \bar{w} + \frac{\eta}{\varepsilon}\left(\bar{w}_f^b - \bar{w}\right)\right] \tag{A.17}$$

Value-added per worker is then given by

$$y_f - n_f = a_f - (1-\eta)n_f - \ln(1-\eta) - n_f \tag{A.18}$$

Inserting A.16 results in

$$y_f - n_f = \frac{1}{\varepsilon + \eta}\left[\varepsilon a_f + \eta b_f + \eta \ln(1+\varepsilon) + \eta \bar{w} - \frac{\eta^2}{\varepsilon}\left(\bar{w}_f^b - \bar{w}\right)\right] - \ln(1-\eta) \tag{A.19}$$

Here, the misperception is written as the difference between the perceived average and actual average wage. To map the misperceptions to the data, this can be rewritten to

$$y_f - n_f = \frac{1}{\varepsilon + \eta}\left[\varepsilon a_f + \eta b_f + \eta \ln(1+\varepsilon) + \eta \bar{w} + \frac{\eta^2}{\varepsilon}\left(\left(w_f - \bar{w}_f^b\right) - \left(w_f - \bar{w}\right)\right)\right] - \ln(1-\eta) \tag{A.20}$$

where we add and subtract w_f in the last parenthesis and flip the sign outside and inside the parenthesis. This is identical to Eq. 6 in Section 4.

C. The Survey Questionnaire

This section contains the original Danish survey questions and the corresponding English translations. We only include the questions from the questionaire that are used in this paper.

Questions on the role of respondents

- Danish: *Hvad er din rolle i virksomheden. Vælg det der passer bedst.*
  - *Ejerleder*
  - *Direktør uden ejerskab*
  - *Bestyrelsesmedlem uden ejerskab*
  - *Ejer uden at være bestyrelsesmedlem*
  - *Andet: _____*
- English: *What is your role in the company? Choose the one that fits best.*
  - *Owner manager*
  - *Director without ownership*
  - *Board member without ownership*
  - *Owner without being a board member*
  - *Other: _____*
- Danish: *I de følgende spørgsmål vil vi spørge om løn og ansættelsespraksis i virksomheden. Hvor tæt er du på sådanne beslutninger?*
  - *Jeg har ansvaret for løn og ansættelsesforhold.*
  - *Jeg er ikke ansvarlig men jeg kender til og forstår løn og ansættelsesforhold.*
  - *Jeg kender kun en smule til løn og ansættelsesforhold.*
- English: *In the following questions, we ask about pay*[20] *and hiring practices. How close are you to such decisions?*
  - *I am responsible for pay and employment conditions*
  - *I am not responsible, but I know about pay and employment conditions*
  - *I only know a little about pay and employment conditions*

[20] In Danish, the word løn is usually translated as salary, pay or wages. The definition in the dictionary ordnet.dk is "payment that an employee receives for working".

Question on change in revenue

- Danish: *Hvor meget ændrede omsætningen sig i 2020 i forhold til 2019? Note: Hvis du ikke kender den eksakte ændring, giv dit bedste bud.*
  - *Faldet med 100%*
  - *Faldet, angiv med ca. hvor meget: _____%*
  - *0% (Uændret)*
  - *Steget, angiv med ca. hvor meget: _____%*
  - *Steget med 100% eller mere*
- English: *How much did revenue change in 2020 compared to 2019? Note: If you do not know the exact change, give your best estimate.*
  - *Reduced by 100%*
  - *Reduced, indicate approximately how much: _____%*
  - *0% (Unchanged)*
  - *Increased, indicate approximately how much: _____%*
  - *Increased by 100% or more*

Main question about relative wages

Danish: *Tror du, at denne virksomhed tilbyder lavere eller højere lønninger end konkurrerende virksomheder i jeres branche? Konkurrerende virksomheder er andre arbejdsgivere, der ansætter folk med samme evner i jeres region. Hvis du ikker er sikker så kom med et estimat.*
Options: *Meget lavere, Lavere, Cirka det samme, Højere, Meget højere.*

English: *Do you think that this company offers lower or higher salaries than competing companies in your industry? Competing companies are other employers that hire people with the same skills in your region. If you are not sure, please come up with an estimate.*
Options: *Much lower, Lower, About the same, Higher, Much higher.*

Motives for paying a higher wage

If firms answered *Higher* or *Much Higher*, in the question on the relative wage of the firm, they were asked the following question:

- Danish: *Hvorfor tilbyder I højere lønninger end andre i jeres branche? Angiv venligst din holdning til det følgende udsagn*
- English: *Why do you offer higher salaries than others in your industry? Please state your position on the following statement.*

The statements were the following:

- Danish: *Vi vil gerne kompenserer for negative aspekter ved jobbet (jobusikkerhed, arbejdsvilkår, etc.)*
- English: *We want to compensate for negative aspects of the job (job insecurity, working conditions, etc.)*
- Danish: *Vi vil gerne tiltrække de bedste kandidater.*
- English: *We want to attract the best candidates.*
- Danish: *Vi vil gerne ansætte hurtigt.*
- English: *We want to hire quickly.*
- Danish: *Vi vil gerne sikre stabile medarbejdere der ikke skifter job tit (undgå at medarbejdere går over til konkurrenter.)*
- English: *We want to ensure reliable employees who do not change jobs often (avoid employees switching to competitors).*
- Danish: *Vi vil gerne increase employee morale.*
- English: *We want to increase employee morale.*
- Danish: *Vi vil gerne reducere behovet for kontrolllere og monitorere de ansatte.*
- English: *We want to reduce the need to control and monitor employees.*
- Danish: *Vi vil gerne dele den høje indtjening vi genererer med de ansatte.*
- English: *We want to share the high earnings we generate with the employees.*

For each statement, the firms could choose one of the following responses:

- Danish: *Meget enig, Enig, Hverken enig eller uenig, Uenig, Meget uenig*
- English: *Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree.*

Motives for paying a lower wage

If firms answered *Lower* or *Much Lower*, in the question on the relative wage of the firm, they were asked the following question:

- Danish: *Hvorfor tilbyder I lavere lønninger end andre i jeres branche? Angiv venligst din holdning til det følgende udsagn*
- English: *Why do you offer lower salaries than others in your industry? Please state your position on the following statement.*

The statements were the following:

- Danish: *Vi kan ikke betale højere lønninger (lav efterspørgsel efter vores produkter/service eller høj grad af konkurrence)*

- English: *We cannot pay higher wages (low demand for our products / service or high level of competition)*
- Danish: *Vi har ikke behov for høje lønninger, da der er få konkurrerende arbejdsgivere*
- English: *We do not need to pay high wages as there are few competing employers.*
- Danish: *Vi behøver ikke at betale for høje lønninger, da vi kan tilbyde en masse værdifulde faciliteter, der kompenserer for højere lønninger (jobsikkerhed, arbejdsmiljø osv.).*
- English: *We do not have to pay too high wages as we can offer a lot of valuable facilities that compensate for higher wages (job security, work environment etc)*
- Danish: *Vi er nødt til at holde lønninger lave for at kunne inverstere indtjeningen, som vi genererer, i andre strategiske prioriteter (f.eks. forskning og udvikling, marketing)*
- English: *We need to keep wages low to invest the profit we generate in other strategic priorities (e.g. research and development, marketing)*

For each statement, the firms could choose one of the following responses:

- Danish: *Meget enig, Enig, Hverken enig eller uenig, Uenig, Meget uenig*
- English: *Strongly agree, Agree, Neither agree nor disagree Disagree, Strongly disagree.*

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