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ABSTRACT

What Makes Hiring Difficult? Evidence from Linked Survey-Administrative Data*

We design a survey that asks firms about the obstacles that discourage them from hiring despite having potential needs. Using Danish administrative data and subjective beliefs elicited from our survey, we show how hiring obstacles vary across firms. Over two-thirds of employers agree that skill shortages are a hiring obstacle. One-third of employers consider labor costs, the time to find candidates, and the time to train new recruits as hiring obstacles. High-wage firms are less discouraged by labor costs, while younger or smaller firms are more discouraged by search and training time. Around thirty percent of employers prefer to hire the already employed over the unemployed because they believe that unemployed workers have lower abilities due to negative selection or skill depreciation during unemployment. Firms with such preferences are more likely to report hiring obstacles.

JEL Classification: J23, M12

Keywords: labor demand, hiring behavior, linked survey-administrative data, employer perceptions

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1 Introduction

Hiring plays a crucial role in determining the level of employment and production, but there is little evidence on how firms make their hiring decisions. Presumably, several obstacles can discourage firms from hiring. But which factors make hiring difficult? Do they vary across firms? Despite the high stakes of these questions for policymakers and search theories of the labor market, evidence is scarce.[1] A better understanding of the sources of hiring obstacles can help the design of labor market policies targeting hiring difficulties.

This paper helps to fill this void with new evidence on hiring difficulties. To this end, we field a unique survey to Danish private firms and ask them about the obstacles that discourage them from hiring despite potential needs. Our survey contains responses from over 2,000 firms, and is a representative sample of the population of Danish firms. Firms report the relevance of several hiring obstacles, including skill shortages, labor costs, search time, training time, and economic uncertainty.[2] We then link our survey to administrative data to show how hiring difficulties vary across firms. Our linked survey-administrative data allows us to uncover the role of factors such as firm size, age, productivity, pay premiums, and monopsony power. Finally, we connect hiring obstacles to firms' subjective beliefs. We ask participants about their beliefs regarding hiring job seekers with different employment statuses: those already employed and the unemployed. We ask whether they prefer to hire employed workers because they perceive the unemployed to have lower abilities due to negative selection or skill deterioration during the unemployment spell. We also investigate whether firms' labor costs concerns are related to firms' misperception of their own wage level. We measure misperception by comparing the firm's actual position in the wage distribution from administrative data to their beliefs. Overall, this paper provides the first comprehensive study of the extent of hiring obstacles, their variations across firms, and the role of subjective beliefs.

Our linked firm-level survey-administrative data have some key advantages. First, our data allow us to uncover how hiring obstacles vary across firms by using data of firm characteristics unavailable in surveys. Our survey is linked to firms' financial accounts, which allows us to measure their productivity. It is also linked to individual-level labor market data, allowing us to measure firm-specific wage

[1] This contrasts with the developments in the empirical job search literature. Recent contributions include, e.g., Belot, Kircher, and Muller (2022); Faberman and Kudlyak (2019); Faberman, Mueller, Sahin, and Topa (2022); Marinescu and Skandalis (2021); Nekoei and Weber (2017).

[2] Employers must report their perceptions on a 5-point Likert scale: strongly disagree, disagree, neutral, agree, or strongly agree. Our survey includes open-ended text answers to allow employers express their opinions on other hiring obstacles.

premiums.[3] Additionally, we measure how the labor market in which firms operate correlates with hiring obstacles. We do so by measuring the firm's monopsony power (i.e., its employment share in its local labor market) and the labor market tightness the firm faces. Second, our survey contains unique questions that uncover how the stigma of unemployment and firms' misperception of their own wage affect hiring decisions.

Our findings can be summarized as follows. Three-quarters of the firms agree that the lack of qualified workers discourages them from hiring despite their potential needs (labeled "skill shortage"). Only ten percent disagree with this statement. Around two-fifths agree that job seekers ask for a higher wage than the firm can offer (labeled "labor costs"), while one-fifth disagree with this statement. More than a third agree that search and matching frictions matter, and a similar percentage of respondents report that training new hires in firm-specific skills discourages them from hiring (labeled "search time" and "training time"). The uncertainty of economic activity is also a concern for more than a third of the respondents. Our results suggest that skill shortage is the most common friction that discourages firms from hiring, while labor costs, search, training, and uncertainty are important factors as well.

Next, we investigate how hiring obstacles vary across firms.[4] High-wage or high-productivity firms are less likely to consider labor costs a hiring obstacle. Interestingly, these firm characteristics do not reduce the difficulties regarding the search and training frictions. Smaller and younger firms are more likely to be affected by search and matching frictions, but they are not more likely to experience difficulties due to skill shortages or labor costs than larger and older firms. As predicted by monopsony models (Manning, 2021), an increase in a firm's employment share in its local labor market reduces its search time.

Third, we show how hiring obstacles correlate with subjective beliefs. We start by documenting a wide variation in the preferences for hiring employed workers over the unemployed. Around a quarter of employers prefer to hire employed workers, believing that skills deteriorate during unemployment. A similar share of firms indicates the same preference because they believe the unemployed have lower abilities on average. Ordered probit model estimates reveal that the preference for hiring the employed over the unemployed increases the probability of agreeing with having multiple hiring obstacles by 10 percentage points. This effect is quite large in magnitude compared to other firm characteristics. Using adminis-

[3] We estimate the proportional wage premium (or discount) that is paid by a firm to all employees using the Abowd, Kramarz, and Margolis (1999; hereafter, AKM) model.

[4] Our ordered probit model regressions include characteristics of the market, the firm, the respondent, and the workforce.

trative data, we compare the abilities of the employed and the unemployed. To do so, we estimate an AKM model and compare worker fixed effects (i.e., skills and other factors that are rewarded equally across firms) across workers with different employment statuses.[5] We find that the unemployed do indeed have lower abilities on average. The median worker effect of the unemployed corresponds to the first tercile of the worker effect of all workers. Interestingly, including the difference between the abilities of the employed and the unemployed in our regressions[6] does not change our estimates on firms' hiring difficulties.

Moreover, we show that firms' misperception of their own wage affects hiring decisions. When firms believe that they offer lower wages than their peers, while the administrative data on wage premiums shows the opposite, they are more likely to agree that labor costs discourage them from hiring. This effect is also important in magnitude, as underestimating its own wage increases the probability of reporting labor costs as an issue by 6 percentage points. Our results suggest that the stigma of the unemployed and firms' misperceptions of their wage substantially alter firms' hiring decisions.

We conduct several tests to strengthen the credibility of our findings. First, we show that survey responses on firm size and change in revenue are consistent with the same measures from the administrative data. Second, our estimates are robust when we change our baseline specification. Our estimates control for labor market conditions that could make hiring more or less difficult across firms, as well as the extent of job amenities that firms offer.

The institutional setting of the labor market and the economic context limit the concern that our results are specific to Denmark. Danish firms are not subject to stringent hiring and firing regulations, and wages are typically set at the firm level. When we conducted our survey in the summer of 2021, the labor market was tight, but not historically tight, as in 2022. The empirical case of Denmark provides access to unique data without limiting external validity.

Overall, we design and field a unique survey to understand firms' hiring decisions. We link our survey to administrative data to uncover how hiring obstacles vary across firms. Our novel evidence on the demand side of the matching process between workers and firms complements the evidence on the supply side (e.g., Faberman et al. 2022; Marinescu and Skandalis 2021) in several dimensions.

[5]For the unemployed, the worker effect is estimated before the last unemployment spell. This limits the concern that previous unemployment spells bias worker effects.

[6]We measure the difference in the employed and the unemployed at the occupation level and construct a firm-level measure of the difference using the occupational composition of firms.

Our results contribute to the literature on firms' hiring behaviors. The current literature mainly focuses on how hiring standards (e.g., adjustment of the wage offered and required experience) vary over business cycles and firm performance.[7] However, evidence on the sources of hiring difficulties is scarce. Existing surveys show that hiring difficulties are widespread and have detrimental consequences on firms' output. In the years preceding the pandemic, 5% to 25% of companies in various European countries reported that the labor shortage limited their production.[8] Recent literature has studied the causal consequences of labor shortages. Le Barbanchon, Ronchi, and Sauvagnat (2023) and Signorelli (2022) use different research designs to show that labor shortages affect firms' production. We complement these studies by showing the factors that contribute to hiring difficulties. Our results also show that ex-ante and ex-post matching frictions (i.e., search and training time) are as important as labor costs, and even the most desirable firms (i.e., high-productivity and high-wage firms) suffer from such frictions. This result supports Algan, Crépon, and Glover (2023), who find a positive employment impact of a job placement policy that helps firms hire.

We also show that a more generous wage policy mitigates the concern of labor costs. Nevertheless, firm-specific wage premiums are not negatively associated with firms' concerns about search and training frictions. This result is consistent with Mueller, Osterwalder, Zweimüller, and Kettemann (2022), who show that wage premiums can account for only a small fraction of the variation in vacancy filling rates across establishments.

We find that younger firms are more discouraged from hiring even after controlling for size, wage, productivity, and labor market tightness. This result is particularly important as young firms drive employment growth (Decker, Haltiwanger, Jarmin, and Miranda, 2014), and the quality of the initial workers plays a significant role in young firm's long-term success (Babina, Ma, Moser, Ouimet, and Zarutskie, 2019). There are two potential explanations for this. Younger firms have a smaller network and are less capable of using referrals and word-of-mouth techniques as hiring channels. Job seekers might also be reluctant to apply to younger firms because of low visibility and imperfect information about the quality of these firms. Our study highlights these issues and suggests that employment policies aimed at reducing young firms' hiring difficulties would be effective.

The fact that some employers prefer to hire already employed workers suggests that they might restrict their search to fewer job seekers, which impacts their hir-

[7] Faberman (2020) reviews the literature. Carrillo-Tudela, Gartner, and Kaas (2022) and Bagger, Fontaine, Galenianos, and Trapeznikova (2022) provide novel evidence.

[8] We illustrate this point in Figure A.2

ing decisions. This finding complements the literature on unemployment duration dependence and on the job search behavior among the employed and the non-employed.[9] The question of whether being unemployed is a stigma is yet to be settled. Faberman et al. (2022) show that the employed are three times more likely to receive offers, while Farber, Herbst, Silverman, and von Wachter (2019) show that job seekers with an interim job are at a disadvantage.[10] We provide novel evidence that a significant share of firms have negative views of the unemployed, which affects their hiring behaviors. On the other hand, we also show that employed workers do have higher worker fixed effects than the unemployed.

Finally, we show that a firm's own wage misperception matters at the hiring margin. This complements recent literature (e.g., Cullen, Li, and Perez-Truglia 2022) that studies the effects of salary benchmarking. Taken together, our results contribute to the recent literature that studies subjective beliefs in the labor market, which so far has focused on the supply side (e.g., Jäger, Roth, Roussille, and Schoefer 2023). Our study shows that subjective beliefs on the demand side can also play a substantial role in the search and matching process.

The paper is organized as follows. Section 2 describes the dataset and the institutional setting. Section 3 documents hiring obstacles and how they vary across firms. Section 4 documents firm beliefs about hiring workers with different employment statuses and shows their impact on hiring obstacles. Section 5 concludes.

2 Linked Firm-Level Survey-Administrative Data

We link various datasets to characterize the sources of hiring difficulties. The main dataset is a survey we conduct in 2021 among private sector firms in Denmark. We link this survey to administrative datasets using unique firm identifiers, where we obtain information about each firm's financial situation, workforce characteristics, and the labor market condition under which they operate.

2.1 Survey Implementation

Sample frame. An international consulting firm (Rambøll) conducted the online survey by sending invitation emails to firms in June 2021. The target population was all private and public limited firms (ApS, *Anpartsselskab* and A/S, *Aktieselskab*)

[9] Recent work on unemployment duration dependence includes Zuchuat, Lalive, Osikominu, Pesaresi, and Zweimüller (2023), Mueller and Spinnewijn (2023). Faberman et al. (2022) documents the extent and nature of job search among the employed.

[10] Eriksson and Rooth (2014) find unemployment stigma effects for unemployment spells lasting at least nine months in Sweden.

in Denmark, excluding the agricultural and mining sectors. The coverage error, i.e., the difference between the potential pool of respondents and the target population, should be negligible, as all firms in Denmark must be able to receive emails from the authorities (e.g., the tax authority). The international consulting company has access to a dataset that links legal firm identifiers to company email addresses. The survey closing date was at the beginning of August 2021, and reminders were sent in July to increase the response rate.

Invitation letter. The email contained an invitation letter stating that Rambøll is surveying on behalf of the University of Copenhagen. The invitation letter was designed to recruit as many respondents as possible to minimize selection bias. It provided useful information to respondents: the deadline for completing the survey and that it could be completed using mobile-friendly devices. The actual topic of the survey was kept vague and used simple language to minimize selection bias. The University of Copenhagen logo was visible, and we explained that the data generated comply with data protection rules (see Figure A.1). An invitation letter containing this information increases the response rate (Stantcheva, 2022).

Question ordering. The questionnaire starts with background questions about respondents and firm characteristics. Respondents must state their role in the firm, their knowledge of pay and employment policies, the number of employees, and the change in revenue in 2020 compared to 2019. We demonstrate that the respondents know the economic situation of the firm (see Figure A.4). The survey also asks questions about firm characteristics that are unavailable in administrative data sets. We ask whether one person or a family owns the company and whether it is subcontracting for other firms. The next part of the questionnaire asks questions about layoffs and wages. Using these questions, Bertheau, Kudlyak, Larsen, and Bennedsen (2023b) and Bertheau and Hoeck (2023) study why firms lay off workers instead of cutting wages, and firms' beliefs about wage setting. This study mainly focuses on the second part of the questionnaire, which asks about firms views on hiring (Appendix A reports the questionnaire).

Types of questions. Qualitative questions are reported in five answer categories to make the Likert scale manageable following common practice (Dillman, Smyth, and Christian, 2014). The five categories are the following: "Strongly agree", "Agree", "Neutral", "Disagree", and "Strongly disagree". The odd number ensures that there is a middle option.

2.2 Administrative Data on Firms and Workers

The administrative datasets come from various sources gathered by the National Statistics Agency (Statistics Denmark), the National Employment Policy Agency (STAR), and the largest employer association in Denmark (DA).

Firm and worker characteristics. We use the dataset FIRM (*Generel firmastatistik*) which contains annual financial statements for all private sector firms up to 2020. Nonfinancial information, such as firm age and industry codes, are also extracted from this dataset. Workforce characteristics are obtained from various administrative registers and are averaged at the firm level. We measure whether an employee belongs to a union, her education level, age, sex, and job tenure. We measure the extent of non-wage job amenities using a mandatory employer survey (LONN, *Lønstatistikken*).

Additional data sources. We observe the number of vacancies and the number of unemployed at the occupational level.[11] Additionally, we have access to a dataset that indicates whether a wage floor applies to each occupation (1-digit level) by industry (3-digit level).[12] When at least 50% of a firm's employees are subject to wage floors, we classify this firm as being covered by wage floors.

2.3 Institutional Setting and Economic Context

Institutional setting. Hiring and layoffs are not subject to stringent regulations. Denmark ranks 26 out of 36 on the OECD employment protection index. The US is ranked 36 (Kreiner and Svarer, 2022). For 80 percent of the private sector workers, the wage is set at the firm level, and wage floors apply to the other 20 percent (Dahl, Le Maire, and Munch, 2013). Wage floors are minimum wages a firm must pay in an occupation and industry for workers who do not have experience. Still, firms usually deviate from it with higher hourly wages. Employment clauses by which firms attempt to prevent employees from being employed by other firms are prohibited.

Economic context. When the survey was fielded in June 2021, the Danish labor market was tight, but not historically tight as in 2022 (Figure A.3). Figure A.2 measures hiring difficulties in Europe and the United States around 2021. These figures

[11] Vacancy data contain the universe of job vacancies posted online in Denmark. Most vacancies are scraped from the two largest job board platforms in Denmark (Jobnet and Jobindex). In Denmark, workers must file their occupation at the start of any unemployment spell.

[12] We obtain the dataset from the largest Danish employer association.

also show that the hiring difficulties were not as high in 2021 compared to 2022. June 2021 was an opportune time to ask about human resources strategies because the world economy and the Danish economy were on the recovery track.

2.4 Sample Characteristics

Sample restriction. We impose the following sample restrictions. Firms and the respondents had to i) employ at least five employees in 2019,[13] ii) operate in the private sector, iii) have non-missing financial account data, and iv) (the respondents) have sufficient knowledge of the human resources policy of the firm. We delete respondents who respond "I only know a little about pay and employment conditions" to the question "In the following questions, we ask about pay and employment practices. How close are you to such decisions?" [14]

Sample representativeness. Table 1 reports descriptive statistics of the dataset for different samples. Column 1 and column 2 show the mean of the population of firms under study and the mean in our sample, respectively. The sample overrepresents larger (33 vs. 40 employees), older (18 vs. 20), and more productive firms (88,000 EUR vs. 95,000 EUR value added per worker). The characteristics of the employees who work for the firms we surveyed are mostly similar. We reweight our sample such that it is more similar to the population reported in column 1. We construct weights using the entropy-balancing method (see Hainmueller and Xu 2013) to match the firm size, industry composition, and productivity deciles. We use these weights throughout the paper. In our reweighted sample (column 3), the differences between the sample and the population are small.

Validating our survey. We use two questions from our survey to validate the firm's attention and knowledge of the economic situation of the firm. The question on firm size is "How many employees were in the firm on May 1, 2021?" We compare the reported number to the number of employees in March 2021 in the matched employer-employee dataset (BFL). Figure A.4, Panel (a) shows that the results are similar. The second question concerns the revenue change from 2019 to 2020. We classify firms, both in our survey and in firm's financial account data (FIRM), into unchanged, increased, and decreased. Figure A.4, Panel (b) shows that

[13] Our sample is limited to firms that employ five employees in full-time equivalent units in December 2019 in the matched employer-employee data (BFL).

[14] The two other choices for this question are: I am responsible for pay and employment conditions. I am not responsible, but I know about pay and employment conditions.

Table 1: Descriptive Statistics Across Samples of Firms

	Firm Population (Admin. data)	Linked Survey-Admin. (Unweighted)	Linked Survey-Admin. (Weighted)
Firm characteristics			
Number of employees	33.15	39.59	33.46
Firm age	17.88	20.43	19.84
Productivity	88.11	95.21	93.91
Wage premium	-0.01	0.01	-0.00
In manufacturing (%)	14.50	18.81	15.03
In services (%)	60.02	58.70	59.76
In other sectors (%)	25.48	22.49	25.21
In Copenhagen (%)	27.71	25.64	25.11
Covered by wage floor (%)	16.20	17.26	17.73
Employee characteristics			
Female (%)	28.64	28.38	28.05
Age	40.22	42.12	41.95
Tenure (years)	4.74	5.40	5.42
Bachelor and above (%)	18.93	22.48	21.04
Unionized workers (%)	55.76	60.75	59.76
Observations	21835	2063	2063

Note: This table compares firm characteristics of the sample to the population of firms. Column 1 reports the mean characteristics of the population, i.e., firms with at least five full-time employees in 2019. Columns 2 and 3 report the mean of the unweighted and the weighted sample, respectively. See Section 2 for more information about the variables and the weights.

the administrative data and the survey responses align well. The figure shows that most participants know the firm's economic situation.

2.5 Regression Models

We use ordered probit models to test the relevance of several hiring obstacles. The outcome variable reports the response to our main question "What factors can discourage the firm from recruiting despite the potential need?". The outcome variable takes five different values: Strongly agree, agree, neutral, disagree, strongly disagree.

$$y_i^* = \beta \mathbf{x}_i' + \gamma_{\text{region}} + \eta_{\text{industry}} + \varepsilon_i$$

The ordered probit model includes region and industry fixed effects. We report marginal effects (multiplied by 100) where covariates are evaluated at their mean values. Therefore, estimates reported in tables are interpreted as percentage point changes. We report the baseline probability of agreeing with the outcome variables, to be able to measure the magnitude of the effects.

Firm and worker fixed effects. To estimate firm and worker fixed effects, we estimate an AKM model (Abowd, Kramarz, and Margolis, 1999) using the following specification:

$$Y_{it} = X_{it}'\beta + \alpha_i + \psi_{j(i,t)} + \varepsilon_{it},$$

where Y_{it} is the log of hourly wages of worker i in period t, X_{it} are exogenous covariates, α_i is the unobserved worker effect, $j(i,t)$ is the firm where i works at t, $\psi_{j(i,t)}$ is the unobserved firm effect, and ε_{it} is an idiosyncratic error term. We include in X_{it} an unrestricted set of year dummies, as well as quadratic and cubic terms in age fully interacted with educational attainment. The model is estimated using data from 2008 to 2019.[15] The firm-specific wage premium $\psi_{j(i,t)}$ is reported in Table 1 (labeled "wage premium"). It represents the proportional wage premium (or discount) that is paid by firm j to all employees. Such a premium is typically interpreted as rent-sharing, efficiency-wage, or strategic wage posting behavior to attract and retain employees. The worker effect is typically interpreted as a combination of skills and other factors that are rewarded equally across firms (Card, Cardoso, Heining, and Kline, 2018).

[15] We estimate the model using a matched employer-employee dataset (IDAN) containing information on the universe of jobs in Denmark with information on earnings and hours worked for each employment relationship at the yearly frequency.

Firm-specific labor market tightness. We calculate the tightness of the labor market that applies to a firm, given its workforce composition. The tightness for firm j, denoted by θ_j, is the weighted sum of the two-digit occupation-specific ($o = 1....O$) labor market tightness ($\theta_0 = \frac{V_o}{U_o}$).

$$\theta_j = \sum_{o=1}^{O} w_{oj}\theta_o, \tag{1}$$

Where V_o and U_o are the number of vacant jobs and the number of unemployed in an occupation o. $w_{oj} = \frac{N_{oj}}{N_j}$ is the number of workers in an occupation (N_{oj}) over the number of workers in the firm in 2019 (N_j).[16] Figure A.3 plots the evolution of the labor market from 2016 to 2022. The figure shows that the tightness fluctuates around 0.1.

Additional controls. We include the firm ownership type (family-owned firm), capital stock, liquidity, the change in revenue and employment, educational attainment of new hires (to proxy for upskilling), subcontracting to other companies, and the presence of a representative worker as additional controls in our regressions. The rich firm-level financial account data available for all firms allow us to control for heterogeneity in firm performance. Our regressions also include the average of the following employee characteristics: unionized, women, age, job tenure, percentage of workers with at least a bachelor's degree, and an index of the intensity of routine tasks.[17] We include a dummy indicating the respondents' knowledge of the HR policy and their occupations. We also include labor market concentration at the industry-region level.

3 Hiring Obstacles

This section documents the obstacles that discourage firms from hiring despite potential needs. We then show how these obstacles vary across firms.

3.1 Survey Evidence

Figure 1 reports the responses to the survey question "What factors can discourage the firm from recruiting despite the potential need?" Respondents must report their perceptions about five possible factors. To ensure that we did not leave out any

[16] Hoeck (2023) is the first to use a firm-specific tightness measure.

[17] The index is $RTI_k = ln(T_k^R) - ln(T_k^M) - ln(T_k^A)$ where T_k^R, T_k^M, and T_k^A are the routine, manual, abstract task inputs in occupation k. We measure it by linking O*NET to employer-employee data.

important factors, there is an additional category that asks firms to provide details of "other" factors.[18] Figures A.5, A.6 and A.7 display the responses by industry. The most prevalent hiring obstacle is the lack of qualified candidates, which more than 70 percent of the firms agree with. This is the most popular answer and almost doubles the second most popular one. It affects more firms in the construction and hospitality sectors than in the other (Figure A.5). A significant share of the firms also agree that other factors discourage them from hiring. Around 38% of the firms agree that the jobseekers' wage expectations are too high. Around 36% of the firms agree that finding and choosing the right employee is too time-consuming, and around 35% of the firms agree that training employees in firm-specific skills is too time-consuming. Around 37% of the firms say that the uncertainty of economic activity discourages them from hiring. Our unique survey results complement the literature on hiring difficulties. Haskel and Martin (2001) use UK representative establishment data and report that 35% of employers report skill shortages. Bergeaud, Cette, and Stary (2022) show that French manufacturing firms believe the labor shortage is a more prominent obstacle than the labor costs. Terry and De Zeeuw (2018) examine hiring difficulties in the US and also highlight skill shortages. However, these papers do not document the extent of search and matching frictions as we do. A key takeaway from our analysis is that search and training frictions are relevant factors that typically make hiring difficult. These are important results as they provide support for models that show how predictions differ when hiring costs include both vacancy posting and training costs. Pissarides (2009) shows that the Diamond-Mortensen-Pissarides model can predict the US economy's labor market dynamics once hiring costs include a fixed component. Faccini and Yashiv (2022) show that hiring costs generate strong propagation of macroeconomic variables in response to technology shocks. Finally, our evidence shows that the uncertainty of economic activity discourages firms from hiring, as predicted by Den Haan, Freund, and Rendahl (2021). Our analysis concludes that search and training frictions are relevant factors that typically make hiring difficult.

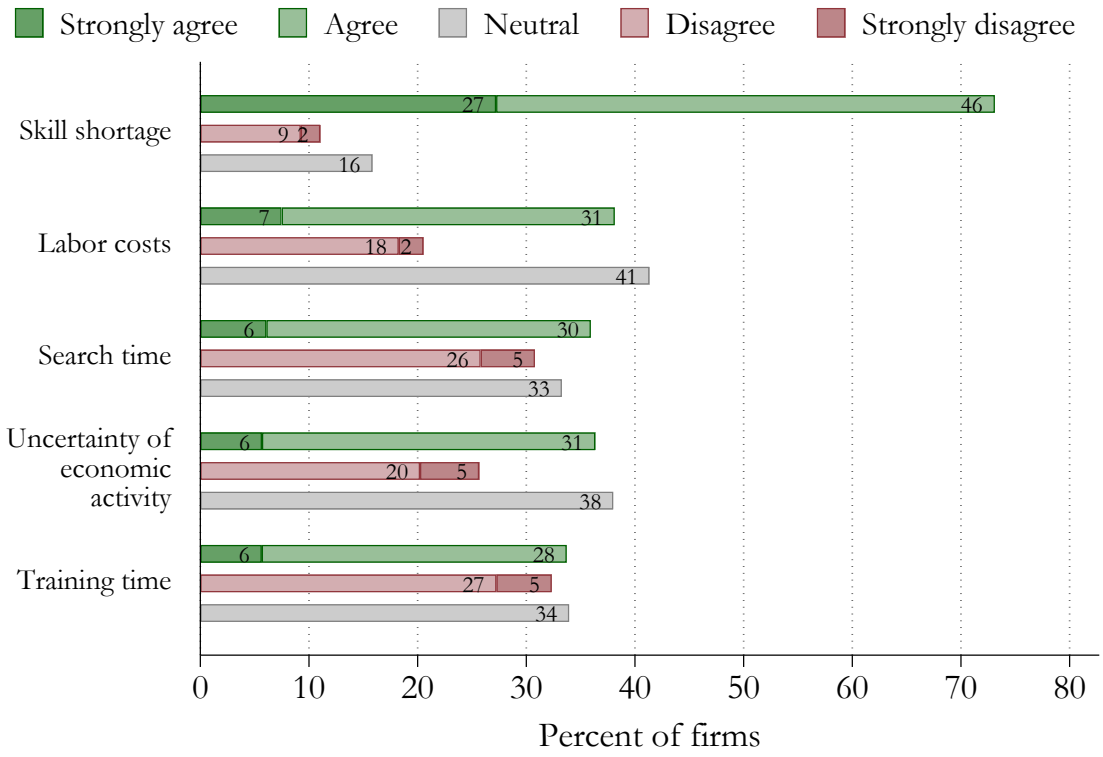
To show that the responses about hiring obstacles do not reflect respondents' misperceptions, we compare survey responses to plausibly objective measures of hiring difficulties. Table A.2 reports the results. We consider three measures of objective hiring difficulties: the labor market tightness, the percentage of unfilled vacancies (labeled "unfilled vacancies"), and the percentage of new hires who are unqualified ("labeled "unqualified hires").[19] Estimates are all positive, and the skill

[18] We find that the majority of the "other" factors are similar to or are variants of the five categories we provided in the survey.

[19] Unfilled vacancies and unqualified hires are estimated from a survey (*Rekrutteringssurvey*) that asks the hiring outcomes of a specific job vacancy four months after the vacancy is posted on a job

shortage estimate is three times as large as the training estimate. Meanwhile, none of these measures are correlated with economic uncertainty. This further reassures us, since the current labor market condition would have little impact on firms' hiring decisions if they are discouraged by future economic uncertainty. These results show that our survey responses indeed capture firms' hiring situations.

Figure 1: Obstacles Discouraging Firms From Hiring



Note: The figure reports responses to the question: What factors can discourage the firm from recruiting despite the potential need? The hiring obstacles are: The lack of qualified candidates (Skill shortage); Job seekers want a higher wage than the firm can offer (Labor costs); Finding and choosing the right employee is too time-consuming (Search time); Training employees in firm-specific skills is too time-consuming (Training time); The uncertainty of economic activity.

3.2 Hiring Obstacles, Firm and Labor Market Characteristics

Our results so far suggest that firms face several different hiring obstacles. The next step is to document how these hiring obstacles vary across firms. The characteris-

board. The survey is fielded by the National Employment Policy Agency (STAR). We link these measures to our survey using the firm-level share of employment in each occupation from the administrative employer-employee data.

tics of interests are firm size, age, wage premium, labor productivity (value added per worker), and the firm's monopsony power.[20] For easier interpretation, we normalize the characteristics of interests (i.e., we convert them to a Z-score). Table 2 reports the marginal effects from the ordered probit models discussed in the previous section. We estimate the probability that firms agree or strongly agree with each hiring obstacle. Table 2 reports the selected firm characteristics, but all models include additional controls as well as regional and industry fixed effects.[21]

Our results are as follows. Some hiring obstacles are less prevalent for larger and older firms. A one standard deviation (SD) decrease in firm size is associated with a 3.45 percentage point (pp) increase in the probability that search time is considered a hiring obstacle. Smaller firms are also more concerned about training time (4.09 pp). Similarly, younger firms are more likely to be discouraged by these two obstacles. The estimates range from -3.14 pp for search time to -3.68 pp for training time, even after controlling for wage and productivity. Our results are consistent with and complement studies that characterize young firms. Studies on administrative data show that young firms are matched with lower-quality workers despite being generally high-wage firms (Babina et al., 2019; Sorenson, Dahl, Canales, and Burton, 2021). While our survey does not provide direct channels on why those young firms are more impacted by search and training frictions, one plausible explanation is that referrals and networks are less available for younger firms due to their smaller pool of employees.[22] Another possible explanation for our estimates is that it is difficult for job seekers to determine whether younger firms are good employers (i.e., they provide stable or high-quality jobs), given the lack of employment history in these firms. Kim (2023) shows, using a directed search model, that this uncertainty affects young firms' hiring and ultimately dampens the growth of high-potential young firms. Since young firms play a key role in employment growth (Decker et al., 2014), and the quality of the initial workers plays a significant role in young firm's long-term success (Babina et al., 2019), our results suggest employment policies that help firms hire should potentially put more emphasis on younger and smaller firms.

Next, we document the role of firm wage policy. In labor market models with search frictions (e.g., Burdett and Mortensen (1998)), firms can attract more job seekers (either already employed or unemployed) by setting a higher wage than

[20] Table A.1 reports the definition of each variable.

[21] Specifically, the firm-specific tightness, the firm (ownership, task-contents of jobs, capital, cash, revenue, and employment growth, hiring upskilling, a subcontractor to other companies, and the presence of wage floors), the respondent and the workforce characteristics.

[22] A large literature in sociology and economics shows that employee referral is one of the most used hiring methods (Topa, 2011). Firms use these networks to attract workers with better quality in hard-to-observe dimensions (Hensvik and Skans, 2016)

Table 2: Hiring Obstacles and Firm Characteristics

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Size	0.47	-1.91	-3.45***	-4.09***	-2.15*
	(1.25)	(1.27)	(1.33)	(1.38)	(1.23)
Age	-1.74	-1.96	-3.14***	-3.68***	-1.76
	(1.15)	(1.25)	(1.22)	(1.20)	(1.21)
Productivity	0.46	-3.36***	-0.30	-1.24	-4.75***
	(1.13)	(1.19)	(1.25)	(1.19)	(1.30)
Wage premium	0.22	-4.15***	-0.99	0.80	-2.03*
	(1.13)	(1.11)	(1.08)	(1.05)	(1.14)
Monopsony power	-1.62	0.12	-4.92***	-0.41	-2.60**
	(1.55)	(1.49)	(1.81)	(1.72)	(1.13)
Wage floor	-5.94	-9.80***	-1.59	-1.76	0.55
	(3.72)	(3.48)	(3.66)	(3.52)	(3.86)
N	2063	2063	2063	2063	2063
Probability	.72	.37	.35	.33	.36
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports ordered probit marginal effects of firm characteristics on the probability of agreeing with different hiring obstacles. The exact wording of the hiring obstacles is reported in Section 3.1. Firm characteristics are measured from administrative data and are normalized (i.e., convert to a Z-score), except for whether the firm is covered by wage floor (indicator). Additional controls include firm, workforce, and respondent characteristics, as well as 59 industry- and 5 region-fixed effects, and firm-specific labor market tightness (see Section 2.4). Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

their competitors.[23] Does a higher wage premium reduce hiring obstacles? Table 2 shows this is partly true. Indeed, high-productivity and high-wage firms are less concerned about labor costs. The magnitude of the effect is stronger for high-wage than high-productivity firms: A one SD increase in firm productivity (wage premium) decreases the probability that the labor costs are considered a hiring obstacle by 3.36 pp (4.15pp). However, the wage premium and productivity are not associated with other obstacles, such as skill shortages, search, and training frictions. This result complements the work by Mueller et al. (2022). They find that in Austria, the duration of a vacancy negatively correlates with the starting wage, but the effect is small in magnitude. Therefore, while more desirable employers are probably less affected by hiring obstacles, the variation does not seem to be large enough that other hiring frictions do not impact those firms. One implication of our results is that high-quality firms could potentially create more jobs and increase labor demand if there were less labor market friction.

While firm-specific characteristics matter in hiring decisions, theories suggest that the labor market in which firms operate should also impact their decisions. It is well-documented that firms have monopsonistic power, as the number of potential employers in a given industry region is typically low (Manning, 2021). In a more concentrated market, we expect that search time is lower as employers have fewer competitors. We measure firm-level monopsony power as its employment share in its local labor market.[24] We find that firms with higher monopsony power are less likely to consider search friction or uncertainty to be hiring obstacles. The association is also strong in magnitude, as the estimates are larger than the role of firm age or firm size. Interestingly, even firms with high monopsony power consider training time or skill shortages to be hiring obstacles.

Finally, the labor market institutional setting plausibly plays a role in hiring decisions. In Denmark, employment protection is low and does not significantly impact hiring decisions.[25] However, in our sample, 17% of firms are covered by wage floors that set minimum wages for most of their employees. This institutional setting could lead to firms being more discouraged from hiring. However, we do not find this to be the case. On the contrary, being covered by wage floors reduces the probability of firms reporting that labor cost is a hiring obstacle by 9.80 percentage points.[26]

[23] Bertheau and Hoeck (2023) provide evidence that high-wage firms do so to attract job seekers.

[24] Firms are assigned a given local labor market within a given region (5 regions) and industry (at the two-digit level). This definition is common in the empirical monopsony literature.

[25] Our open-ended text, where employers express other hiring obstacles, shows this.

[26] This result is less robust compared to results on firm and labor market characteristics. Table A.5 restricts to firms with at least ten employees, and the magnitude of this effect is similar (-7.02 pp vs. -9.80 pp), but standard errors are larger, and we cannot reject a zero effect.

Figure 1 documents that 36 percent of the firms agree that economic uncertainty discourages them from hiring. We find that higher productivity significantly reduces the impact of economic uncertainty (4.75pp). This is consistent with Den Haan, Freund, and Rendahl (2021), who show that volatility increases the option value of waiting. It deters low-productivity firms from posting vacancies and leads to lower job creation.

Heterogeneity analysis. To better understand our estimates, we uncover how the average marginal effects vary by firm size, age, productivity, wage premium, and monopsony power. Figures A.8, A.9 and A.10 report the results. We evaluate the marginal effects of each individual firm and plot the average marginal effect of each decile.[27] Overall, the average marginal effects are larger for smaller, younger, less productive, lower wage, or lower labor market power firms. These results indicate that the chance of encountering hiring obstacles decreases faster when firms in the lower end of the distribution move up. These results suggest that policies that target firms at the lower end of the distribution could be more effective.

Additional analysis. We conduct additional analyses to ensure our results are not specific to a particular specification. First, we find similar results using OLS instead of ordered probit (see Table A.3). Second, regressions without weights yield similar results (see Table A.4). Third, we test whether different job amenities explain our results. The regressions include the fraction of the firm's wage bill devoted to paying for non-standard working conditions. Non-standard working conditions are defined as irregular work schedules (such as night work, work on public holidays, delayed lunch, on-call and relocation) and irregular working conditions (such as outdoor work and extreme weather) in our data. We also measure the positive non-wage amenities (labeled "employee benefits"). They are defined as the value of free cars, meals, lodging, multimedia, taxable health insurance and treatments, canteen arrangements, and work clothes. The estimates are reported in Table A.5.[28] Non-standard work conditions are positively associated with reporting that search is a hiring obstacle (2.53 pp). This result is consistent with studies showing that unfavorable job amenities are associated with a lower labor supply (e.g., Maestas, Mullen, Powell, von Wachter, and Wenger 2018). Despite having a much smaller sample size, how hiring obstacles vary across firms is similar in this specification. Younger and smaller firms are still more likely to be affected by similar hiring obstacles. Higher wage premiums still reduce the likelihood of reporting labor costs

[27] We show the results only when the effect of the variable is statistically significant in Table 2.

[28] Data on work conditions is only available for firms with at least ten employees (LONN).

being an issue (-4.69 pp vs. -4.15 pp in the main specification). These additional results provide support for our main results.

4 Subjective Beliefs and Hiring Obstacles

The previous section documents the extent of hiring obstacles and their variation across firms. This section investigates how hiring obstacles vary with firms' subjective beliefs about hiring workers with different employment statuses (either employed or unemployed) and firms' beliefs about their wages compared to other firms.

4.1 Firms' Beliefs about Unemployed Job Seekers

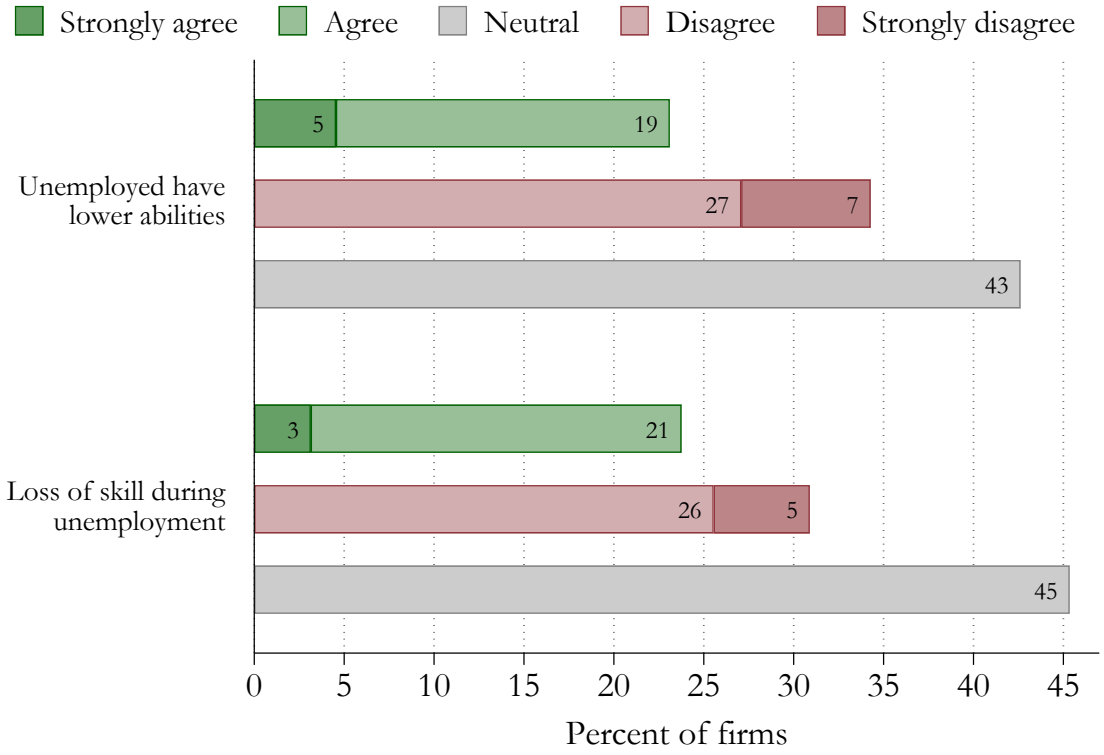
Figure 2 reports firms' preferences for hiring already employed workers over unemployed workers. We distinguish the two main motives that can make the unemployed unfavorable. We ask firms to provide their beliefs about the following statements: "We prefer to hire employed candidates as the unemployed lose their skills." This statement relates to the literature that evaluates the depreciation of skills during an unemployment period (e.g., Cohen, Johnston, and Lindner (2023)). The second statement is: "We prefer to hire employed candidates because unemployed workers have lower skills than those employed." This statement relates to the literature on adverse selection and layoffs (e.g., Gibbons and Katz 1991). Despite the large literature on unemployment duration, we know little about employers' beliefs on the employed vs. the unemployed. We find a wide variation in firm beliefs regarding this topic in our survey. Around 24 percent of the firms believe that skills depreciate over an unemployment spell, and 23 percent of the firms believe that the unemployed workers are negatively selected, i.e., are of lower ability. Firms' answers to these two questions are correlated but not perfectly aligned. Overall, around 31 percent of the respondents (633 out of 2063) agree with at least one of these two statements. This shows that a significant share of firms do have some preference for already employed workers.

To our knowledge, we are the first to ask firms their perceptions of hiring employed over unemployed workers in a large-scale and representative sample. The closest work to us is Bewley (1999). He finds that 30 out of 99 firms interviewed consider being unemployed a negative factor. Our result, despite being in a different country setting and a much larger sample size, is close in the share of firms with similar beliefs. There might be less stigma attached to the unemployed in Denmark compared to other countries, largely due to the low employment protection. As de-

scribed in Section 2.3, the level of employment protection is low, and it is closer to the level of the US than in other European country. Therefore, we expect to find less selection in workers' abilities between the unemployed and the employed.[29] This result contributes to the ongoing discussion in the employed and unemployed job search literature. Faberman et al. (2022) show that the employed are at least three times more effective than the unemployed in the job search. However, using randomized controlled trial designs, Eriksson and Rooth (2014) show that only long term unemployment spells have negative effects on the call back rate, while Farber et al. (2019) show that job seekers with an interim job actually received a slightly lower call-back rate than the unemployed.

[29]When the level of employment protection is higher, i.e., when separations are more costly for firms, they should only let go of the low-ability workers. When separation is less costly, firms are more likely to lay off more workers.

Figure 2: Firms' Beliefs about Hiring Already Employed over Unemployed Workers



Note: The figure reports responses to the question: Tell us your thoughts about hiring other firms' employees. Please express your opinion on the following statements. The statements are "We prefer to hire candidates who are employed as the unemployed lose their skills" (labeled "Loss of skill during unemployment"), and "We prefer to hire candidates who are employed because unemployed workers have lower abilities than those who are employed" (labeled "Unemployed have lower abilities").

We further investigate whether such preferences are based on objective differences in ability between the employed and the unemployed using individual-level labor market data. Worker abilities are hard to observe. We use the worker fixed effects from an AKM model as a proxy for workers' abilities. Recall that our AKM specification includes an unrestricted set of year dummies and quadratic and cubic terms in age fully interacted with educational attainment as time-varying exogenous variables. Hence, variations in worker effects capture a combination of skills and other factors that are rewarded equally across firms, taking into consideration that different cohorts would get distinct wages depending on their educational at-

tainment. To compare worker abilities by employment status, we proceed as follows. We classify workers in 2019 as employed and unemployed according to administrative records.[30] We assign each worker a worker effect based on the AKM specification discussed above (estimated on data from 2008 to 2019). For the unemployed, the worker effect is estimated before the last unemployment spell. We restrict the unemployed in 2019 to those who have been employed at least once since 2015. These restrictions limit the concern that previous unemployment spells bias worker effects.[31]

Figure 3 Panel (a) shows the distribution of the worker effects by employment status. We find that the employed have higher worker effects than the unemployed. To quantify the difference in worker abilities, we plot the position of the worker effect percentile of the unemployed in the overall worker effect distribution. Figure 3 Panel (b) reports the result. Specifically, the horizontal axis shows the percentile of the unemployed worker effects, and the vertical axis shows the corresponding percentile of the unemployed worker effects in the whole workforce. The median worker effect of the unemployed is equivalent to the 32nd percentile of all the workers (both employed and unemployed). These results show that firms' preference for hiring employed over unemployed workers is not unfounded. It is consistent with the study by Mueller and Spinnewijn (2023), who show that the dynamic selection into long-term unemployment can explain half of the decline in the job finding rate, and Faberman et al. (2022), who show that 61 percent of the unemployed and employed wage differential can be attributed to unobserved worker heterogeneity.

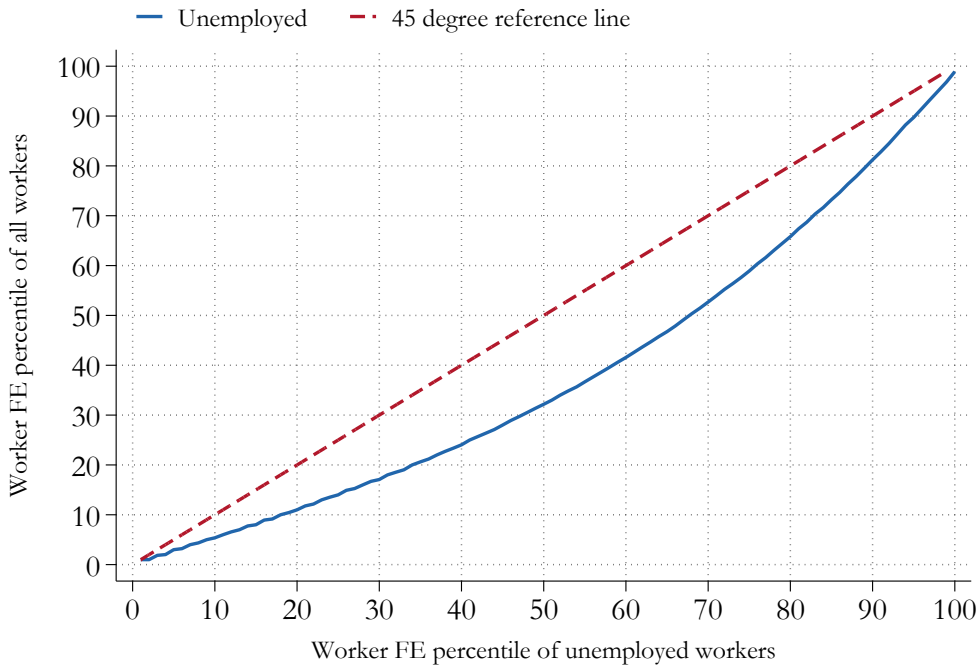
[30] We get employment status using the administrative dataset (IDAP) that classifies all individuals living in Denmark by their socio-economic status.

[31] This restriction is typically applied in the recent job displacement literature (Bertheau, Acabbi, Barcelo, Gulyas, Lombardi, and Saggio (2023a); Schmieder, von Wachter, and Heining (2023)).

Figure 3: Comparing Employed and Unemployed Abilities

Panel (a): Distribution of Worker Effect by Employment Status

Panel (b): Unemployed Worker Effects in the Entire Worker Effects Distribution



Note: Panel (a) plots the kernel distribution for employed and unemployed workers. The solid blue line in Panel (b) shows the relationship between the percentile of the unemployed worker effect and the percentile of the worker effect of all workers.

Next, we show how firms' beliefs about hiring workers with different employment statuses vary across firms. We find that firm size, age, productivity, skills, and monopsony power do not explain variations in firms' beliefs (see Table A.6). We also include a variable that measures firm-specific employed and unemployed worker effect differences.[32] Interestingly, the differences in worker abilities do not explain firms' preferences. Potentially, this can be explained by the fact that the employed have higher worker effects than the unemployed on average in most occupations, and there is not enough variation in worker differences across firms.

Do employers who prefer to hire already employed workers experience greater hiring difficulties? We hypothesize that employers who prefer the employed over the unemployed workers, either due to skill depreciation or adverse selection concerns, have a more limited pool of candidates, which would increase their hiring difficulties.[33] To test this hypothesis, we construct a dummy variable that indicates whether the respondents agree with at least one of these two statements (labeled "prefer hiring employed"). Table 3 presents our results. The specification is the same as in Table 2. Estimates of firms' beliefs are conditional on firm and labor market characteristics. This reduces the concern that tighter labor market conditions induce some firms to prefer hiring employed over unemployed workers. Additionally, we control for worker abilities by employment status at the firm level. We find that the preference for the already employed over the unemployed strongly correlates with all the hiring obstacles except economic uncertainty. Agreeing with at least one of the two statements is associated with a 7.69 to 10.65 pp increase in the probability of reporting hiring difficulties.

[32]This variable is constructed by using the occupational level worker effect difference, weighted by the occupation share in each firm.

[33]Even though thoroughly understanding this relationship is beyond the scope of this paper, we nonetheless suggest a channel that can potentially explain this link.

Table 3: Hiring Obstacles and Preferring Hiring Employed over Unemployed

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage	Labor costs	Search	Training	Uncertainty
	(1)	(2)	(3)	(4)	(5)
Prefer hiring employed	10.65***	9.74***	8.31***	7.69***	1.68
	(2.23)	(2.27)	(2.21)	(2.12)	(2.16)
N	2035	2035	2035	2035	2035
Probability	.72	.37	.35	.33	.36
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes
Worker FE difference	Yes	Yes	Yes	Yes	Yes

Note: The table reports ordered probit marginal effects of firms' preference for the employed over the unemployed on the probability of agreeing with different hiring obstacles. "Prefer hiring employed" is an indicator variable. Firm characteristics from Table 2 are included as controls and their estimates are reported in Table A.7. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

To provide further evidence for the proposed channel and ensure that our results on preferences for hiring already employed workers translate to actual behaviors, we ask "What percentage of your employees are recruited from other firms?" Participants have the option to choose from 0% to 100%. Figure A.11 shows the result. A third of the firms state that up to a fifth of the workers come from other firms, and a quarter say that at least 90% come from other firms.[34] We compare the poaching rate with the poaching rate from the administrative data, which is defined as the fraction of all new hires with less than a two week non-employment period between jobs divided by all hires.[35] The correlation between the two measures is positive (Figure A.13), but the poaching rate in our survey has more dispersion than the poaching rate from the administrative data. This implies that the most commonly used administrative poaching rate may underestimate the extent of poaching across firms.

We use the poaching rate to investigate whether firms' preferences for the em-

[34]Figure A.12 shows that the finance industry has almost three-quarters of its employees coming from other firms. Other industries poach around 50% of their workers from other firms.

[35]We measure $Poaching_j = \frac{H^{EE}_{jt}}{H_j t}$ where j is a firm and H^{EE} is the number of new hires directly coming from other firms, and H is all new hires (excluding recalls) of the firm.

ployed over the unemployed impacts their hiring behavior. The outcome variable is the poaching rate from our survey, and we include firms' preferences for hiring already employed workers as explanatory variables. The results are reported in Table 4. We find that preferring the employed for either reason (skill loss or lower abilities) is associated with an increase in the poaching rate by around 10 percentage point.

Table 4: Firms' Beliefs about Unemployed Abilities and Poaching Rate

Q: What percentage of your employees are recruited from other firms?	(1)	(2)
Prefer hiring employed		
Yes: Loss of skills	10.02***	
	(1.89)	
Yes: Lower abilities		10.82***
		(1.95)
Firm Characteristics		
Size	3.69***	3.62***
	(0.83)	(0.83)
Age	0.02	0.10
	(0.96)	(0.95)
Productivity	2.96***	2.97***
	(0.99)	(0.98)
Wage premium	1.20	1.27
	(0.93)	(0.92)
Monopsony power	-0.19	0.20
	(0.78)	(0.77)
Wage floor	-3.24	-3.10
	(3.12)	(3.10)
N	2024	2024
Mean Dep. Var.	51.98	51.98
Adj.R2	0.149	0.151
Additional controls	Yes	Yes
Worker FE difference	Yes	Yes

Note: This table reports OLS estimates of the effect of firms' beliefs to hire already employed workers over unemployed workers on their poaching rate. Column 1 includes the loss of skill during unemployment belief as a reason to prefer already employed workers. Column 2 includes the belief that the unemployed have lower abilities. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

These results show that firms' preference for the employed over the unemployed affects their hiring behavior. It also provides evidence for the channel that by limiting the number of potential candidates to already employed workers, firms with such preferences are more likely to encounter hiring difficulties.

4.2 Hiring Obstacles and Firm Beliefs about Their Wages

We document that firms' beliefs about job seekers with different employment statuses impact their hiring decisions. We ask whether misperception of their own wage affects hiring difficulties. To do so, we use one survey question that asks firms their beliefs about their wage policy relative to other firms. The wording of the question is the following: "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 abilities in your region." The respondents have five potential options: much lower, lower, about the same, higher, and much higher. We then compare their answers to firm-specific wage premiums. Bertheau and Hoeck (2023) show that the firm's beliefs about its position in the wage distribution are correlated with its position in the firm-specific wage premium distribution. However, many firms misperceive their position in the wage distribution.

We define a categorical variable that measures whether a firm underestimates or overestimates its' own wage in the wage distribution. A firm overestimates its wage if it answers that it pays about the same as its peers, yet its actual wage premium is below the 30th percentile of the distribution. It also overestimates its wage if it answers that it pays higher or much higher than its peers, yet its actual wage premium is below the 50th percentile.[36] With this measure, 24 percent of the respondents underestimate their wage in the distribution, and 28 percent of the firms overestimate their wage.[37]

Table 5 shows that misperceptions are strongly associated with the hiring obstacle related to labor costs. We control for firm-specific labor market tightness to alleviate the concern that a tight labor market might alter firms' beliefs of their own wage. We find firms that underestimate their wages are 5.94 pp more likely to agree that labor costs are a hiring obstacle. This means that firms that think they pay lower wages than their peers, despite the administrative data showing the opposite, are discouraged from hiring due to their perceived labor costs. This result

[36] Similarly, we consider firms to be underestimating their wage if they answer that they pay about the same as their peers but their wage premium is above the 70th percentile, or if they think they pay lower or much lower than their peers, but their wage premium is above the medium.

[37] We also define misperception using different thresholds and we find the results are similar.

suggests an explanation for why firms use salary benchmarking (see Cullen (2023) for a literature review). On the other hand, when a firm overestimates its own wage in the wage distribution, it reduces the probability that it views the expected salary as a hiring obstacle. Overall, these results shed new light on the role of the demand side of subjective beliefs, complementing the literature that studies how supply side subjective beliefs affect labor market outcomes (e.g., Altmann, Falk, Jäger, and Zimmermann 2018).

Table 5: Hiring Obstacles and Wage Misperception

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage	Labor costs	Search	Training	Uncertainty
	(1)	(2)	(3)	(4)	(5)
Underestimate own wage	-3.62	5.94**	-1.31	-5.05**	-0.83
	(2.82)	(2.91)	(2.76)	(2.55)	(2.80)
Overestimate own wage	-2.11	-10.08***	5.11*	1.46	-1.00
	(3.03)	(2.79)	(3.02)	(2.95)	(2.95)
N	2063	2063	2063	2063	2063
Probability	.72	.37	.35	.33	.36
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports ordered probit marginal effects of firms' misperception of their wage in the wage distribution on the probability of agreeing with different hiring obstacles. Underestimating and overestimating own wage are indicator variables. The baseline category is the correct belief about a firm's wage compared to other firms. Firm characteristics displayed in Table 2 are included as controls, and their estimates are reported in Table A.8. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

5 Conclusion

This paper documents the extent to which factors discourage firms from hiring despite potential needs, their variations across firms, and the role of firms' subjective beliefs. Our results are useful for several reasons. First, in leading labor market models, employers post vacancies to attract job seekers. Recent work shows how hiring standards vary over firm performance (Faberman, 2020). However, less is known about what factors could discourage firms from hiring and how these vary

across firms. Beyond theoretical motivations, a better understanding of the sources of hiring difficulties can help design labor market policies that target hiring difficulties (see Algan, Crépon, and Glover (2023) for an evaluation of a public policy that helps firms hire). We designed and fielded a large-scale representative firm survey in Denmark. Our findings are as follows. Ex-ante and ex-post matching costs (i.e., search and training time) are as important as labor costs. These frictions are larger for smaller and younger firms, even after controlling for their productivity. A more generous pay policy reduces hiring obstacles related to labor costs but does not affect these matching frictions. Our unique survey uncovers how hiring obstacles relate to firms' subjective beliefs. Wage misperception matters, as firms that underestimate their rank in the wage distribution report hiring difficulty due to labor costs. Finally, firms that prefer to hire already employed workers report more hiring obstacles.

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Online Appendix

A Additional Information on Data

A.1 The Survey Questionnaire

This section reports the questions we use in this paper. While some phrases can seem uncommon in English, they are perfectly understandable in Danish. Key phrases and Danish words are reported in parenthesis in Danish for Danish speakers.

Background question.

- What is your role in the company?
  - Owner manager
  - Director without ownership
  - Board member without ownership
  - Owner without being a board member
  - Others

  All categories but "Others" are combined in this question to create the variable "Manager respondents".

- Does a person or family have 50% or more of the ownership?
  - Yes
  - No
  - Do not know

  The category "Yes" in this question corresponds to the variable "Family-owned firm".

- How many employees were there in the company on May 1, 2021? Note: Include all employees, including full-time, part-time, furloughed and employees on apprenticeship and parental leave. Give your best estimate.
  - _____

- How much did revenue (*omsætningen*) change in 2020 compared to 2019? Note: If you do not know the exact change, give your best estimate.
  - Reduced by 100 percent
  - Reduced (indicate the percentage): ——————
  - Unchanged
  - Increased (indicate the percentage): ——————
  - Increased by 100 percent or more
- Is the company primarily a subcontractor (*underlerverandør*) to other companies?
  - Yes, for 90 percent or more of the revenue
  - Yes, for 50 percent to 89 percent of the revenue
  - Yes, for 25 percent to 49 percent of the revenue
  - Yes, for 10 percent to 24 percent of the revenue
  - Yes, for less than 10 percent of the revenue
  - No
  - Do not know

  The categories "Yes, for 90 percent or more of the revenue" and "Yes, for 50 percent to 89 percent of the revenue in this question corresponds to the variable "Subcontractor".
- In the following questions, we ask about pay (*løn*)[38] and hiring practices (*ansættelsespraksis*). 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
- 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.

[38]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".

  - Much lower
  - Lower
  - About the same
  - Higher
  - Much higher

Hiring question.

- What percentage of your employees are recruited from other firms? Recruited employees from other firms mean people who were already employed and not unemployed or had not just entered the labor market. If you are not sure, come up with your best guess.

  - 0% from other firms
  - 10%
  - 20%
  - 30%
  - 40%
  - 50%
  - 60%
  - 70%
  - 80%
  - 90%
  - 100%, all from other firms

- Tell us your thoughts about hiring other firms' employees. Please express your opinion on the following statements. Respondents have five options (strongly agree, agree, neutral, disagree, and strongly disagree).

  - We do not necessarily prefer candidates who are employed, as there is still a need for company-specific qualities and training.
  - We do not necessarily prefer candidates who are employed as we are in doubt as to why an applicant wants to change jobs.
  - We prefer to hire candidates who are employed as unemployed workers lose their skills.

  - We prefer to hire candidates who are employed because unemployment workers have lower abilities than those who are employed.
  - Other, please write.

- When recruiting an employee, which part of the hiring process is most costly in time or money?
  - Search for candidates, conducting interviews
  - Briefing of new employees (either through his / her manager or colleagues)

- What factors can discourage the firm from recruiting despite the potential need? Please express your opinion on the following statements. Respondents have five options (strongly agree, agree, neutral, disagree, and strongly disagree).
  - The lack of qualified candidates.
  - Candidates typically want a higher salary than what the firm can offer.
  - Finding and choosing the right employee is too time consuming
  - Training (*Orientering og træning)* with company-specific skills *(evner)* and knowledge *(viden)* takes too much time
  - The uncertainty of economic activity
  - Other, please write.

- When will the newly hired employee achieve/have achieved the same productivity as an average employee in a similar position? Please indicate the estimate in months. The possible options are from within one month up to 18 months (or more).

B Additional Tables and Figures

B.1 Tables

Table A.1: Definition of Variables and Data Sources

Variable:	Definition and construction:	Dataset:	Variable name:
Information at the firm level:			
Firm age	Number of years since firm creation	FIRM	JUR_FRA_DATO
Firm size	Number of employees (full-time equivalent, FTE)	BFL	AJO_LOENTTIMER
Value added	Revenues minus intermediate expenses	FIRM	GF_VTV
Productivity	Value added per firm size	FIRM	GF_VTV
Monopsony power	Firm's employment divided by total employment within a given region-industry	FIRM	GF_ANSATTE
Industry	59 industries codes (NACE)	FIRM	GF_GR019_DB07
Region	5 Danish regions codes (NUTS)	FIRM	JUR_BEL_REGION_KODE
Employment growth	Net job creation rate from 2019 to 2020	BFL	AJO_LOENTTIMER
Wage floors	=1 if at least 50% of employees are subject to a wage floor set at the industry-occupation level	DA	——
Capital stock	Fixed assets (e.g, buildings, machines, patents)	FIRM	GF_AAT
Liquidity	Liquid assets (e.g., cash, bonds)	FIRE	VKT
Revenue growth	Revenue growth from 2019 to 2020	FIRM	GF_OMS
Information at the worker level:			
Hourly wage	Earnings per hour	IDAP	BREDT-LOEN-BELOEB/LOENTIMER
Education	Percentage of workers with at least a bachelor's degree	UDDA	HFAUDD
Female	% of females in the firm	IDAP	KON
Unionization	% unionized workers in the firm	IND	FAGFKD
Upskilling	Mean education of new hires in 2020 / Mean education of new hires in 2019	UDDA	HFAUDD
Age	Mean age in the firm	IDAP	ALDERNOV
Tenure	Mean tenure in the firm	IDAN	ANSAAR
Wage	Earnings per hour	LONN	FORTJ_PRAE
Benefits	Percentage of salary paid as benefits	LONN	PERSGODE_PRAE
Non standard conditions	Percentage of salary paid as compensation for non standard conditions	LONN	GENE_PRAE
Labor market characteristics:			
Labor market concentration	Regional industrial level HHI	FIRM	GF_ANSATTE
Tightness	Weighted occupation-specific tightness	STAR	——
Unfilled vacancies	Weighted occupation-specific vacancies not filled	STAR	——
Unqualified hires	Weighted occupation-specific vacancies filled by unqualified	STAR	——

Note: The table reports the administrative datasets and the variables that we use. All variables are measured in 2019 unless specified otherwise.

Table A.2: Hiring Obstacles and Objective Hiring Difficulty

Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Labor market tightness	0.09***	0.07***	0.06***	0.03*	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	2063	2063	2063	2063	2063
Unqualified hires	0.07***	0.05**	0.03	0.04*	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	2033	2033	2033	2033	2033
Unfilled vacancies	0.14***	0.06***	0.08***	0.05***	-0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	2033	2033	2033	2033	2033

Note: This table reports univariate OLS estimates between objective hiring difficulties and survey responses to the question "What factors can discourage the firm from recruiting despite the potential need?" Objective hiring difficulties are available at the two-digit occupational level. They are linked to our firm-level survey using the share of employment in a particular occupation. The objective hiring difficulties measures are converted to a Z-score. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Table A.3: Hiring Obstacles and Firm Characteristics: OLS regressions

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Size	0.01	-0.05*	-0.08***	-0.10***	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age	-0.04	-0.03	-0.07**	-0.08***	-0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Productivity	0.01	-0.07***	-0.00	-0.03	-0.11***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
Wage premium	-0.01	-0.08***	-0.02	0.01	-0.04*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
Monopsony power	-0.05	0.01	-0.08***	-0.01	-0.05**
	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)
Wage floor	-0.17**	-0.21***	-0.03	-0.05	-0.01
	(0.08)	(0.08)	(0.09)	(0.09)	(0.08)
N	2063	2063	2063	2063	2063
Mean Dep. Var.	3.85	3.21	3.03	2.99	3.1
Adj.R2	0.050	0.049	0.055	0.037	0.082
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports OLS estimates of agreeing with different statements related to the question: "What factors can discourage the firm from recruiting despite the potential need?" The specifications are the same as in Table 2. The scale ranges from 1 (strongly disagree) to 5 (strongly agree). Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Table A.4: Hiring Obstacles and Firm Characteristics: Unweighted Sample

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Size	0.49	-2.00	-3.12**	-3.81***	-1.99
	(1.26)	(1.24)	(1.29)	(1.33)	(1.21)
Age	-1.93*	-1.78	-3.75***	-3.81***	-1.53
	(1.15)	(1.22)	(1.19)	(1.17)	(1.19)
Productivity	0.79	-3.01**	-0.47	-1.75	-4.77***
	(1.14)	(1.19)	(1.22)	(1.18)	(1.28)
Wage premium	-0.01	-4.37***	-0.90	0.72	-2.54**
	(1.12)	(1.08)	(1.04)	(1.02)	(1.10)
Monopsony power	-1.64	0.07	-4.81***	-0.21	-2.64**
	(1.54)	(1.44)	(1.74)	(1.64)	(1.12)
Wage floor	-5.46	-9.96***	-2.01	-2.06	1.64
	(3.72)	(3.37)	(3.54)	(3.42)	(3.83)
N	2063	2063	2063	2063	2063
Probability	.72	.37	.35	.33	.36
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports unweighted ordered probit estimates of agreeing with different statements related to the question: "What factors can discourage the firm from recruiting despite the potential need?" The specifications are the same as in Table 2. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Table A.5: Hiring Obstacles and Job Amenities

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Firm Characteristics					
Size	0.69	-1.77	-2.65*	-2.21	0.20
	(1.34)	(1.36)	(1.42)	(1.39)	(1.32)
Age	-3.14**	-2.67	-4.56***	-4.90***	-1.43
	(1.50)	(1.66)	(1.64)	(1.56)	(1.56)
Productivity	1.41	-1.85	-0.33	-2.85	-4.93**
	(1.73)	(1.80)	(1.70)	(1.77)	(1.95)
Wage premium	-2.95	-4.69**	-1.53	-0.23	-2.85
	(1.85)	(1.86)	(1.86)	(1.80)	(1.78)
Monopsony power	-0.00	0.78	-4.74**	0.49	-3.57**
	(1.70)	(1.59)	(2.05)	(1.78)	(1.42)
Wage floor	-6.32	-7.02	-3.96	-2.46	3.90
	(5.58)	(4.91)	(4.96)	(4.76)	(5.37)
Job Amenities					
Non standard condition (%)	-0.24	-0.34	2.53**	-0.05	-3.56***
	(1.22)	(1.10)	(1.29)	(1.55)	(1.36)
Employee benefit (%)	1.73	1.57	-1.13	1.90	-0.06
	(1.43)	(1.41)	(1.57)	(1.27)	(1.21)
N	1075	1075	1075	1075	1075
Probability	.72	.37	.35	.33	.36
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports the marginal effects of firm characteristics on the probability of agreeing with hiring obstacles from ordered probit models. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses. The specifications are the same as in Table 2, except for two additional variables. Non-standard working conditions are the percentage of pay for non-standard working conditions, which includes irregular work schedules (such as night work, work on public holidays, delayed lunch, on-call and relocation) and irregular working conditions (such as outdoor work and extreme weather). Employee benefits are the percentage of pay for benefits, which is defined as the value of a free car, meals, lodging, multimedia, taxable health insurance and treatments, canteen arrangements, and work clothes.

Table A.6: Firm Beliefs about Unemployed Abilities and Firm Characteristics

The company prefers to hire candidates who are employed because...		
	Loss of skill during employment	Unemployed have lower abilities
	(1)	(2)
Size	-1.01	-0.73
	(0.97)	(0.97)
Age	-0.32	-0.45
	(1.02)	(0.98)
Productivity	1.58	1.19
	(0.99)	(0.99)
Wage premium	-0.77	-0.43
	(0.88)	(0.86)
Monopsony power	1.94	-0.91
	(1.24)	(1.15)
Wage floor	1.74	0.41
	(3.01)	(2.96)
Worker FE difference	0.22	0.14
	(0.94)	(0.94)
N	2035	2035
Probability	.24	.23
Additional controls	Yes	Yes

Note: The table reports the ordered probit marginal effects of firm and worker characteristics on the probability of agreeing with firm's prefernce for hiring already employed workers over unemployed workers. The additional controls are the same as in Table 2. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Table A.7: Hiring Obstacles, Firm Characteristics and Firm Preferences

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles:	Skill shortage (1)	Labor costs (2)	Search (3)	Training (4)	Uncertainty (5)
Prefer hiring employed	10.65***	9.74***	8.31***	7.69***	1.68
	(2.23)	(2.27)	(2.21)	(2.12)	(2.16)
Firm Characteristics					
Size	0.73	-1.63	-3.12**	-3.80***	-2.13*
	(1.23)	(1.27)	(1.33)	(1.37)	(1.23)
Age	-2.00*	-2.02	-3.40***	-3.85***	-1.94
	(1.15)	(1.27)	(1.24)	(1.22)	(1.22)
Productivity	0.29	-3.54***	-0.55	-1.31	-4.83***
	(1.12)	(1.23)	(1.26)	(1.19)	(1.31)
Wage premium	0.10	-4.38***	-0.94	0.65	-2.33**
	(1.13)	(1.13)	(1.11)	(1.06)	(1.16)
Monopsony power	-1.70	-0.13	-5.04***	-0.74	-2.54**
	(1.58)	(1.51)	(1.78)	(1.68)	(1.14)
Wage floor	-4.62	-9.38***	-0.77	-0.33	1.70
	(3.68)	(3.52)	(3.76)	(3.63)	(3.93)
N	2035	2035	2035	2035	2035
Probability	.72	.37	.35	.33	.36
Additional controls	Yes	Yes	Yes	Yes	Yes
Worker difference	Yes	Yes	Yes	Yes	Yes

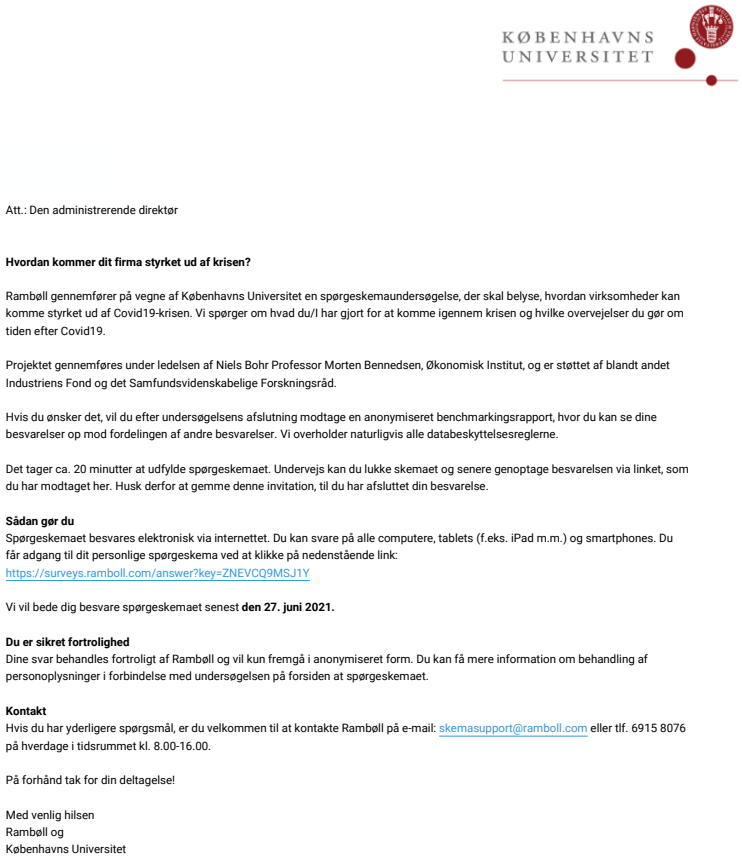
Note: The table reports ordered probit marginal effects of firm characteristics and firms' preferences for the employed over the unemployed on the probability of agreeing with different hiring obstacles. It uses the exact same specification as Table 3 but, in addition, we report the estimates of the firm characteristics. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Table A.8: Hiring Obstacles, Firm Characteristics and Wage Misperception

Question: What factors can discourage the firm from recruiting despite the potential need?					
Hiring obstacles: time	Skill shortage time	Labor costs	Search	Training	Uncertainty
	(1)	(2)	(3)	(4)	(5)
Underestimate own wage	-3.62	5.94**	-1.31	-5.05**	-0.83
	(2.82)	(2.91)	(2.76)	(2.55)	(2.80)
Overestimate own wage	-2.11	-10.08***	5.11*	1.46	-1.00
	(3.03)	(2.79)	(3.02)	(2.95)	(2.95)
Firm Characteristics					
Size	0.48	-2.20*	-3.31**	-3.98***	-2.16*
	(1.26)	(1.29)	(1.34)	(1.38)	(1.23)
Age	-1.73	-2.07*	-3.11**	-3.64***	-1.76
	(1.15)	(1.25)	(1.22)	(1.20)	(1.21)
Productivity	0.54	-3.14***	-0.43	-1.26	-4.72***
	(1.13)	(1.20)	(1.25)	(1.20)	(1.30)
Wage premium	0.39	-8.40***	0.75	2.32	-2.14
	(1.61)	(1.52)	(1.55)	(1.50)	(1.61)
Monopsony power	-1.53	-0.08	-4.89***	-0.28	-2.60**
	(1.56)	(1.52)	(1.83)	(1.72)	(1.13)
Wage floor	-5.92	-9.89***	-1.57	-1.79	0.54
	(3.72)	(3.47)	(3.67)	(3.53)	(3.86)
N	2063	2063	2063	2063	2063
Probability	.72	.37	.35	.33	.36
Additional controls	Yes	Yes	Yes	Yes	Yes

Note: The table reports ordered probit marginal effects of firm characteristics and wage misperception on the probability of agreeing with different hiring obstacles. It uses the same specification as Table 5, but we this table reports the estimates of the firm characteristics. Asterisks report statistical significance at the 1, 5 and 10% level (***,**,* respectively). Standard errors are in parentheses.

Figure A.1: Invitation Letter to Participate in the Survey



KØBENHAVNS UNIVERSITET

Att.: Den administrerende direktør

Hvordan kommer dit firma styrket ud af krisen?

Rambøll gennemfører på vegne af Københavns Universitet en spørgeskemaundersøgelse, der skal belyse, hvordan virksomheder kan komme styrket ud af Covid19-krisen. Vi spørger om hvad du/I har gjort for at komme igennem krisen og hvilke overvejelser du gør om tiden efter Covid19.

Projektet gennemføres under ledelsen af Niels Bohr Professor Morten Bennedsen, Økonomisk Institut, og er støttet af blandt andet Industriens Fond og det Samfundsvidenskabelige Forskningsråd.

Hvis du ønsker det, vil du efter undersøgelsens afslutning modtage en anonymiseret benchmarkingsrapport, hvor du kan se dine besvarelser op mod fordelingen af andre besvarelser. Vi overholder naturligvis alle databeskyttelsesreglerne.

Det tager ca. 20 minutter at udfylde spørgeskemaet. Undervejs kan du lukke skemaet og senere genoptage besvarelsen via linket, som du har modtaget her. Husk derfor at gemme denne invitation, til du har afsluttet din besvarelse.

Sådan gør du
Spørgeskemaet besvares elektronisk via internettet. Du kan svare på alle computere, tablets (f.eks. iPad m.m.) og smartphones. Du får adgang til dit personlige spørgeskema ved at klikke på nedenstående link:
https://surveys.ramboll.com/answer?key=ZNEVCQ9MSJ1Y

Vi vil bede dig besvare spørgeskemaet senest **den 27. juni 2021.**

Du er sikret fortrolighed
Dine svar behandles fortroligt af Rambøll og vil kun fremgå i anonymiseret form. Du kan få mere information om behandling af personoplysninger i forbindelse med undersøgelsen på forsiden at spørgeskemaet.

Kontakt
Hvis du har yderligere spørgsmål, er du velkommen til at kontakte Rambøll på e-mail: skemasupport@ramboll.com eller tlf. 6915 8076 på hverdage i tidsrummet kl. 8.00-16.00.

På forhånd tak for din deltagelse!

Med venlig hilsen
Rambøll og
Københavns Universitet

Note: The figure shows the invitation letter that firms received in an email asking them to participate in the survey. See an English translation of the letter below.

Att: The Administrative Director

How does your company come out of the crisis stronger?
On behalf of the University of Copenhagen, Rambøll is carrying out a survey to shed light on how firms can emerge stronger from the COVID19 crisis. We ask what you/you and others have done to get through the crisis and what thoughts you have about the time after COVID19.
The project is carried out under the leadership of Niels Bohr Professor Morten Bennedsen, Department of Economics, University of Copenhagen, and is supported by, among others Industriens Fond and the Social Science Research Council.
If you participate in the survey, we will offer you an anonymized benchmarking report that shows your responses against the distribution of the other responses. We naturally comply with all data protection regulations.
It takes approximately 20 minutes to complete the questionnaire. You can close the form and resume it later by again clicking on the link below. Therefore, please remember to save this invitation until you have completed the survey.

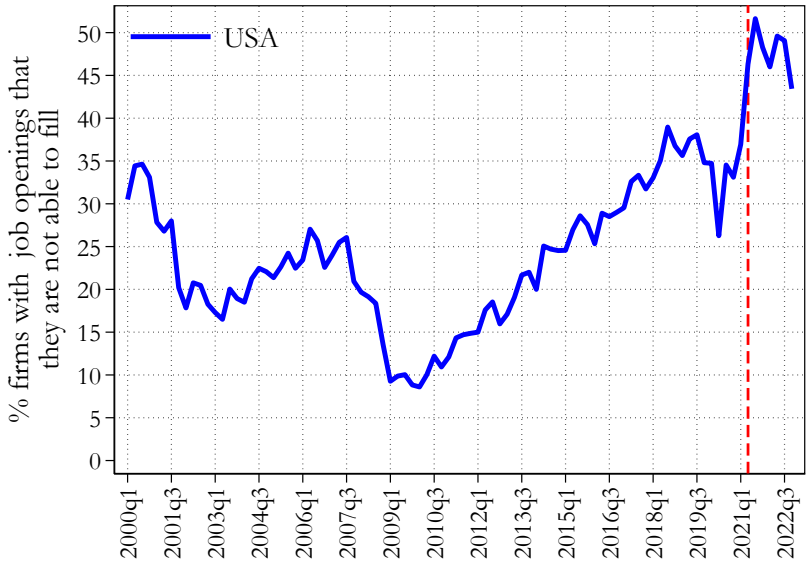
Here's how you do it
The questionnaire is answered electronically via the Internet. You can complete the questionnaire on any computer, tablet (e.g. iPad, etc.) or smartphone. To access your personal questionnaire, click on the link below: LINK
We ask that you complete the questionnaire no later than 27 June 2021.

You are guaranteed confidentiality
Your answers are treated confidentially by Rambøll and will only appear in anonymized form. You can find more information about the treatment of personal data in connection with the survey on the front page of the questionnaire.

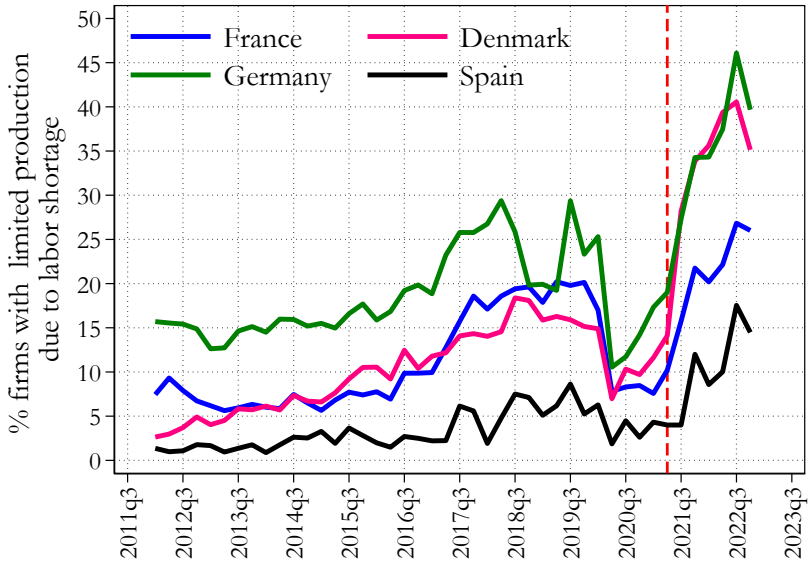
Contact
If you have further questions, please feel free to contact Rambøll by e-mail: skemasupport@ramboll.com or tel. 6915 8076 on weekdays between 8.00-16.00.
Thank you in advance for your participation
Yours sincerely
Rambøll and University of Copenhagen

Figure A.2: The Prevalence of Hiring Difficulties

Panel (a)



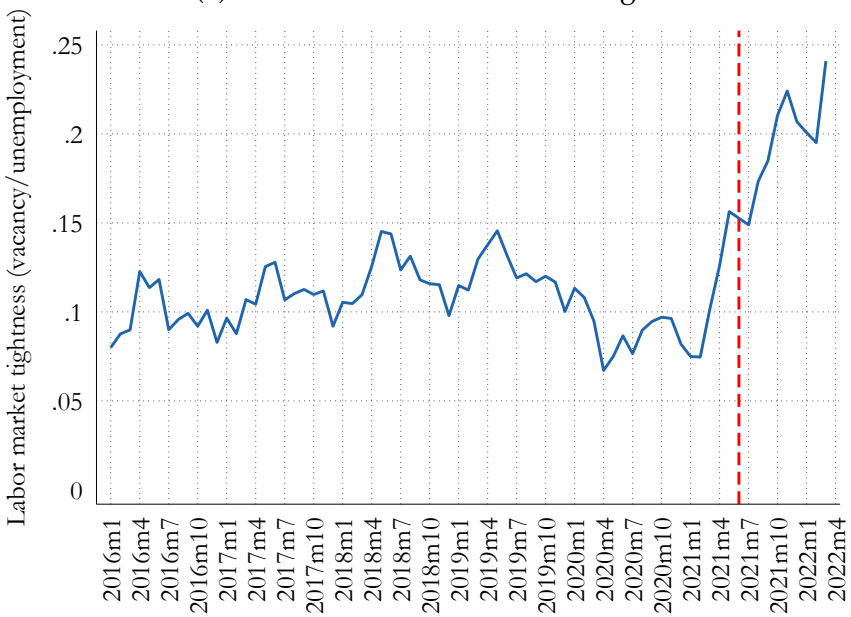
Panel (b)



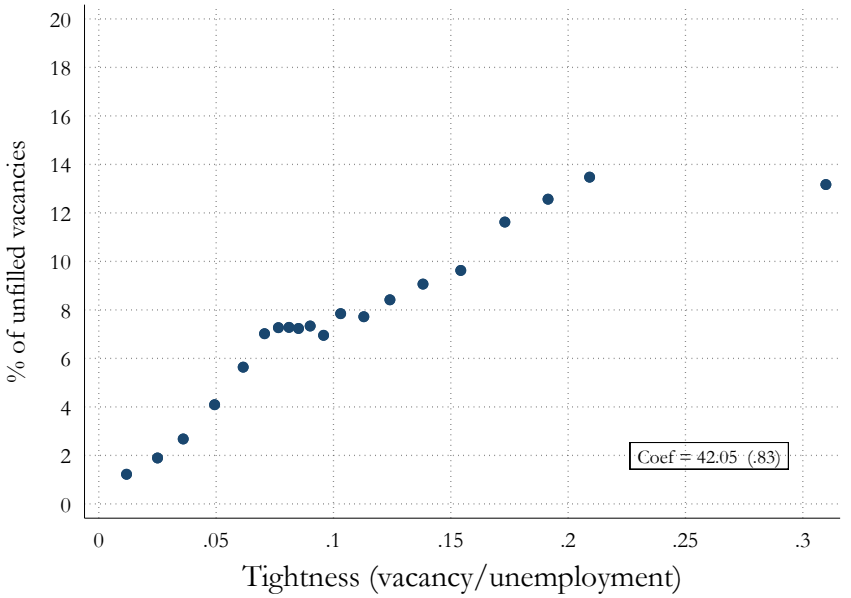
Note: Panel (a) reports the response to the question: Do you have any job openings that you are not able to fill right now? Source: Small Business Economic Trends, NFIB. Panel (b) reports the percentage of firms with limited production due shortage of labor in selected European countries. The question is: What main factors are currently limiting your production? Possible responses are: none, insufficient demand, shortage of labor force, shortage of material and/or equipment, financial constraints, other factors. Source: Business Survey from the DG-ECFIN 2022, i.e., the European Commission department for Economic and Financial Affairs. The dotted red line indicates the time (June 2021) when the survey was fielded.

Figure A.3: Labor Market Tightness in Denmark

Panel (a): Evolution of Labor Market Tightness



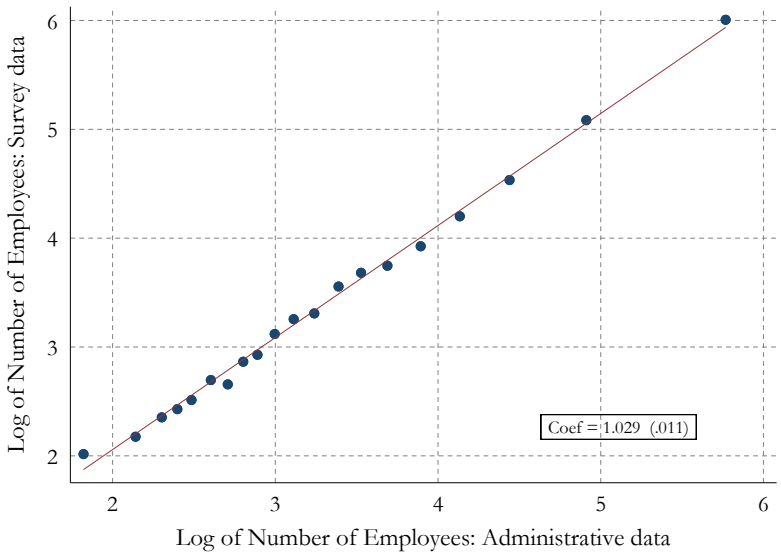
Panel (b): Tightness and % of Unfilled Vacancies



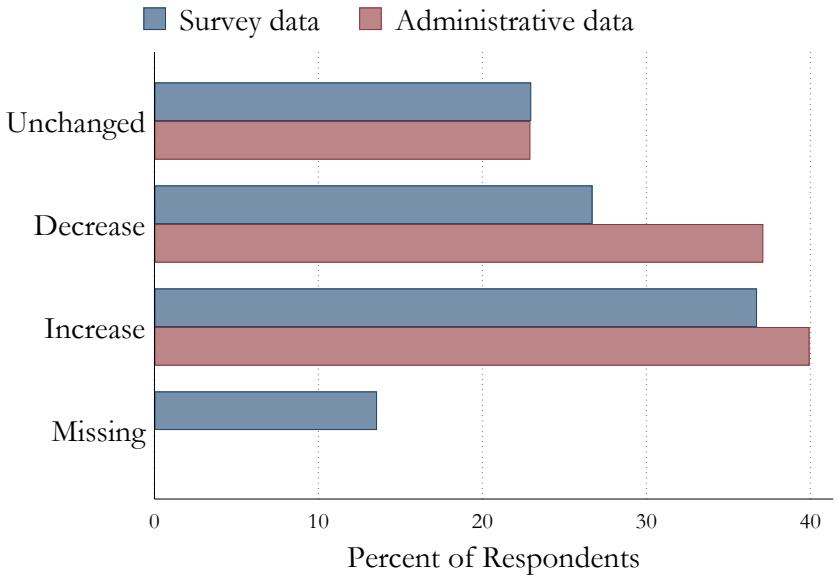
Note: Panel (a) reports the number of vacant positions over the number of unemployed workers in Denmark. Panel (b) links the labor market tightness and the percentage of firms reporting not having filled a vacancy four months after posting it. The dotted red line indicates the time (June 2021) when the survey was fielded. Source: STAR and (*Rekrutteringssurvey*).

Figure A.4: Comparison of Survey and Administrative data

Panel (a): Number of Employees



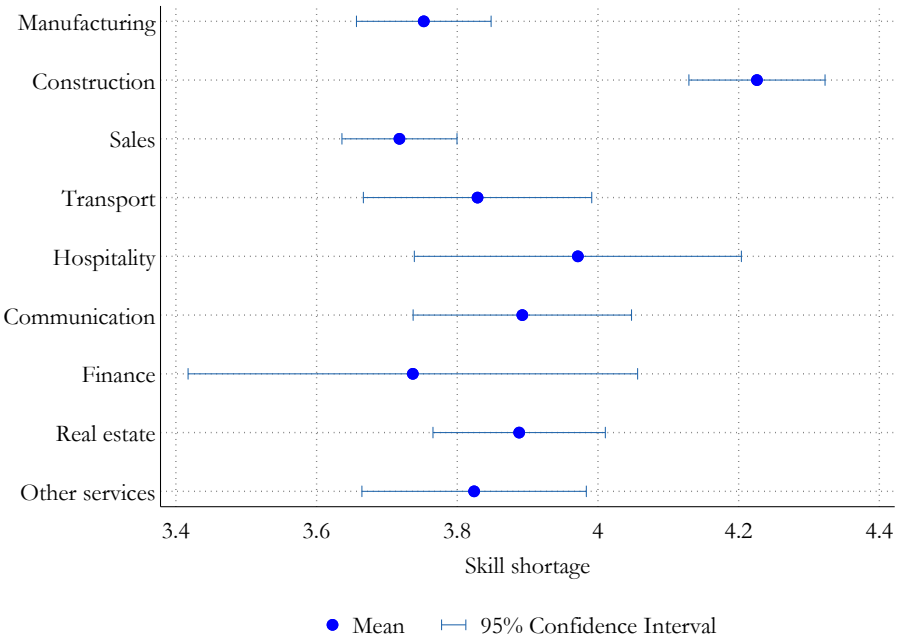
Panel (b): Revenue change



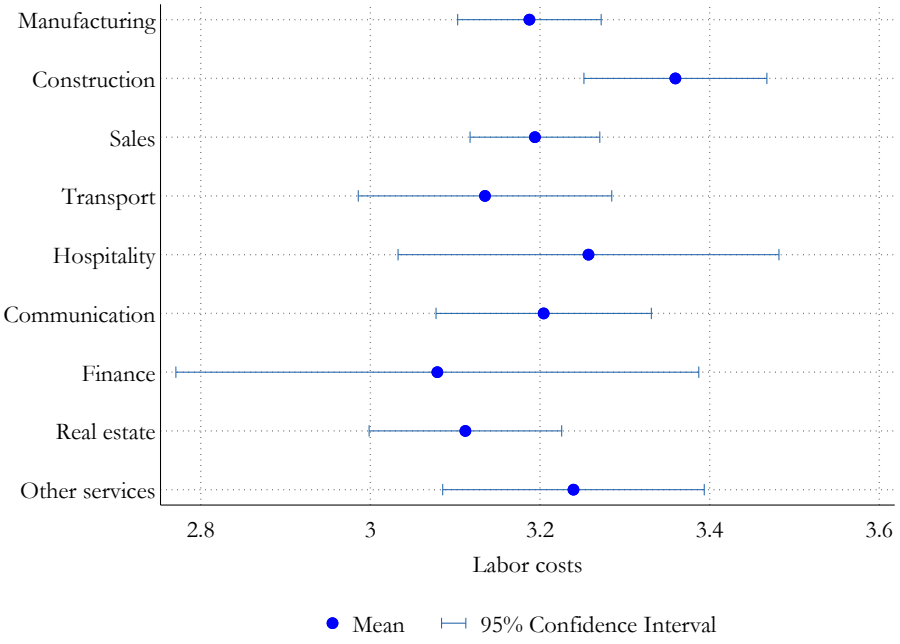
Note: Panel (a) compares the survey question, "How many employees were there in the company on May 1, 2021?" to the number of employees in March 2021 in the matched employer-employee dataset (BFL). Both variables are in logs and are winsorized. Panel (b) compares revenue changes from 2019 to 2020, in the survey and the firm's financial account data (FIRM).

Figure A.5: Hiring Obstacles by Industry

Panel (a): Skill Shortages



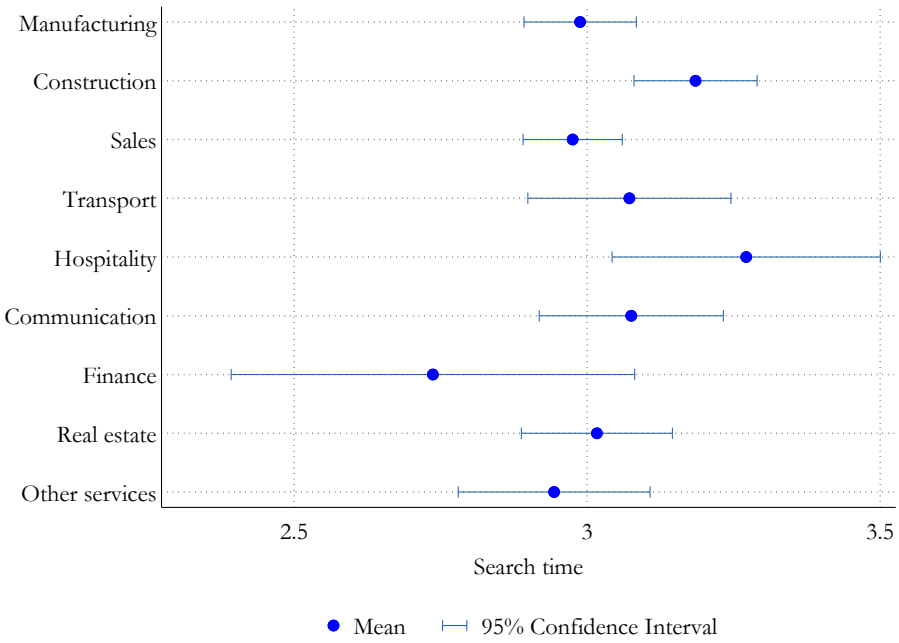
Panel (b): Labor Costs



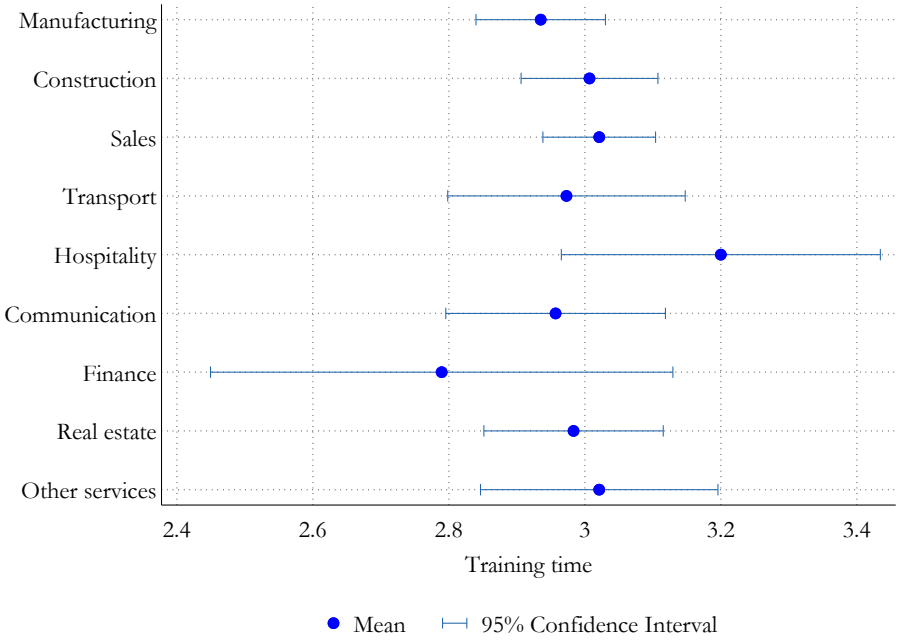
Note: Panel (a) and (b) report the extent to which each industry agrees that the lack of qualified candidates or labor costs is a reason that discourages them from hiring workers despite the need. The scale ranges from 1 to 5, where 5 stands for "strongly agree" and 1 stands for "strongly disagree". We report the mean responses and the 95 percent confidence intervals for each industry.

Figure A.6: Hiring Obstacles by Industry

Panel (a): Search Time

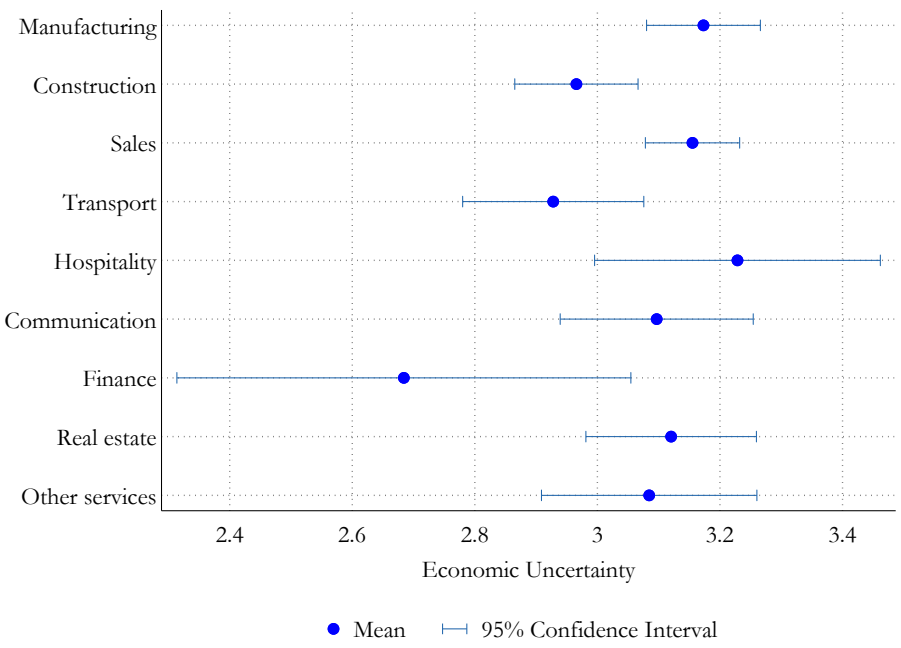


Panel (b): Training Time



Note: Panel (a) and (b) report the extend to which each industry agrees that search time or training time is a reason that discourages them from hiring workers despite the need. The scale ranges from 1 to 5, where 5 stands for "strongly agree" and 1 stands for "strongly disagree". We report the mean responses and the 95 percent confidence intervals for each industry.

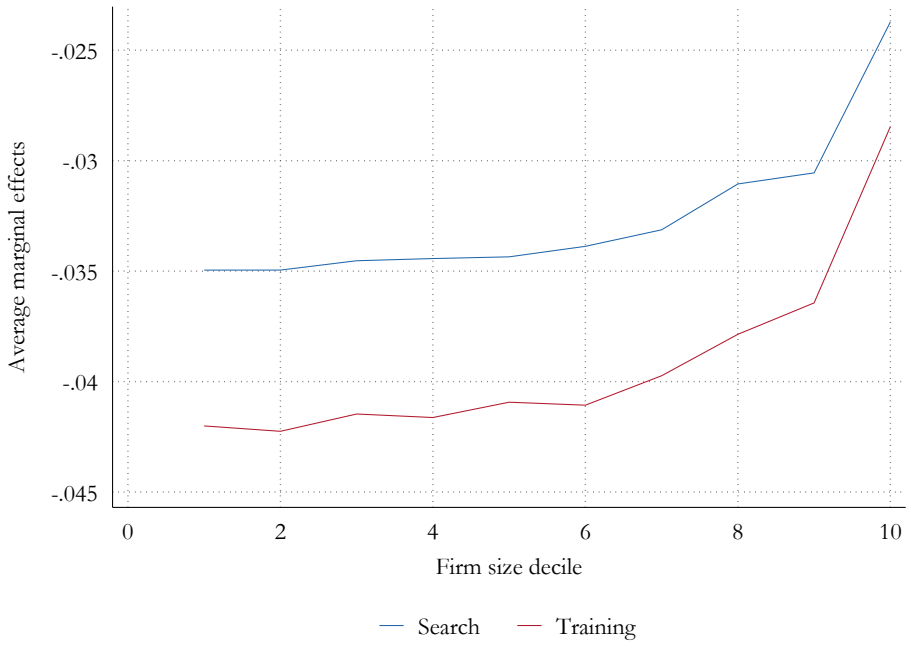
Figure A.7: Hiring Obstacles by Industry



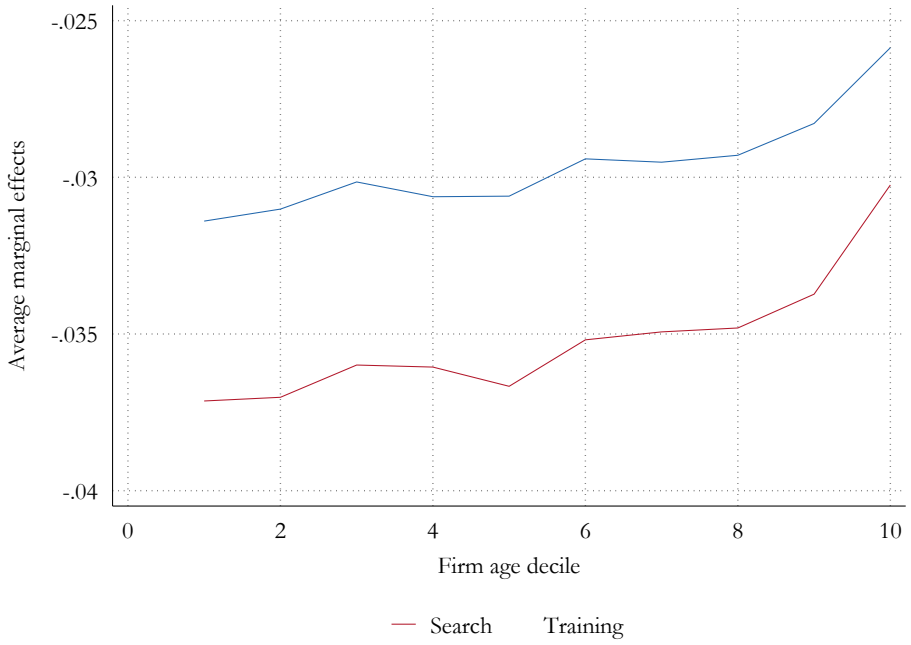
Note: This figure reports the extend to which each industry agrees that economic uncertainty is a reason that discourages them from hiring workers despite the need. The scale ranges from 1 to 5, where 5 stands for "strongly agree" and 1 stands for "strongly disagree". We report the mean responses and the 95 percent confidence intervals for each industry.

Figure A.8: Marginal Effects By Decile of Firm Size and Firm Age

Panel (a): Firm Size



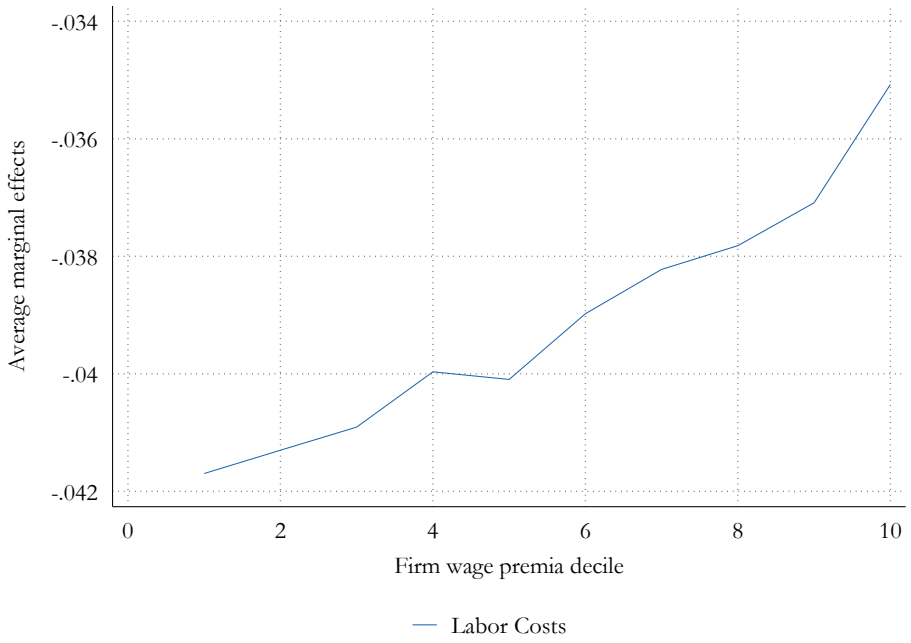
Panel (b): Firm Age



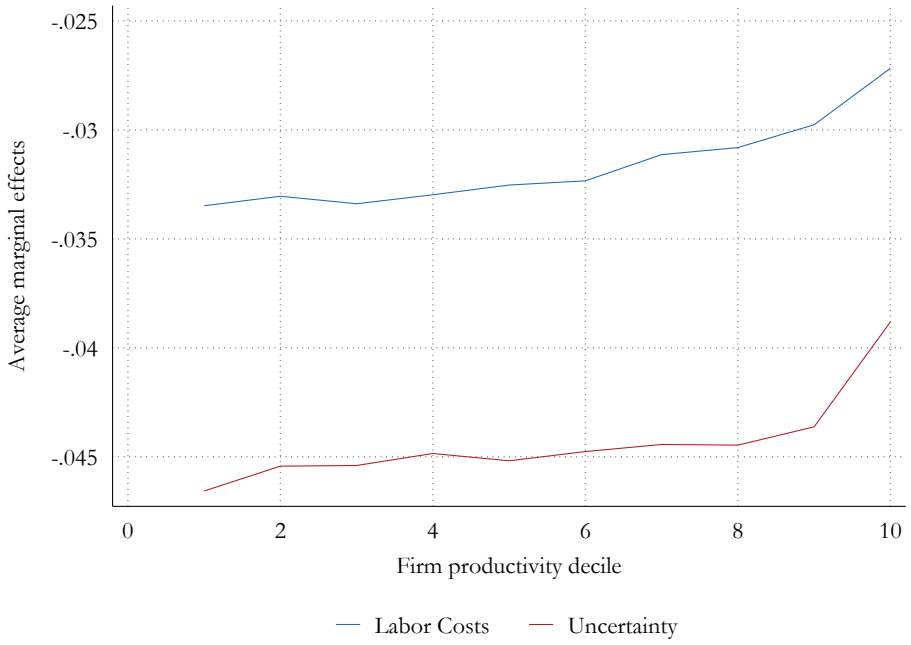
Note: This figure reports the average marginal effects of firm size and firm age on firms' probability of agreeing with each statement. The marginal effects are the average marginal effects (evaluated at the observational level) of each decile.

Figure A.9: Average Marginal Effects of Wage Premium and Productivity

Panel (a): Firm Wage Premium

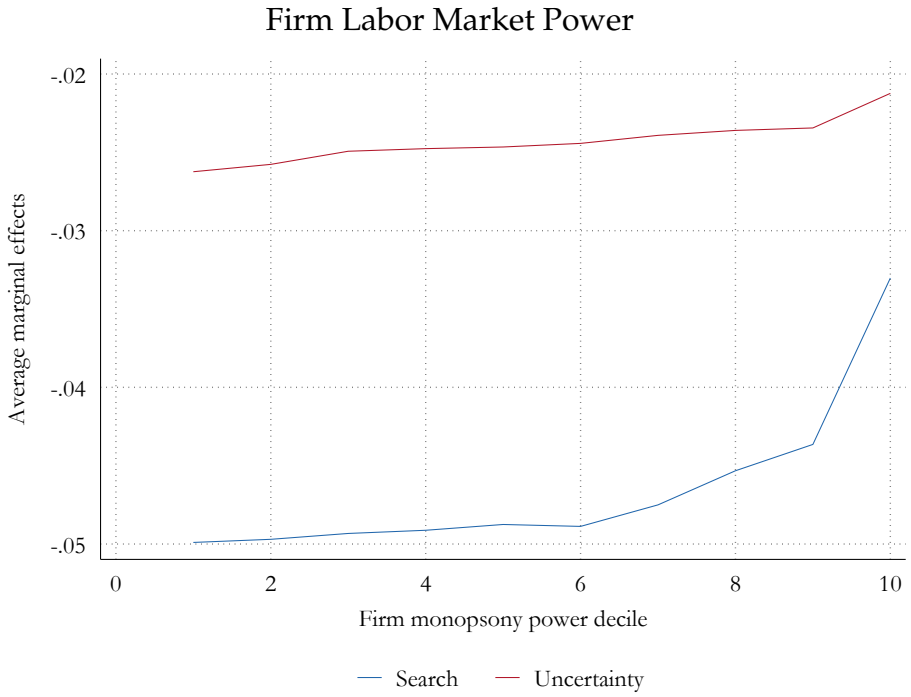


Panel (b): Firm Productivity



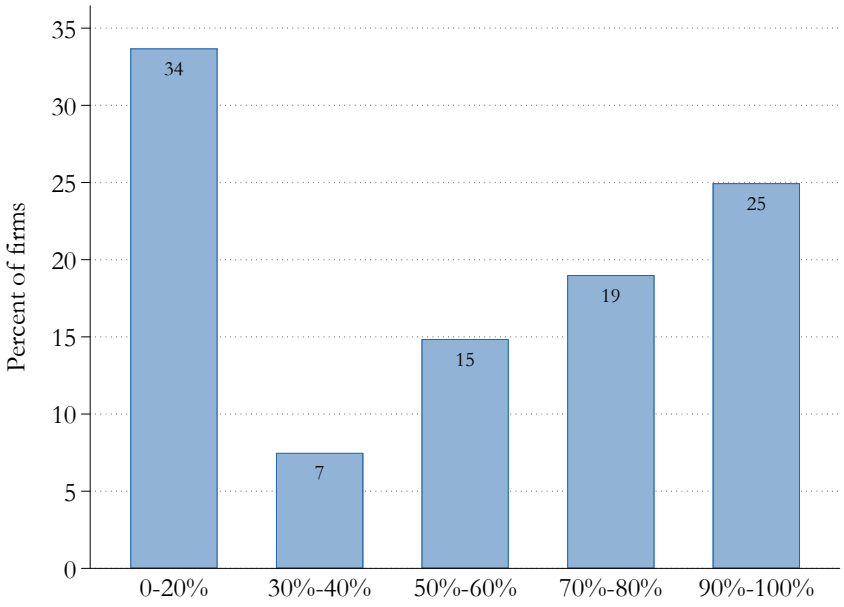
Note: This figure reports the average marginal effects of wage premiums and productivity on firms' probability of agreeing with each statement. The marginal effects are the average marginal effects (evaluated at the observational level) of each decile.

Figure A.10: Average Marginal Effects of Labor Market Power



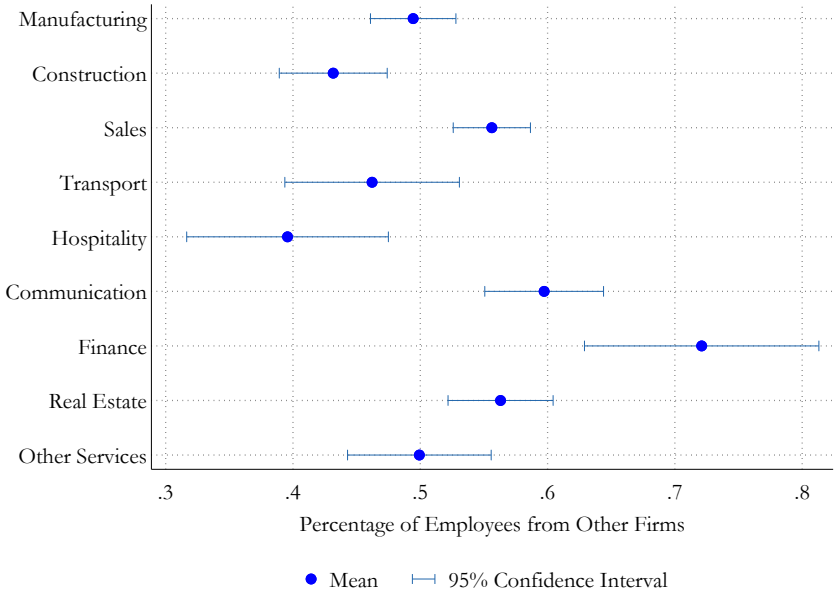
Note: This figure reports the average marginal effects of labor market power on firms' probability of agreeing with each statement. The marginal effects are the average marginal effects (evaluated at the observational level) of each decile.

Figure A.11: Percentage of Employees Coming from Other Firms



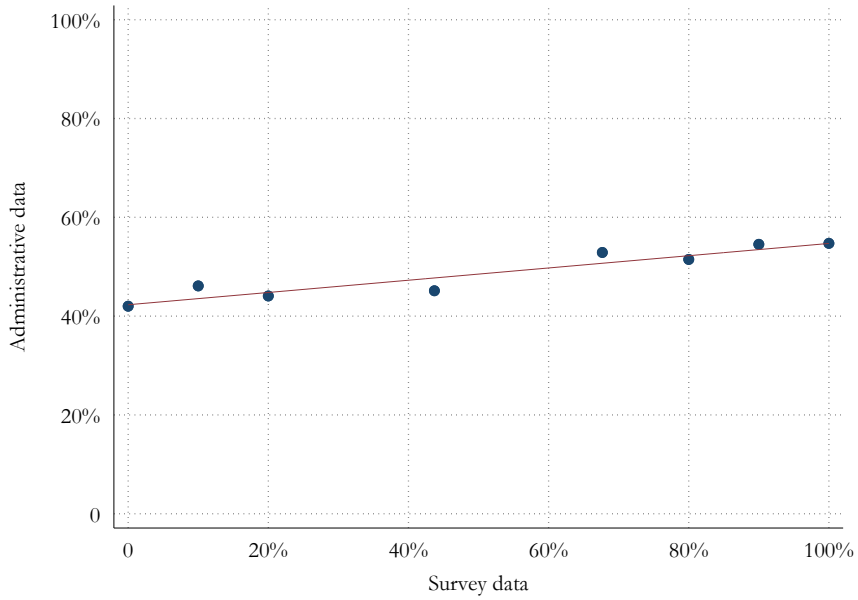
Note: The figure reports responses to the question: "What percentage of your employees are recruited from other firms? " The respondents have the following options: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%.

Figure A.12: Poaching Rate by Sector



Note: The figure reports responses to the question: "What percentage of your employees are recruited from other firms? " We split firms into nine sectors.

Figure A.13: Survey and Administrative Poaching Rate Comparison



Note: The figure reports the survey poaching rate and administrative poaching rate comparison. The vertical axis shows the poaching rate from administrative data. The horizontal axis shows the poaching rate from our survey. The poaching rate from our survey is measured using the question: "What percentage of your employees are recruited from other firms?"