When Tight Labor Markets Don't Raise Wages: Firms' Beliefs About Hiring*

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Abstract

How do firms translate perceived labor shortages into wage-setting decisions? We combine a randomized information experiment with structured belief elicitation in a large, representative panel of German firms to study this question. Providing firms with occupation-specific forecasts of vacancy durations leads to substantial updating of beliefs about hiring difficulty. However, these revisions translate into only limited adjustments in planned wage growth. To shed light on this wedge, we directly elicit firms' perceived wage elasticity of recruitment speed. Roughly half of firms state that higher wages would not reduce vacancy durations at all. Among firms that view wages as operative, small wage increases imply sizeable local elasticities, but incorporating the extensive margin yields an average perceived elasticity that is substantially smaller than estimates based on realized vacancy data. Open-ended responses indicate that firms primarily attribute hiring difficulties to skill constraints and recruitment processes rather than insufficient pay. The results are consistent with an expectations channel in wage setting: wage responses to labor shortages depend critically on firms' beliefs about the recruitment technology.

JEL Classification: D83, E24, J23, J31, J63, M52
Keywords: labor shortage, wage adjustment, vacancy duration elasticity, firm expectations

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1 Introduction

Labor shortages are widely perceived as a central challenge for firms in many advanced economies. These pressures are likely to intensify in coming decades as demographic change reduces labor supply and shifts the composition of the workforce. Firms report difficulty filling vacancies and long time-to-hire in a wide range of occupations. Standard search-and-matching logic suggests that tighter labor markets should translate into stronger wage growth and faster recruitment when firms raise pay (Mortensen and Pissarides, 1994; Moen, 1997). Yet the extent to which perceived hiring difficulties translate into stronger wage growth remains an open empirical question. Understanding how firms translate perceived labor shortages into wage-setting decisions is central for labor market adjustment and for policy debates in which tight labor markets are viewed as a potential source of wage pressure and inflation.

A large literature offers explanations for muted wage responses. Search frictions and hiring costs can weaken the link between labor market tightness and wages (Pissarides, 2000). Wage rigidity arising from internal pay structures, norms, or contractual arrangements can further limit wage adjustment (Bewley, 1999). Empirically, wage increases may attract relatively few additional applicants, implying low true labor supply elasticities at the firm level (Marinescu and Wolthoff, 2020). Related work emphasizes recruitment intensity and firm recruitment policies as determinants of job-filling rates (Davis, Faberman, and Haltiwanger, 2012; Davis, Faberman, and Haltiwanger, 2013; Carrillo-Tudela, Gartner, and Kaas (2023)). Vacancy-level evidence further documents how wages correlate with recruitment outcomes (Van Ours and Ridder, 1992; Mueller, Osterwalder, Zweimüller, and Kettemann, 2024; Bassier, Manning, and Petrongolo, 2025).

A less explored explanation is that firms' beliefs about the effectiveness of wages themselves may constrain wage responses. If firms believe wages have limited impact on recruitment speed, then even objectively tight labor markets need not translate into stronger wage growth. Empirically assessing this belief channel is challenging, however, because firms' perceptions, expectations, and planned responses are rarely observed and are difficult to disentangle from realized behavior. Recent work provides direct evidence that beliefs can be inaccurate and economically consequential: Jäger, Roth, Roussille, and Schöfer (2024) document that workers systematically misperceive their labor market outside options and anchor beliefs on their current wages, comparing stated beliefs to objective benchmarks. Related work links firm-side misperceptions to wage setting and hiring decisions in linked survey–administrative data

(Bertheau and Hoeck, 2025). However, little is known about how firms perceive the wage elasticity of recruitment speed and how these beliefs shape responses to labor shortages.

This paper studies how firms perceive labor shortages and how those perceptions translate into wage plans and recruitment beliefs. We combine three complementary components.

First, we implement a randomized information intervention in the Bundesbank Online Panel–Firms. Firms are randomly provided with occupation-specific forecasts of average vacancy durations. The treatment generates substantial belief updating: firms revise their expectations of hiring difficulty in the direction of the benchmark, with larger revisions among firms whose priors deviate more strongly. However, these revisions translate into only limited adjustments in planned wage growth. The experimental evidence establishes a central wedge: exogenous information changes firms' perceived hiring difficulty substantially, but planned wage responses remain weak. This result is consistent with the idea that the shortage–wage link may be weak not only because of institutions or constraints, but also because firms do not view wage increases as an effective remedy for hiring difficulty.

Second, we directly elicit firms' beliefs about the causal effect of wage increases on vacancy filling times using structured hypothetical scenarios. We measure both the extensive margin, i.e. whether firms believe wages affect recruitment speed at all, and the intensive margin, i.e. the magnitude of the perceived elasticity. Roughly half of firms state that higher wages would not shorten vacancy duration, implying a perceived elasticity of zero. Among firms that view wages as operative, small wage increases imply a local elasticity of around -3, comparable in magnitude to vacancy-duration elasticities estimated using quasi-experimental wage variation in job-ad or vacancy data (e.g. Bassier et al., 2025). However, incorporating the extensive margin yields an implied average elasticity that is substantially smaller in absolute value than reduced-form estimates based on realized data. This gap suggests that firms' perceived wage elasticities are smaller than elasticities estimated from realized vacancy outcomes.

Third, we analyze open-ended responses from firms that dismiss wages as an effective margin. Firms predominantly attribute recruitment difficulties to skill mismatches, recruitment processes, and non-wage job attributes rather than insufficient pay. This pattern aligns with models emphasizing recruitment intensity and hiring policies (Davis et al., 2012; Davis et al., 2013; Carrillo-Tudela et al., 2023), and suggests that many firms conceptualize labor shortages as constraints on match quality or search capacity rather than as a price problem.

Our contribution is threefold. First, we provide causal evidence that treatment-induced changes in perceived hiring difficulty are accompanied by only limited adjustments in wage

plans, complementing work that emphasizes recruitment intensity and firm recruitment policies as key determinants of job-filling rates (Davis et al., 2012; Davis et al., 2013; Carrillo-Tudela et al., 2023) by highlighting that even when firms revise their beliefs about hiring conditions, wage responses depend critically on perceived effectiveness.

Second, we introduce direct evidence on firms' perceived wage elasticity of recruitment speed. While the vacancy-duration literature estimates elasticities from realized wage variation (Bassier et al., 2025; Mueller et al., 2024), we measure the belief-based counterpart. This allows us to compare perceived elasticities to empirical benchmarks and to assess the role of expectations in shaping wage-setting behavior.

Third, we document how firms conceptualize recruitment frictions. The open-ended evidence shows that many firms prioritize non-wage margins—skills, recruitment processes, and job characteristics—over wage adjustment. This provides a mechanism-based interpretation of the wedge between updated perceptions of labor shortages and muted wage plans.

Taken together, our results point to an expectations channel in wage setting. Muted wage responses to labor shortages may reflect not only market power, institutional rigidities, or low true labor supply elasticities, but also firms' beliefs about the recruitment technology. Even when firms update their perceptions of labor market tightness, wage adjustment remains limited if wages are not perceived as an effective lever for accelerating hiring. Understanding wage dynamics in tight labor markets therefore requires accounting not only for constraints and frictions, but also for firms' expectations about how recruitment responds to wages.

The remainder of the paper proceeds as follows. Section 2 describes the data and the design of the randomized information treatment and presents the experimental evidence on belief updating and planned wage responses. Section 3 introduces the survey-based hypothetical modules, outlines the conceptual framework, and quantifies firms' perceived wage elasticities along the extensive and intensive margins. Section 4 provides evidence on firms' reasoning using an open-ended survey question. Section 5 concludes.

2 Experimental Evidence: Information Treatment

In standard search-and-matching models, tighter labor markets raise equilibrium/bargained wages, implying a positive wage–tightness relationship (e.g. Mortensen and Pissarides, 1994; Moen, 1997). The experiment randomizes information about occupation-level expected vacancy durations. Because the information treatment does not change underlying fundamentals,

it provides a way to study how updated perceptions of hiring conditions affect firms' expectations and planned responses. The design therefore allows us to test directly whether changing firms' views about labor market conditions causally affects wage-setting plans.

2.1 Data and Sample

The analysis uses data from the Bundesbank Online Panel–Firms (BOP-F), a large quarterly survey of German firms. The survey is designed to be representative of the population of German firms with respect to sectoral composition, firm size, and regional characteristics. In each quarter, approximately 9,000 firms participate in the survey. Participating firms are randomly assigned to one of three monthly waves within each quarter. The survey has a panel structure, with each firm being surveyed every three months, which allows us to track firms over time. In the first quarter of 2025, we added a dedicated question module on labor shortages, recruitment difficulties, and wage setting, which forms the basis for the RCT. The pre-treatment belief elicitation, the information provision, the post-treatment belief question, and the questions on expected wage and employment adjustments are all implemented within the same survey wave. This sequencing ensures that belief updating and planned responses are measured immediately after the randomized information shock. Participating firms are assigned randomly to a treatment and a control group. Table 1 provides summary statistics for the full sample of firms as well as for the treatment and control group. Table 1 shows that treatment and control groups are balanced across observable characteristics, including firm size, turnover, sector, and region. We do not detect statistically significant differences across groups, supporting the validity of the randomization.

2.2 Experimental Design

Figure 1 presents a high level overview of the experimental design, of which the key elements are described below. The pre-treatment belief elicitation, the information provision, the post-treatment belief question, and the questions on expected wage and employment adjustments are all implemented within the same survey wave. We include the full question module in Appendix Section B.[1]

[1]The study was pre-registered in the AEA RCT Registry as AEARCTR-0015037.

Table 1: Summary Statistics

Variable	Sample	Treatment	Control
Turnover			
1 to 1 m	0.48	0.48	0.48
$>$ 1 m to 7 m	0.30	0.30	0.31
$>$ 7 m to 34 m	0.14	0.14	0.14
$>$ 34 m to 229 m	0.05	0.05	0.05
$>$ 229 m	0.03	0.03	0.03
Employment			
1 to 10	0.55	0.55	0.55
11 to 50	0.29	0.29	0.28
51 to 200	0.12	0.11	0.12
201 to 1000	0.04	0.04	0.03
$>$ 1000	0.01	0.01	0.01
Sectors			
Primary	0.05	0.05	0.05
Secondary	0.43	0.43	0.44
Tertiary	0.52	0.52	0.52
Regions			
West	0.82	0.82	0.82
East	0.18	0.18	0.18
Search Duration			
Weeks	16.58	16.49	16.67
# Firms	6,497	3,361	3,136

Pre-Treatment Block Prior to the information treatment, firms are asked two baseline questions. First, they report the most important occupational group in their establishment.[2] Second, they state their expectations about recruitment difficulty by indicating how long they think it will take, on average in Germany this year, to find suitable new employees in that occupational group. These pre-treatment questions elicit firms' baseline perceptions of hiring conditions in their core occupation.

[2]We provide an info box, which defines the most important occupational group as the one "that plays the most important role in your enterprise's core business, taking into account aspects such as value added, strategic importance, bottlenecks and the number of employees in the occupational group." Occupations are classified into two-digit occupational main groups according to the German Classification of Occupations 2010 (KldB 2010).

Information Treatment Next, firms are randomly assigned to either a treatment or a control group. Firms in the treatment group receive quantitative information about average recruitment durations in Germany for their most important occupational group. The information treatment provides an exogenous signal about occupation-specific average recruitment durations in Germany in 2025. Importantly, this information concerns occupation-specific labor market conditions rather than firm-specific constraints. It does not alter the firm's own vacancy, recruitment technology, or institutional environment. Instead, it shifts firms' perceptions about the hiring conditions of the relevant external labor market. Specifically, treated firms are informed that, according to leading labor market research institutes in Germany, it is expected to take on average a given number of days in 2025 to find a suitable worker for a vacancy in the relevant occupation. The information provides occupation-specific forecasts of average vacancy durations in Germany for 2025. These forecasts are externally produced and independent of the surveyed firms. [3]

To facilitate interpretation, the information additionally states that when a recruitment process lasts longer than 90 days, the probability that the vacancy remains unfilled exceeds the probability that it is successfully filled (Maier, Kalinowski, Zika, IAB, Mönnig, and GWS, 2022). The additional statement regarding the 90-day threshold only aims at contextualizing the quantitative treatment information with a commonly used threshold for prolonged vacancies. The threshold is constant across occupations.

Firms in the control group do not receive any information about aggregate labor market conditions. Immediately after the information treatment (or, for the control group, without prior information), all firms are asked to consider a situation in which they need to fill a vacancy in the same occupational group within the next twelve months. They are then asked how long they think it would take their firm to find a suitable candidate for this position. This question elicits firms' expectations about firm-specific recruitment durations following the treatment.

[3]The forecasts were prepared by the Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung – BIBB) and the Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung – IAB). BIBB is a government institution whose aim is to research and advance vocational education and training in Germany. The IAB in Nuremberg is a special institute of the Federal Employment Agency (Bundesagentur für Arbeit). The forecasts of how long it will take in the future to find staff are prepared in cooperation with the Institute of Economic Structures Research (Gesellschaft für wirtschaftliche Strukturforschung). The link to the data portal containing the forecasts can be found here. The information and the link is also provided to the treatment group in an info box.



Figure 1: Experimental Design

Post-Treatment Following the information treatment, all firms are asked about their expectations for key firm-level outcomes over the next twelve months. Specifically, firms report the expected average percentage change in (A) salaries in their own firm, (B) salaries in their sector, (C) output prices charged by their firm, and (D) the number of employees in their firm. These questions capture firms' planned adjustments along the wage, price, and employment margins after the treatment.

2.3 Identification Strategy

To study how perceived hiring difficulty affects firms' wage plans, we first estimate the following reduced-form specification:

$$Y_i = \alpha_0 + \alpha_1 T_i \times Misperception_i + \beta T_i + \gamma Misperception_i + \theta X_i + u_i \tag{1}$$

where Y_i represents the outcome variable of interest, for instance, the expected wage change in the own firm in the next 12 months. T_i is a binary variable that takes the value one if individual i is randomly assigned to the treatment group. The variable $Misperception_i$ measures the difference between a firm's pre-treatment belief and the occupation specific treatment information based on the forecasts. X_i is a set of control variables, that, by design, are orthogonal to the treatment group. We control for the firms' employment, log turnover, region, sector and the survey month.

Equation 1 exploits heterogeneity in pre-treatment misperceptions to identify how exogenous information affects outcomes. The interaction term captures whether firms whose prior beliefs deviate more strongly from the benchmark adjust their expectations differentially when exposed to the information shock.

Next, to facilitate the economic magnitude of the effects, we follow Jäger et al. (2024) and employ an instrumental variable (IV) framework. The treatment dummy interacted with pre-treatment misperceptions generates exogenous variation in post-treatment beliefs about occupation-level hiring conditions. The IV estimates therefore capture how treatment-induced changes in perceived vacancy durations translate into firms' planned wage, price, and employment adjustments. We estimate the following equations:

$$\text{Belief}_i^{\text{Post}} = \pi_0 + \pi_1 (T_i \times (\underbrace{\text{Belief}_i^{\text{pre}} - \text{Benchmark}_i}_{\text{Misperception}_i})) + \lambda T_i + \phi \text{Misperception}_i + \Omega' X_i + \varepsilon_i, \quad (2)$$

$$\text{Y}_i = \gamma_0 + \gamma_1 \widehat{\text{Belief}_i^{\text{post}}} + \rho \text{Misperception}_i + \Gamma X_i + u_i \quad (3)$$

controlling for firms' employment, (log) turnover, region of the headquarter, sector and month of interview. The identifying assumption is that the information treatment affects planned outcomes through its impact on firms' perceptions of hiring difficulty, as measured by expected vacancy duration. Because the treatment provides aggregate occupation-level information and does not alter firm-specific fundamentals, any effect on wage plans operates through belief updating rather than through direct changes in economic constraints.

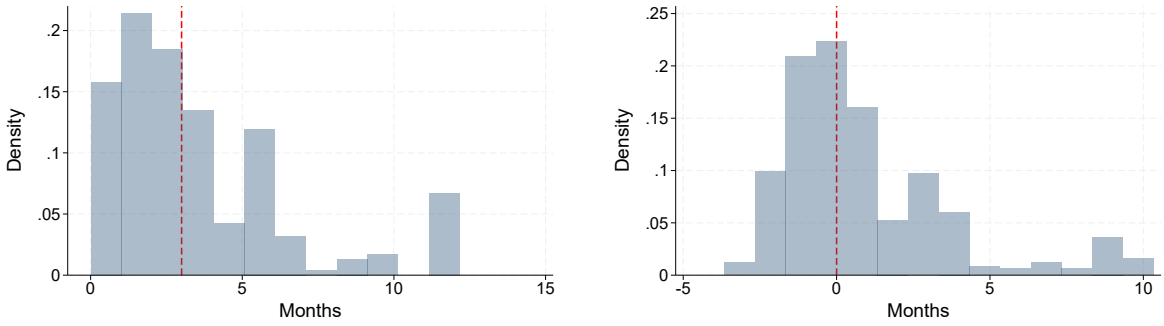
2.4 Descriptive Statistics and Intervention Checks

Labor Shortages Figure 2a shows firms' beliefs on how long it would take their firm to find a suitable candidate for an open position based on the control group that did not receive any information. Maier et al. (2022) argue based on data from the IAB Job Vacancy Survey that the risk of not filling a position becomes higher than the likelihood of successfully completing the search if a firm searches for more than three months. Using this threshold, 43.6 % of firms report expected recruitment durations exceeding three months, implying that a substantial fraction of firms reports non-trivial hiring difficulties even absent any experimental intervention. Moreover, Appendix Figure A.1 shows that there is a lot of variation in the perceived labor shortages across occupations: while firms in cleaning occupations and in security and surveillance occupations think that it will take less than two months on average to fill a vacancy, firms in mechatronics, energy and electrical occupations as well as interior construction and finishing occupations believe that the process will take on average about 4.7 months.

Misperception We compare firms' pre-beliefs about labor shortages, measured by how long they think it will take, on average this year, to find suitable new employees in their core occupation to proxies for how long it will actually take, measured by the benchmarks used for the information treatment (see Section 2.2 and Appendix Section B for more details). Figure 2b shows the distribution of the misperception. Roughly half of firms overestimate (positive misperception) and half underestimate (negative misperception) recruitment difficulty relative to the benchmark. There are only 24 firms without any misperception. The average absolute misperception amounts to approximately 58.7 days, corresponding to roughly 2 months. This substantial dispersion implies meaningful scope for belief updating in response to the information treatment.

Intervention Check Figure 3 illustrates the effect of the information treatment on firms' beliefs about vacancy filling times.

Panel (a) plots post-treatment beliefs against pre-treatment misperceptions, defined as the difference between prior beliefs and the occupation-specific benchmark shown to treated firms, visualizing Equation 2. In the control group, post beliefs closely track prior misperceptions, indicating little systematic revision, which is consistent with the absence of new information. In contrast, treated firms exhibit pronounced updating: firms whose pre-treatment beliefs exceeded the benchmark revise downward, while those with negative pre-treatment misperception



(a) Beliefs about Labor Shortage (Own Firm)

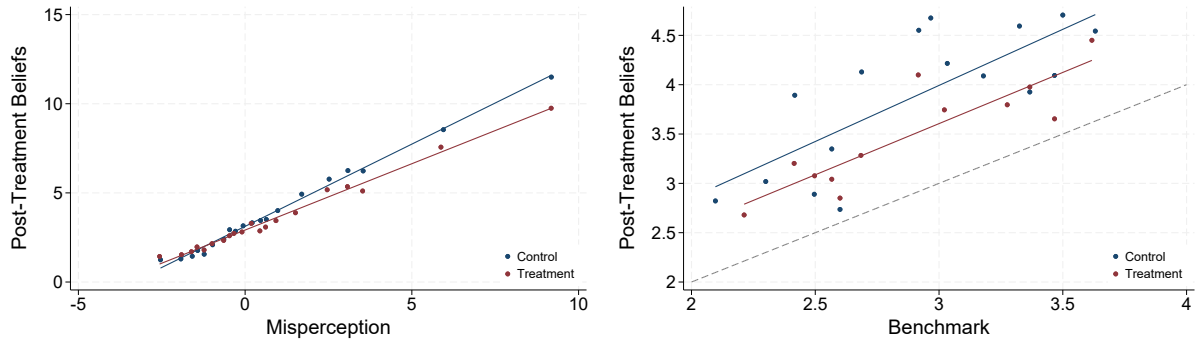
(b) Misperception of Labor Shortage (Own Occupation)

Figure 2: Distribution of Labor Shortage and Misperception. Panel (a) shows the distribution of perceived hiring difficulties in the own firm based on the sample of control group firms only. The red dashed line indicates the 3 months threshold, over which the probability that the vacancy remains unfilled exceeds the probability that it is successfully filled. Panel (b) plots the distribution of perceived hiring difficulties in Germany in the firms main occupation based on both control and treatment group firms. The red dashed line marks the point where misperceptions are zero. Beliefs are winsorized at the 99th percentile.

revise their beliefs upward. Moreover, the magnitude of revision increases with the size of the prior gap. Quantitatively, the slope of post-treatment beliefs with respect to prior misperceptions is therefore significantly flatter for treated firms than for control firms, consistent with partial updating toward the benchmark.

Importantly, treated firms do not mechanically adopt the benchmark. If firms mechanically repeated the benchmark information, post-treatment beliefs would collapse to the benchmark, implying a slope of zero with respect to prior misperceptions. Instead, post-treatment beliefs remain strongly correlated with prior beliefs, indicating updating rather than simple repetition of the provided statistic.

Panel (b) complements this evidence by plotting post-treatment beliefs against the occupation-specific benchmark. Beliefs are positively correlated with the benchmark even in the control group, indicating that the benchmark captures economically meaningful variation across occupations rather than arbitrary information. Firms appear to possess partial information about labor market conditions in their relevant occupations. The treatment increases the alignment between beliefs and the benchmark, shifting responses closer to the 45-degree line. At the same time, updating remains incomplete, indicating that firms combine the provided signal with their prior assessments rather than replacing them entirely.



(a) Post-Treatment Beliefs and Misperception **(b)** Post-Treatment Beliefs and Benchmark

Figure 3: Intervention Checks. The figure shows binned scatter plots. Panel (a) plots firms post-treatment beliefs about labor shortage against the pre-treatment misperceptions, separately for the control and treatment group. Pre-treatment misperceptions are defined as the difference between firms beliefs about vacancy filling durations in the main occupation in this year and the benchmark (the forecast by the German labor market institutes). The plot illustrates the first stage. Panel (b) plots post-treatment beliefs against the benchmark, where the dashed line corresponds to the 45 degree line.

Taken together, the two panels provide clear evidence that the information treatment induces structured and economically meaningful belief updating. Firms revise beliefs in the direction implied by the benchmark and in proportion to the magnitude of their prior misperception.

2.5 Results of the Information Treatment

We begin by examining the effects of the information treatment on firms' beliefs about labor shortages and their planned responses. Panel A of Table 2 reports OLS estimates of the reduced-form effects, while Panel B presents instrumental-variable estimates that isolate exogenous variation in firms' perceived labor shortages induced by the treatment.

The information treatment has a strong and precisely estimated effect on firms' perceptions of hiring difficulty. Firms that receive information update their beliefs about labor shortages significantly, with larger updates among firms whose prior beliefs deviate more strongly from the information provided. This pattern is reflected in a large and highly significant interaction between the treatment indicator and pre-treatment misperceptions, confirming that the intervention successfully shifts firms' beliefs in the intended direction. The corresponding first-stage F-statistic of 78.26 indicates that the information treatment provides a strong source of exogenous variation in perceived labor shortages.

Despite this substantial belief updating, the treatment has only limited effects on firms' planned wage adjustments. In the reduced-form estimates, the interaction between the treatment and pre-treatment misperceptions has a negative but statistically insignificant effect on firms' planned own wages. The IV estimates similarly indicate that increasing perceived hiring durations by 10 days raises planned own wages by about 0.14 percentage points, but this effect is only marginally significant ($p = 0.10$). An increase of one month (30 days) raises planned wage growth by roughly 0.42 percentage points, i.e. less than one-tenth of baseline expected wage growth in the control group (5.2 percent). Despite the substantial and precisely estimated shift in perceived labor shortages, the implied wage response remains modest and statistically weak. Alternatively, we estimate the model in log beliefs (see Appendix Table A.1). This yields a coefficient of 2.05, implying that a 10% increase in perceived vacancy duration raises expected wage growth by approximately 0.2 percentage points. This magnitude is economically similar to the baseline level specification and remains statistically insignificant.

In addition to own wages, we examine firms' expectations regarding sectoral wages, output prices, and employment. The IV estimates indicate that increases in perceived hiring difficulty are associated with modest increases in expected sectoral wage growth and own output price growth, while planned own wage growth and employment respond only weakly. This pattern suggests that firms view tighter hiring conditions primarily as a source of broader cost pressures rather than as a trigger for substantial adjustments in their own wage setting. In other words, firms anticipate some wage and price pressures at the sectoral level but translate changes in perceived hiring difficulty into only limited adjustments in their own wage policies. This asymmetry is consistent with the central finding of the experiment: even when firms update their perceptions of labor shortages, internal wage-setting plans remain comparatively inert.

Taken together, the results show that while firms substantially revise their perceptions of labor shortages in response to new information, these revisions translate into at most weak adjustments in planned wages and quantities. This disconnect between strong belief updating and muted wage plans constitutes the central empirical puzzle of the experiment and motivates the subsequent analysis of firms' beliefs about the effectiveness of wages as a recruitment tool.

Table 2: Main Experimental Results

	First Stage	Labor Market Beliefs			
	Labor shortage belief (post)	Own wage	Sector wage	Own price	Own employment
A: OLS					
Treat x Misperception	−0.201***	−0.003	−0.005**	−0.001	0.004
	(0.013)	(0.002)	(0.002)	(0.003)	(0.005)
Treat	−6.846***	−0.061	0.024	−0.832*	−0.017
	(1.305)	(0.251)	(0.269)	(0.483)	(0.670)
Misperception	0.948***	0.004**	0.005***	0.002	−0.006
	(0.010)	(0.001)	(0.001)	(0.002)	(0.004)
B: IV					
Post-Treatment Belief		0.014	0.020**	0.023*	−0.016
		(0.009)	(0.009)	(0.014)	(0.021)
Misperception		−0.010	−0.014*	−0.017	−0.009
		(0.007)	(0.008)	(0.012)	(0.018)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6,441	6,441	6,441	6,441	6,441

Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The table shows estimates based on the BOP-F dataset. Panel A is based on Equation 1 and Panel B is based on Equation 2 and Equation 3. Robust standard errors are reported in parentheses.

3 Firms' Perceived Wage Elasticity of Vacancy Duration

Section 2 documents that firms substantially revise their beliefs about hiring difficulty when exposed to exogenous information, yet planned wage adjustments remain limited. Whether this pattern is puzzling depends on how firms perceive the effectiveness of wages as a recruitment instrument. If firms believe that higher wages substantially accelerate hiring, then updated perceptions of hiring difficulty should translate into wage adjustments. If, instead, firms perceive little causal effect of wages on recruitment speed, muted wage responses are consistent with optimal behavior. While planned wage adjustments in practice may reflect institutional constraints on wage setting, the hypothetical scenarios introduced below isolate firms' beliefs about the causal effect of wages on recruitment speed.

To assess this mechanism directly, we elicit firms' beliefs about the causal effect of wage changes on vacancy filling times using structured hypothetical scenarios. The objective of this

section is to measure firms' perceived wage elasticity of recruitment speed and to examine whether heterogeneity in these beliefs can rationalize the limited wage adjustments observed in the information experiment.

3.1 Conceptual Framework: Perceived Elasticity of Vacancy Duration

The key object of interest is firms' perceived causal effect of wages on recruitment duration, holding other job characteristics and economic conditions constant. Formally, this object can be summarized by the perceived elasticity of vacancy duration with respect to wages,

$$\varepsilon = \frac{\partial \log d}{\partial \log w}, \tag{4}$$

where d denotes vacancy duration and w the offered wage.

A firm with $\varepsilon = 0$ views wages as ineffective for influencing recruitment speed. A firm with $\varepsilon < 0$ believes that higher wages reduce vacancy duration, with the magnitude of ε capturing the perceived strength of this effect. ε therefore directly shapes how firms translate perceived labor shortages into planned wage adjustments.

Recent empirical work estimates vacancy-duration elasticities using realized wage variation and vacancy-level data (Mueller et al., 2024; Bassier et al., 2025; Carter, Delaney, and Papps, 2024).

In contrast, we measure firms' ex ante beliefs about this relationship under explicit counterfactual wage changes, i.e. holding other job conditions fixed. These belief-based elasticities are useful for understanding firms' planned wage responses to perceived labor shortages. In the survey, this object is elicited using firm-specific hypothetical wage scenarios for the firm's core occupation. Let d_{ij} denote firm i's expected vacancy duration under scenario j, and let w_{ij} denote the corresponding wage level. The perceived wage elasticity of vacancy duration is defined as the responsiveness of $\log d_{ij}$ to $\log w_{ij}$ across these hypothetical scenarios. For a given pair of scenarios, this elasticity can be written as

$$\varepsilon_i = \frac{\log d_{i1} - \log d_{i0}}{\log w_{i1} - \log w_{i0}}.$$

Firms that report that higher wages would not reduce vacancy duration are coded as assigning zero effectiveness to the wage margin. Section 3.2 describes the survey design in detail and explains how these scenario-level responses are aggregated.

3.2 Design: Hypothetical Scenarios on Wages and Vacancy Filling Time

To elicit firms' beliefs about the relationship between wages and vacancy filling time, we implemented a set of structured hypothetical scenarios in the BOP-F survey in the fourth quarter of 2025.[4]

Baseline Anchoring: All scenarios are framed with respect to the firm's most important occupational group, defined as the occupation that plays the largest role for the firm's core business in terms of value creation, strategic importance, staffing needs, and employment size.

We begin by eliciting firm-specific baseline expectations. Firms are first asked to report the expected time (in weeks) it would take to fill a vacancy in this occupation within the next twelve months. They are then asked to state the annual gross wage they would typically offer for such a position, including all regular bonus payments. These baseline responses anchor the subsequent hypothetical questions at firm-specific reference points, ensuring that hypothetical scenarios are constructed relative to each firm's own wage and recruitment environment.

Extensive Margin: Firms are next asked whether they believe that increasing the offered wage would affect the duration of the recruitment process in their core occupational group. This question identifies the extensive margin of perceived wage effectiveness. Firms that respond negatively are interpreted as assigning a perceived elasticity of zero. Only firms that indicate that higher wages could influence recruitment speed proceed to the hypothetical scenarios. This step allows us to distinguish between firms that rule out wage effects (the extensive margin) and those that perceive wages as a potentially effective recruitment tool.

Intensive Margin: Among firms that believe wages matter, we randomly assign firms to one of two hypothetical modules.

Small Wage Increase Module (+5% / +10%) Firms are asked to consider counterfactual wage increases of 5 percent and 10 percent relative to their previously stated baseline wage, holding all other job characteristics and economic conditions constant. For each wage increase, firms report how long they think it would take to fill the vacancy under these counterfactual conditions. This module elicits firms' perceived effects of small, incremental wage changes on

[4]Please see Appendix Section B for the entire survey module.

vacancy filling times, i.e. the perceived local slope of the wage–duration relationship around the baseline

Halving-Duration Module Firms are asked what annual wage their firm would need to offer in order to fill the vacancy in half the time they previously reported. As in the first module, all other conditions are explicitly held fixed. This module captures firms' beliefs about the wage increase required to achieve a substantial reduction in vacancy duration and therefore captures the perceived slope over a larger range of wage changes.

Random assignment to the two hypothetical modules ensures that firms are not simultaneously exposed to both framings, which reduces cognitive burden. Together, the modules provide complementary information on perceived marginal effects and potential nonlinearities in the wage–recruitment relationship.

Estimation We estimate log–log specifications using the stacked hypothetical scenario responses. Let d_{ij} denote firm i's expected vacancy duration under scenario j, and let w_{ij} denote the corresponding wage level. We estimate regressions of the form

$$\log d_{ij} = \beta \log w_{ij} + \alpha_i + \varepsilon_{ij},$$

where α_i denotes firm fixed effects and standard errors are clustered at the firm level. Because each firm evaluates multiple hypothetical wage scenarios, identification comes from within-firm variation in wages and expected vacancy durations across scenarios. The coefficient β can therefore be interpreted as the average belief-implied elasticity of vacancy duration with respect to wages among firms that report that wages affect recruitment speed. In the full-sample analysis, we additionally incorporate the extensive margin by assigning a zero elasticity to firms that report that higher wages would not reduce vacancy duration.

3.3 Results

Extensive Margin We first examine the extensive margin of firms' beliefs about the effect of wages on recruitment speed.

51.13% of firms report that increasing wages would not change vacancy filling times. These firms categorically rule out wages as an effective tool for speeding up recruitment in their core

occupation. The remaining firms state that higher wages could affect recruitment duration and are therefore asked to consider counterfactual wage scenarios in subsequent questions.

Importantly, this extensive-margin result does not reflect an absence of hiring difficulties. Firms that report no wage effect also report positive and often substantial baseline vacancy filling times. Indeed, the fraction of firms that think that wages do not help rather tends to increase with baseline vacancy filling time (e.g. 57% in the quarter of firms with the highest baseline vacancy time). Rather, these firms appear to view recruitment frictions as driven by factors other than wages, a point we explore further when analyzing firms' open-ended responses on alternative recruitment margins.

This extensive-margin result is remarkably stable across firm characteristics. We find little heterogeneity by firm size (employment and turnover), or sector, indicating that the belief that wages do not accelerate recruitment speed is broadly shared across firms (see Appendix Figure A.2).

This large mass at a perceived zero elasticity offers a natural interpretation for the muted wage responses observed in the information experiment: if roughly half of firms believe that wages do not affect recruitment speed, belief updating about labor shortages will not translate into wage adjustments for a substantial portion of firms.

Table 3: Belief-Implied Elasticities of Vacancy Filling Time with Respect to Wages

	Small wage increases (+5% / +10% module)	Halve duration (required wage module)
Intensive margin	$-3.43***$	$-1.24***$
	(0.11)	(0.15)
Implied average elasticity	-1.68	-0.59

Notes: The "Small wage increases" module elicits counterfactual vacancy filling times under wage increases of 5% and 10% relative to firms' stated baseline wages, holding other conditions constant. The "Halve duration" module elicits the wage increase required to reduce the stated vacancy filling time by half. The intensive-margin elasticity is estimated among firms who state that wage increases affect recruitment speed. The implied average elasticity assigns a zero elasticity to firms who state that wages do not affect vacancy filling time.

Intensive Margin We next examine the magnitude of perceived wage effects among firms that state that wages matter, using two complementary hypothetical modules.

Using the small wage-increase module and estimating log–log specifications with firm fixed effects, we obtain an elasticity of vacancy duration with respect to wages of -3.4. Interpreted quantitatively, this implies that, conditional on firms perceiving wages as affecting recruitment speed, a 1 percent increase in wages is expected to reduce vacancy filling time by 3.4 percent.

The halving-duration module yields a smaller elasticity in absolute value of -1.2. This elasticity reflects the average slope required to achieve a large improvement in recruitment speed—namely, reducing vacancy duration by 50 percent. The difference between the two estimates suggests perceived nonlinearity in the wage–recruitment relationship: small wage increases are perceived to have relatively strong effects near the baseline, whereas achieving large reductions in duration requires disproportionately larger wage increases.

To benchmark these magnitudes, recent studies using realized vacancy outcomes and plausibly exogenous wage variation estimate vacancy-duration elasticities in the range of roughly -3 to -5 (Bassier et al., 2025) and around -6 (Carter et al., 2024). Our intensive-margin elasticity based on small wage increases is therefore of similar order of magnitude, while the halving-duration elasticity is smaller in absolute value.

Importantly, both elasticities apply only to firms that view wages as an operative margin for recruitment. To obtain an aggregate measure, we incorporate the extensive margin by assigning a zero elasticity to firms that report that wages do not affect vacancy filling time. Weighting the intensive-margin elasticity by the share of firms that perceive wages as operative yields an implied average elasticity that is substantially smaller in absolute value than the intensive-margin estimates.

This heterogeneity in perceived wage effectiveness plays a central role in shaping aggregate responses to hiring difficulties. Even if a subset of firms perceives sizable wage effects, the presence of a large group assigning zero effectiveness reduces the average perceived return to wage adjustments. This belief structure provides a coherent interpretation of the experimental evidence in Section 2: strong updating of hiring-difficulty beliefs can coexist with muted wage plans if firms perceive wages as an ineffective or secondary recruitment margin.

4 Open-Ended Responses

To better understand why many firms perceive wages as ineffective for accelerating recruitment, we analyze responses to an open-ended survey question posed to firms that stated that higher wages would not change vacancy filling times. Firms were asked which alternative factors they

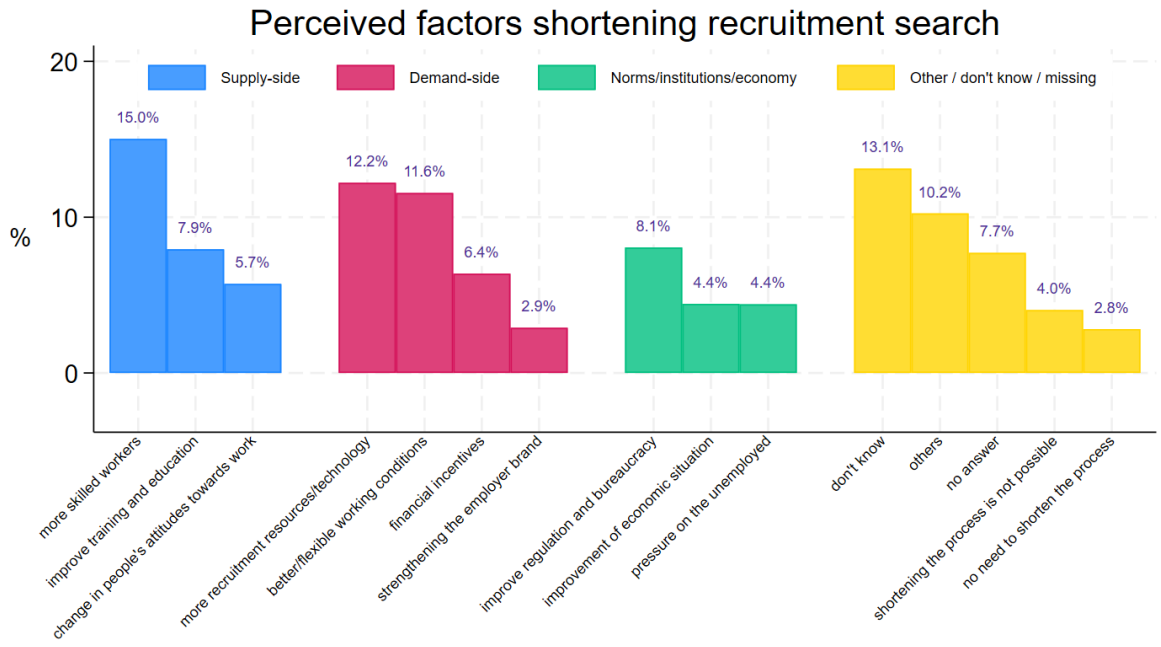


Figure 4: Perceived Factors Shortening Recruitment Duration Source: BOP-F

believe could improve recruitment outcomes instead. Open-ended responses were coded by the survey company using a predefined coding scheme. Appendix Section C describes the coding procedure. Figure 4 summarizes the main response categories.

A central pattern emerges from the distribution of responses. First, the most frequently cited factors relate to skills and qualifications. A large share of firms attribute recruitment difficulties to insufficient applicant qualifications or skill mismatches. Relatedly, many responses refer to improving skills or training. This suggests that firms interpret vacancy duration primarily as reflecting constraints in the available skill pool rather than insufficient wage offers.

Second, a substantial fraction of firms emphasize recruitment processes and organizational margins. This indicates that firms view recruitment speed as influenced by search intensity and internal recruitment policies. This emphasis mirrors the recruiting-intensity framework developed by Davis et al. (2012) and Davis et al. (2013), which stresses that job-filling rates depend on firms' recruiting effort and practices beyond posted wages. More directly, Carrillo-Tudela et al. (2023) show that establishment-level job-filling rates are strongly related to recruitment policies—search effort and hiring standards—providing a natural interpretation for why firms may not view wages as the primary margin for speeding up hiring.

By contrast, comparatively few firms mention financial incentives explicitly in their open responses, consistent with the earlier finding that roughly half of firms rule out wage effects altogether. Instead, firms frequently cite non-wage job attributes, such as working conditions, flexibility, job content, and location, echoing evidence from Hall and Krueger (2012) and Maestas, Mullen, Powell, Von Wachter, and Wenger (2023) that job attributes play a central role in recruitment and job choice.

This distribution is informative for interpreting the results in Section 2 and Section 3. Section 2 shows that firms update beliefs about hiring difficulty in response to information but adjust planned wages only weakly. Section 3 shows that roughly half of firms assign a zero elasticity to wages with respect to recruitment speed. The open-ended responses provide a mechanism-based interpretation of these findings. Many firms appear to conceptualize labor shortages not as a price problem but as a constraint arising from skill availability, hiring standards, or recruitment capacity. Under this perceived recruitment technology, raising wages is not viewed as the primary instrument for accelerating hiring.

Importantly, this pattern does not suggest that firms deny the existence of labor shortages. On the contrary, firms acknowledge recruitment difficulties but attribute them to non-price margins. This belief structure helps reconcile substantial updating about hiring conditions with muted wage adjustments: if wages are not perceived as the operative margin, information about tighter labor markets need not translate into stronger wage plans.

Taken together, the open-ended evidence reinforces the central contribution of the paper. The limited wage response to perceived labor shortages is closely linked to how firms conceptualize recruitment frictions. Many firms operate with a belief structure in which match quality, recruitment policies, and non-wage job attributes dominate the wage margin. This expectations channel is consistent with the wedge between updated perceptions of labor shortages and limited wage adjustments documented in the experiment.

5 Conclusion

This paper studies whether firms' beliefs about the effectiveness of wages help explain muted wage responses in tight labor markets. This may be particularly relevant in the context of demographic change, where persistent labor shortages may become more common. Using a randomized information intervention in a large, representative firm panel, we show that firms substantially update their perceptions of hiring difficulty when provided with occupation-specific

labor market information. Yet these revisions translate into only limited adjustments in planned wages.

We then directly measure firms' perceived wage elasticity of vacancy duration using structured hypothetical scenarios. Roughly half of firms state that wage increases would not reduce recruitment durations at all. Among firms that view wages as operative, perceived elasticities are sizable for small wage increases but substantially smaller when considering large reductions in hiring time. Incorporating the extensive margin implies an average perceived elasticity that is markedly below estimates based on realized vacancy data.

Open-ended responses indicate that firms primarily attribute recruitment difficulties to non-wage margins—skill mismatches, recruitment processes, and job characteristics—rather than insufficient pay. Taken together, the results suggest that muted wage responses to labor shortages are not only the outcome of institutional rigidities or market power, but are also closely linked to firms' belief structures about the recruitment technology.

These findings point to an expectations channel in wage setting: even when firms revise their perceptions of hiring difficulty, wage adjustment remains limited if wages are not perceived as an effective instrument for accelerating hiring. Understanding wage dynamics in tight labor markets therefore requires accounting not only for constraints and frictions, but also for firms' beliefs about how recruitment responds to pay.

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Firms' Beliefs About Recruitment Elasticities and Wage Adjustment

Online Appendix

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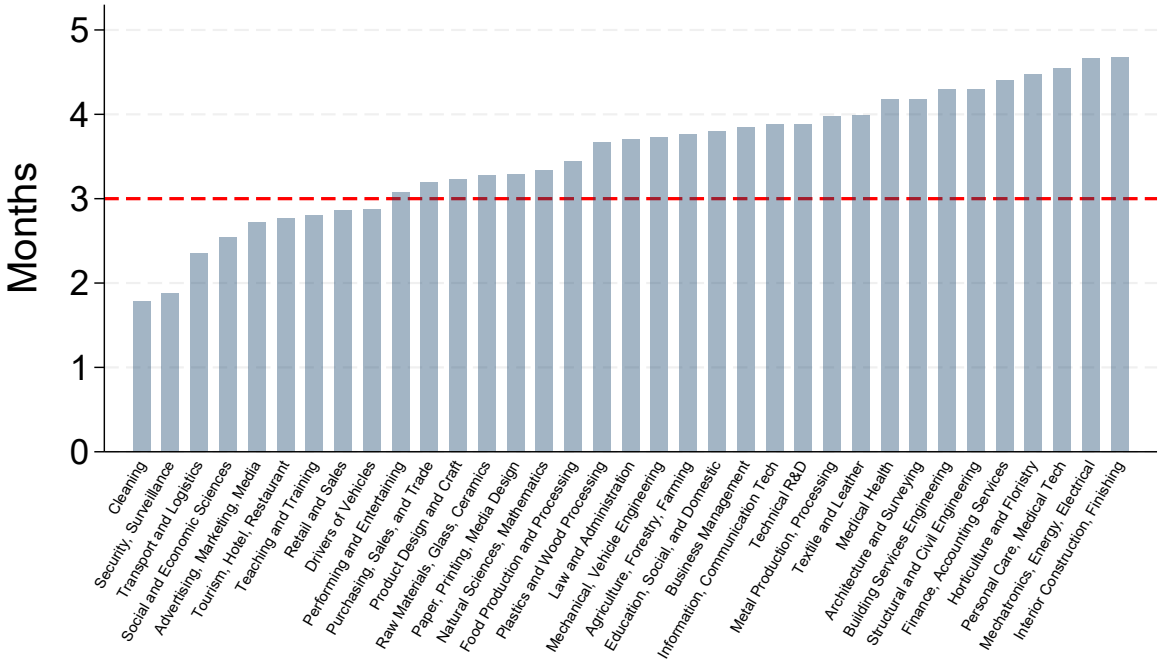


Figure A.1: Beliefs about Labor Shortage (Own Firm), By Occupation. The graph shows the perceived mean number of months to fill a vacancy in the own firm by occupation based on the sample of control group firms only. The red dashed line indicates the 3 months threshold, over which the probability that the vacancy remains unfilled exceeds the probability that it is successfully filled. Beliefs are winsorized at the 99th percentile. The figure is based on occupations with at least 25 firms.

Table A.1: Experimental Results: Log-Specification

	First Stage	**Labor Market Beliefs**			
	(Log) Labor shortage belief (post)	Own wage	Sector wage	Own price	Own employment
A: OLS					
Treat x Misperception	−0.166***	−0.304	−0.932*	−0.112	1.396
	(0.025)	(0.296)	(0.534)	(0.391)	(0.909)
Treat	−0.041***	−0.172	0.079	−0.852*	0.138
	(0.0129)	(0.232)	(0.244)	(0.455)	(0.619)
Misperception	0.888***	0.364	0.577**	0.0223	−1.205
	(0.017)	(0.231)	(0.232)	(0.294)	(0.779)
B: IV					
Post-Treatment Belief		2.046	5.286*	2.460	−7.939
		(1.684)	(2.702)	(2.531)	(4.987)
Misperception		−1.435	−4.148*	−1.810	5.885
		(1.330)	(2.320)	(2.531)	(3.883)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6,408	6,408	6,408	6,408	6,408

Note: Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The table shows estimates based on the BOP-F dataset. Panel A is based on Equation 1 and Panel B is based on Equation 2 and Equation 3. Misperception is defined as the firms log pre-beliefs minus the log occupation-specific benchmark. Post-treatment beliefs are defined as the log of the post-beliefs. Robust standard errors are reported in parentheses. The f-statistic in the first stage is 141.11.

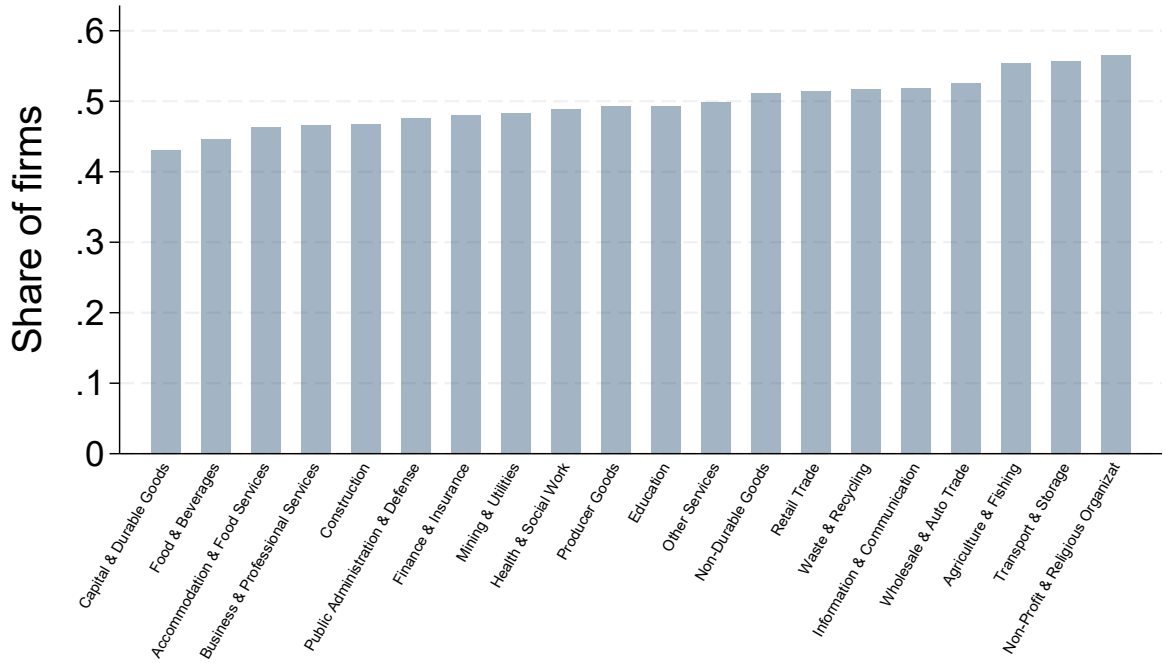


Figure A.2: Share of Firms Believing Wage Increases Speed Up Hiring by Sector.

B Appendix BOP-F Question Modules

B.1 BOP-F Question Module Q1 2025

1. MOST IMPORTANT OCCUPATION GROUP

   QUESTION: We would now like to ask you some questions about seeking new staff. What is the most important occupational group <i> in your enterprise?

   After the term "occupational group", an info box <i> with the following text is shown: "Please select the occupational group that plays the most important role in your enterprise's core business, taking into account aspects such as value added, strategic importance, bottlenecks and the number of employees in the occupational group."

   Note: Please enter an answer and select the term from the list that will appear that best describes the most important occupational group.

2. DURATION OF SEARCH - PRE

   QUESTION: How long do you think it will take on average this year in Germany to find suitable new staff in the area of <<X>>?

   Note: We are aware that searching for staff is more likely to take weeks or months. Nevertheless, we ask you to enter a number in days for statistical reasons. Please indicate the expected period from when the search for staff begins up to a decision being made about a candidate.

   [Input field] calendar days

Split sample randomly into two groups of roughly equal size: treat and control

3. DURATION OF SEARCH - POST

   Group treat only:

   QUESTION: According to leading labor research institutes in Germany, it is likely to take <<Y>> days on average in 2025 to find <i> a suitable person for a job in the area of <<X>>. To put this into perspective: if a search for staff takes more than 90 days, the risk that the position will not be filled is greater than the chance of the position being filled successfully <i>.

After the term “find”, an info box <i> with the following text is shown: “The forecasts were prepared by the Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung – BIBB) and the Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung – IAB). BIBB is a government institution whose aim is to research and advance vocational education and training in Germany. It supports the planning, practice and research community of vocational education and training. The IAB in Nuremberg is a special institute of the Federal Employment Agency (Bundesagentur für Arbeit). It researches the labor market and work in order to advance discussions at the level of academia, the general public, politics and administration. The forecasts of how long it will take in future to find staff are prepared in cooperation with the Institute of Economic Structures Research (Gesellschaft für wirtschaftliche Strukturforschung. The link to the data portal containing the forecasts can be found here.”

After the term “filled successfully”, an info box <i> with the following text is shown: “A publication containing more detailed explanations of the statistics (see page 14) can be found here.”

Group treat and group control:

QUESTION: Now let’s look at your enterprise. Please imagine that in the next twelve months a position [treat = 1: in this area; control = 1: in the area of <<X>>] needs to be filled. How long do you think it would take to find a suitable person for this position?

Note: We are aware that searching for staff is more likely to take weeks or months. Nevertheless, we ask you to enter a number in days for statistical reasons. Please indicate the expected period from when the search for staff begins up to a decision being made about a candidate.

[Input field] calendar days

End sample split

4. CHANGE HR KEY FIGURES

QUESTION: What average percentage change in the following metrics do you expect over the next twelve months?

Note: If you expect the metric to increase, please enter a positive percentage value. If you expect the metric to decrease, please enter a negative percentage value. Please enter a value with a maximum of one decimal place.

a. Average wages and salaries at your enterprise: [Input field] percent
b. Average wages and salaries in your sector: [Input field] percent
c. Average sales prices at your enterprise: [Input field] percent
d. Number of employees at your enterprise: [Input field] percent

B.2 BOP-F Question Module Q4 2025

1. EXPECTED TIME REQUIRED TO FILL VACANCY

   QUESTION: Please imagine that in the next twelve months a position in your enterprise's most important occupational group <i> needs to be filled. How long do you think it would take to find a suitable person for this position?

   After the term "occupational group", an info box <i> with the following text is shown: "Please think about the occupational group that plays the most important role in your enterprise's core business, taking into account aspects such as value added, strategic importance, staff shortages and the number of employees in the occupational group." If there are several similarly important occupational groups, please select one these groups to have in mind when answering the next question.

   Note: Please indicate the period from when the search for staff begins up to a decision being made about a candidate

   [Input field] weeks

2. EXPECTED WAGES

   QUESTION: What annual salary <i> would you offer on average if a position in your enterprise's most important occupational group <i> needed to be filled in the next twelve months?

   After the term "annual salary", an info box<i> with the following text is shown: "This refers to gross annual salary for a full-time employee. Please take into account all special payments (e.g. 13th monthly salary, holiday or Christmas bonuses."

After the term “occupational group”, an info box <i> with the following text is shown: “Please think about the occupational group that plays the most important role in your enterprise’s core business, taking into account aspects such as value added, strategic importance, staff shortages and the number of employees in the occupational group.” If there are several similarly important occupational groups, please select one that you associate yourself with.

[Input field],000 euro gross per year

3. IMPACT WAGE INCREASE

QUESTION: Do you think that raising the annual salary offered would affect the time it takes to find staff in your enterprise’s most important occupational group <i>?

After the term “occupational group”, an info box <i> with the following text is shown: “Please think about the occupational group that plays the most important role in your enterprise’s core business, taking into account aspects such as value added, strategic importance, staff shortages and the number of employees in the occupational group.” If there are several similarly important occupational groups, please select one that you associate yourself with.

1 = Yes

2 = No

Split sample randomly into two groups of roughly equal size: Group 1 and Group 2

Group 1 & IMPACT WAGE INCREASE=1:

4. HYPOTHETICAL TIME TO FILL VACANCY

QUESTION: You stated that it would take roughly <<vacancyfill_exp>> weeks to find a suitable person for a position in the most important occupational group. In addition, you would offer an average annual salary of <<wage_exp>>*1000 euro gross for such a position. Please imagine that when filling the position in the most important occupational group <i>, your enterprise could raise the annual salary offered by 5 % or 10 %, i.e. to <<wage_exp>>*1050 or <<wage_exp>>*1100 euro gross. However, all other conditions and parameters <i> would remain the

same as assumed in the previous questions. How long do you think it would take to find a suitable person for this position?

After the term "occupational group", an info box <i> with the following text is shown: "Please think about the occupational group that plays the most important role in your enterprise's core business, taking into account aspects such as value added, strategic importance, staff shortages and the number of employees in the occupational group." If there are several similarly important occupational groups, please select one that you associate yourself with.

After the term "parameters", an info box <i> with the following text is shown: "This refers to the economic conditions, such as the market situation, economic activity and competitive pressure."

Note: Please indicate the period from when the search for staff begins up to a decision being made about a candidate

a. 5 % higher annual salary than planned: [Input field] weeks
b. 10 % higher annual salary than planned: [Input field] weeks

Group 2 & IMPACT WAGE INCREASE=1:

5. HYPOTHETICAL CHANGE WAGE

QUESTION: You stated that it would take roughly <<vacancyfill_exp>> weeks to find a suitable person for a position in the most important occupational group. In addition, you would offer an average annual salary of <<wage_exp>>*1000 euro gross for such a position.

Please imagine that when filling the position in the most important occupational group <i>, your enterprise could raise the annual salary offered. However, all other conditions and parameters <i> would remain the same as assumed in the previous questions. What annual salary <i> do you think your enterprise would have to offer to fill the position twice as quickly with a suitable person, i.e. in <<vacancyfill_exp>> /2 weeks?

After the term "occupational group", an info box <i> with the following text is shown: "Please think about the occupational group that plays the most important role in your enterprise's core business, taking into account aspects such as value

added, strategic importance, staff shortages and the number of employees in the occupational group." If there are several similarly important occupational groups, please select one that you associate yourself with.

After the term "parameters", an info box <i> with the following text is shown: "This refers to the economic conditions, such as the market situation, economic activity and competitive pressure."

- After the term "annual salary", an info box <i> with the following text is shown: "This refers to gross annual salary for a full-time employee. Please take into account all special payments (e.g. 13th monthly salary, holiday or Christmas bonuses."

  [Input field],000 euro gross

Group 1 and group 2 & IMPACT WAGE INCREASE=2:

6. DRIVERS OF SEARCH DURATION

   QUESTION: What do you think would help shorten the search for suitable staff in your enterprise's most important occupational group?

   Note: Please make your answer as brief and concise as possible.

   [Input field]

C Appendix Coding of Open-Ended Responses

The survey included an open-ended question asking firms to explain what would help to shorten vacancy duration in their core occupation. The responses were coded by the survey company using a structured coding scheme.

After the first two weeks of fieldwork, the survey company reviewed the open-ended responses collected up to that point and proposed a preliminary coding scheme. The authors did not observe the raw responses at this stage. Instead, the survey company provided a proposed list of coding categories based on the early responses. We reviewed and slightly revised this coding plan to ensure that the categories covered mechanisms relevant from a theoretical perspective and to sharpen the distinction between some categories.

Using this finalized coding scheme, the survey company then coded all open-ended responses. The authors received only the coded responses and did not have access to the raw text answers.

For the purpose of the analysis presented in Figure 4, we group the detailed coding categories into four broader conceptual groups: demand-related factors, supply-related factors, institutional or norm-based factors, and other explanations. These broader groupings are used only for presentation purposes in the figure; the underlying coding was performed using the more detailed categories defined in the coding scheme.

Table C.1: Mapping of Coding Categories to Conceptual Groups

Coding category	Description	Group in Figure 4
better working conditions	less stress, secure job, attractive work	demand
flexible/shorter working hours	work-family balance, work-life balance, remote work, individual working time models	demand
financial incentives	higher pay	demand
more resources for recruitment	higher company spending on recruitment, use of headhunters, recruitment agencies, using different job boards	demand
change in people's attitudes towards work	changes in societal attitudes/mentality, greater willingness to work/perform	supply
more pressure on the unemployed	sanctions, lower unemployment benefits, cuts to social benefits	institutions
better supply of qualified workers	more available and qualified staff, more skilled workers	supply
improve training and qualification	more training, faster training, better qualifications	supply
better school education		supply
easier access for skilled workers from abroad	recognition of foreign qualifications, easier work permits for skilled workers from abroad, simplified visa processes	institutions
better cooperation with job centers		others
improvement of economic situation	economic upswing, higher demand, more economic growth, improvement of the overall economic situation in Germany	institutions
less bureaucracy	reduction of bureaucracy, simplification of processes, reduction of administrative burden, reduction/adjustment of legal or regulatory requirements that restrict access to certain professions	institutions
more business-friendly labor law	less dismissal protection, no continued payment of wages during illness	institutions
greater recognition for certain professions		others
technological support in recruitment	use of recruiting software, online platforms, AI-supported solutions	demand
strengthening the employer brand	active measures to improve the company's image in order to attract talented applicants	demand
use of internships and trainee programs	offering internships or trainee programs to identify and promote potential employees early	others
flexibility in requirements	willingness to deviate from strict qualification requirements in order to consider more candidates	others
reduce applicants' salary expectations		others
no need to shorten the process	we have enough applicants, the hiring process is already fast enough	others
shortening the process is not possible		others
we are not hiring	we are not looking for staff, not applicable	others
others		others
don't know	no idea, I would also like to know	others
no answer		others

Note: The table shows how detailed coding categories are grouped into the broader conceptual groups used in Figure 4.