The firm side of labour shortages: Five new facts from the OECD-GFP Employer Survey*

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Abstract

We study labour shortages using firm-level survey data covering 34 OECD countries, Brazil, and South Africa. The analysis is based on a harmonised cross-country online survey of employers , combined with regression analyses that relate reported recruitment difficulties to firm characteristics. Our results yield five main findings. First, labour shortages are widespread: around 80% of firms report recruitment difficulties, and one-third indicate that most or all vacancies are hard to fill. Second, firms facing greater shortages are more likely to experience changing skill needs and skill mismatches. Third, young firms report higher recruitment difficulties, while small firms encounter increasing constraints as they grow, suggesting that shortages can hinder both entry and scale-up. Fourth, recruitment difficulties are more common among firms investing in green, digital, and Artificial Intelligence technologies. Fifth, the nature of shortages differs by productivity level: low-productivity firms attribute shortages to low wages and poor working conditions, and report that shortages lead to production losses; by contrast, high-productivity firms report difficulties in finding the right skill profiles, prompting responses such as automation, investment in training, and organisational changes. Overall, the findings highlight the heterogeneous nature of labour shortages across firms, and their potential implications for firm dynamics.

JEL Codes: D22, J23, J24, J63
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1 Introduction

Labour shortages occur when the demand for labour — or for workers with specific skills — exceeds the available supply, as frictions prevent quick adjustments in supply and wages (Blank and Stigler, 1957; Arrow and Capron, 1959). At the aggregate level, this results in the simultaneous presence of both vacancies and unemployment in the economy (Pissarides, 2000; Şahin et al., 2014). In recent years, labour shortages have emerged as a growing concern across global economies, as reflected by a marked increase in indicators such as labour market tightness over the past decade (OECD, 2024). This trend extends beyond cyclical fluctuations and is particularly pronounced in industries undergoing structural long-term changes, such as those exposed to the green and digital transitions (Dorville et al., 2025). Persistent struggles to fill vacancies may convince firms to change their optimal production strategy. Firms may reduce production, either because labour is an essential input to production, or because the higher cost of labour translates into reduced other investments. Other firms can enact strategies to sustain production with reduced labour availability, including by automating production or providing training to existing workers, restructuring internally, or increasing their efforts in recruitment. Many such changes can in turn affect firms' productivity.

In this paper we study the varying incidence of labour shortages across firms. We leverage new data from the OECD-GFP Employer Survey on Labour Shortages. The survey is a comprehensive effort to measure firm-level recruitment difficulties across 34 OECD countries, Brazil, and South Africa, covering approximately 500-1,000 employers per country across 13 1-digit ISIC sectors. It surveys firms about the extent of labour shortages, and their perceived causes and consequences at the company level. It also collects information on the company background that allows to connect labour shortages and changes related to long-term economic structural trends such as the green and digital transition. Data were collected at the aid of an online questionnaire from May to August 2024. The survey design enabled the representativeness of the sample by macro-sectors and firm size, via ex-ante sampling quotas for firm size and macro-sector to ensure that our data is closely in line with the true distribution of firms along these two dimensions.

We highlight five key results. First, labour shortages are widespread and severe in all countries and sectors surveyed. Approximately 80% of firms reported recruitment difficulties, with one-third indicating that most or all vacancies were hard to fill. Shortages are more pronounced in manufacturing and mining, followed by market services (e.g., ICT, professional services, construction). This is consistent with what found for Europe by Groiss and Sondermann (2024). While recruitment difficulties are generally lower in public services, they are particularly high in healthcare.

Second, new skills and skill mismatch are an important correlates of shortages at the firm level. We provide evidence that firms with shortages are more likely to report changing skill needs. Moreover, firms reporting greater difficulties recruiting are also those that report higher skill mismatch (measured as underskilling, or the fact that existing workers do not have sufficient skills to perform their tasks). This is especially true in low-productivity firms. We therefore provide descriptive evidence of the joint rise of

shortages and skill mismatch (McGuinness et al., 2018; Brunello and Wruuck, 2021). Our results also stress the importance of skill requirements in recruitment policies (Deming and Kahn, 2018), as labour markets are increasingly skill-specific.

Third, we inquire which firm's characteristics are associated to higher labour shortages. Younger firms (within their first five years of existence) report a 10 percentage-point higher probability of labour shortages. Similarly, small firms face heightened constraints as they grow: growing firms consistently report higher shortages, with the gap most pronounced among small enterprises. Shortages can therefore act as a barrier to both firm entry and growth (Fontaine and Signorelli, 2020; Stevens, 2007).

Fourth, shortages are higher in firms undergoing technological changes related to long term trends, such as digitalisation and decarbonisation. Firms adopting digital technologies, artificial intelligence (AI), and technologies that reduce the firm's energy consumption or environmental footprint report significantly higher labour shortages, up to 15 percentage points more in some countries. Such shortages are closely tied to the demand for digital (Lennon et al., 2023) and "green" skills (Vona et al., 2018). Regression and dominance analyses reveal that long-term trends account for over two-thirds of within-country-sector variation in shortages. This result suggests relevant impacts of the ongoing green and digital transition on macro-labour market outcomes, such as tightness and mismatch (Dorville et al., 2025).

Fifth, the relationship between labour shortages and labour productivity at the firm level is multifaceted. While the two are generally negatively correlated, the pattern is partially U-shaped as shortages tick up for top productivity firms. In other words, both low-productivity and frontier firms report higher shortages than firms in the middle of the productivity distribution. We thus investigate how the perceived causes, consequences and remedies of labour shortages vary according to firms' productivity, finding that low- and high- productivity firms within the same country and sector face shortages of different nature. Low-productivity firms often attribute shortages to low wages and poor working conditions, and report that shortages lead to production losses, including reduced innovation. This could be interpreted as a sign of ongoing labour market sorting, corresponding to workers transition to higher-quality jobs (Autor et al., 2023). Yet, the result raises concerns about deepening productivity disparities across firms (Andrews et al., 2016). Conversely, high productivity firms more frequently report shortages due to a lack of workers with suitable skills, which suggests the existence of talent misallocation across firms in the same country and sector (Bergeaud et al., 2022). We also find empirical evidence that, especially in high-productivity firms, shortages are associated to greater automation (Acemoglu, 2010), workforce training (Brunello and Gambarotto, 2007), and efficiency-improving re-organisation.[1]

The paper is organized as follows. Section 2 summarizes the related literature. Section 3 introduces our new data and discusses the survey design. Section 4 presents five new facts on labour shortages and discusses them in light of the relevant literature. Section 5 concludes suggesting some policy implications.

[1]While reorganisation is conceptually distinct, it is potentially related to the adoption of better management practices (Bloom et al., 2012).

2 Related Literature

We contribute to the literature on labour shortages, which has attracted renewed attention over the past year as shortages have become increasingly widespread in advanced economies. Early studies focused on shortages in specific occupational profiles (Blank and Stigler, 1957; Arrow and Capron, 1959), defining shortages as the result of shifts in labour demand or supply that create excess demand at prevailing wages. Subsequent research has shown how shortages, though originating from microeconomic disequilibria, can persist due to market frictions, leading to misalignments between aggregate job postings and actual hires (Pissarides, 2000), as measured for example by labour market tightness.[2] A related body of work examines various forms of labour market mismatch, such as skill mismatch (McGuinness et al., 2025) and occupational mismatch (Şahin et al., 2014). Mismatch is closely related to shortages (Brunello and Wruuck, 2021), as firms may adjust skill and qualification requirements depending on how difficult vacancies are to fill (Modestino et al., 2016, 2020; Deming and Kahn, 2018).

Our study is tightly linked to the literature focusing on the measurement of labour market shortages. Measuring occupational shortages is particularly challenging, as no single metric captures the full scope of the phenomenon. While there exist a number of country-specific analyses (Bergeaud et al., 2022; De Zeeuw and Terry, 2018), there are only a few efforts to measure shortages in a harmonised way across countries, either from private sources (ManpowerGroup, 2024) or focused only on EU member states (Groiss and Sondermann, 2024; Eurofound, 2024) and lacking detailed firm-level information. Some studies have used survey data from national statistical offices to track the number of job postings and the duration of unfilled vacancies (Le Barbanchon et al., 2023; Horbach and Rammer, 2022; Carioli and Czarnitzki, 2023). However, vacancy data are often inconsistently measured across countries and the number of outstanding vacancies fails to fully capture the multifaceted nature of labour shortages, for example by ignoring recruitment intensity (Davis et al., 2013).

An additional related strand of research is the one studying the causes of labour shortages at the firm level. Starting from the cause of shortages, rising evidence suggests they are not only arising from short-term cyclical factors but also from long-term structural trends (OECD, 2024). Dorville et al. (2025) report that sectors more affected by the long-term shift toward digital and green technologies tend to show greater tightness. Camussi et al. (2024) identifies greater hiring difficulties among firms in fast-growing or labour-intensive industries. Shortages may also result from the interaction between firms' labour market power and minimum wage floors, as studied by Faia et al. (2026).

In turn, other research focuses on the consequences of labour shortages on firms. De Zeeuw and Terry (2018) show that firms remedy to shortages both through raising wages and through productivity-enhancing activities such as training and re-organisation. Camussi et al. (2024) also finds that firms commonly respond to shortages by using monetary

[2] These indicators are widely used in the macroeconomic literature as key measures of the business cycle and also reflect structural aspects of the economy, for instance through the Beveridge curve framework.

rewards, together with remote or flexible work, improved career paths and job security. Notably, shortages can trigger capital deepening, both in terms of physical capital (through automation, Acemoglu, 2010) and human capital (for instance, through workplace training, Brunello and Gambarotto, 2007).[3]

Finally, beyond their firm-level causes and consequences, shortages have relevant implications for aggregate productivity. On the one hand, when highly productive firms lack sufficiently skilled workers, shortages can be interpreted as a source of talent misallocation (Bergeaud et al., 2022) and entail a cost in terms of aggregate output (Garibaldi et al., 2025). On the other hand, when they are concentrated in jobs with low wages and bad conditions, shortages can simply be a sign of workers climbing the job ladder (Autor et al., 2023). This highlights the importance of measuring the extent and nature shortages and mismatch to understand their economic nature and evaluate policy implications.

3 Survey design

3.1 Overview

We survey a representative sample of firms with more than 10 employees in 34 OECD countries, as well as Brazil and South Africa.[4] We collected our survey data between March 2024 and August 2024 using the survey company *Cint*. The survey company maintains a panel of online respondents to whom it sends the survey link, offering a small reward in exchange for completing the questionnaire.

We sample between 500 and 1,000 observations per country, with a few exceptions for smaller countries. To ensure the final sample is representative of firms with more than 10 employees in each country, we apply sampling quotas by sector groups and by firm-size (small: 10-49; medium: 50-249; large: 250+). The quotas require the total number of respondents who complete the questionnaire to be proportional to national employment shares across firm-size categories and sector groups, according to OECD Structural Business Statistics or other sources as needed. Respondents exceeding their quota are filtered out during the initial screening phase. In some cases, the quota is not perfectly met, or we obtain an excessive number of responses due to sluggish adjustments in the survey system. To address this, we estimate sampling weights and apply them throughout the paper to our observations. Additionally, we include only respondents who identify as managers, decision-makers, or hold positions with sufficient visibility into the firm's re-

[3] Factors like technological advancement can act as both a cause and an outcome of shortages. For example, Acemoglu (2010) argues that labour scarcity may spur automation, yet new technologies can also drive up demand for labour if they rely on specific profiles as complements for adoption.

[4] The complete list of OECD countries includes Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czechia, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Korea, Lithuania, Mexico, Netherlands, New Zealand, Norway, Poland, Slovak Rep., Slovenia, Spain, Sweden, Switzerland, Türkiye, United Kingdom, United States. To translate the questionnaires into local languages we used an online software and revisions by native speakers at the OECD.

cruitment strategies and challenges. Appendix Table A.1 provides an overview of the survey's country coverage.

The questionnaire consists of 29 questions, approximately half of which are displayed only if specific answers are selected in previous questions. Most questions are multiple-choice, while three require numerical responses regarding the firm's size, age and sales. Labour shortages are assessed by asking companies whether they have experienced recruitment difficulties over the past 24 months (yes/no) and what proportion of vacancies was affected (all/most/some/few/none). In addition to information on labour shortages, the questionnaire includes questions about past technological changes within the company, the kind of skills the company is trying to recruit, the perceived causes and consequences of labour shortages, and the measures taken to address recruitment difficulties. In addition to screening questions on the firm's industry and size class, we collect details on basic company characteristics, including ownership structure, firm age, total sales, and the number of employees (both overall and by skill group). Finally, we survey the incidence of skill gaps, inquiring about the share of under-skilled employees in the workforce and which skills are demanded.

Our final dataset contains 20,050 observations. We focus on two main measures of labour shortages. First, what we call *Recruitment difficulties*, or simply *shortages*. This is derived from a question asking respondents if their enterprise encountered any difficulties in recruiting workers with vocational qualification, university degree or others, and for which reason. Respondents declaring recruitment difficulties of any of this profiles were considered as in labour shortage. A second measure is a measure of the intensity of labour shortages, following Frohm (2024), asking which share of vacancies the company finds hard to fill (all/most/some/few/none). We define as companies in *Severe shortage* those who declare having difficulties in filling "all" or "most" of their vacancies.

3.2 Data quality and validation

Online surveys of this nature have become a widely used tool in academic research, but they can suffer of certain limitations derived from the online survey design.

One group of limitations concerns the representativeness of our sample. A first issue is that respondents may be employed in a specific subset of the economy. To mitigate this risk, as mentioned above, our data collection strategy combines quota design and post-stratification weighting. Quotas included key structural variables (firm size and sector), thereby reducing heterogeneity within cells. In addition, post-survey calibration weighting was applied to align the achieved sample with known population margins, ensuring representativeness along observable dimensions.

Respondents complying with the representativeness cells, however, could still be a non-random sample of the total eligible population. First of all, they must have had an internet connection at the time of surveying (Stantcheva, 2023; Boeri et al., 2024; Dechezleprêtre et al., 2025). This, in practice, could translate into a bias towards firms that have

higher productivity.[5] According to the OECD ICT Access and Usage survey, however, the quasi totality of businesses (93%) and of adult individuals (98%) had access to and used a broadband fixed or mobile connection in 2024, on average across the considered countries. This reduces significantly the probability that the online panel of potential respondents is an unfitting representation of the actual population.

Even then, individuals with an internet connection may still self-select into being part of an online panel, and into responding to our specific survey, in a non-random way with respect to our main question of interest (presence of labour shortages in firms). However, it is unclear why this would be the case in our setting. Online panels are mostly used for multiple business purposes, and much less frequently for economic research. Moreover, the invitation to online panelists that carried the link to the online survey did not mention labour shortages and could not therefore influence the choice of individuals to begin the survey out of concern for the problem itself. Nevertheless, a certain probability of selection into the survey based on unobservable characteristics remains, and this may bias responses even when quotas are accurately filled (e.g. in the case of strongly opinionated individuals). This is a known usual caveat in quota-based online surveys, and accordingly response rates and non-response bias cannot be formally estimated in the same way as in surveys based on probability samples. Nonetheless for indicative purposes we calculate the ratio of the number of individuals falling within the representativeness quotas that completed the survey, to the sum of that number, plus the number of individuals that were reached by an invitation and never opened it, plus the number of those who started the survey but did not complete it. This "pseudo" response rate stands at 25% on average across the considered countries, with a standard deviation of 9%. This is in line with the response rate in similar online surveys, such as Boeri et al. (2024).

A distinct concern is the extent to which our survey responses accurately capture the constructs of interest. For instance, a source of potential bias in the responses is the fact that the key outcome variables of interest rely on respondents' self-reported perception of the problem (mismeasurement or reporting bias). In particular, perceptions could vary across firms depending on internal organization or strategic considerations, and potentially across countries, sectors, or firm lifecycle characteristics. We acknowledge this limitation, and our outcome measures should be interpreted as capturing firms' *perceived* recruitment constraints. That said, we perform a battery of tests to assure the validity of the information we collected, by checking the quality of responses and the internal consistency of the dataset, and by benchmarking selected dimensions of our dataset against external data.

The quality of responses was checked both during the survey time in the field and after the data collection was closed. During the data collection, we dropped (i) responses from respondents who completed the questionnaire in less than 3 minutes, i.e., half the

[5]The direction for labour shortages is more difficult to predict, as firms that do not have digital instruments are likely to rely more heavily on word-of-mouth for recruitment, which may or may not increase the incidence of shortages, depending on the nature of the business. However, conditioning the sample to individuals in firms with at least 10 employees should considerably reduce the extent of any such biases in our analysis.

average expected time; (ii) inconsistent answers across questions, such as respondents reporting zero vacancies but flagging recruitment issues; and (iii) respondents who follow a trivial pattern in replying to multiple-choice questions, e.g., by always selecting the first response option in any question. In addition, we filter out answers that repeat unrealistically similar patterns in a short period of time from respondents with same screening characteristics, to avoid duplicate responses.

After the data collection, responses to open questions on firm employment, sales and labour productivity were cleaned by removing outliers (top and bottom 1% of the distribution by country). We also replaced with missing values the values of firms that reported more than 1 million employees (the official size of the two largest companies in the US market) or 612 billion USD (the size of the largest firm in the US by turnover). As for firm age, we disregarded observations that reported to be created later than 2024 and earlier than 1800. Lastly, we disregarded observations where the number of reported outstanding vacancies was twice the number of employees.

We also filtered low-quality answers based on internal consistency. Figure A.1 in the Appendix shows broad consistency between the different measures of labour shortages in the survey, and in particular between reported recruitment difficulties and the share of vacancies firms perceive as hard to fill. The correlation across country/sector pairs between the share of companies with recruitment difficulties and the share reporting that all, most or some vacancies are hard to fill is 0.43, holding also across countries (Figure A.2).[6] A second check compares the firm class size declared by respondents in the screening question that determine their participation to the survey, with the number of firm employees that respondents report while answering the questionnaire itself. Figure A.3 reassuringly shows that respondents behave very consistently across questions.

A final check we conduct to assess data quality in general is to compare the evolution of key variables in our sample to aggregate statistics on the total population from official sources. First, in Appendix Figure A.4, Panel A, we correlate our measure of shortages with the percentage change in labour market tightness (i.e. the vacancies-to-unemployed ratio) from the pre-pandemic period to the reference period of our survey, as reported in the OECD Registered Unemployment and Job Vacancies statistics. In Panel B, we compare our shortage measure with the same evolution across sectors in the United States, where sector-specific unemployment and job openings are reported by the Bureau of Labor Statistics.[7] In both cases, there is a clear positive correlation between our measure of labour shortages and the evolution of tightness in official statistics. Turning to the concern on underrepresentation of firms with low digital access, Appendix Figure A.7 shows that the share of firms changing high-speed internet connection in our survey is tightly correlated with the increase in the share of firms with broadband across EU countries. While comparison of levels is limited by differences in the definition of

[6]The correlation is weaker when restricting the attention only to companies declaring that all or most vacancies are hard to fill, consistently with the idea that the yes/no question on recruitment difficulties captures the share of companies with at least some recruitment difficulties.

[7]Namely, the Current Population Survey for unemployment and the Job Openings and Labor Turnover Survey for job openings. Data on tigthness at granular sectoral disaggregation is not readily available for other countries in the study.

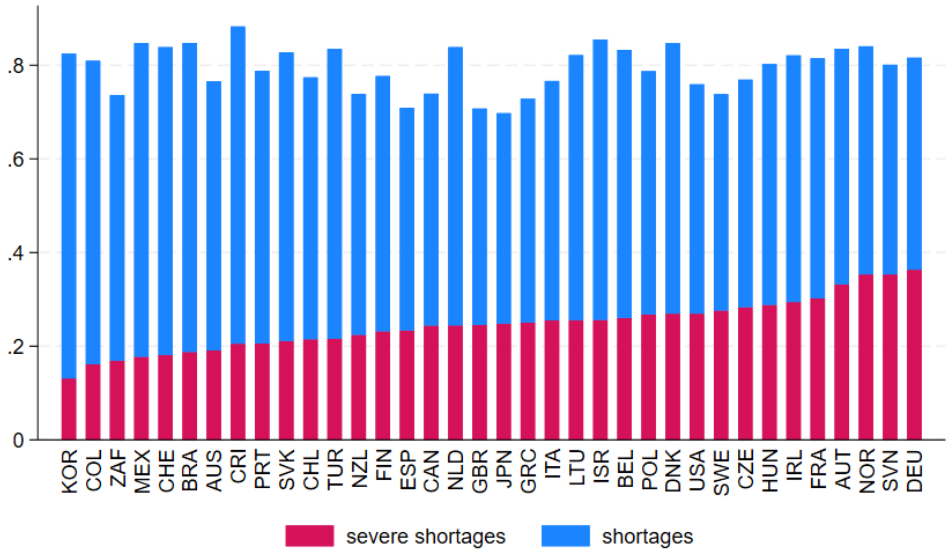
the indicators and wording of the underlying questions across data sources, and can be controlled through country/sector fixed effects in our analysis, these checks show that variation in respondents' answers is broadly consistent with that of the overall population.

4 Results: Five Facts on Labour Shortages

4.1 Labour shortages are high for employers across all countries and sectors

Our first analysis focuses on establishing the incidence of labour shortages across countries and sectors. Figure 1 shows whether firms faced recruitment difficulties ("shortages") and whether all or most of their vacancies were affected by these difficulties ("severe shortages"). Overall, 70% to 85% of firms report labour shortages, with these issues being especially prevalent in Costa Rica and Israel. Additionally, 15% to 35% of firms report severe shortages, with at least one-third of firms in Germany, Slovenia, Norway and Austria reporting recruitment difficulties in all or most of their vacancies.

Figure 1: Share of firms reporting recruitment difficulties and severe shortages, 2022-2023

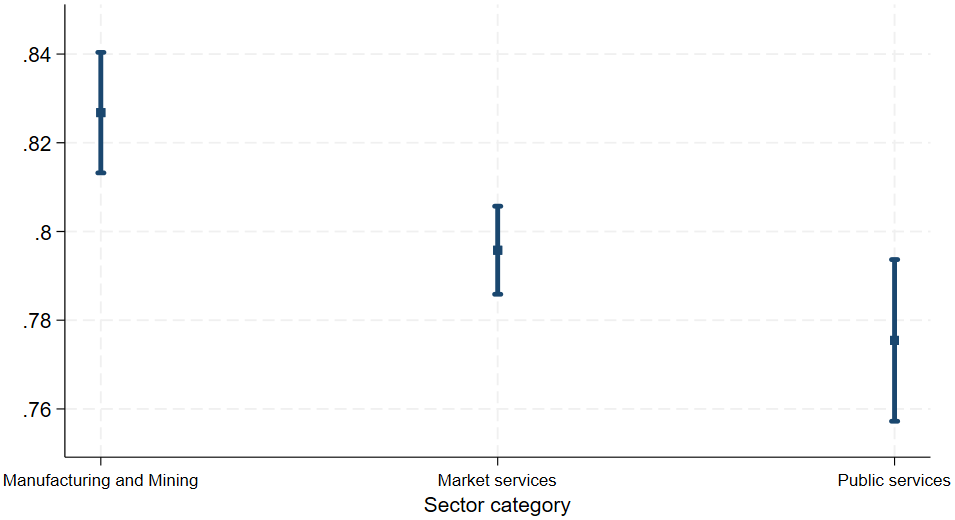


Notes. Respondents were asked if their firm encountered any difficulties in recruiting employees in the last 24 months. Severe shortages occur if all or most of the opened vacancies in the firm were hard to fill. Source: OECD-GFP Employer Survey data.

Labour shortages are also widespread across sectors. In all sectors, more than three fourth of companies report facing difficulties in recruiting personnel. Companies in

manufacturing and mining report the highest incidence of shortages (Figure 2), followed by market services (e.g., ICT, professional services, construction).[8]. While shortages in public sectors are less frequent, they remain significant, and particularly in healthcare, where 27% of entities in the sample report severe labour shortages (Figure A.6 in the Appendix).

Figure 2: Predicted share of firms reporting shortages, by sector group



Notes. The graph shows the predicted values of labour shortages by sector, controlling for country-level fixed effects, evaluated at means of covariates. Error bars represent 95% confidence intervals, with standard errors clustered by country-sector. Market services include construction (ISIC rev. 4, Section F), wholesale and retail trade (G), transportation and storage (H), accommodation and food service activities (I), information and communication services (J), real estate (L), professional, scientific and technical activities (M) and administrative services (N); Public services include human health and social work activities (Q), arts, entertainment, and recreation (R), and other services activities (S). Table A.2, Column 1, shows the regression underlying the results. Source: OECD-GFP Employer Survey data.

These results contribute to the few studies measuring labour market shortages across countries and sectors (Groiss and Sondermann, 2024; ManpowerGroup, 2024). Compared to Groiss and Sondermann (2024), we find similar figures comparing our measure of severe labour shortages and their single measure of shortages, i.e. the share of companies reporting labour shortages "as a factor limiting production". Instead, our measure of the share of companies reporting recruitment difficulties reaches much higher levels.

[8]The Figure reports predicted values of the macro-sector dummies, evaluated at the means of covariates. Table A.2 shows the underlying regressions (Column 1), showing that the relationship is robust to the progressive inclusion of country, size class and age class fixed-effects, as well as controls for growth in size (Columns 2-5). Country by sector FEs are not included as they would absorb the cross-sectoral variation of interest. Figure A.5 in the Appendix visualises the same exercise but with controls for firm's age, size and growth in size. Table A.13 in the Appendix further shows that the results are robust to excluding any country from the sample.

The distribution of our measure of recruitment difficulties across sectors is also relatively similar to the one of Groiss and Sondermann (2024), although accommodation and health services stand out, possibly due to differences in the years considered.

Finally, we calculate the firm's vacancy rate using self-reported information on employment and number of outstanding vacancies. Figure A.8 in the Appendix shows no visible difference between the distribution of vacancy rates in firms with or without recruitment difficulties. This highlights the importance of measuring recruitment difficulties separately from outstanding vacancies, as relying solely on vacancies as an indicator of labour shortages may overlook differences in firms' recruitment intensity (Davis et al., 2013).

4.2 Skills matter! Firms with shortages are more likely to require new skills

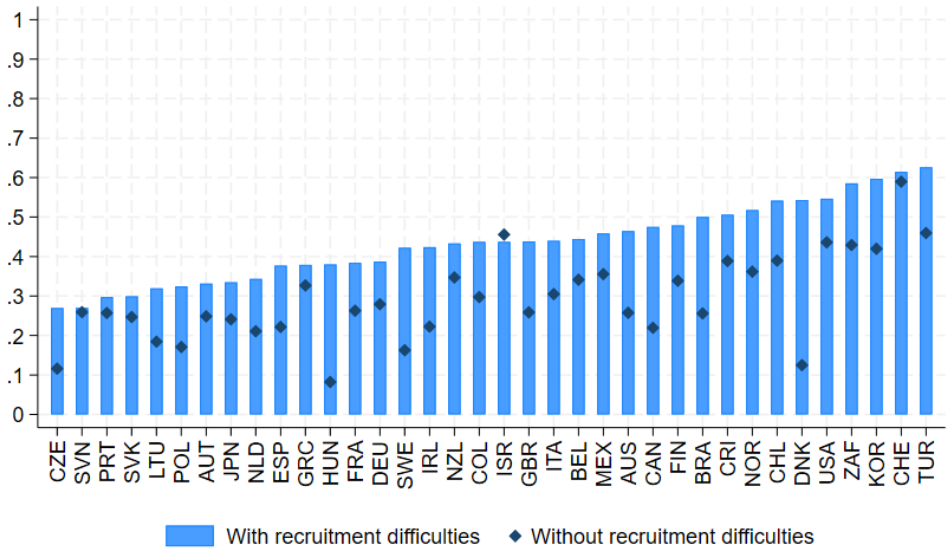
Shortages are more frequent for firms in high-wage sectors (Figure A.9 in the Appendix), and even more so when firms are seeking to fill positions that require tertiary education. This is in line with the long-standing increase in labour market tightness in high-skill sectors Dorville et al. (2025). High shortages in high-wage firms likely reflect the sorting of high-skill workers into these firms. Education has historically warranted a salary premium, and the share of high-skilled workers in high-wage firms is larger than in firms at the bottom of the firm wage distribution. This is likely because high-skilled workers increasingly cluster in the same firms as those get more specialised, or because better performing firms pay higher wages to attract better workers.

Moreover, in most countries, at least 40% of firms experiencing labour shortages reported changes in skill needs - a higher proportion compared to firms without shortages (Figure 3, with Appendix Table A.5 testing the significance of the results through regression analysis).[9] This disparity is particularly sizeable in Denmark, Hungary, and Sweden. Such results can emerge for example as changes in the products or services offered, the inputs utilised, or new investments in tangible and intangible assets alter the tasks required in a firm (Autor et al., 2024). To fulfil these changing skill needs, firms may resort to hiring new profiles, that may in turn be difficult to find, for instance because they are inherently scarce or because the firm lacks experience in hiring workers a different skill set than in the past.[10]

[9] Appendix Table A.15 shows that the results are robust to excluding any country out of the sample.

[10] Results using the "severe shortages" measure (Appendix Table A.6) are somewhat less robust, particularly when employing more demanding fixed-effects structures and additional controls. High-skill shortages are therefore less likely to affect firms where most or all vacancies are hard to fill.

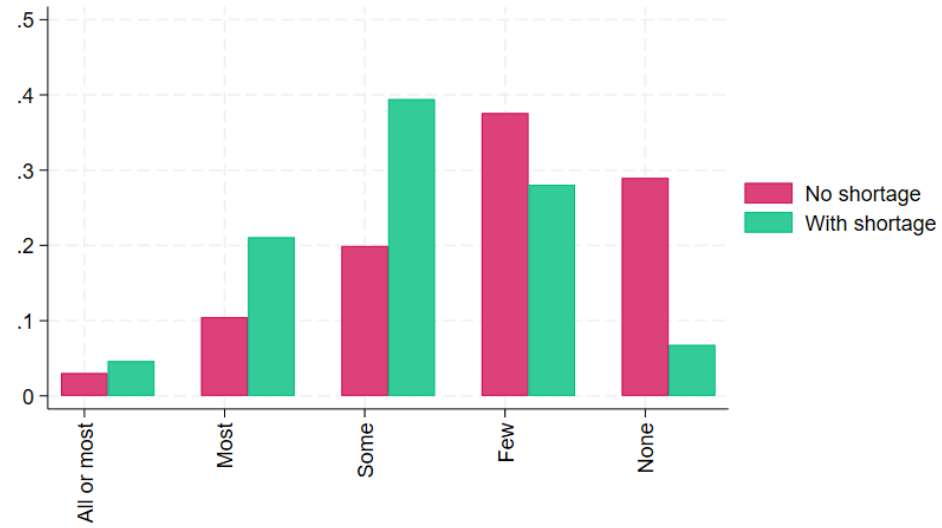
Figure 3: Share of firms with and without labour shortages that report opening vacancies due to changing skill needs



Notes. The graph reports the share of firms reporting for which the main reasons for opening vacancies in the past 24 months was "changing skill needs", by firms having recruitment difficulties or not. See Table A.5 for the full regression results. Source: OECD-GFP Employer Survey data.

In addition, firms facing shortages tend to report higher levels of on-the-job skill mismatch, particularly under-skilling. Figure 4 shows that the distribution of workers who "lack the skills needed to perform their job at the required level" is markedly skewed toward larger skill gaps in companies experiencing labour shortages. One way to reconcile this finding with results in Figure 3 is to consider that, when firms are in shortage because they are looking for workers with a specific level of skills and such workers are hard to find, they may adjust by accepting hires with suboptimal competences. In other words, they accept higher skill gaps as an adjustment margin to fill vacancies.

Figure 4: Distribution of the share of workers that "do not have the skills needed to do their job to the required level", by declared labour shortages



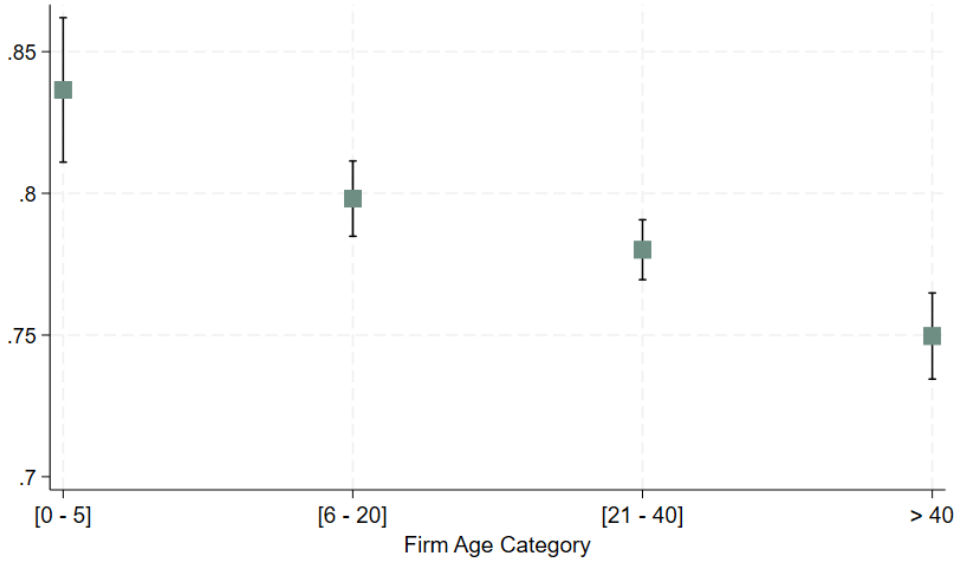
Notes. The graph reports the distribution of answers to the question "Thinking about the skills of staff employed in your enterprise and the skills needed to do their current job, how many do you think do not have the skills needed to do their job to the required level", by firms declaring recruitment difficulties vs. not. Source: OECD-GFP Employer Survey data.

4.3 Young firms face higher shortages, and to some extent small firms, too

The incidence of shortages changes depending on various firm characteristics. Table A.3 in the Appendix studies how shortages vary in our sample within country-by-sector, according to firms' age, size and growth in size. Some patterns emerge.[11] First, young firms face higher labour shortages. Firms in their start-up phase – particularly within their first five years – are about 10 percentage points more likely to report recruitment difficulties compared to their more established counterparts (Figure 5). Limited established networks and lower perceived attractiveness on the labour market may contribute to this outcome. This suggests that labour shortages may act as a barrier to growth, for young firms, and potentially also as a barrier to entry for new employers. Similarly, Mandelman et al. (2024) shows that restrictions to migration can prevent young firms in particular from hiring highly skilled foreign workers and constrain the production of new technology and aggregate job creation. These dynamics underscore the need for targeted support to help young firms overcome workforce-related challenges during their critical early stages.

[11] Robustness leaving excluding country one by one from the sample can be found in Table A.14 in the Appendix.

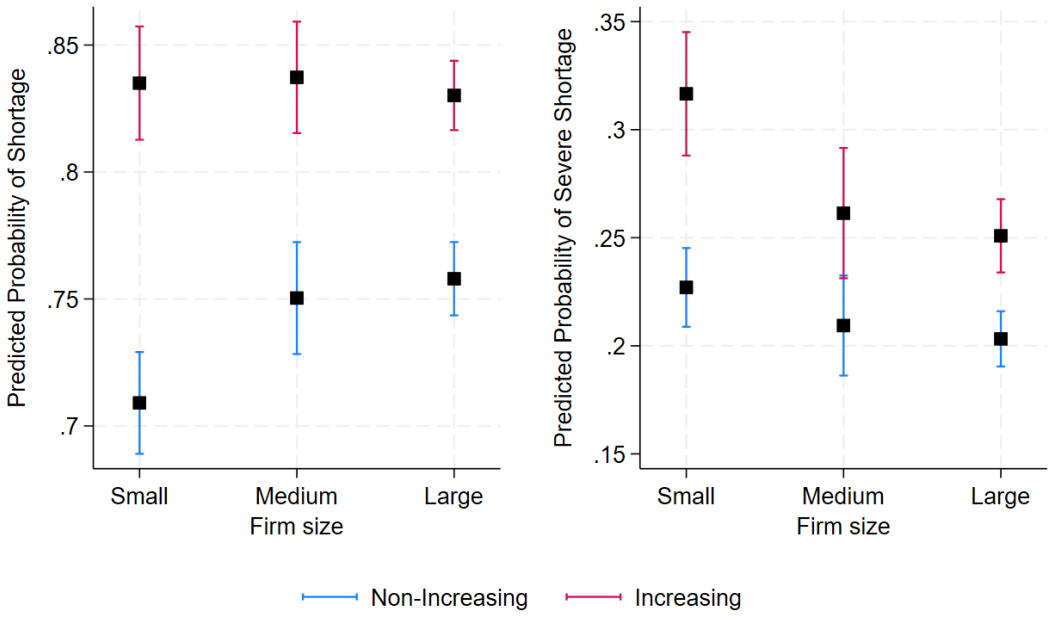
Figure 5: Share of firms with shortages, by firm's age category



Notes. The figure shows the predicted values of labour shortages conditional on different firm age categories. Regressions include country-sector fixed effects and controls for size in level and growth. The Figure is based on Table A.3, Column 2, in the Appendix. Error bars represent 95% confidence intervals with standard errors are clustered by country-sector. Source: OECD-GFP Employer Survey data.

Beyond the startup phase, labour shortages emerge as a significant constraint on the growth of firms (Stevens, 2007), in particular for small firms, becoming more pronounced as these businesses expand. Growing firms consistently report higher levels of shortages (Figure 6, left panel), which mirrors the broader impact of economic cycles on aggregate labour market tightness. Moreover, the gap in reported shortages between growing and non-growing firms is widest among small businesses, highlighting how labour constraints can hinder their growth potential. The same analysis focusing on severe shortages (Figure 6, right panel) confirms the result that firms increasing in size suffer more shortages, and further reveals that small firms experience more sever shortages than other firms, especially if they are expanding. This is consistent with Fontaine and Signorelli (2020), for instance, who find that following an alleviation of hiring constraints for firms in France, gains in employment and revenues in percentage terms are much larger for small and young businesses. This evidence is particularly concerning, as it suggests that the recent rise in labour shortages, constraining employment growth in firms, may be linked to the simultaneous decline in business dynamism and productivity, as noted by Decker et al. (2020).

Figure 6: Share of firms with shortages, by firm size and size dynamics



Notes. "(Non) increasing" implies that a firm was (not) expanding employment over 2022-23. Firm size categories refer to small, medium, large firms with 10-49, 50-249 and 250+ employees, respectively. Regressions control by firm's age and country-sector fixed effects, and standard errors are clustered by country-sector. Regressions results underlying the figure are reported in Table A.3, Column 2 (left panel) and Table A.4 Column 2 (right panel), in the Appendix. Source: OECD-GFP Employer Survey data.

4.4 Labour shortages are more frequent in firms that invest in green, digital and artificial intelligence technologies

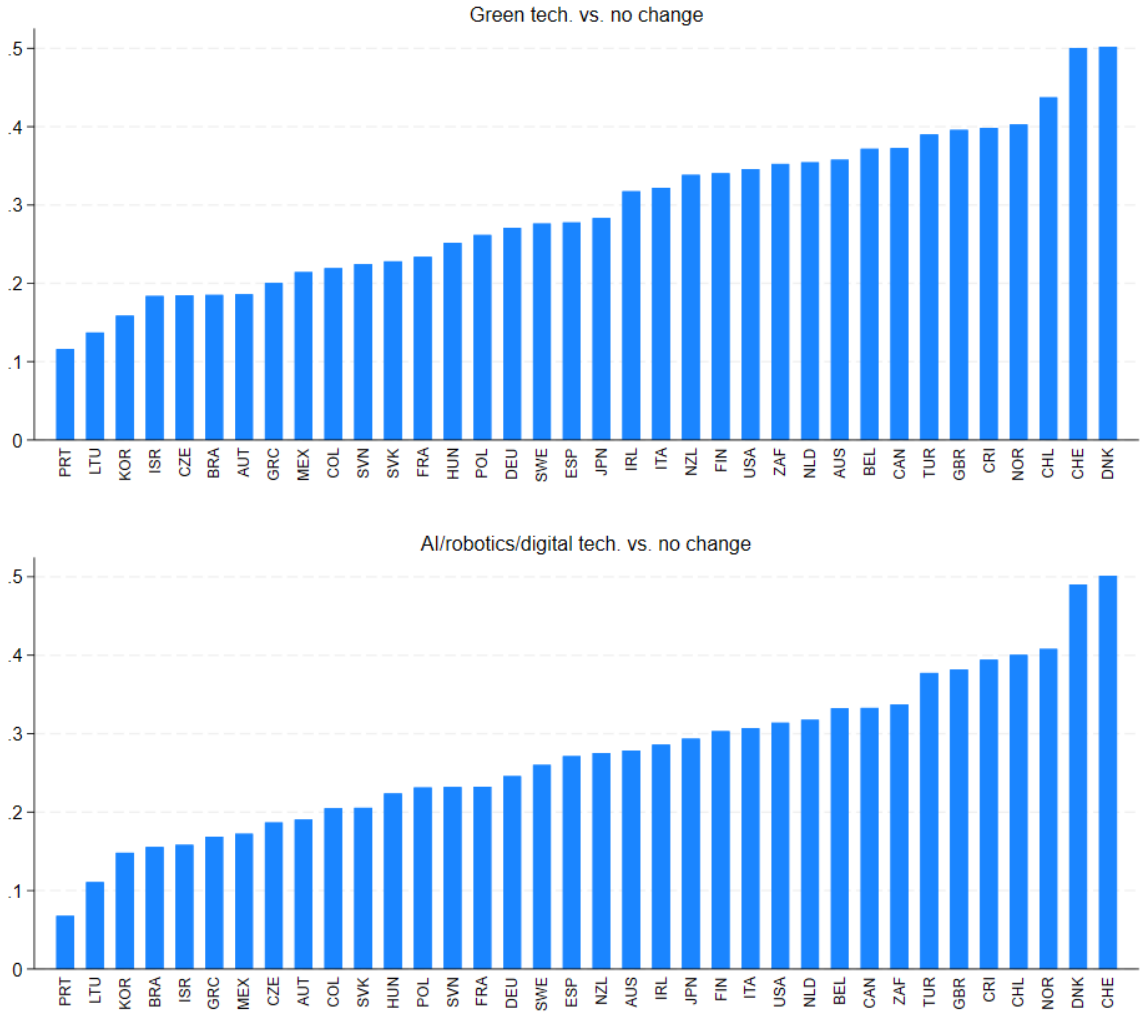
Dorville et al. (2025) show that decarbonisation efforts and the diffusion of digital technologies in the last decade have worsened labour market tightness. In a similar way, the OECD-GFP Employer Survey allows to relate firms' investments in certain technologies, and the probability that the firm experiences a labour shortage. Figure 7 illustrates the difference in labour shortages between firms that have embraced these technologies in the past two years, and firms that did not. On average, firms that adopted digital, AI, or green technologies reported a 5 to 8% higher probability to experience recruitment difficulties, respectively, than the average firm.[12]

The green and digital transition are significantly reshaping labour markets and skill demands across OECD countries. The green transition requires substantial workforce reallocation, as polluting sectors shrink in size and shed workers, while the demand for green jobs expands, and so does investment in complementary green skills. Similarly,

[12]Table A.7 shows the results in a regression framework with country/sector FEs and controls for firm age, size and size growth.

the diffusion of AI is transforming skill requirements by automating tasks and creating new ones, particularly in knowledge-intensive industries such as ICT.

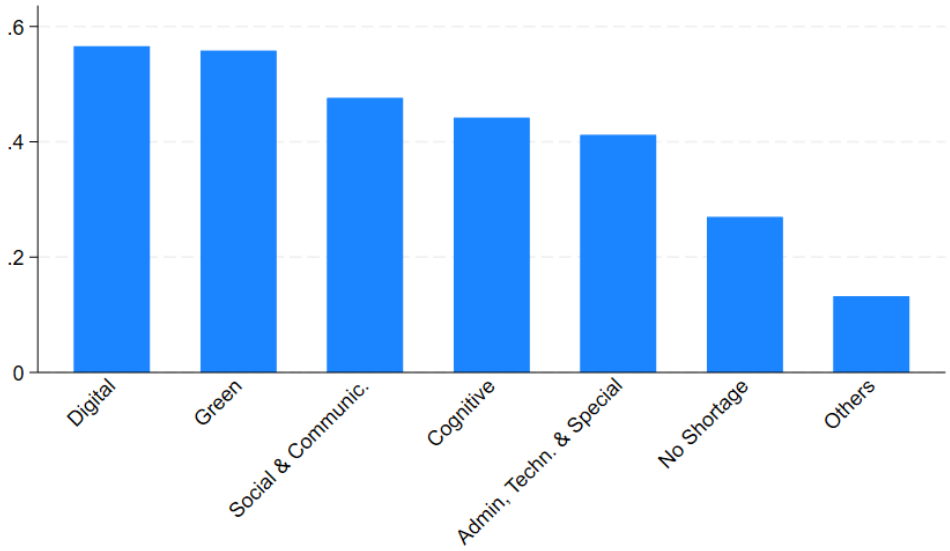
Figure 7: Percentage point difference in the probability of facing a shortage between firms experiencing a technological change and firms that experience no technological change



Notes. "Green technology" means that in the previous two years the firm has invested in products or technologies that reduce the firm's energy consumption or improve its environmental footprint. "AI/robotics/digital tech." means that the firm has implemented a change in at least one of the following areas: acquisition and management of data in support of decision-making (Business 4.0), process analysis, high speed internet, Internet of Things, machine-to-machine communication technologies, ICT security, text or image generating AI (e.g., ChatGPT; Dall-E), natural language processing including sentiment analysis, computer vision, machine learning algorithms, process optimisation/ automation or monitoring, creative and experimentation activities, augmented and virtual reality, 3D printing, interconnected and programmable collaborative robots. Table A.7 shows the results in a regression framework with country/sector FEs and controls for firm age, size and size growth. Source: OECD-GFP Employer Survey data.

Moreover, firms that open vacancies due to changing skill needs experience shortages in skills that are largely linked to structural trends. As Figure 8 illustrates, digital and green skills are the most needed skills among firms opening vacancies due to changing skill needs, followed by social and communication skills, which often complement digital expertise (Grundke et al., 2018). Further analysis shows that firms in Brazil, Turkey, and South Africa report particularly strong difficulties in finding both green and digital skills. Green skills are instead in significant shortage in the United States and Italy, while Swiss firms face pronounced shortages of digital skills.

Figure 8: Firms opening vacancies due to changing skill needs, by specific skills needed



Notes. The figure reports the share of firms that report opening vacancies due to changing skill needs, by the kind of skills they are searching for. Weighted averages over 36 countries. Green skills are defined as skills needed to improve the environmental footprint or energy efficiency of the company. Digital skills are basic and advanced ICT skills and skills needed to develop and/or use AI in the company. Social and communication skills encompass customer handling, management, team working, foreign language, oral and written communication skills. Cognitive skills include mathematics and calculating skills, reading and problem solving skills. Source: OECD-GFP Employer Survey data.

A dominance analysis shows that long-term trends are the most significant contributors to the variation in the probability of experiencing a shortage across firms in the same country and sector (Table A.10 in the Appendix).[13] Notably, developments associated with green, digital, and AI technologies collectively account for approximately

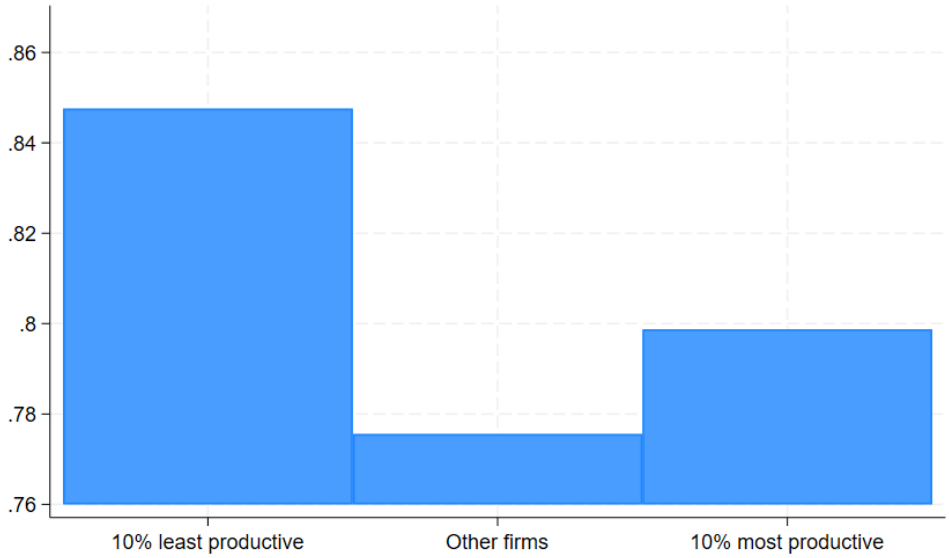
[13] A dominance analysis allows comparing the relative importance of the different predictors when the predictors are subject to multicollinearity, hence their explanatory power depends from the inclusion of the other predictors in the empirical model (Grömping, 2007). The procedure runs regressions using every possible subset of predictors and calculates each predictor's average contribution to model fit (e.g., R-squared) across all possible subsets. This averaging provides a comprehensive estimate of the predictor's overall importance.

two-thirds of the observed variance at the country-sector level, in a model that also controls for firms current size and projected change, firm's age, share of workers in skilled occupations, and if the firm has implemented other kinds of changes.

4.5 Low-productivity and frontier firms face shortages of very different nature

The overall correlation between a firm's labour productivity (as approximated by sales per employee) and its probability to report recruitment difficulties is negative: low-productivity firms are more likely to experience a labour shortage. This can be deduced from Figure 9 and Annex Table A.8, that show that shortages are highest in the bottom productivity decile However, firms at the top of the productivity distribution ("frontier firms") also report higher shortages than other firms.[14]

Figure 9: Share of firms with recruitment difficulties by decile of productivity



Notes. Productivity is measured as reported values of sales per employee, corrected by purchasing power parities. Deciles are constructed for the productivity distribution over specific countries. Table A.8 reports the underling regression results. Source: OECD-GFP Employer Survey data

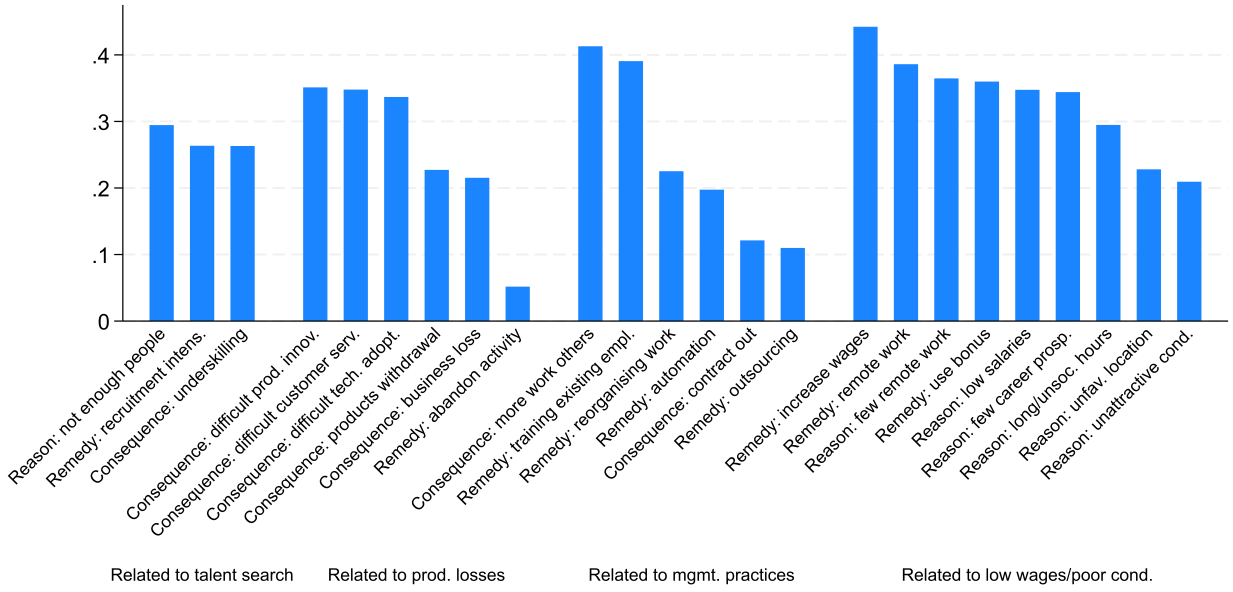
A number of different mechanisms can drive the slightly U-shaped relation between labour shortages and productivity in Figure 9. On the one hand, shortages can affect productivity of firms. The sign of such effect of shortages on productivity can be negative, for instance if shortages force companies to renounce to innovation, and operate

[14]Table A.9 replicates the results using severe shortages as outcome. Interestingly, while the higher shortages for low productivity firms are confirmed, severe shortages for top productivity firms do not tick up as in the case of overall shortages. This could be interpreted as firms in the top productivity decile having more likely shortages than other firms, but only for a few vacancies.

at lower efficiency. Or, the sign can be positive if shortages push companies to enact productivity-enhancing measures such as training, automation, or efficiency-improving re-organisation. On the other hand, a firm's productivity can affect the probability that it faces a shortage. The sign of the effect can again be ambiguous. Higher productivity may result in higher shortages if firms that experience a positive productivity shock (e.g., from adopting a new technology that requires complementary skills) are also more likely to struggle in finding the complementary talent for that technology. Conversely, firms facing negative productivity shocks may not be able to offer competitive wages, foregoing potential hires, and suffer higher shortages.

Testing all these hypothetical channels in cross-sectional data as ours is clearly challenging. However, a unique feature of the OECD-GFP Employer Survey is that it directly asks companies about their perception about the causes, consequences, and remedies to recruitment difficulties. Figure 10 displays the results of these questions. It emerges that a large share of firms considers monetary incentives to be a key determinant of labour shortages: for instance, increasing wages is frequently seen as a solution, while low pay is cited as a contributing factor. A similar pattern applies to remote work arrangements, which are widely viewed as a way to ease recruitment difficulties, whereas limited opportunities for remote work are perceived as a source of shortages. Training is also commonly identified as an important remedy. More broadly, firms report that labour shortages give rise to various forms of production-related difficulties. We group these reported causes, consequences, and responses into four categories: factors related to talent search, those associated with production losses, those linked to management practices, and those reflecting low wages and poor working conditions. While our survey does not explicitly capture adjustments along the margin of working hours—such as increased overtime or reductions in hours—this likely constitutes an additional channel through which firms respond to labour shortages and shape recruitment outcomes.

Figure 10: Share of firms reporting recruitment difficulties that declare different causes, consequences and remedies to recruitment difficulties



Notes. Source: OECD-GFP Employer Survey data

Leveraging such data, we can return to our question of what drives the relationship between shortages and productivity, and examine how firms of different productivity levels relate to the four categories of labour shortages in Figure 10. It emerges that, behind the slightly U-shaped relation between productivity and shortages in Figure 9, low- and high- productivity firms face a fundamentally different nature of shortages (Table 1).[15]

First, Column 1 of Panel A shows that low-productivity firms more often attribute shortages to low wages and poor working conditions. This fact can be seen as suggestive of a well-functioning labour market with positive labour market sorting, where workers leave or avoid low-wage companies and transition towards higher-quality, higher-pay jobs, especially during tight labour markets (Autor et al., 2023; Börschlein et al., 2024). For example, this may arise in a perfectly competitive yet frictional setting, where workers' outside options improve (e.g. as competing firms become more productive and offer higher wages), while frictions keep some workers in low-productivity firms, which are unable to raise wages enough to attract new hires and thus experience shortages due to low pay (or, equivalently, poor working conditions). As an alternative explanation, firms may experience labour shortages in a frictionless but monopsonistic setting. In fact, monopsony per-se implies a wage markdown, so that labour demand exceeds supply at the monopsonistic wage, and at the same time monopsonistic firms find that raising

[15]Results are robust to the inclusion of controls, in Appendix Table A.11, except the one that relates productivity and production losses, which becomes insignificant when including control for changes in size.

wages would harm their profits, perceiving this as wage-related shortages. Moreover, monopsonistic firms may face shortages even when paying the minimum wage (Faia et al., 2026).[16]

Second, Column (2) of Panel (a) shows that shortages lead to productivity losses especially in low-productivity firms, including reduced innovation. Although such result signals that shortages in part play a desirable cleansing role, concerns can be raised about the risk that shortages worsen market concentration, similarly to what could happen with supply-chain shortages (Franzoni et al., 2023), and lower aggregate productivity due to widening gaps between high- and low-productivity firms (Andrews et al., 2016).

High-productivity firms, conversely, more frequently report shortages due to a lack of skilled workers (Panel B, column 3). This could be seen as a signal of talent misallocation, whereby firms with high productivity cannot find the appropriate talent to support their growth (Bergeaud et al., 2022). Column (4) in Panel B additionally finds that high-productivity firms are also more likely to deploy remedies to labour shortages that are productivity-enhancing, such as automation, training, and improved management. Labour shortages therefore can push firms to invest in training, re-organization and new technologies, potentially affecting labour productivity (both through capital-deepening and TFP increases).

Based on Table 1, we may identify two different natures of shortages in the economy, depending on the productivity of firms. First, skill shortages, which appear more commonly in high-productivity firms and stimulate automation, training and improved management practices. Second, shortages related to low wages and poor working conditions, that are more common in low-productivity firms, and potentially lead to further production losses in these firms.

Finally, Table A.12 in the Appendix shows that less productive firms are more likely to suffer of on-the-job mismatch – that is, to employ a larger share of workers in roles for which they lack the required skills (Column 1). For all firms the skills gap tends to widen with the likelihood of experiencing shortages (Column 2), suggesting a tight relationship between shortages and mismatch. Yet, this pattern is especially pronounced in low-productivity firms (Column 3). Such firms may be generally less effective in recruitment and in assigning workers to the "right" tasks. When labour shortages increase, they also appear to rely more heavily on mismatch as a margin of adjustment, i.e. on the available workers even when their skill sets are ill-suited to the job, or lowering their recruitment standards (what Modestino et al., 2016, denote as *downskilling*).

[16] In particular, for some firms the minimum wage may lie above their monopsonistic wage but below the competitive market-clearing wage. Faia et al. (2026) show that, under specific conditions, such firms may still find it optimal to pay the minimum wage rather than the market-clearing wage, since raising wages even marginally above the minimum entails a discontinuous increase in marginal cost (as wages must rise for all workers). Yet, for these firms labour demand exceeds supply at the minimum wage, generating perceived shortages.

Table 1: Different nature of shortages according to firms' productivity

	Panel A: Low-productivity firms		**Panel B: High-productivity firms**	
	(1) Shortage related to low wages/conditions	(2) Production losses	(3) Shortage related to lack of skills	(4) Automation, training & re-org.
Productivity (log, std)	-0.547*** (0.131)	-0.496*** (0.169)	1.738*** (0.245)	1.707*** (0.181)
Observations	12,727	12,727	12,727	12,727

Notes: Coefficients of a regression of the firm probability to experience a shortage of a given type, on log-labour productivity (sales per employee, corrected by international purchasing power parities). The dependent variable is a dummy taking value 1 if the firm reports that it is experiencing a shortage and that it is experiencing it because the firm offers poorer wages or working conditions (longer hours, unfavourable location, limited career options, limited remote work flexibility) than the competitors (Panel A, column 1). For panel A, column 2, the firm reports that shortages are the cause of production losses, withdrawals of certain products or services, and difficulties introducing new technologies, products or services. For panel B, column 3 the firm reports that it lacks fitting applicants for a vacancy, has to recruit staff with less competencies than needed, or has to increase spending on recruitment. For panel B, column 4, the firm responds to shortages by training workers, automating parts of production, reallocating work across staff, or outsourcing it. All regressions include country by sector FEs. Coefficients are for a standard deviation in productivity, based only on firms reporting a shortage. Results are robust to the inclusion of controls for firm's age, size, and public/private ownership. Standard errors in parentheses, clustered at the country-sector level. *** p<0.01, ** p<0.05, * p<0.1.

Source: OECD-GFP Employer Survey data

5 Conclusion

This paper presents findings from the OECD-GFP Employer Survey on Labour Shortages. A comprehensive employer survey, it covers 34 OECD countries, plus Brazil and South Africa, with data from approximately 20,000 firms across 13 sectors and three firm size categories for 2023-2024. At the best of our knowledge, we are the first to collect cross-country comparable, representative data on the extent, causes, and consequences of firm recruitment difficulties.

The analysis highlights five key findings. First, labour shortages are widespread: about 80% of firms report recruitment difficulties, with a third stating that most or all vacancies are hard to fill. Shortages are especially acute in manufacturing, mining, and market services (e.g., ICT, professional services, construction), while public services, particularly healthcare, also face challenges, though to a lesser degree. Second, firms experiencing shortages are more likely to need new skills. Third, young firms report higher shortages, and small firms face growing constraints as they scale. Fourth, shortages are more prevalent in firms adopting AI, green, and digital technologies, explaining over two-thirds of within-country sectoral variation. Fifth, shortages differ across productivity levels: both low- and high-productivity firms report more shortages, but for different reasons. Low-productivity firms often cite low wages and poor conditions, while high-productivity firms struggle to find skilled workers. This reflects a broader labour market sorting, with workers gravitating toward better jobs—potentially deepening productivity gaps. Notably, high-productivity firms are more likely to respond by investing in automation and training.

The paper underscores that labour shortages are a significant challenge for firms, warranting greater policy attention and yielding some specific policy implications. First, as we find that shortages are more prevalent in firms adopting AI, green, and digital technologies, productivity policies aiming at promoting digitalisation and decarbonisation may increase recruitment difficulties (Dorville et al., 2025). While such policies are vital to achieve related policy goals and stronger economic growth, they may carry unintended costs in the form of increased labour shortages. We argue this should be carefully considered when designing pro-productivity, pro-growth policies. Second, our analysis shows that firms recognise training, automation, and re-organisation as potential remedies to shortages. Informed by these results, governments can tackle shortages through measures to support investment, workforce training in firms, and the development of managerial skills. Third, our findings show that high-productivity firms often face shortages due to a lack of suitable profiles in the market, indicating misallocation. This underlines the importance of policies that promote an efficient allocation of labour — for instance, active labour market policies (ALMPs) and a sound balance between employment and job protection.[17]

[17] Two additional supply-side policy areas are often discussed to mitigate labour shortages: efforts to increase labour market participation of vulnerable groups, and migration. These fall outside the scope of this paper and are left to further research.

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Appendix

A Additional Tables and Figures

Table A.1: Number of Final Observations by Country

Country	**N. Obs**	**Country**	**N. Obs**	**Country**	**N. Obs**
Australia	351	Austria	489	Belgium	499
Brazil	523	Canada	928	Switzerland	379
Chile	333	Colombia	442	Costa Rica	193
Czech Republic	445	Germany	949	Denmark	460
Spain	994	Finland	446	France	955
United Kingdom	1003	Greece	497	Hungary	480
Ireland	291	Israel	262	Italy	947
Japan	973	South Korea	1004	Lithuania	340
Mexico	498	Netherlands	516	Norway	477
New Zealand	182	Poland	500	Portugal	469
Slovakia	495	Slovenia	290	Sweden	431
Turkey	446	United States	1034	South Africa	529
Total					**20,050**

Table A.2: Labour shortages variation across industries

VARIABLES	(1) Shortage	(2) Shortage	(3) Shortage	(4) Shortage	(5) Shortage
Market services (rel. Manufacturing and Mining)	-0.115*** (0.0320)	-0.139*** (0.0318)	-0.133*** (0.0319)	-0.151*** (0.0317)	-0.151*** (0.0316)
Public services (rel. Manufacturing and Mining)	-0.185*** (0.0412)	-0.188*** (0.0426)	-0.183*** (0.0427)	-0.194*** (0.0424)	-0.182*** (0.0428)
Increasing size (rel. non-increasing)					0.342*** (0.0304)
Constant	0.846*** (0.133)	0.838*** (0.151)	0.792*** (0.152)	1.006*** (0.153)	0.869*** (0.153)
Observations	19,442	16,808	16,808	16,808	16,808
Country FE	YES	YES	YES	YES	YES
Size class FE	NO	NO	YES	YES	YES
Age class FE	NO	NO	NO	YES	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. Market services include construction (ISIC rev. 4, Section F), wholesale and retail trade (G), transportation and storage (H), accommodation and food service activities (I), information and communication services (J), real estate (L), professional, scientific and technical activities (M) and administrative services (N); Public services include human health and social work activities (Q), arts, entertainment, and recreation (R), and other services activities (S). All regressions include controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.3: Labour shortages variation within industries

VARIABLES	(1) Shortage	(2) Shortage
Increasing in size (rel. non-increasing/ rel. small non-increasing in col 2)	0.336*** (0.0316)	0.465*** (0.0567)
Medium (rel. small, non-increasing, age [0-5])		0.120** (0.0503)
Large (rel. small, non-increasing, age [0-5])		0.129*** (0.0446)
Medium and Increasing (rel. small, non-increasing, age [0-5])		-0.135 (0.0846)
Large and Increasing (rel. small, non-increasing, age [0-5])		-0.183*** (0.0689)
Firm's age [6-20] (rel. small, non-increasing, age [0-5])	-0.154** (0.0640)	-0.152** (0.0644)
Firm's age [21-40] (rel. small, non-increasing, age [0-5])	-0.221*** (0.0635)	-0.216*** (0.0639)
Firm's age [>40] (rel. small, non-increasing, age [0-5])	-0.326*** (0.0653)	-0.325*** (0.0654)
Constant	0.388*** (0.0593)	0.347*** (0.0621)
Observations	16,557	16,557
Country x Sector FE	YES	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. Regressors distinguish firms into those declaring increasing in size over the last year vs. not, and into small (10-49 employees), medium (50-249 employees), or large (250+ employees). All regressions include controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.4: Severe labour shortages variation within industries

VARIABLES	(1) Severe shortage	(2) Severe shortage
Increasing in size (rel. non-increasing rel. small non-increasing in col 2)	0.229*** (0.0324)	0.293*** (0.0528)
Medium (rel. small)		-0.0848 (0.0576)
Large (rel. small)		-0.131*** (0.0475)
Medium × Increasing (rel. small, non-increasing)		-0.0884 (0.0895)
Large × Increasing (rel. small, non-increasing)		-0.0860 (0.0684)
Firm's age [6-20] (rel. age [0-5])	-0.199*** (0.0553)	-0.199*** (0.0554)
Firm's age [21-40] (rel. age [0-5])	-0.0559 (0.0564)	-0.0539 (0.0566)
Firm's age [>40] (rel. age [0-5])	-0.0156 (0.0618)	-0.0155 (0.0619)
Constant	-1.021*** (0.0505)	-1.045*** (0.0525)
Observations	16,619	16,619

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering difficulties in filling all or most of the outstanding vacancies (severe shortage) in the last 24 months. Regressors distinguish firms into those declaring increasing in size over the last year vs. not, and into small (10-49 employees), medium (50-249 employees), or large (250+ employees). All regressions include country-by-sector FEs, controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.5: Labour shortages and changing skill needs

VARIABLES	(1) Shortage	(2) Shortage	(3) Shortage
Changing skill needs	0.362***	0.367***	0.350***
	(0.0309)	(0.0337)	(0.0340)
Constant	0.289***	0.348***	0.517***
	(0.0140)	(0.0320)	(0.0609)
Observations	18,014	15,569	15,569
Size class FE	NO	YES	YES
Age class FE	NO	NO	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. The regressor is a dummy for firms reporting that the main reasons for opening vacancies in the past 24 months was "changing skill needs". All regressions include country-by-sector FEs, controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.6: Labour shortages and changing skill needs

VARIABLES	(1) Severe shortage	(2) Severe shortage	(3) Severe shortage
Changing skill needs	0.0548**	0.0373	0.0483
	(0.0263)	(0.0308)	(0.0312)
Constant	-0.829***	-0.962***	-0.833***
	(0.0235)	(0.0310)	(0.0538)
Observations	18,047	15,500	15,500
Country x Sector FE	YES	YES	YES
Size class FE	NO	YES	YES
Age class FE	NO	NO	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. The regressor is a dummy for firms reporting that the main reasons for opening vacancies in the past 24 months was "changing skill needs". All regressions include controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.7: Labour shortages and changes in green or AI/robotics/digital technology

VARIABLES	(1) Shortage	(2) Severe shortage
Green tech.	0.0852***	0.0472***
(rel. to no change)	(0.00818)	(0.00861)
AI/robotics/digital tech	0.204***	0.0358***
(rel. to no change)	(0.0103)	(0.0108)
Constant	0.594***	0.185***
	(0.0147)	(0.0154)
Observations	16,267	16,324

Notes: The table reports the coefficients of a regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. The regressor is a dummy for firms reporting that they experienced changes related to green or AI/robotics/digital technology. All regressions include controls for firm age, size growth and size. All regressions include country by sector fixed-effects as well as controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.8: Labour shortages and changing skill needs

VARIABLES	(1) Shortage	(2) Shortage	(3) Shortage	(4) Shortage
1st productivity decile	0.0752***	0.0717***	0.0744***	0.0580***
	(0.0145)	(0.0164)	(0.0164)	(0.0125)
2nd productivity decile	0.0373***	0.0295*	0.0293*	
	(0.0144)	(0.0162)	(0.0162)	
3rd productivity decile	0.0190	0.0195	0.0185	
	(0.0144)	(0.0160)	(0.0160)	
4th productivity decile	0.0278*	0.0300*	0.0296*	
	(0.0144)	(0.0159)	(0.0159)	
5th productivity decile	0.0145	0.0153	0.0160	
	(0.0144)	(0.0158)	(0.0158)	
6th productivity decile	-	-	-	
7th productivity decile	0.00915	0.0155	0.0161	
	(0.0144)	(0.0157)	(0.0157)	
8th productivity decile	0.0173	0.0200	0.0224	
	(0.0144)	(0.0156)	(0.0155)	
9th productivity decile	-0.00679	-0.00477	-0.000641	
	(0.0145)	(0.0157)	(0.0157)	
10th productivity decile	0.0259*	0.0309**	0.0351**	0.0194*
	(0.0146)	(0.0157)	(0.0157)	(0.0117)
Constant	0.769***	0.758***	0.794***	0.811***
	(0.0102)	(0.0128)	(0.0173)	(0.0137)
Observations	16,161	13,855	13,855	13,855
Size class FE	NO	YES	YES	YES
Age class FE	NO	NO	YES	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. The regressors are deciles of a proxy for labour productivity, obtained as reported values of sales per employee, corrected by purchasing power parities. All regressions include country-by-sector FEs, controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.9: Severe labour shortages and changing skill needs

VARIABLES	(1) Severe shortage	(2) Severe shortage	(3) Severe shortage	(4) Severe shortage
1st productivity decile	0.108***	0.0955***	0.0913***	0.0817***
	(0.0153)	(0.0167)	(0.0167)	(0.0128)
2nd productivity decile	0.0498***	0.0389**	0.0358**	
	(0.0153)	(0.0166)	(0.0166)	
3rd productivity decile	0.0318**	0.0239	0.0228	
	(0.0153)	(0.0164)	(0.0164)	
4th productivity decile	0.0130	0.00814	0.00632	
	(0.0153)	(0.0163)	(0.0163)	
5th productivity decile	0.00585	0.00460	0.00304	
	(0.0153)	(0.0162)	(0.0162)	
6th productivity decile	-	-	-	
7th productivity decile	0.000952	-0.000639	-0.000937	
	(0.0152)	(0.0161)	(0.0161)	
8th productivity decile	0.00306	0.00192	0.00163	
	(0.0152)	(0.0159)	(0.0159)	
9th productivity decile	0.0134	0.00917	0.00833	
	(0.0153)	(0.0161)	(0.0161)	
10th productivity decile	-0.00302	-0.00311	-0.00357	-0.0122
	(0.0154)	(0.0161)	(0.0161)	(0.0120)
Constant	0.226***	0.250***	0.283***	0.293***
	(0.0108)	(0.0131)	(0.0177)	(0.0140)
Observations	16,222	13,911	13,911	13,911
Size class FE	NO	YES	YES	YES
Age class FE	NO	NO	YES	YES

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm having difficulties filling all or most of the outstanding vacancies (severe shortages) in the last 24 months. The regressors are deciles of a proxy for labour productivity, obtained as reported values of sales per employee, corrected by purchasing power parities. All regressions include country by sector FEs, controls for firm age, size growth and size. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.10: Dominance Statistics and Rankings for Shortage and other regressors (within sector-country)

Variable	(1) Dominance Stat.	(2) Std. Dominance Stat.	(3) Ranking
Growing firm	0.0071	0.0909	4
Age (log)	0.0022	0.0283	5
Share of high-skill occupations	0.0001	0.0008	9
Firm size = big	0.0001	0.0011	7
Firm size = medium	0.0000	0.0002	10
Firm size = small	0.0001	0.0009	8
Past changes - green technologies	0.0248	0.3177	2
Past changes - digital technologies	0.0270	0.3464	1
Past changes - AI technologies	0.0149	0.1905	3
Other past changes	0.0018	0.0231	6
Overall Fit Statistic (within country-sector) = 0.0780			

Notes: This table reports general dominance statistics for a linear regression of the "shortage" outcome on our set of predictor variables, where both outcomes and regressors were residualised by country-sector FEs. Column 1 shows each variable's average incremental contribution to explained variance within country-sector, Column 2 its share of the total, and Column 3 its rank (1 = highest contributor). Source: OECD-GFP Employer Survey data.

Table A.11: Different nature of shortages according to firms' productivity - with controls

	Panel A: Low-productivity firms		**Panel B: High-productivity firms**	
	(1) Shortage related to low wages/conditions	(2) Production losses	(3) Shortage related to skill gaps	(4) Automation, training & re-org.
Productivity (log, std)	-0.352**	-0.220	1.561***	1.556***
	(0.1415)	(0.1744)	(0.2641)	(0.1953)
Observations	12,257	12,257	12,257	12,257

Notes: All regressions include country by sector FEs. Coefficients of a regression of the firm probability to experience a shortage of a given type, on log-labour productivity (sales per employee, corrected by international purchasing power parities). Coefficients for a standard deviation in productivity, based only on firms reporting a shortage. Regressions include controls for firm age, size growth and size. Standard errors clustered by country and sector in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: OECD-GFP Employer Survey data

Table A.12: Shortages are more often associated to on-the-job mismatch, and especially so in low-productivity firms

Dep. variable: on-the-job mismatch	(1)	(2)	(3)
Labour productivity (log, std.)	-0.049***	-0.046***	-0.027***
	(0.0044)	(0.0044)	(0.0081)
Shortages		0.114***	0.116***
		(0.0081)	(0.0083)
Shortages $\times$ labour productivity (log)			-0.023**
			(0.0095)
Observations	15,740	15,740	15,740

Notes: Coefficients of a regression of the firm probability to report a mismatch on log-labour productivity (sales per employee, corrected by international purchasing power parities) and an indicator of labour shortages. A firm is experiencing a mismatch if it reports that all or most of its employees lack the necessary skills to perform their jobs. All regressions include country by sector FEs. Results are robust to the inclusion of controls. Standard errors clustered by country and sector in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data

Table A.13: Labour shortages variation across industries - robustness to leaving one country out of the sample

VARIABLES	(1) Shortage	(2) Shortage	(3) Shortage	(4) Shortage	(5) Shortage	(6) Shortage	(7) Shortage	(8) Shortage	(9) Shortage	(10) Shortage	(11) Shortage	(12) Shortage	(13) Shortage	(14) Shortage	(15) Shortage	(16) Shortage	(17) Shortage	(18) Shortage
Market services	-0.142***	-0.152***	-0.150***	-0.150***	-0.153***	-0.148***	-0.156***	-0.148***	-0.163***	-0.164***	-0.155***	-0.143***	-0.148***	-0.146***	-0.152***	-0.154***	-0.151***	-0.152***
(rel. Manufacturing and Mining)	(0.0304)	(0.0324)	(0.0322)	(0.0321)	(0.0322)	(0.0320)	(0.0320)	(0.0318)	(0.0307)	(0.0321)	(0.0325)	(0.0318)	(0.0325)	(0.0322)	(0.0324)	(0.0320)	(0.0324)	(0.0325)
Public services	-0.160***	-0.177***	-0.189***	-0.179***	-0.184***	-0.183***	-0.187***	-0.169***	-0.196***	-0.193***	-0.177***	-0.189***	-0.181***	-0.180***	-0.185***	-0.194***	-0.177***	-0.186***
(rel. Manufacturing and Mining)	(0.0416)	(0.0435)	(0.0437)	(0.0438)	(0.0437)	(0.0435)	(0.0436)	(0.0428)	(0.0419)	(0.0433)	(0.0441)	(0.0428)	(0.0440)	(0.0436)	(0.0435)	(0.0431)	(0.0442)	(0.0435)
Increasing size	0.326***	0.344***	0.335***	0.345***	0.341***	0.328***	0.332***	0.343***	0.339***	0.341***	0.345***	0.339***	0.347***	0.349***	0.339***	0.332***	0.347***	0.348***
(rel. non-increasing)	(0.0301)	(0.0308)	(0.0306)	(0.0312)	(0.0312)	(0.0303)	(0.0304)	(0.0306)	(0.0305)	(0.0307)	(0.0311)	(0.0308)	(0.0312)	(0.0308)	(0.0311)	(0.0311)	(0.0311)	(0.0308)
Observations	16,521	16,418	16,376	16,366	16,019	16,478	16,520	16,434	16,652	16,413	16,027	16,430	15,951	16,421	15,982	15,987	16,383	16,408
Left-out country	AUS	AUT	BEL	BRA	CAN	CHE	CHL	COL	CRI	CZE	DEU	DNK	ESP	FIN	FRA	GBR	GRC	HUN

VARIABLES	(19) Shortage	(20) Shortage	(21) Shortage	(22) Shortage	(23) Shortage	(24) Shortage	(25) Shortage	(26) Shortage	(27) Shortage	(28) Shortage	(29) Shortage	(30) Shortage	(31) Shortage	(32) Shortage	(33) Shortage	(34) Shortage	(35) Shortage	(36) Shortage
Market services	-0.157***	-0.146***	-0.156***	-0.159***	-0.152***	-0.147***	-0.154***	-0.146***	-0.156***	-0.145***	-0.155***	-0.150***	-0.142***	-0.153***	-0.159***	-0.144***	-0.151***	-0.151***
(rel. Manufacturing and Mining)	(0.0311)	(0.0317)	(0.0326)	(0.0325)	(0.0323)	(0.0319)	(0.0323)	(0.0315)	(0.0320)	(0.0317)	(0.0328)	(0.0324)	(0.0314)	(0.0327)	(0.0318)	(0.0319)	(0.0322)	(0.0326)
Public services	-0.196***	-0.172***	-0.186***	-0.176***	-0.191***	-0.173***	-0.178***	-0.173***	-0.185***	-0.173***	-0.182***	-0.177***	-0.173***	-0.183***	-0.192***	-0.170***	-0.188***	-0.182***
(rel. Manufacturing and Mining)	(0.0420)	(0.0435)	(0.0440)	(0.0429)	(0.0435)	(0.0434)	(0.0436)	(0.0432)	(0.0433)	(0.0421)	(0.0436)	(0.0437)	(0.0432)	(0.0441)	(0.0431)	(0.0435)	(0.0435)	(0.0441)
Increasing size	0.346***	0.346***	0.336***	0.343***	0.340***	0.352***	0.340***	0.342***	0.344***	0.342***	0.340***	0.337***	0.347***	0.350***	0.354***	0.346***	0.348***	0.348***
(rel. non-increasing)	(0.0308)	(0.0308)	(0.0311)	(0.0310)	(0.0310)	(0.0300)	(0.0310)	(0.0311)	(0.0306)	(0.0308)	(0.0312)	(0.0308)	(0.0309)	(0.0310)	(0.0310)	(0.0310)	(0.0311)	(0.0311)
Observations	16,579	16,595	16,002	16,055	15,976	16,508	16,400	16,367	16,438	16,664	16,393	16,395	16,369	16,558	16,431	16,454	15,944	16,366
Left-out country	IRL	ISR	ITA	JPN	KOR	LTU	MEX	NLD	NOR	NZL	POL	PRT	SVK	SVN	SWE	TUR	USA	ZAF

Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. Market services include construction (ISIC rev. 4, Section F), wholesale and retail trade (G), transportation and storage (H), accommodation and food service activities (I), information and communication services (J), real estate (L), professional, scientific and technical activities (M) and administrative services (N); Public services include human health and social work activities (Q), arts, entertainment, and recreation (R), and other services activities (S). All regressions include controls for firm age, size growth and size, and country-by-sector fixed effects. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.14: Labour shortages variation within industries - robustness to leaving one country out of the sample

VARIABLES	(1) Shortage	(2) Shortage	(3) Shortage	(4) Shortage	(5) Shortage	(6) Shortage	(7) Shortage	(8) Shortage	(9) Shortage	(10) Shortage	(11) Shortage	(12) Shortage	(13) Shortage	(14) Shortage	(15) Shortage	(16) Shortage	(17) Shortage	(18) Shortage
Medium	0.117**	0.119**	0.107**	0.123**	0.119**	0.125**	0.122**	0.137***	0.112**	0.125**	0.116**	0.112**	0.132**	0.107**	0.122**	0.113**	0.154***	0.0880*
(rel. small, non-increasing, age [0–5])	(0.0506)	(0.0507)	(0.0502)	(0.0509)	(0.0514)	(0.0503)	(0.0507)	(0.0511)	(0.0506)	(0.0516)	(0.0509)	(0.0512)	(0.0515)	(0.0506)	(0.0513)	(0.0511)	(0.0506)	(0.0501)
Large	0.134***	0.129***	0.118***	0.130***	0.127***	0.124***	0.141***	0.144***	0.138***	0.136***	0.135***	0.123***	0.134***	0.112**	0.133***	0.129***	0.148***	0.106**
(rel. small, non-increasing, age [0–5])	(0.0452)	(0.0453)	(0.0442)	(0.0453)	(0.0456)	(0.0448)	(0.0447)	(0.0441)	(0.0443)	(0.0451)	(0.0452)	(0.0454)	(0.0458)	(0.0456)	(0.0457)	(0.0456)	(0.0453)	(0.0452)
Increasing in size	0.453***	0.460***	0.447***	0.463***	0.466***	0.453***	0.468***	0.461***	0.463***	0.458***	0.478***	0.478***	0.461***	0.460***	0.460***	0.461***	0.499***	0.457***
(rel. non-increasing, small, age [0–5])	(0.0569)	(0.0571)	(0.0561)	(0.0576)	(0.0578)	(0.0567)	(0.0567)	(0.0575)	(0.0570)	(0.0575)	(0.0575)	(0.0573)	(0.0582)	(0.0576)	(0.0577)	(0.0581)	(0.0586)	(0.0582)
Medium and Increasing	-0.130	-0.131	-0.122	-0.139	-0.144*	-0.137	-0.147*	-0.134	-0.128	-0.133	-0.138	-0.148*	-0.132	-0.117	-0.140	-0.136	-0.185**	-0.116
(rel. small, non-increasing, age [0–5])	(0.0858)	(0.0854)	(0.0844)	(0.0861)	(0.0865)	(0.0861)	(0.0856)	(0.0866)	(0.0851)	(0.0856)	(0.0858)	(0.0855)	(0.0870)	(0.0843)	(0.0859)	(0.0863)	(0.0861)	(0.0863)
Large and Increasing	-0.188***	-0.175**	-0.172**	-0.175**	-0.189***	-0.179***	-0.212***	-0.179**	-0.184***	-0.176**	-0.202***	-0.207***	-0.171**	-0.172**	-0.181**	-0.196***	-0.218***	-0.166**
(rel. small, non-increasing, age [0–5])	(0.0699)	(0.0699)	(0.0693)	(0.0699)	(0.0703)	(0.0688)	(0.0678)	(0.0695)	(0.0696)	(0.0696)	(0.0699)	(0.0691)	(0.0708)	(0.0700)	(0.0705)	(0.0706)	(0.0705)	(0.0701)
Firm's age [6–20]	-0.165**	-0.141**	-0.151**	-0.154**	-0.155**	-0.159**	-0.154**	-0.157**	-0.147**	-0.152**	-0.154**	-0.159**	-0.158**	-0.160**	-0.154**	-0.163**	-0.162**	-0.155**
(rel. small, non-increasing, age [0–5])	(0.0656)	(0.0645)	(0.0652)	(0.0660)	(0.0654)	(0.0654)	(0.0652)	(0.0657)	(0.0644)	(0.0654)	(0.0652)	(0.0649)	(0.0654)	(0.0658)	(0.0650)	(0.0657)	(0.0663)	(0.0638)
Firm's age [21–40]	-0.230***	-0.207***	-0.207***	-0.211***	-0.217***	-0.236***	-0.225***	-0.234***	-0.214***	-0.222***	-0.217***	-0.222***	-0.214***	-0.218***	-0.217***	-0.214***	-0.224***	-0.227***
(rel. small, non-increasing, age [0–5])	(0.0655)	(0.0639)	(0.0650)	(0.0654)	(0.0656)	(0.0619)	(0.0652)	(0.0652)	(0.0641)	(0.0646)	(0.0648)	(0.0646)	(0.0651)	(0.0653)	(0.0647)	(0.0657)	(0.0658)	(0.0628)
Firm's age [>40]	-0.341***	-0.311***	-0.319***	-0.320***	-0.326***	-0.344***	-0.333***	-0.354***	-0.319***	-0.326***	-0.330***	-0.318***	-0.327***	-0.323***	-0.332***	-0.324***	-0.342***	-0.333***
(rel. small, non-increasing, age [0–5])	(0.0668)	(0.0659)	(0.0669)	(0.0668)	(0.0675)	(0.0641)	(0.0656)	(0.0663)	(0.0653)	(0.0664)	(0.0664)	(0.0667)	(0.0666)	(0.0672)	(0.0663)	(0.0671)	(0.0669)	(0.0647)
Constant	0.759***	0.336***	0.356***	0.344***	0.352***	0.366***	0.351***	0.348***	0.338***	0.344***	0.346***	0.357***	0.343***	0.362***	0.348***	0.358***	0.339***	0.368***
	(0.0729)	(0.0623)	(0.0614)	(0.0638)	(0.0635)	(0.0618)	(0.0635)	(0.0636)	(0.0624)	(0.0629)	(0.0629)	(0.0629)	(0.0631)	(0.0634)	(0.0629)	(0.0635)	(0.0638)	(0.0609)
Observations	16,326	16,167	16,134	16,140	15,776	16,242	16,269	16,194	16,408	16,164	15,776	16,195	15,700	16,170	15,743	15,739	16,136	16,158
Left-out country	AUS	AUT	BEL	BRA	CAN	CHE	CHL	COL	CRI	CZE	DEU	DNK	ESP	FIN	FRA	GBR	GRC	HUN

VARIABLES	(19) Shortage	(20) Shortage	(21) Shortage	(22) Shortage	(23) Shortage	(24) Shortage	(25) Shortage	(26) Shortage	(27) Shortage	(28) Shortage	(29) Shortage	(30) Shortage	(31) Shortage	(32) Shortage	(33) Shortage	(34) Shortage	(35) Shortage	(36) Shortage
Medium	0.101**	0.129**	0.119**	0.127**	0.122**	0.119**	0.118**	0.113**	0.131***	0.0971*	0.121**	0.127**	0.126**	0.114**	0.132**	0.119**	0.122**	0.125**
(rel. small, non-increasing, age [0–5])	(0.0502)	(0.0504)	(0.0518)	(0.0519)	(0.0517)	(0.0518)	(0.0509)	(0.0510)	(0.0501)	(0.0504)	(0.0521)	(0.0518)	(0.0518)	(0.0516)	(0.0517)	(0.0508)	(0.0510)	(0.0507)
Large	0.117***	0.132***	0.131***	0.129***	0.142***	0.132***	0.141***	0.122***	0.137***	0.129***	0.124***	0.126***	0.115**	0.121***	0.121***	0.139***	0.129***	0.130***
(rel. small, non-increasing, age [0–5])	(0.0450)	(0.0445)	(0.0459)	(0.0457)	(0.0454)	(0.0457)	(0.0445)	(0.0454)	(0.0451)	(0.0457)	(0.0447)	(0.0455)	(0.0456)	(0.0452)	(0.0448)	(0.0451)	(0.0453)	(0.0454)
Increasing in size	0.452***	0.462***	0.450***	0.463***	0.463***	0.471***	0.455***	0.458***	0.478***	0.465***	0.462***	0.463***	0.464***	0.472***	0.474***	0.467***	0.474***	0.482***
(rel. non-increasing, small, age [0–5])	(0.0572)	(0.0570)	(0.0583)	(0.0577)	(0.0582)	(0.0575)	(0.0577)	(0.0573)	(0.0570)	(0.0563)	(0.0578)	(0.0585)	(0.0570)	(0.0575)	(0.0577)	(0.0581)	(0.0577)	(0.0577)
Medium and Increasing	-0.110	-0.144*	-0.125	-0.146*	-0.134	-0.141	-0.122	-0.118	-0.144*	-0.101	-0.139	-0.149*	-0.145*	-0.129	-0.138	-0.120	-0.155*	-0.154*
(rel. small, non-increasing, age [0–5])	(0.0845)	(0.0858)	(0.0868)	(0.0868)	(0.0867)	(0.0863)	(0.0863)	(0.0857)	(0.0851)	(0.0812)	(0.0864)	(0.0863)	(0.0857)	(0.0856)	(0.0872)	(0.0862)	(0.0859)	(0.0860)
Large and Increasing	-0.161**	-0.171**	-0.174**	-0.178**	-0.185***	-0.175**	-0.175**	-0.181***	-0.198***	-0.198***	-0.184***	-0.184***	-0.169**	-0.184***	-0.177**	-0.187***	-0.183***	-0.199***
(rel. small, non-increasing, age [0–5])	(0.0692)	(0.0688)	(0.0705)	(0.0704)	(0.0705)	(0.0702)	(0.0699)	(0.0701)	(0.0696)	(0.0680)	(0.0703)	(0.0705)	(0.0690)	(0.0701)	(0.0704)	(0.0706)	(0.0706)	(0.0705)
Firm's age [6–20]	-0.149**	-0.152**	-0.163**	-0.158**	-0.151**	-0.150**	-0.141**	-0.154**	-0.134**	-0.143**	-0.142**	-0.156**	-0.147**	-0.131**	-0.143**	-0.143**	-0.162**	-0.139**
(rel. small, non-increasing, age [0–5])	(0.0650)	(0.0649)	(0.0655)	(0.0649)	(0.0675)	(0.0648)	(0.0657)	(0.0656)	(0.0651)	(0.0641)	(0.0641)	(0.0650)	(0.0652)	(0.0639)	(0.0649)	(0.0656)	(0.0668)	(0.0662)
Firm's age [21–40]	-0.209***	-0.214***	-0.225***	-0.221***	-0.223***	-0.219***	-0.205***	-0.209***	-0.187***	-0.203***	-0.209***	-0.217***	-0.218***	-0.200***	-0.203***	-0.213***	-0.221***	-0.207***
(rel. small, non-increasing, age [0–5])	(0.0651)	(0.0646)	(0.0649)	(0.0645)	(0.0663)	(0.0643)	(0.0653)	(0.0647)	(0.0643)	(0.0632)	(0.0643)	(0.0646)	(0.0653)	(0.0639)	(0.0643)	(0.0653)	(0.0663)	(0.0651)
Firm's age [>40]	-0.314***	-0.309***	-0.340***	-0.339***	-0.330***	-0.333***	-0.316***	-0.319***	-0.302***	-0.323***	-0.327***	-0.329***	-0.324***	-0.318***	-0.311***	-0.317***	-0.334***	-0.300***
(rel. small, non-increasing, age [0–5])	(0.0661)	(0.0658)	(0.0665)	(0.0659)	(0.0676)	(0.0658)	(0.0665)	(0.0670)	(0.0660)	(0.0649)	(0.0659)	(0.0663)	(0.0664)	(0.0661)	(0.0656)	(0.0667)	(0.0681)	(0.0655)
Constant	0.349***	0.338***	0.359***	0.353***	0.342***	0.342***	0.331***	0.352***	0.320***	0.345***	0.346***	0.353***	0.350***	0.335***	0.335***	0.333***	0.351***	0.493***
	(0.0626)	(0.0623)	(0.0634)	(0.0629)	(0.0645)	(0.0625)	(0.0636)	(0.0632)	(0.0623)	(0.0622)	(0.0627)	(0.0631)	(0.0632)	(0.0620)	(0.0625)	(0.0630)	(0.0642)	(0.0634)
Observations	16,343	16,360	15,751	15,804	15,729	16,263	16,152	16,117	16,187	16,424	16,142	16,144	16,121	16,311	16,185	16,213	15,697	16,115
Left-out country	IRL	ISR	ITA	JPN	KOR	LTU	MEX	NLD	NOR	NZL	POL	PRT	SVK	SVN	SWE	TUR	USA	ZAF

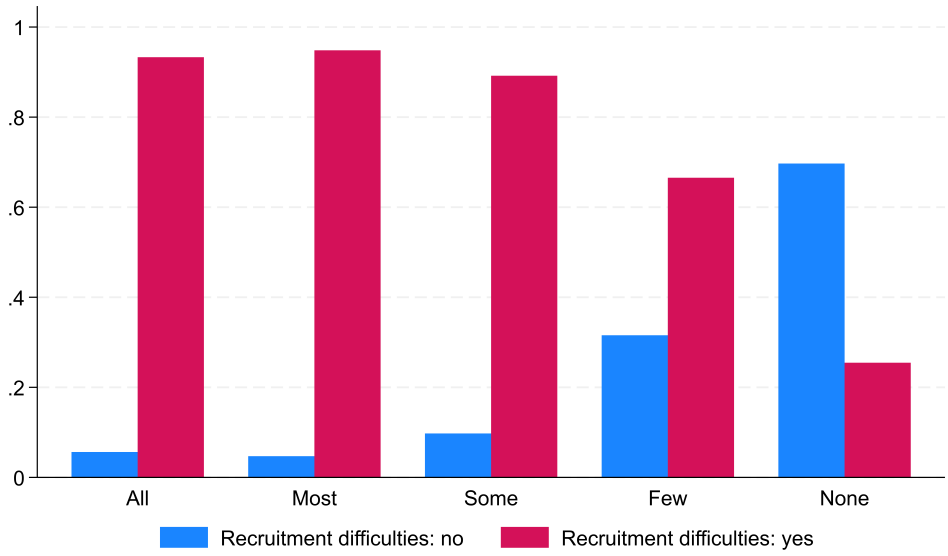
Notes: Coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. Regressors for firms increasing in size over the last year vs. not, and into small (10-49 employees), medium (50-249 employees), or large (250+ employees). All regressions include controls for firm age, size growth and size, and country-by-sector fixed effects. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Table A.15: Labour shortages and changing skill needs - robustness to leaving one country out of the sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
VARIABLES	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage
Changing skill needs	0.352***	0.356***	0.354***	0.343***	0.340***	0.356***	0.349***	0.349***	0.354***	0.344***	0.351***	0.334***	0.348***	0.351***	0.351***	0.347***	0.359***	0.338***
	(0.0346)	(0.0345)	(0.0341)	(0.0347)	(0.0348)	(0.0347)	(0.0337)	(0.0349)	(0.0332)	(0.0335)	(0.0346)	(0.0342)	(0.0351)	(0.0346)	(0.0348)	(0.0350)	(0.0345)	(0.0342)
Constant	0.984***	0.503***	0.520***	0.516***	0.531***	0.531***	0.508***	0.519***	0.508***	0.517***	0.522***	0.536***	0.511***	0.532***	0.517***	0.526***	0.512***	0.531***
	(0.0751)	(0.0611)	(0.0611)	(0.0628)	(0.0620)	(0.0621)	(0.0616)	(0.0622)	(0.0609)	(0.0618)	(0.0620)	(0.0618)	(0.0618)	(0.0626)	(0.0617)	(0.0624)	(0.0623)	(0.0601)
Observations	15,349	15,188	15,168	15,158	14,842	15,285	15,294	15,215	15,423	15,196	14,813	15,216	14,750	15,196	14,799	14,790	15,168	15,189
Left-out country	AUS	AUT	BEL	BRA	CAN	CHE	CHL	COL	CRI	CZE	DEU	DNK	ESP	FIN	FRA	GBR	GRC	HUN
	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
VARIABLES	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage
Changing skill needs	0.348***	0.356***	0.352***	0.354***	0.348***	0.348***	0.352***	0.352***	0.348***	0.354***	0.349***	0.356***	0.356***	0.358***	0.338***	0.349***	0.352***	0.353***
	(0.0345)	(0.0338)	(0.0350)	(0.0348)	(0.0347)	(0.0346)	(0.0345)	(0.0344)	(0.0345)	(0.0343)	(0.0343)	(0.0337)	(0.0346)	(0.0341)	(0.0345)	(0.0346)	(0.0350)	(0.0347)
Constant	0.529***	0.507***	0.524***	0.523***	0.505***	0.516***	0.501***	0.516***	0.495***	0.517***	0.517***	0.518***	0.525***	0.506***	0.514***	0.507***	0.522***	0.778***
	(0.0617)	(0.0611)	(0.0622)	(0.0618)	(0.0620)	(0.0611)	(0.0624)	(0.0624)	(0.0614)	(0.0607)	(0.0616)	(0.0614)	(0.0620)	(0.0611)	(0.0614)	(0.0622)	(0.0633)	(0.0638)
Observations	15,366	15,388	14,799	14,894	14,874	15,308	15,187	15,166	15,208	15,447	15,175	15,172	15,161	15,335	15,218	15,242	14,794	15,142
Left-out country	IRL	ISR	ITA	JPN	KOR	LTU	MEX	NLD	NOR	NZL	POL	PRT	SVK	SVN	SWE	TUR	USA	ZAF

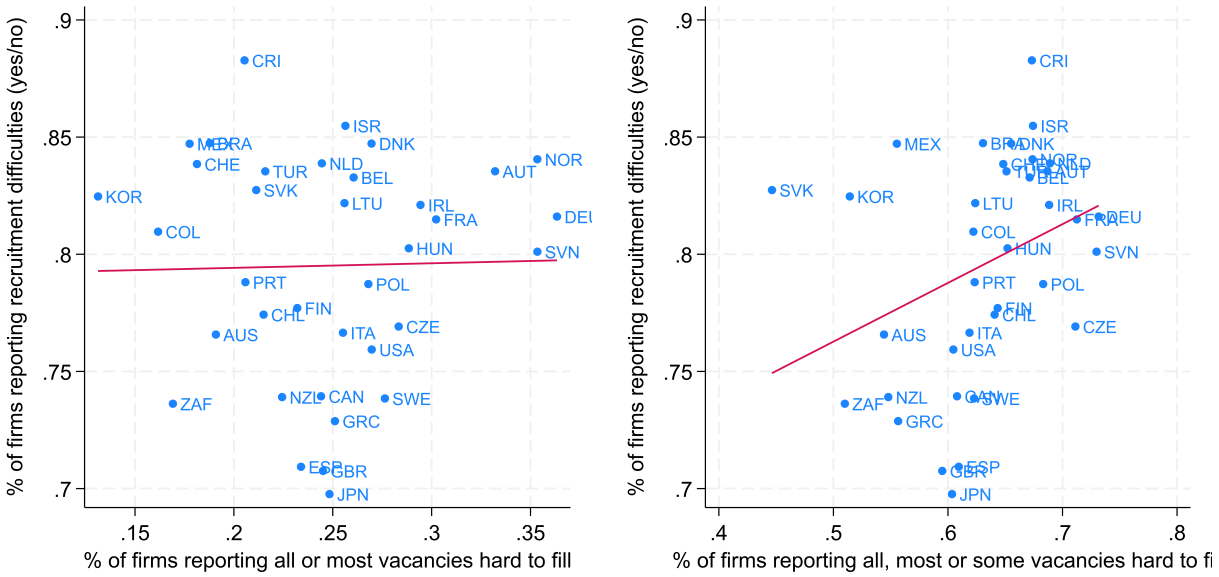
Notes: The table reports the coefficients of probit regressions, where the outcome is a dummy for firm encountering any difficulties in recruiting employees in the last 24 months. The regressor is a dummy for firms reporting that the main reasons for opening vacancies in the past 24 months was "changing skill needs". All regressions include controls for firm age, size growth and size, and country-by-sector fixed effects. Standard errors clustered by country and sector are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: OECD-GFP Employer Survey data.

Figure A.1: Distribution of recruitment difficulties and share of vacancies that are hard to fill



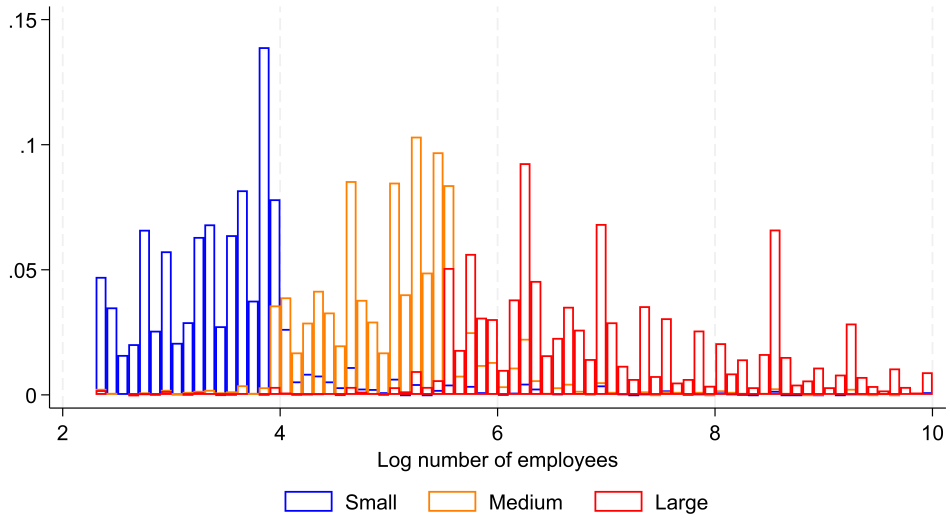
Notes. The Figure reports the distribution of answers to the question "Which proportion of your vacancies in your enterprise were proving hard to fill?", separating firms who have answered yes vs. no to a previous question asking "In the last 24 months, has your enterprise encountered any difficulties in recruiting employees for jobs which normally require a formal vocational qualification, employees for jobs which normally require a university degree, or employees for jobs that do not require any formal qualification nor degree?". Source: OECD-GFP Employer Survey data.

Figure A.2: Country-level correlation between share of firms with recruitment difficulties and share of firms where different shares of vacancies are hard to fill



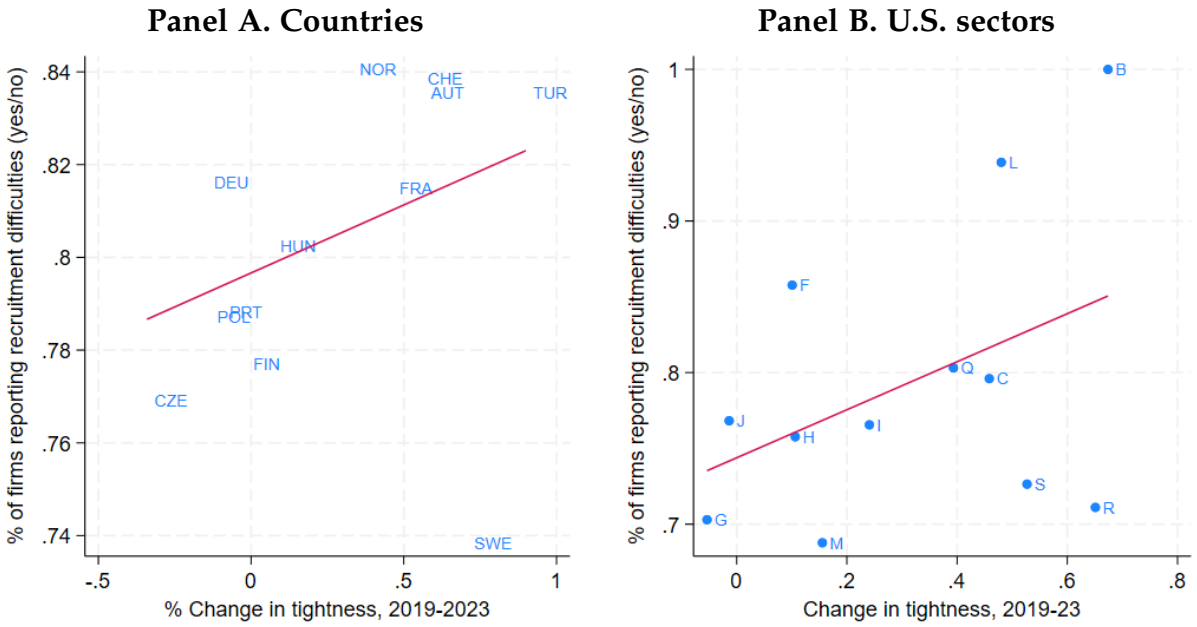
Notes. The graph reports the correlation between the share of firms answering yes to the question "In the last 24 months, has your enterprise encountered any difficulties in recruiting employees for jobs which normally require a formal vocational qualification, employees for jobs which normally require a university degree, or employees for jobs that do not require any formal qualification nor degree?" (on the vertical axis) and different measures of shortages intensity (horizontal axis). On the left panel, the horizontal axis reports the share of firms by country that answered "all" or "most" to the question "Which proportion of your vacancies in your enterprise were proving hard to fill?". The right panel include also the companies who answered "some". Source: OECD-GFP Employer Survey data.

Figure A.3: Distribution of declared continuous number of employees and class-size declared in screening question



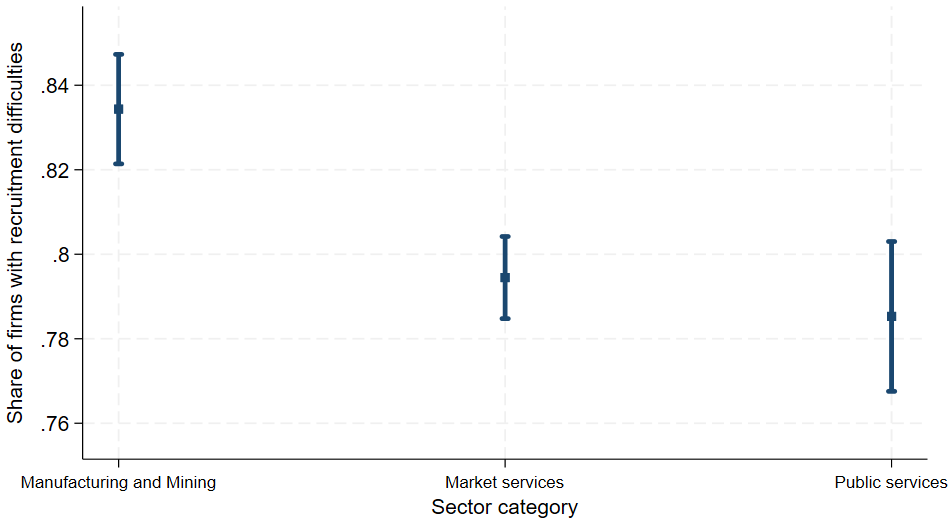
Notes. The Figure reports an histogram with bin 0.5 of the natural logarithm of the declared number of employees, separately for firms who previously declared belonging to the small (10-49 employees), medium (50-249 employees), or large (250+ employees) categories in the screening part of the survey.

Figure A.4: Labour shortages and labour market tightness in official statistics



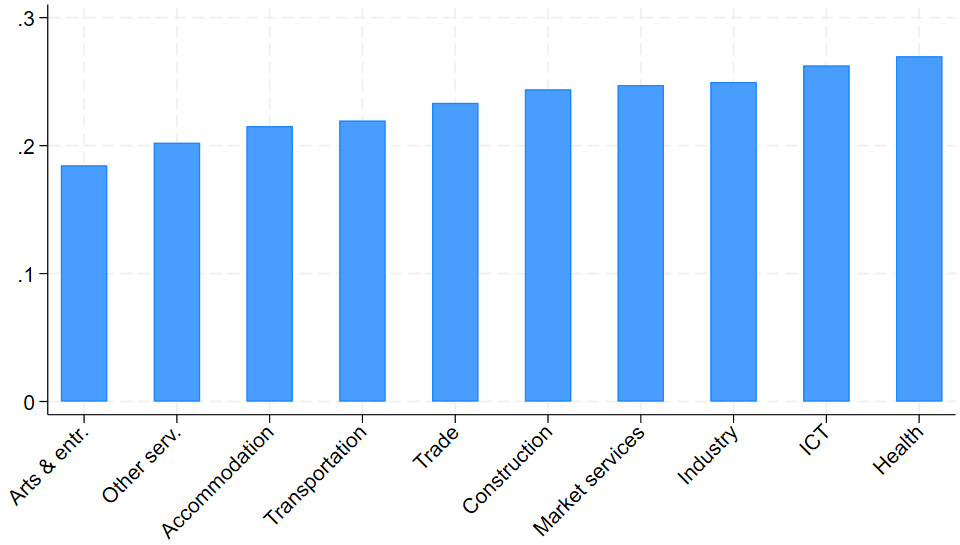
Notes. Panel A plots the relationship across countries between our measure of labour shortages and the percentage change in labour market tightness (vacancies-to-unemployed ratio) from the pre-pandemic period to the survey reference period, using OECD Registered Unemployment and Job Vacancies statistics. Panel B reports the analogous relationship across sectors in the United States, using sector-specific unemployment from the Current Population Survey and job openings from the Job Openings and Labor Turnover Survey. In both panels, higher values indicate a stronger increase in tightness.

Figure A.5: Predicted share of firms reporting shortages, by sector group



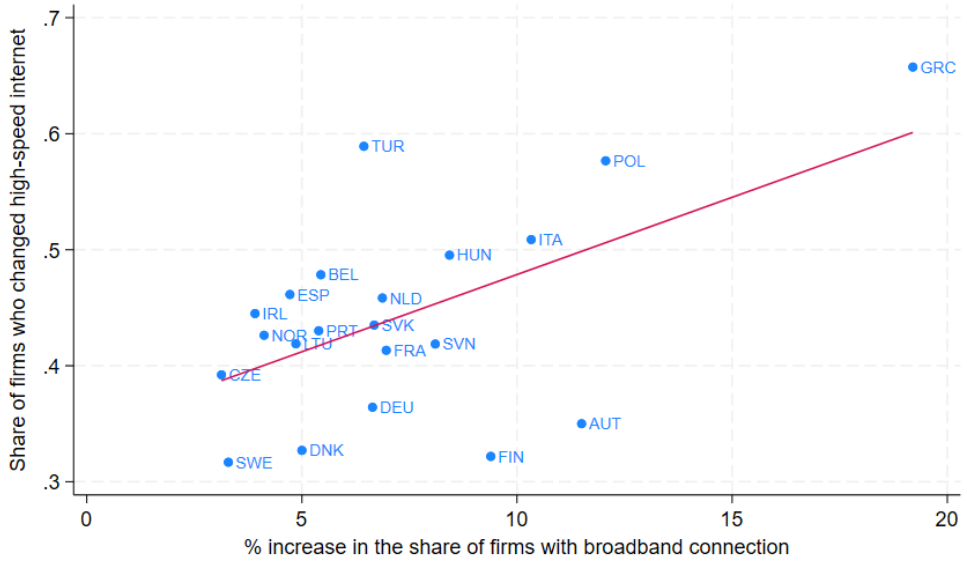
Notes. The graph shows the predicted values of labour shortages by sector, controlling for country-sector fixed effects, firms age and growth category. Error bars represent 95% confidence intervals. Market services include construction (ISIC rev. 4, Section F), wholesale and retail trade (G), transportation and storage (H), accommodation and food service activities (I), information and communication services (J), real estate (L), professional, scientific and technical activities (M) and administrative services (N); Public services include human health and social work activities (Q), arts, entertainment, and recreation (R), and other services activities (S). Source: OECD-GFP Employer Survey data.

Figure A.6: Share of firms with severe shortages across sectors



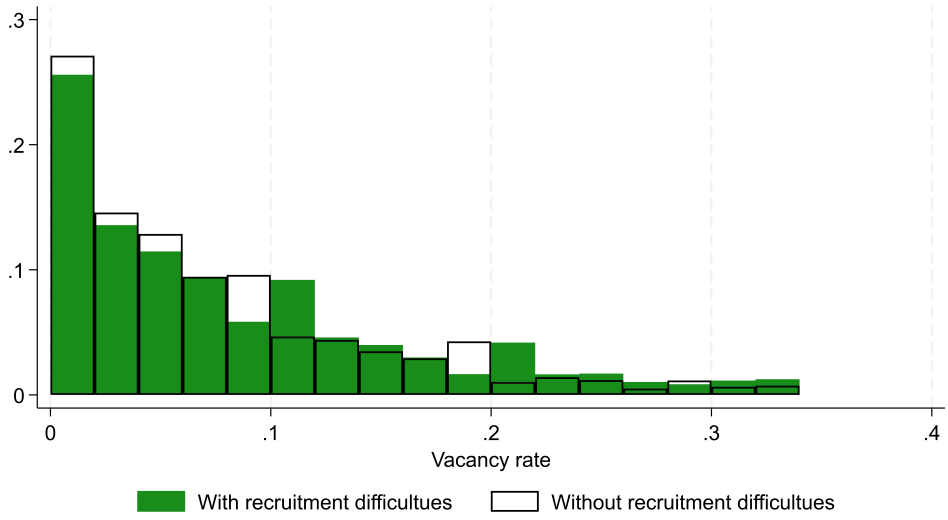
Notes. Share of firms reporting severe shortages in the sector. "Industry" corresponds to ISIC rev. 4, Section B and C; "Construction" to Section F; "trade" to retail and wholesale (G); "transportation" to transportation and storage (H); "accommodation" to accomodation and food service activities (I); "ICT" to information and communication services (J); "market services" to real estate (L) and professional, scientific and technical activities (M) and administrative services (N); "Health" to human health and social work activities (Q); "Arts and entr." to arts, entertainment, and recreation (R); and other services activities to Section S. Source: OECD-GFP Employer Survey data.

Figure A.7: Introduction of high speed interned in sample's firms and in official statistics, across countries



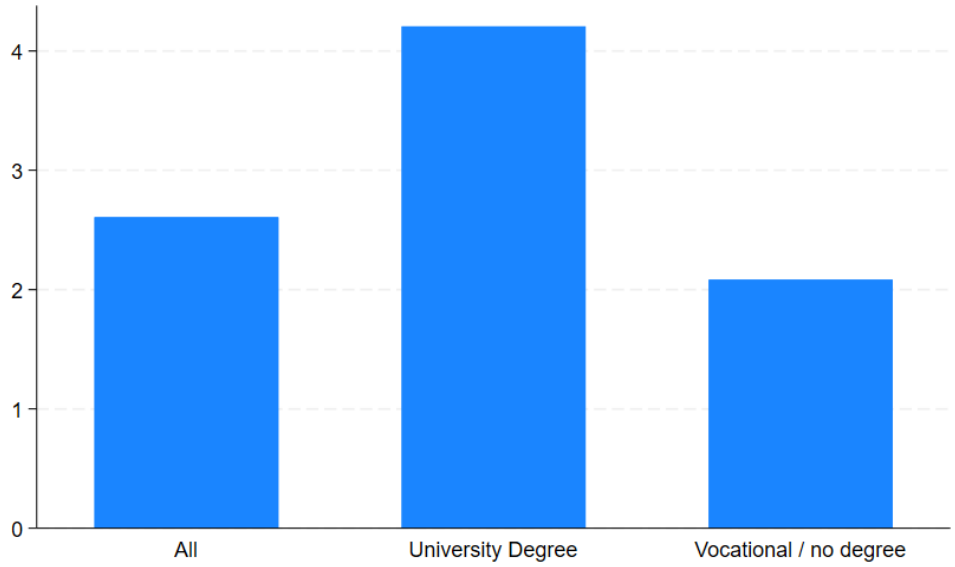
Notes. The figure plots, across EU countries, the relationship between the share of firms in our survey reporting changes related to high-speed internet and the change in the share of firms with broadband access. The latter is measured using external statistics on broadband diffusion from Eurostat.

Figure A.8: Distribution of declared number of vacancy over number of employees, by declared recruitment difficulties (yes/no)



Notes. The Figure reports the distribution of the ratio of the declared "approximate number of vacancies in your enterprise in the past 24 months" over the "total number of persons employed by the enterprise as of 31.12.2023", separating firms who have answered yes vs. no to a previous question asking "In the last 24 months, has your enterprise encountered any difficulties in recruiting employees for jobs which normally require a formal vocational qualification, employees for jobs which normally require a university degree, or employees for jobs that do not require any formal qualification nor degree?". Source: OECD-GFP Employer Survey data.

Figure A.9: Percentage point difference in the conditional probability to report a shortage between firms in high- versus low-wage sectors, by educational attainment of sought personnel



Notes. The figure plots the coefficient of a dummy variable that identifies firms operating in high-wage sectors, conditional on the firm's age, growth in size and country of affiliation. Coefficients significant at the 95% confidence level. High-wage sectors are sectors where the average wage is above the median (industry, manufacturing; ICT services; professional services; healthcare). Source: OECD-GFP Employer Survey data.