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Abstract

Despite their importance for the success of firms, the job prospects of the unemployed and overall unemployment, the factors that determine firms' decisions to report vacancies to the Public Employment Service and to hire the unemployed are largely unexplored. We address this research gap by analysing how firms respond to labour market tightness in their region and industry, measured by the ratio of jobseekers to vacancies, the vacancy rate and vacancy duration. Our results show that firms report more vacancies to the PES when the labour market tightens, suggesting that they diversify their search channels to extend their reach and access a larger pool of potential candidates. However, we do not find a clear relationship between labour market tightness and firms' recruitment of the unemployed. The share of the unemployed in a firm's hiring tends to fall rather than rise when the labour market tightens. This suggests that the negative signal of unemployment is stronger when labour is scarce.

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1 Introduction

In the labour market, job seekers and firms with vacancies interact. Matching is often hindered by frictions such as search costs and incomplete information, resulting in unemployed people and unfilled vacancies side by side. Public Employment Services (PES) can help mitigate these frictions by acting as intermediaries to facilitate matching (Cahuc et al., 2014; McCall & McCall, 2008; Pissarides, 2011). To date, most research has focused on the job-seeking processes of workers. In contrast, the recruitment behaviour of firms on the demand side of the labour market is much less studied (Bagger et al., 2022). Similarly, the bulk of labour market policy evaluations looks at impacts on workers ignoring effects on firms (Blasco & Pertold-Gebicka, 2013; Lechner et al., 2013). However, understanding firms' recruitment decisions is crucial for a complete picture of the labour market.

A key research gap we are addressing is the factors that influence firms to report vacancies to the PES and hire unemployed individuals. These decisions are relevant for the success of companies, the job prospects of the unemployed, and broader societal outcomes. First, the PES is an important recruitment channel, providing access to many jobseekers and improving matching through various channels, including counselling, monitoring, placement, and labour market measures (Brändle et al., 2023). Studies show that such labour market institutions can strongly influence firms' hiring and firing strategies and thus their economic performance (Blasco & Pertold-Gebicka, 2013).

Second, when firms report vacancies to the PES, unemployed people gain access to a larger pool of available jobs, regardless of their social network or access to other job boards. The PES can then effectively match them with these jobs. Third, recent studies show that firms' decisions affect broader labour market outcomes, such as wage inequality and gender gaps (Card et al., 2013, 2016; Weber & Zulehner, 2014). Whether they use the PES to recruit and hire the unemployed can influence overall unemployment.

These decisions are becoming even more important. This is because employers in many developed countries are finding it increasingly difficult to fill vacancies, especially since the COVID-19 pandemic (Causa et al., 2022). In the future, the ageing and shrinking of the population will further exacerbate labour shortages. The unemployed represent an important reserve of untapped labour. Better matching of unemployed and companies can therefore reduce both unemployment and labour shortages.

We contribute to a better understanding of the factors that determine firms' vacancy posting and hiring behaviour by shedding light on the under-researched link between labour market tightness and firms' recruitment. More specifically, we examine for Austria whether and how firms respond to labour market tightness in their region and industry – in the frequency with which they report vacancies to the PES and hire unemployed workers (with or without PES mediation). For this purpose, we use a unique combination of data from the Austrian social security database (ASSD), the unemployment register and the job vacancy database of the Austrian PES (AMS).

We use vacancy data that are an underutilised resource in scientific research so far (exceptions are Bamieh and Ziegler (2022), Bamieh and Ziegler (2023), and Mueller et al. (2024)) and shed more light on the role of vacancies for the labour market which is still not well understood internationally. So far, no 'one size fits all' measure of labour market tightness has been established in the literature. In related studies, the choice of the indicator seems to have a crucial impact on the results. With our data, we can compare three different measures: the ratio of job seekers to vacancies, the job vacancy rate, and vacancy duration.

In theory, a tighter labour market means more vacancies relative to qualified workers, suggesting

that employers face increased competition for workers and find it more difficult to fill positions. This increased hiring difficulty may lead firms to diversify their search channels and report more vacancies to the PES in order to extend their reach and access a larger pool of potential candidates. By using PES services, firms might find suitable candidates more quickly. In addition, they may be more willing to adjust their recruitment criteria and consider the unemployed to meet their staffing needs.

However, firms may still be reluctant to report vacancies to the PES and hire unemployed individuals. This reluctance could be due to the perception that PES services are not beneficial or that unemployed candidates do not meet their requirements, i.e. qualifications, skills and experience. Previous studies show that firms are hesitant to hire the unemployed due to perceived productivity concerns (Bertheau et al., 2023; Riekhoff et al., 2023). Extended periods of unemployment, in particular, may carry a negative signal, leading firms to perceive hiring from this group as too risky.

Theoretical models offer different predictions about firms' behaviour in tight labour markets. Ranking models (Blanchard & Diamond, 1994; Fernández-Blanco & Preugschat, 2018) suggest that firms receiving multiple acceptable applications view longer unemployment as a signal of low unobserved productivity and prefer candidates with shorter unemployment spells. This negative duration dependence depends on the state of the labour market. It may be less pronounced in a tight labour market, where hardly anyone except the long-term unemployed applies for a vacancy, than in a slack labour market, where there are many applications for a vacancy.

Not only long-term unemployment, but unemployment as such could signal lower productivity, leading firms to prefer other, employed workers. This ranking effect could be weaker in a tight labour market due to fewer available candidates, resulting in more unemployed being hired. Conversely, in a slack labour market with more candidates, the negative signal of unemployment has a greater impact, leading to fewer unemployed hires.

Screening models, however, suggest that in a tight labour market, long-term unemployment is a stronger negative signal due to composition effects (Lockwood, 1991; Vishwanath, 1989): In a tight labour market with low unemployment, those who remain unemployed for longer are likely less skilled or productive, making long-term unemployment a more informative and stronger negative signal. Conversely, in a slack labour market, both low- and high-skilled workers experience long-term unemployment, making the signal less informative about a worker's productivity or skill level (Carlsson et al., 2018; Kroft et al., 2013). Applied to our setting, screening models predict that fewer unemployed individuals will be hired in a tighter labour market because a higher proportion of the unemployed is less skilled or less productive and therefore the negative signal of unemployment is stronger.

Our results show that firms report more vacancies to the PES when the labour market tightens. This suggests that they diversify their search channels in order to find sufficient staff. However, we do not find a clear relationship between labour market tightness and firms' hiring of the unemployed. In fact, the share of the unemployed in a firm's hiring tends to fall when the labour market tightens. This supports screening models suggesting that unemployment is viewed more negatively when labour is scarce. It appears that firms remain reluctant to recruit from the unemployed even when they report more vacancies to the PES. They try to avoid the increased risk of lower productivity associated with hiring from a pool that they perceive as less skilled. However, there may also be other reasons. These include, among others, a mismatch between the qualifications of the unemployed and job requirements, inefficient job placement by the PES, and other composition effects.

2 Previous Literature

Our paper relates to two strands of the personnel economics literature: *how* firms hire and *whom* they hire in tight labour markets. For the former, we focus on posting vacancies with the PES and using the related placement services provided by this labour market intermediary. For the latter, we focus on the recruitment of unemployed people.

Hiring channels and the role of the PES. There is a large literature on firms’ hiring channels (Behrenz, 2001; Oyer & Scott, 2011): e.g. studies on internal hiring (Bertheau, 2021; Waldman, 2012), the role of networks and referrals (Burks et al., 2015; Casella & Hanaki, 2008; Dustmann et al., 2016; Heath, 2018; Hoffman, 2017; Montgomery, 1991), and the relevance and market share of the PES (Eppel et al., 2020; Merkl & Sauerbier, 2024). In contrast, there is only little work focusing on the choice of PES placement services as a consequence of labour market tightness. Lochner et al. (2021) link firm-level data from the IAB Job Vacancy Survey with administrative information from the German register on wages and labour market flows. Their data also contains a measure for the number of search channels (count out of maximum six categories in the survey) that establishments used for their most recent hire. One search channel is ‘contact to the Federal Employment Agency’. Lochner et al. (2021) do not present any evidence for this specific channel in their paper but do find a positive correlation between labour market tightness and the number of search channels (including the PES). Similar results are found by Russo et al. (2000).

Age. Several studies examine the effect of labour market tightness on the hiring behaviour of firms towards older people (Conen et al., 2011; Riekhoff et al., 2023) and younger applicants (Forsythe, 2022). E.g. Forsythe (2022) analyses U.S. data from December 2000 through November 2021 and finds that for each additional unit of tightness (e.g., one additional job opening per unemployed worker) young workers are hired at a 0.44 p.p. higher rate.

Ethnicity & Gender. Within the related (and large) literature on hiring discrimination¹, only a few studies test if discrimination based on gender or ethnicity is lower in tight labour markets. Baert et al. (2015), in a study of Turks in Belgium, find less ethnic discrimination in occupations, where vacancies take longer to fill (and which tend to be higher skilled). Lippens, Dalle, et al. (2023) arrive at similar conclusions for Maghrebian job candidates (vs. Flemish candidates) in Belgium.

However, the choice of the scarcity indicator also seems to have a decisive impact on the results as does the country under consideration. Baert et al. (2015) use two measures to test the relationship between hiring discrimination and labour market tightness at the occupational level in the youth labour market in Flanders. The first (composite) measure determines the ‘bottleneck’ status of an occupation by three criteria: (1) at least 10 vacancies must be registered, (2) the vacancy filling rate must be below the median for all occupations, and (3) the median time to fill a vacancy must be above the median for all occupations. The second measure is the median duration required to fill a vacancy. The authors find that ethnic discrimination in the hiring process is essentially present only in occupations without identified recruitment difficulties. This result is consistent with the theoretical prediction of ranking models (e.g. Blanchard & Diamond, 1994) that employers discriminate less in a tight labour market, because they have fewer options and risk leaving the vacancy unfilled for a longer period, with the consequence that refusing to hire a minority worker is extra costly in terms of forgone output.

¹Neumark (2018), see Birkelund et al. (2022) for an overview on gender and Lippens, Vermeiren, and Baert (2023) on ethnic background.

Carlsson et al. (2018) study the case of Sweden and use (similar as in our paper) an occupation and city specific measure of the vacancy-unemployment ratio and for robustness checks the callback rate for native Swedish female applicants. Using these two distinct measures of labour market tightness, the authors find, in contrast to Baert et al. (2015), that ethnic discrimination in hiring increases with labour market tightness. A tightening labour market in an economic upturn creates more job opportunities for the native population than for the ethnic minority, while ethnic discrimination in hiring decreases in economic downturns. An interpretation they offer is that minority status sends a stronger signal about lacking unobserved skills during an economic upturn than during a downturn. This explanation is based on screening models which assume that employers view long-term unemployment as a negative signal of unobserved lower productivity and that this signal is stronger in a tight labour market because it is more informative (e.g. Lockwood, 1991; Vishwanath, 1989). In their meta-analysis, Zschirnt and Ruedin (2015) focus on GDP and unemployment rates and find no association with ethnic discrimination in hiring. Kübler et al. (2018) show for Germany that recruiters seem to discriminate less against women when the supply of suitable candidates is very low.

Downskilling. Another strand of the literature analyses whether firms reduce skill requirements when labour markets are tight. This is also relevant for our article because, on average, the unemployed have lower formal education. Holzer et al. (2006) use linear probability models and instrumental variables (IV) estimation to identify the impact of labour market tightness on hiring practices in the US, with job vacancy rates and local unemployment rates as key measures. Despite the increased willingness to hire less-skilled workers, employers' demand for specific skill certifications rose over time. This indicates that companies in tight labour markets increasingly focus on specific skills and certifications to maximize productivity and efficiency. However, requirements for general qualifications, such as high school diplomas and general work experience, decreased. This implies that companies in tight labour markets become more flexible in hiring less-skilled workers to fill positions quickly. Employers were also more willing to hire workers with certain stigmas (e.g., welfare recipients or those with short-term work experience).

Modestino et al. (2016) find for the U.S. that a 1 percentage point reduction in the local unemployment rate is associated with a 0.27 percentage point reduction in the share of job postings requiring at least a bachelor's degree and a 0.23 percentage point reduction in the fraction requiring five or more years of experience. The causal nature of this relationship is also supported by using the hydraulic fracturing or 'fracking' boom in the United States as an exogenous shock to local labour supply. Bossler and Popp (2023) find a positive but small correlation between tightness and the share of low-skilled workers in firms' employment for Germany.

Unemployment. The number of studies that focus on the relationship between labour market tightness and the probability of hiring from the unemployed is extremely limited, and there is no evidence for Austria. For the U.S., Kroft et al. (2013) find that employers are less likely to call back individuals who have been unemployed for a longer period. However, the negative impact of long-term unemployment is less severe in slacker labour markets and more pronounced in tighter labour markets, suggesting that employers view long-term unemployment more negatively when labour is in shorter supply. This is consistent with the prediction of screening models that the negative signalling effect of long-term unemployment, or negative duration dependence, increases as the labour market tightens, due to a higher share of low-skilled workers among the (long-term) unemployed and thus the signal being more informative.

Farber et al. (2017) investigate the relationship between callback rates and unemployment duration in an audit study design based on randomly assigned differences in résumé characteristics. The authors also conduct separate analyses for low- and high-unemployment cities in the U.S., but

do not find a relationship between unemployment duration and callback rates in either group. In sum, the evidence is mixed, and more research is needed.

3 Data and definitions

3.1 Data and institutional background

To analyse the relationship between labour market tightness and firms' vacancy posting and hiring decisions, we use a unique dataset that integrates several linked registry data sources: the Austrian Social Security Database (ASSD), the Unemployment Register and the AMS Job Vacancy Database.

The ASSD, managed by the Association of Austrian Social Security Institutions, contains comprehensive matched employer-employee data for all private sector employment relationships since 1972. This dataset provides detailed information on employers and employees, including personal characteristics, employment history and gross earnings up to the social security contribution ceiling. In addition, the ASSD includes the geographical location of enterprises at the local labour market district level, which corresponds to one of the 101 regional employment offices in Austria. This allows us to adjust for differences in regional conditions.

From the ASSD, we extract our sample of hiring firms and compile a detailed set of firm characteristics such as industry, firm size, employment growth, turnover and employee characteristics on an annual panel basis. From these data we also derive the total number of firms' hirings. By linking the ASSD to the unemployment register, we can distinguish between hires from the unemployed pool and other groups, such as job changers, new foreign workers or other types. Moreover, this linkage allows us to distinguish new hires from the recall of previously laid-off workers.

The link between the ASSD and the AMS vacancy data allows us to monitor vacancy postings and recruitment through the Austrian Public Employment Service ('AMS'). These data cover all vacancies posted by Austrian enterprises through the AMS and provide daily information on the date of posting, the desired starting date and the date on which a vacancy was closed because it was known to have been filled or expired for other reasons. Thus, they allow us to determine how often firms report vacancies to the AMS and to calculate the duration of vacancies in regions and sectors, one of our labour market tightness indicators.

The AMS administers unemployment benefits and assistance, provides counselling and placement services, and implements active labour market policies. Its main task is to efficiently match jobseekers with vacancies, providing a wide range of services to both jobseekers and employers. Employers can report vacancies to the AMS through various channels (telephone, personal, written or electronic) and commission the AMS to fill these vacancies. Job characteristics and candidate requirements are documented in job profiles, which form the basis for the search and placement process. The AMS receives, approves and publishes vacancies, matches them with jobseekers and selects suitable candidates. Jobseekers are informed about relevant vacancies and are either encouraged to apply independently or directed by their AMS caseworkers to apply for specific vacancies. At the same time, the AMS provides employers with lists of potential candidates.

This matching process may include suitable candidates not registered with the AMS. While the AMS primarily serves the unemployed, it is also available to employed people seeking new opportunities, free of charge to both workers and employers. The AMS tracks and documents the results of its placement activities. A key digital tool in this process is the online platform 'eJob-Room', which acts as a job exchange and allows jobseekers to search for vacancies and apply

online, while employers can post vacancies and search for suitable candidates.

The AMS is by far the most important job platform for enterprises in Austria. Its coverage of vacancies varies by labour market segment. In particular, jobs with lower qualification requirements are more often reported to the AMS than those with higher qualification requirements (Mueller et al., 2024; Pohler et al., 2023). However, overall coverage is high: during our sample period, the AMS covered about 55%-65% of all vacancies, according to a representative quarterly survey by Statistics Austria. Moreover, as we show in Figure 8 in the appendix, our labour market tightness indicators constructed on the basis of registry data (AMS vacancy database and ASSD), namely the job seeker-to-vacancy ratio and the job vacancy rate, correlate strongly with those based on the job vacancy survey of Statistics Austria.

To link ASSD and AMS data, we use an existing correspondence table of establishment identifiers. However, the employer identifiers in the two data sources are not uniquely linked. We address this by randomly sampling cases with multiple ASSD employer identifiers for an AMS employer identifier, weighting by the size of the ASSD establishment. This ensures that no job is counted more than once.

3.2 Sample

We start by identifying all firms that have hired at least one person per year from 2008 to 2022 (standard employment subject to social security contributions) and collect various data on these firms, including their vacancy and hiring behaviour, in an annual panel. This initial sample of 624,649 firms is restricted in several ways.

First, we focus on firms with relevant ‘new hires’, excluding the recall of employees after temporary lay-offs within one year, apprenticeships and employment relationships lasting less than seven days. Second, we exclude establishments with missing information on economic activity, location or wage level. Thirdly, we exclude enterprises in the low reporting sectors of agriculture, forestry and fishing, mining, private households and extra-territorial organisations. Labour leasing agencies are also excluded because the actual activities of the leased workers are not known and to avoid double counting of vacancies reported by both the enterprise and the labour leasing agency.

Fourth, we focus on firms that are reasonably stable and have a sufficient number of hirings. Stable firms are defined as those that meet the following criteria: (1) they have at least one active employee (including blue and white-collar workers in regular employment and civil servants, excluding those temporarily absent) for three consecutive years, and (2) they have more than five active employees for at least one year. Firms with sufficient recruitment meet at least one of the following criteria: (1) they have fewer than 250 employees and an entry rate² of at least 3% in at least one of the three consecutive years; (2) they have 250 or more employees and an entry rate of at least 2% in at least one of the three consecutive years; or (3) they have at least 10 new recruitments in at least one of the three consecutive years.

A firm is included in any year in which it hired at least one person in standard employment. We exclude the year in which an enterprise was founded, as we cannot observe its behaviour for the whole year. Very few observations are dropped due to missing values in our independent variables.

After applying all restrictions, our sample consists of 1,071,954 observations from 119,183 firms with a total of 10,563,364 hires. Of these, 68,481 (57.5%) are from firms with vacancy postings throughout the period 2008-2022 and 50,702 (42.5%) are from firms without vacancy postings.

²The entry rate corresponds to the number of new hires of dependent employees in a given calendar year, divided by the average annual employment level, expressed as a percentage. It is an indicator of hiring turnover.

Depending on the explanatory variable used, a varying but very small number of observations are excluded due to the removal of high outliers.

As shown in Table 1, the largest loss of observations results from focusing on stable firms and excluding the founding year, which removes all firms that did not survive more than one year.³ Summary statistics are presented in Table 2.

Table 1: Sample of hiring firms

	No. of firms		No. of observations		No. of hirings	
	No.	In %	No.	In %	No.	In %
<i>Selection of firms</i>						
Firms with hirings 2008-2022	624,649		2,840,436		28,939,480	
Only firms with relevant new hires	29,131	-4.7	446,147	-15.7	12,160,638	-42.0
Missing firm region information	20,866	-3.5	67,256	-2.8	1,140,427	-6.8
Missing firm wage level	1,129	-0.2	3,247	-0.1	21,758	-0.1
Excl. agriculture, forestry, fishing	22,353	-3.9	81,127	-3.5	329,589	-2.1
Excl. labour leasing	3,688	-0.7	18,919	-0.8	1,328,204	-8.7
Excl. Households, extraterritorial organisations, missing industry	16,495	-3.0	47,765	-2.1	270,738	-1.9
Excl. year of establishment	139,275	-26.2	323,217	-14.9	1,462,999	-10.7
Only stable firms	265,456	-67.8	758,929	-41.0	1,590,087	-13.0
Only firms with sufficient hirings	7,051	-5.6	18,982	-1.7	53,205	-0.5
Excl. years with missing indepvars	22	0.0	2,893	-0.3	18,471	-0.2
Remaining firms	119,183		1,071,954		10,563,364	
With vacancy postings 2008-22	68,481		691,715		7,896,135	
Without vacancy postings 2008-22	50,702		380,239		2,667,229	
<i>Remaining after exclusion of high outliers in indepvar</i>						
Jobseeker-to-vacancy ratio	119,054		1,057,600		10,464,754	
Job vacancy rate	119,120		1,064,422		10,501,166	
Job vacancy duration	119,167		1,071,471		10,559,946	

Notes: Firms correspond to firm identifiers in the ASSD. Relevant new hires: no apprenticeships, no recalls within a year, only standard employment with a minimum duration of 7 days. Stable firms: (1) at least 1 active worker, employee or civil servant for 3 consecutive years and (2) in at least one year more than 5. Firms with sufficient hirings: (1) less than 250 workers and at least once in 3 consecutive years an entry rate of at least 3% or (2) at least 250 workers and at least once in 3 consecutive years an entry rate of at least 2% or (3) at least once in 3 consecutive years at least 10 hirings. Outliers in the independent variable: jobseeker-to-vacancy ratio > 70, job vacancy rate > 7, job vacancy duration > 366 (each in the previous year).

3.3 Variables

As explanatory variables, we use three indicators of labour market tightness, each measured at the industry and region level with a one-year lag. Our first indicator is the jobseeker-to-vacancy ratio (*Stellenandrangsziffer*), expressed as a percentage. This ratio represents the number of unemployed persons (excluding those in PES training and apprenticeship seekers) per immediately available

³In the Appendix, we show that the results would be similar if we included all firms with any type of hiring, instead of applying the various restrictions.

vacancy reported to the AMS. This indicator is based on AMS data and takes into account both the demand and the supply side of the labour market. It shows how many immediately available unemployed (unrealised labour supply) correspond to one immediately available vacancy (unrealised labour demand). A higher jobseeker-to-vacancy ratio indicates a less tight labour market.

Our second explanatory variable is the job vacancy rate (*Offene-Stellen-Quote*), expressed as a percentage. This rate represents the share of immediately available vacancies in all available (filled and vacant) jobs, i.e., the sum of immediately available vacancies and dependent employees. It reflects unrealised labour demand as a proportion of total labour demand, both unrealised and realised. The number of vacancies is obtained from AMS data, while the number of dependent employees comes from the ASSD. A higher job vacancy rate suggests a tighter labour market.

Our third explanatory variable is the average (completed) vacancy duration in the industry and region. Following the official AMS definition, this corresponds to the time, measured in days, between the firm's desired start date (the date when the job becomes available) and the date when the vacancy is filled or lapses for other reasons. All vacancies leaving the AMS stock in a given year, based on AMS vacancy data, are included. A shorter vacancy duration should indicate a tighter labour market.⁴

The first reason for measuring all three labour market tightness indicators with a one-year lag is to avoid endogeneity. In particular, the vacancy rate at the region-industry level could be influenced by firms' own vacancy postings. We mitigate this problem by measuring the explanatory variable in the previous year and by not relying on a single measure of labour market tightness, but by comparing three alternative measures. The second reason for the time lag is to allow firms time to adjust their vacancy posting and hiring behaviour in response to changes in labour market tightness. Moreover, long-term learning is more relevant to understanding what drives firms' hiring than temporary reactions.

As dependent variables, we observe two outcomes at the establishment level: first, the job posting rate, which is the number of vacancy postings by a firm to the AMS as a percentage of the firm's hirings in a calendar year. This measures the frequency with which a firm reports vacancies to the AMS and thus the extent to which it involves the AMS in its recruitment, thereby giving it the opportunity to intervene and contribute to filling positions with unemployed persons. Our second dependent variable is the share of unemployed persons registered with the AMS, including those in PES training, as a percentage of the firm's hirings in a calendar year, expressed as a percentage. Adding this indicator is crucial because most unemployed people are hired without AMS mediation. The hirings in the denominator of both indicators include all relevant 'new hirings' of employees as recorded in the ASSD. This excludes the recall of employees after temporary layoffs within one year, apprenticeships and employment relationships of less than seven days. Both rates are capped at 100% to adjust for implausibly high outliers.

⁴We measure unplanned vacancy duration. Our measurement concept is consistent with the official AMS definition and the concepts commonly used in the literature. However, firms often post vacancies in advance, sometimes long before a job actually becomes available, and there is no information on the effort they already put into recruiting. Therefore, similar to Mueller et al. (2024), we compute two alternative duration measures for comparison. The first is the 'posting duration', which measures the days between the posting and the removal of the vacancy from the AMS stock, thus including the time between the posting and the availability of the job. Second, we again calculate the duration from posting to removal of the vacancy, but limit the time between posting and job availability to a maximum of 30 days. Mueller et al. (2024) call this the 'JOLTS duration' because it follows the concept of the US Job Openings and Labour Turnover Survey (JOLTS), which counts a vacancy only if the job can be started within 30 days. In Figure 7 in the Appendix we show that these alternative duration measures follow a very similar time trend to our main measure.

4 Descriptive statistics

Table 2 presents selected summary statistics on our sample of firms and descriptive outcomes (for full sample characteristics see Table 3 in the Appendix). Small firms dominate the Austrian business landscape, with 89.4% having less than 50 employees. The average enterprise size in our sample is 34.3 employees. About half of the firms are growing, about a third are shrinking and the rest are stagnating. On average, about half of the workforce are white-collar workers. The average age is 36.0 years. The largest proportions of enterprises are in trade (20.2%), hotels and restaurants (14.3%), construction (12.5%) and manufacturing (11.0%), but other service sectors also play a significant role. Our sample is diverse in terms of firm age and location, with most firms located in Vienna, Lower Austria, Upper Austria and Styria. The median gross income, not including extra payments, is 1,912.8 euro.

Regarding our dependent variables, the average vacancy posting rate for the whole economy was 19.7% over the period 2008-2022. This means that about one fifth of all filled vacancies were reported to the PES. This share increased significantly over time, by 8.9 percentage points from 17.0% in 2008 to 25.9% in 2022. Both the average level and the trend vary considerably between business segments, especially between industries. Enterprises in tourism (accommodation and food service activities), manufacturing, construction and ‘administrative and support services’ (for example, travel agencies, security and investigation activities, and services related to buildings and landscaping) report an above-average number of their vacancies to the AMS. Firms with high wage levels are less likely to involve the AMS in their recruitment than those with low or medium wage levels.

Just over a third of all hirings (excluding recalls) are of unemployed persons (34.8%). This share decreased slightly by 2.3 percentage points from 33.4% in 2008 to 31.1% in 2022. It also varies considerably between different sectors of the economy, with construction, transport and storage, trade and ‘administrative and support service activities’ at the top of the list. In large enterprises, the average share of unemployed in hiring is lower than in smaller enterprises.

Table 2: Firms' characteristics, vacancy posting and hiring behaviour

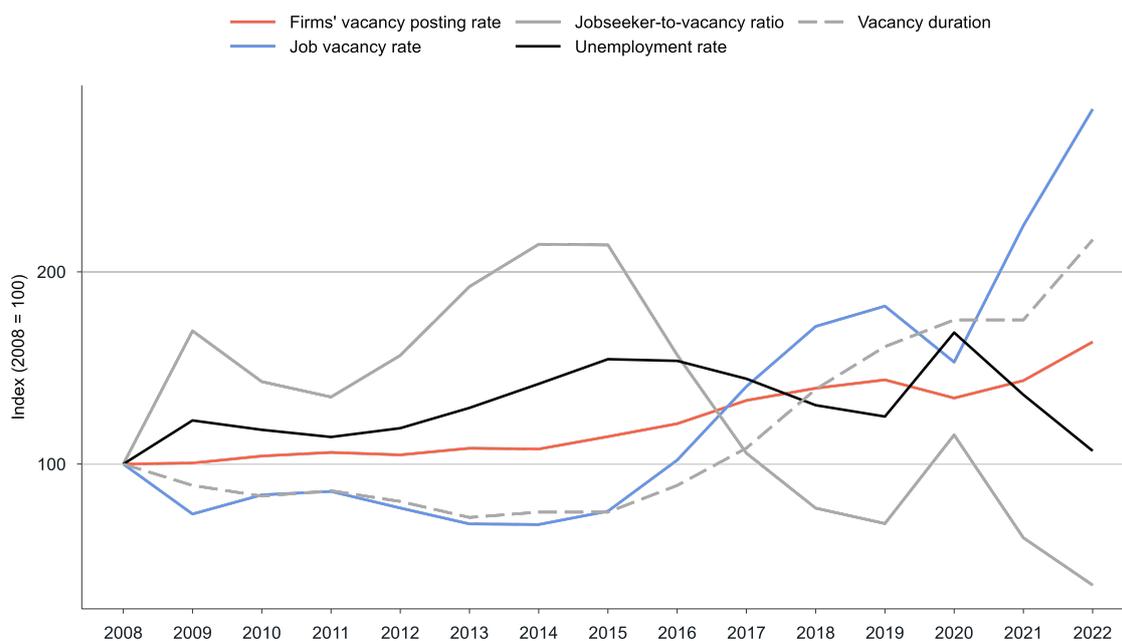
	Mean vacancy posting rate		Mean share of unemployed in hirings		Sample share
	2008-22 %	Δ 2008-22 PP	2008-22 %	Δ 2008-22 PP	2008-22 %
All firms in sample	19.7	8.9	34.8	-2.3	100.0
<i>Firm size</i>					
1-9 workers	19.4	8.7	35.6	-2.1	49.8
10-49 workers	20.3	8.2	34.9	-2.9	39.6
50-99 workers	19.0	10.5	32.6	-1.8	5.2
100-249 workers	18.5	13.5	29.9	0.1	3.5
250+ workers	16.8	15.7	26.2	2.1	1.9
<i>Firm growth</i>					
Growing	18.2	8.6	34.5	-2.9	53.1
Stagnating	20.2	8.1	33.9	-1.3	14.5
Shrinking	21.7	9.5	35.7	-1.8	32.5
<i>Industry</i>					
Manufacturing	23.8	10.0	35.8	-1.4	11.0
Energy, water supply, waste	15.8	10.9	28.1	4.8	0.8
Construction	21.3	7.7	40.6	-5.9	12.5
Trade	19.3	10.4	38.3	-1.3	20.2
Transport, storage	19.2	11.7	39.6	-2.1	5.3
Accommodation, food service	30.5	9.8	33.0	-8.0	14.3
Information, communication	11.8	5.4	27.7	0.5	3.4
Financial and insurance activities	9.0	5.2	25.0	3.0	1.9
Real estate activities	11.6	7.5	33.6	-1.0	2.5
Professional, scientific, technical activities	10.9	4.9	27.2	-0.2	9.7
Administrative, support service activities	20.4	9.9	38.2	-1.4	4.4
Public admin., defence; social security	10.6	7.8	19.0	1.6	2.0
Education	15.3	8.3	32.0	3.1	2.1
Human health, social work	16.8	10.2	34.6	0.6	5.4
Arts, entertainment, recreation	12.5	6.7	29.6	-3.3	1.7
Other service activities	17.7	8.9	35.0	-0.1	3.0
<i>Firm age</i>					
<5 years	17.8	9.1	35.2	-3.8	15.1
<10 years	19.1	9.6	34.9	-2.1	17.3
<15 years	19.8	9.7	35.0	-3.0	14.8
<20 years	20.1	9.2	35.1	-1.9	11.7
\leq 20 years	20.4	7.9	34.4	-1.7	41.1
<i>Firm wage level</i>					
Low	19.5	9.2	32.9	-3.0	19.0
Medium	21.3	9.2	36.8	-2.8	68.9
High	10.5	7.6	26.5	2.1	12.2
<i>Federal province</i>					
Burgenland	23.7	-1.4	29.8	-6.5	2.9
Carinthia	27.5	14.7	42.6	-4.9	5.8
Lower Austria	21.0	7.8	36.4	-2.4	15.8
Upper Austria	20.9	10.3	34.1	-1.3	15.8
Salzburg	23.0	6.7	32.6	-4.1	8.6
Styria	21.6	10.0	36.8	-3.7	12.1
Tyrol	20.9	8.6	31.5	-5.7	9.4
Vorarlberg	18.3	11.0	30.2	-1.7	4.6
Vienna	13.4	9.1	34.8	0.7	24.9
No. of observations					1,071,954

Notes: Vacancy posting rate (in %): number of vacancy postings by a firm to the AMS as a percentage of the firm's hirings in a calendar year. Firm growth: Symmetric rate of change of employment from year to year. Growing: ≥ 0.02 . Stagnating: >-0.02 & <0.02 . Shrinking: ≤ -0.02 . Firm wage level: low: $<2/3$ of the annual median; high: $>3/2$ of the annual median; medium: in between. Unlike the regression analyses, no weighting by number of hires in each year.

Figure 1 shows our three indicators of labour market tightness, firms' vacancy posting rate (our first dependent variable) and the unemployment rate. All indicators are aggregated for the whole economy and indexed to 2008. The three tightness indicators exhibit very similar trends. Moreover, the figure shows that firms' vacancy posting rate increased markedly from 2016 to 2019 and, after an interruption due to the COVID-19 crisis, again in 2021 and especially in 2022. These periods coincide with periods of relatively strong increases in labour market tightness.

In 2009, unemployment increased sharply due to the financial and economic crisis and labour market tightness decreased. In the following two years, the labour market recovered slightly, unemployment fell and labour market tightness increased. The period from 2012 to 2015 was characterised by weak economic growth and a significant increase in labour supply. Unemployment rose again, reaching historical highs, and labour market tightness trended downwards. This was followed by a period from 2016 to 2019 with stronger economic growth, a less rapid increase in labour supply, falling unemployment and a relatively strong increase in labour market tightness. After an interruption in 2020 due to the exceptional situation of the first and most significant COVID-19 closure, this trend continued in 2021 and especially in 2022 as the economy recovered strongly from the COVID-19 crisis.

Figure 1: Labour market tightness and firms' vacancy posting

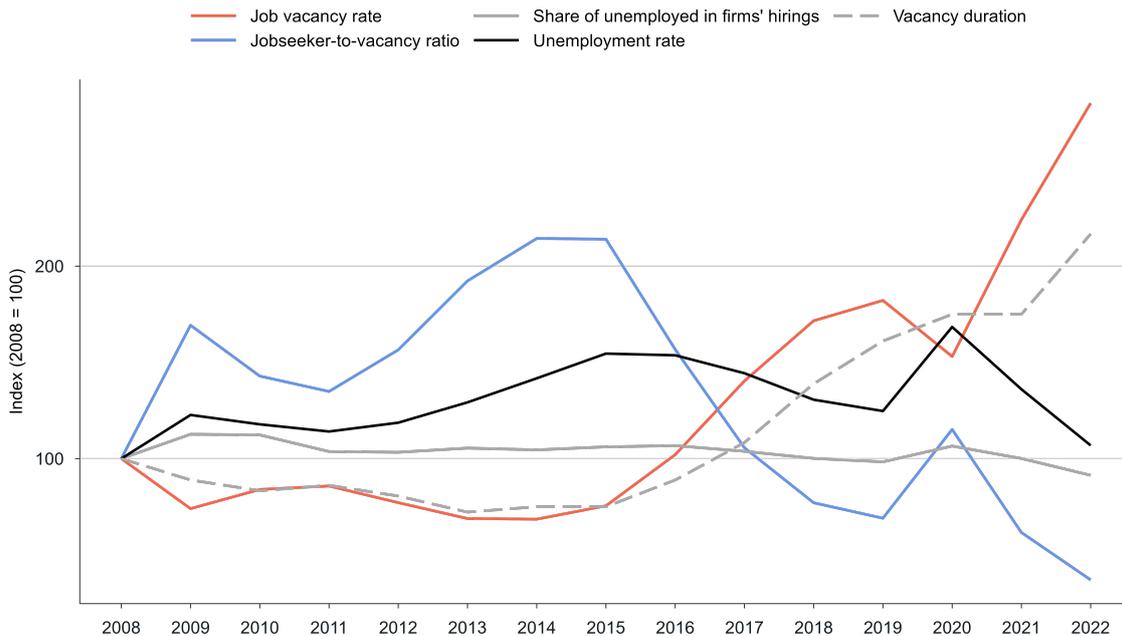


Notes: Mean values in the overall economy.

Figure 2 shows the labour market indicators with our second dependent variable: the share of the unemployed in firms' hirings. This share has remained broadly constant over the long term. Exceptions include two short-term increases during the financial and COVID-19 crises, a sharp decline in 2011 when the labour market was fully opened to foreign workers from the new eastern EU member states of 2004 (Hungary, Poland, Slovakia, Slovenia, Czech Republic, Estonia, Latvia, Lithuania, Malta and Cyprus) and another relatively large decline in 2022. In contrast to the two crises, the strong increase in unemployment in the period from 2012 to 2015 did not go hand in

hand with a noticeably higher share of unemployed in hiring. It is possible that after the opening of the labour market to the East, newly arrived immigrants were increasingly hired to replace unemployed residents. Overall, we do not observe a clear relationship between our labour market tightness indicators and the share of the unemployed in firms' hiring. It appears that the share of the unemployed tends to decrease rather than increase during periods of increasing labour market tightness (2016-2019 and 2021-2022 during the economic recovery after the COVID-19 crisis).

Figure 2: Labour market tightness and firms' hiring from the unemployed



Notes: Mean values in the overall economy.

5 Empirical strategy

To examine the relationship between labour market tightness and firms' job vacancy posting behaviour, we regress the job posting rate of a firm in a calendar year on the labour market tightness in the firm's industry and region in the previous year. For each of our three tightness indicators, we estimate a separate regression. Our model includes 16 industry and 84 region fixed effects, various firm characteristics, real GDP growth, relative labour supply growth (both compared with the previous year), and a dummy variable for the COVID-19 year 2020.

We weight each regression by the number of hirings in the respective year, so that firms with many hirings are given more weight than those with fewer hirings. Standard errors are clustered at the region level. Our OLS estimations have the following specification:

$$y_{it} = \beta_0 + \beta_1 \text{Tightness}_{j,k,t-1} + X_{it}\gamma + Z_{i,t-1}\delta + \beta_2 \text{GDP Growth}_t + \beta_3 \text{Labour Supply Growth}_t + \beta_4 \text{COVID-19}_t + \delta_{\text{industry}} + \delta_{\text{region}} + \varepsilon_{it}$$

where y_{it} is the job posting rate of a firm in year t and $\text{Tightness}_{j,k,t-1}$ represents the labour market tightness in the firm's industry and region in the previous year. X_{it} is a vector of firm characteristics measured in year t . These include firm age, firm size (number of employees), dummies indicating whether the firm is growing, stagnating, or shrinking, median age of the workforce, share of under-25s, share of 55+ year olds, a dummy indicating whether the workforce consists of at least 50% women, share of white-collar workers, a dummy indicating whether the firm has at least one apprentice, median gross income (without special payments), the 25th and 75th percentiles of the firm's monthly income (without special payments), and the federal province of the firm's location. $Z_{i,t-1}$ is a vector of firm characteristics related to labour turnover and measured in the previous year. These include the extent of turnover (none, rather low, low, rather high, high) measured by the turnover rate⁵, indicators for at least 100% entry rate and at least 100% exit rate, and a dummy indicating whether at least 50% of the employees were employed throughout the entire year. GDP Growth_t is the real GDP growth in year t compared to the previous year, $\text{Labour Supply Growth}_t$ is the relative labour supply growth in year t compared to the previous year, COVID-19_t is a dummy variable for the COVID-19 year 2020, δ_{industry} and δ_{region} are industry and region fixed effects, and ε_{it} is the error term.

The dummy variable for COVID-19 year 2020 is included to control for this exceptional year, in which the typical behaviour of firms was likely to have been disrupted by the first and most significant nationwide lockdown.⁶ Our main interest is in how the behaviour of firms in an industry and region evolves as a function of labour market tightness. The variation in tightness is largely driven by the business cycle and growth in labour supply. By controlling for GDP and labour supply growth, we filter out some of the variation of interest – the changes in the overall (not regional and industry specific) business cycle and labour supply that influence labour market tightness. Therefore, we present results both with and without controlling for GDP and labour supply growth. Regions correspond to local labour market districts, some of which we group together to ensure consistent regions over time, despite changes in the administrative boundaries of geographic units.

To examine the relationship between labour market tightness and firms' hiring of the unemployed, we use the same OLS regressions as in our analysis of firms' vacancy posting behaviour, but with a different dependent variable: the share of the unemployed in firms' hiring.

6 Results

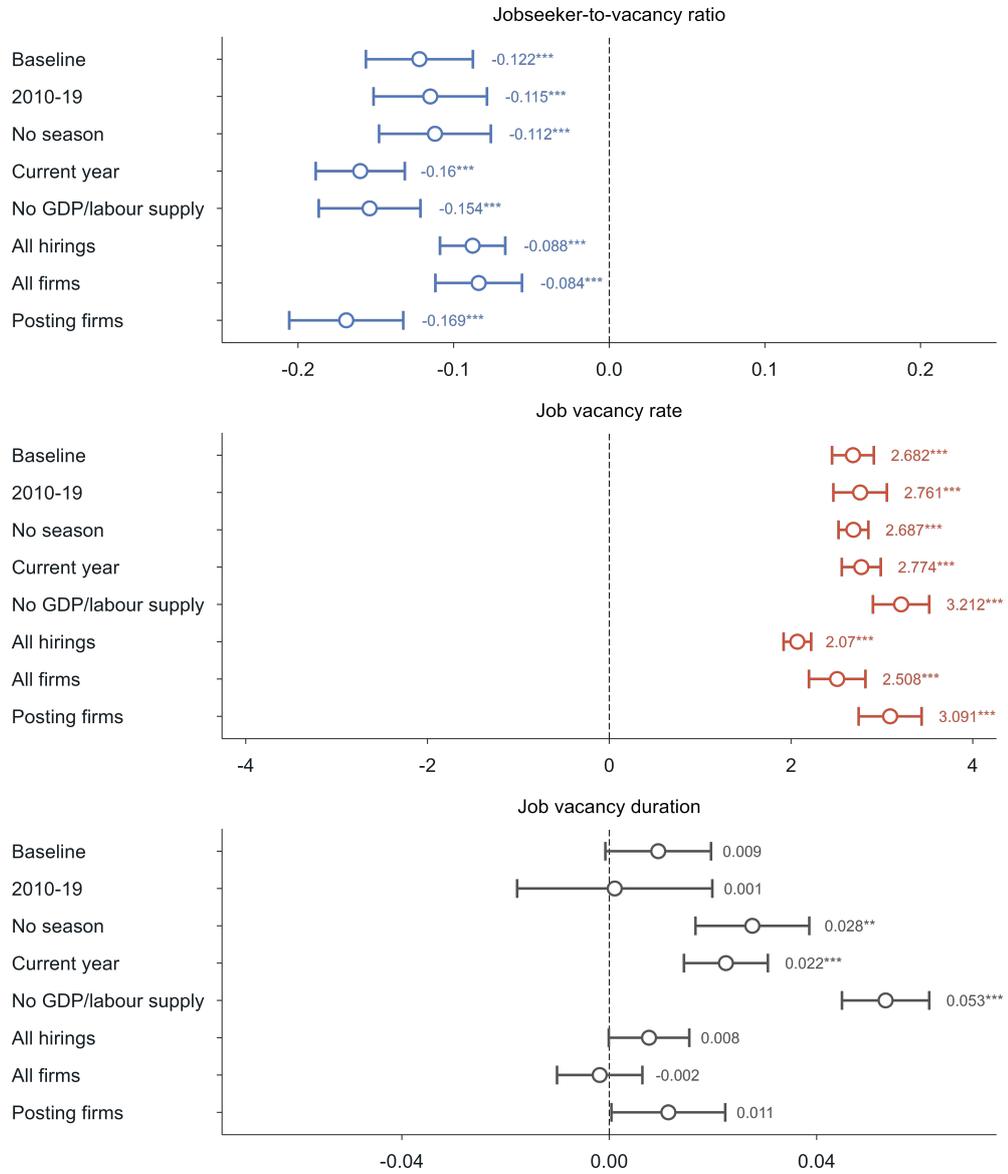
6.1 Vacancy posting

Our results clearly indicate that the frequency with which firms report vacancies to the PES increases with labour market tightness in the region and industry. This relationship is evident with two of our three indicators. First, the vacancy posting rate of a firm decreases with the

⁵We measure and categorise the labour turnover rate, which we define as the percentage of the sum of employee entries and exits relative to the average number of employees during the year.

⁶There were further shutdowns in 2021. However, these are unlikely to have had much of an impact as companies already anticipated that things would soon return to normal and therefore stopped behaving abnormally.

Figure 3: Influence of labour market tightness on the firm's vacancy posting rate



Notes: Estimates from linear regressions. Dependent variable: vacancy posting rate (in %). Independent variables (jobseeker-to-vacancy rate, job vacancy rate, job vacancy duration) are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and further firm characteristics including workforce characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Reading example: The coefficient -0.122 in the baseline model indicates that for every one percentage point increase in the jobseeker-to-vacancy ratio, a firm's job posting rate decreases on average by 0.122 percentage points, controlling for other variables. For every one percentage point increase in the job vacancy rate, firm's job posting rate rises on average by 2.682 percentage points. According to the baseline model, there is no significant relationship between the duration of the vacancy and firm's job posting rate. Excluding seasonal industries, a coefficient of 0.028 suggests that the job posting rate increases by about 0.028 percentage points for each additional day a vacancy remains unfilled.

jobseeker-to-vacancy ratio. In other words, when there are more unemployed individuals per vacancy (higher unrealised labour demand), firms report fewer vacancies. Conversely, they report more vacancies when fewer unemployed individuals compete for each open position, indicating a tighter labour market. This relationship is robust to changes in our sample of firms: it remains consistent when we consider only the years 2010-2019, excluding the 2008/2009 financial crisis, the COVID-19 crisis and the subsequent economic recovery. It also holds when we do not impose any restrictions on our sample of firms and hirings considered, measure labour market tightness in the current year instead of the previous year, do not control for GDP and labour supply growth, exclude the seasonal tourism and construction industries, or consider only firms with vacancies in the period 2008-2022.

Second, the vacancy posting rate of a firm increases with the job vacancy rate. Firms report vacancies more frequently when a larger share of all jobs in the region and industry is unfilled (higher unrealised labour demand) and fewer vacancies when a smaller share is unfilled. This nexus is also robust to variations in the considered firm samples.

Only with the third indicator of labour market tightness is the result somewhat less clear. In our baseline model, we find no significant correlation. However, when we measure vacancy duration in the current year instead of the previous year, omit the control for GDP and labour supply growth, or exclude the seasonal industries, a significant positive correlation emerges that is consistent with the other two indicators: the higher the vacancy duration in the region and industry and, thus, the tighter the labour market, the higher the vacancy posting rate of a firm. It seems that by controlling for GDP and labour supply growth, we filter out too much of the temporal variation in labour market tightness that we are interested in: the variation driven by the business cycle and labour supply growth affecting all regions and industries. Therefore, the positive correlation only becomes apparent when we drop these control variables. As shown in Table 4 in the Appendix, the coefficient for the two variables are highly significant in all three regressions. Higher GDP growth is associated with a higher vacancy posting rate, likely because economic upturns lead firms to create more positions, which they potentially report to the PES. Conversely, higher labour supply growth correlates with a lower vacancy posting rate, suggesting that firms are less reliant on the PES for recruitment as a larger pool of available workers can be reached through other channels.⁷

In separate regressions, we find a significant positive relationship for 10 out of 16 industries (Figure 4). Tourism and construction are not among these; in these cases, the coefficient is insignificant. Seasonal industries have relatively large quantitative importance in Austria. This explains why we obtain a significant result once we exclude these two industries. The insignificant correlation we find for seasonal industries could be due to the fact that, particularly in tourism, companies regularly report vacancies to the PES relatively often. They may therefore be less responsive to labour market tightness.⁸

Overall, our three measures of labour market performance produce qualitatively similar results, suggesting that firms report vacancies more frequently when the labour market tightens. We do not

⁷The coefficient for the COVID-19 year 2020 is also highly significant and positive. One possible explanation is the reduced availability of other search channels due to lockdowns. Additionally, the increased reporting of vacancies may have resulted from more frequent contact with the PES for the administration of support measures such as COVID-19 short-time work or wage subsidies.

⁸Another possible explanation could be that firms report fewer vacancies to the PES as a reaction to negative experiences with long vacancy durations, possibly caused by a lack of PES placement quality (learning effect). The significant correlation we obtain when we measure vacancy duration in the current year rather than in the previous year could indicate this, as we capture less of the firms' reactions to past experiences in this way. In addition, there could be a self-reinforcing mechanism: an increase in the number of vacancies prolongs the vacancy duration and leads to more and more vacancies with longer durations ('slow sellers') remaining.

find a significant relationship for all industries, but for most: 10 out of 16 based on the jobseeker-to-vacancy ratio, 15 out of 16 based on the job vacancy rate, and 10 out of 16 based on vacancy duration (see Figure 4). The relationships are also very consistent across different firm segments, differentiated by firm size, firm growth, firm age, wage level, and the federal province of the firm's location (see Table 5 in the Appendix).

6.2 Hiring from the unemployed

Next, we examine the relationship between labour market tightness and firms' hiring of the unemployed. The results for this outcome are less clear-cut.

In our baseline model, we observe that a higher jobseeker-to-vacancy ratio in the previous year – indicating lower labour market tightness – is associated with an increased share of the unemployed in a firm's hires. Conversely, a lower jobseeker-to-vacancy ratio – reflecting higher labour market tightness – is associated with a reduced share of the unemployed in a firm's hires. This relationship holds as long as we control for GDP growth and labour supply growth. However, in the absence of these control variables, the association becomes statistically insignificant.

For the job vacancy rate we observe a similar pattern. A larger share of unfilled jobs in the region and industry, indicating a tighter labour market, is associated with a lower share of the unemployed in a firm's hiring. Conversely, when fewer jobs in the region and industry are unfilled (indicating lower labour market tightness), the share of the unemployed in a firm's recruitment is higher. This relationship also becomes insignificant if we do not control for GDP and labour supply growth, or if we exclude the seasonal industries of tourism and construction.

As can be seen from Table 6, growth in labour supply seems to be particularly strongly correlated with the recruitment of the unemployed. The greater the increase in the labour supply available to the market, the less often jobs are filled by the unemployed.

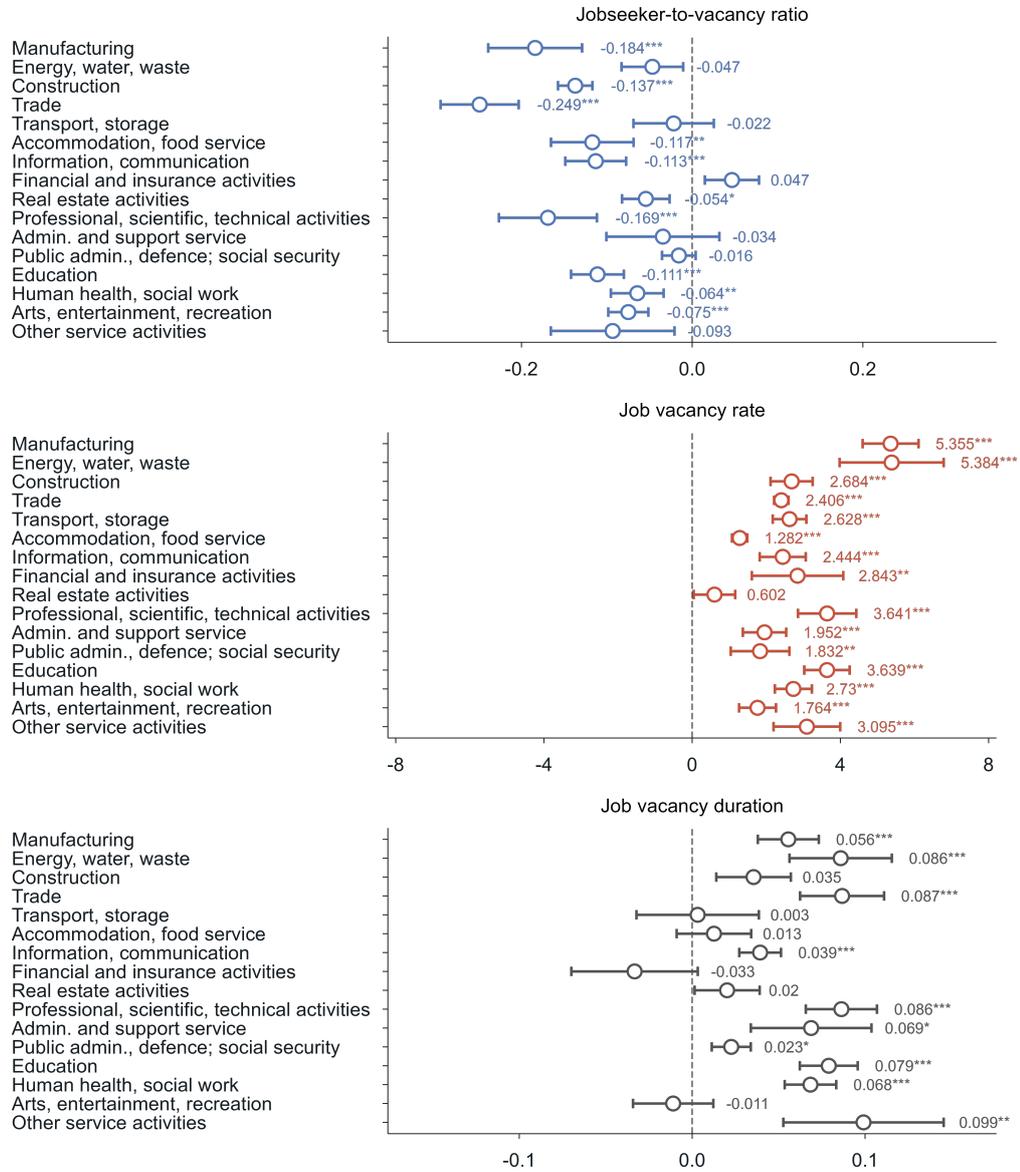
Our third indicator, job vacancy duration, points in a different direction but is also not robust to sample variation. In the baseline model, we find a statistically weak positive association between the duration of job vacancies in the region and industry in the previous year and the share of the unemployed in the firm's hiring, suggesting that firms hire more unemployed individuals during periods of greater labour market tightness. This weak positive association remains if we do not control for GDP and labour supply growth and if we exclude the seasonal industries. However, it becomes insignificant if we restrict the sample period from 2008-2022 to 2010-2019 (thus excluding the two economic crises and the economic recovery from the COVID-19 crisis), measure the vacancy duration in the current year instead of the previous year, impose no restrictions on the firms and hirings considered, or restrict the focus to firms that report vacancies to the PES. Moreover, the relationship varies considerably across industries (see Figure 6) and other firm characteristics, such as firm size and age (see Table 7 in the Appendix).

In summary, while there are some indications that firms may hire more unemployed individuals when labour market tightness decreases, the evidence is not robust across different indicators and sample variations. If there is any relationship at all, it seems to be weak and negative.

7 Conclusion

In the labour market, frictions such as search costs and incomplete information often hinder the matching of job seekers and firms with vacancies, resulting in both unemployment and unfilled

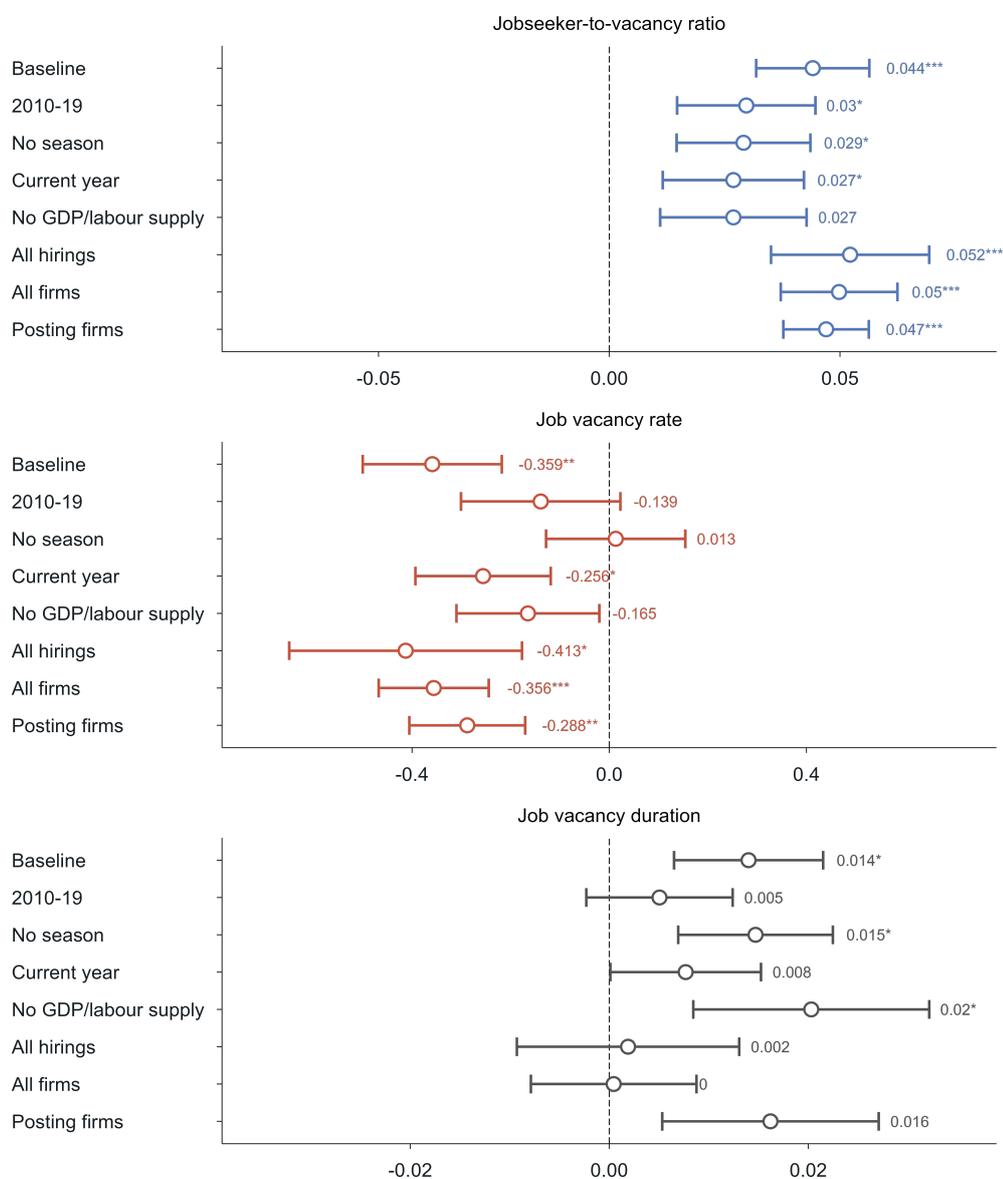
Figure 4: Influence of labour market tightness on the vacancy posting rate by industry



Notes: Estimates from linear regressions. Dependent variable: vacancy posting rate (in %). Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and further firm characteristics including workforce characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Reading example: In manufacturing, for every one percentage point increase in the jobseeker-to-vacancy ratio, a firm's job posting rate decreases on average by 0.184 percentage points.

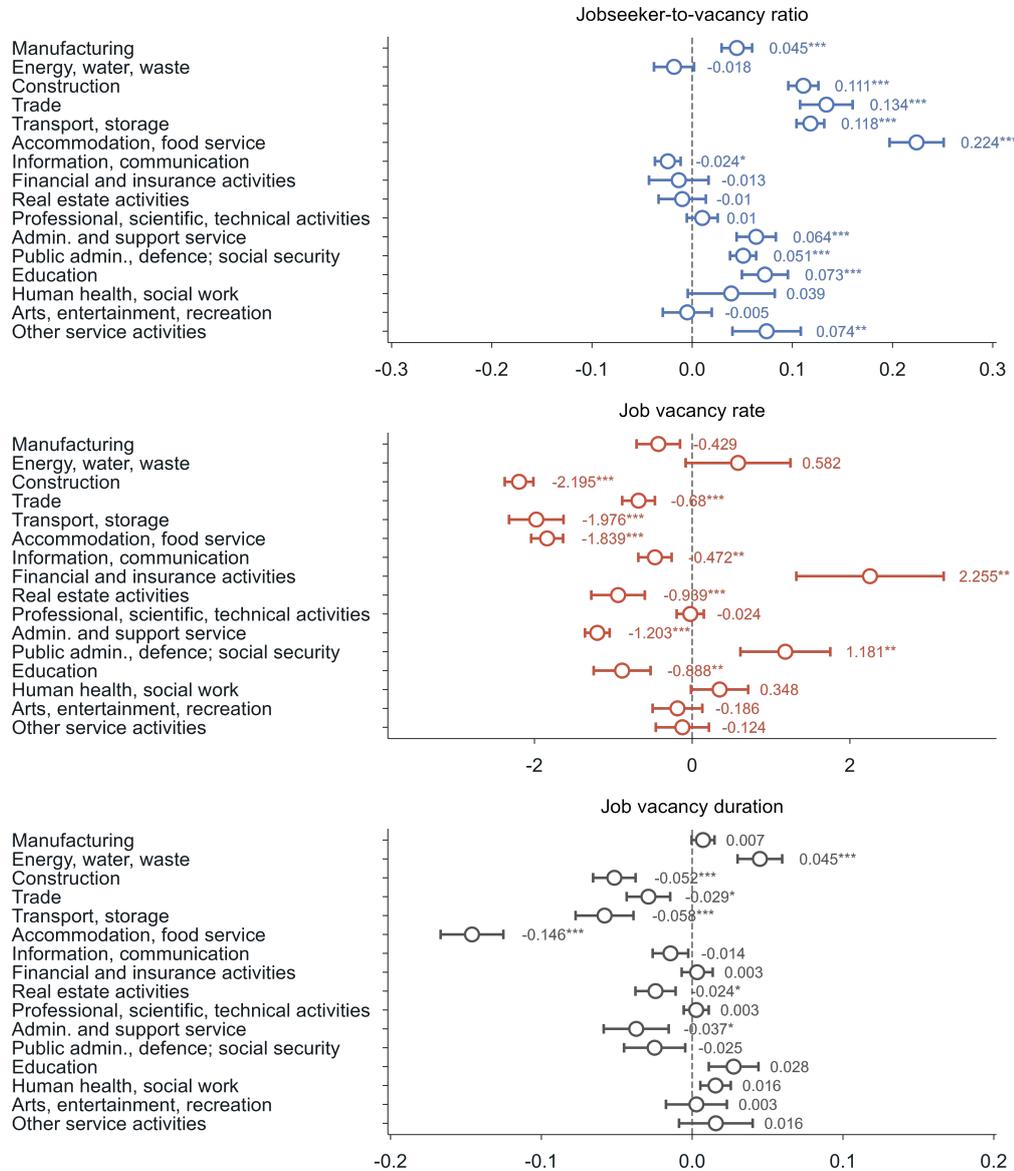
Figure 5: Influence of labour market tightness on the firm's share of unemployed in hiring (in %)



Notes: Estimates from linear regressions. Dependent variable: firm's share of unemployed in hirings in %. Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and firm characteristics including employee characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Reading example: The coefficient of 0.044 in the baseline model indicates that for every one percentage point increase in the job seeker-to-vacancy ratio, a firm's share of the unemployed in hiring increases on average by 0.044 percentage points, controlling for other variables. For every one percentage point increase in the job vacancy rate, the share of the unemployed in hiring decreases on average by 0.359 percentage points. It increases by 0.014 percentage points for each additional day that a vacancy remains unfilled.

Figure 6: Influence of labour market tightness on the firm's share of unemployed in hiring (in %) by industry



Notes: Estimates from linear regressions. Dependent variable: firm's share of unemployed in hirings in %. Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and firm characteristics including employee characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Reading example: In manufacturing, controlling for other variables, for every one percentage point increase in the job seeker-to-vacancy ratio, a firm's share of the unemployed in hiring increases by 0.045 percentage points on average.

positions. Public Employment Services (PES) can mitigate these frictions by acting as intermediaries. While most research has focused on the job-seeking processes of workers, the recruitment behaviour of firms remains underexplored. A key research gap is the factors influencing firms to report vacancies to the PES and hire unemployed individuals, which are essential for company success, job prospects for the unemployed, and aggregate unemployment.

Our study addresses this gap by examining the role of labour market tightness. Based on a unique combination of data from the ASSD, the unemployment register and the job vacancy database of the Austrian PES, we analyse how firms respond to labour market tightness in their region and industry by looking at the frequency with which they report vacancies to the PES and hire unemployed workers. In the absence of a ‘one size fits all’ measure in the literature, we compare three indicators of labour market tightness: the ratio of job seekers to vacancies, the job vacancy rate, and vacancy duration.

Our results show that firms report more vacancies to the PES when the labour market tightens, suggesting they diversify their search channels to expand their reach, access a larger pool of potential candidates, and thus meet their staffing needs despite labour shortages. However, there is no clear link between labour market tightness and firms’ hiring of the unemployed. The share of unemployed individuals hired by firms tends to decrease rather than increase as the labour market tightens.

This finding supports screening models, which suggest that unemployment is viewed more negatively when labour is scarce. In a slack labour market, more highly qualified or productive workers may also be unemployed, making unemployment a less informative signal of a worker's productivity or skill level. In contrast, in a tight labour market, qualified workers quickly find jobs, leaving a higher proportion of less skilled or less productive individuals among the unemployed. This compositional effect makes the negative signal of unemployment stronger and more informative. Consequently, firms remain reluctant to hire unemployed individuals, even if they report more vacancies to the PES. They aim to avoid the increased risk of lower productivity associated with hiring from a pool perceived to be less qualified.

In this context, our results align with Kroft et al. (2013), who found that the negative impact of long-term unemployment is more pronounced in tighter labour markets. Similarly, Carlsson et al. (2018) observed increased ethnic discrimination in hiring during economic upturns, implying that minority status sends a stronger signal about lacking unobserved skills during economic booms.

Alternative explanations for why firms do not hire more unemployed people include a mismatch between the qualifications of unemployed candidates and job requirements. Even if firms report more vacancies to the PES, the skills and experience of unemployed candidates may not meet companies’ needs. Additionally, the mediation process through the PES may not be as effective as expected. Another explanation could be a compositional effect over the business cycle: The proportion of unemployed hires remains relatively constant, while the number of hires from the employed pool increases during an economic upturn, leading to a lower share of unemployed hires even if the absolute number of unemployed hires rises.

Furthermore, the pool of employed candidates available to firms during periods of increased demand is much larger than the pool of unemployed candidates. This is generally the case but is especially true during an economic upturn with decreasing unemployment. Other factors include the substitution of unemployed hires without PES mediation by those mediated by the PES, as well as a time lag between reporting a vacancy and the actual hiring. In a tight market, this lag could be longer, leading to a situation where reported vacancies do not immediately translate into increased hiring of the unemployed.

In summary, while firms report more vacancies to the PES in tighter labour markets, this does not lead to a higher share of unemployed hires. Multiple factors, including screening effects, qualification mismatch, and time lags, may explain this phenomenon. Further research is needed to disentangle these factors and better understand the dynamics at play.

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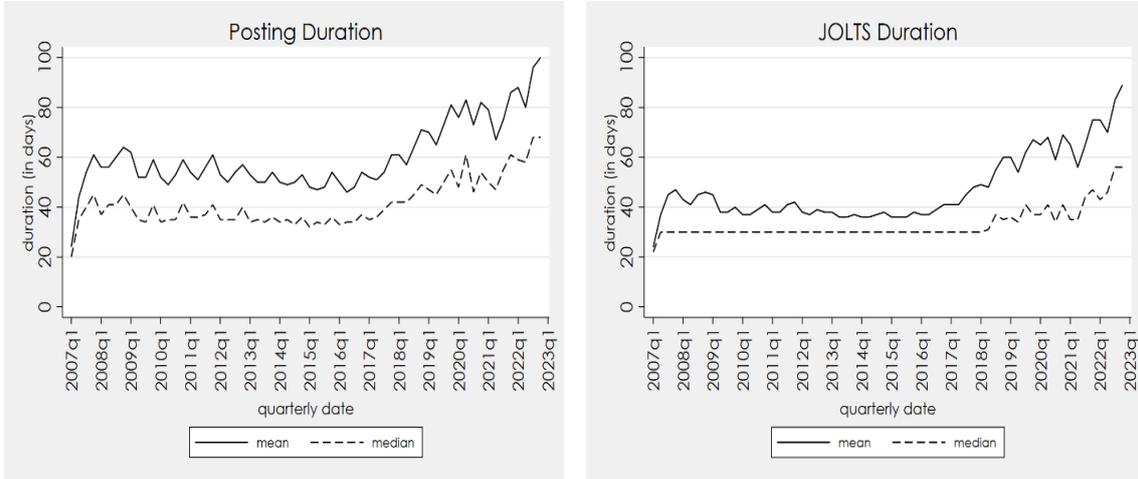
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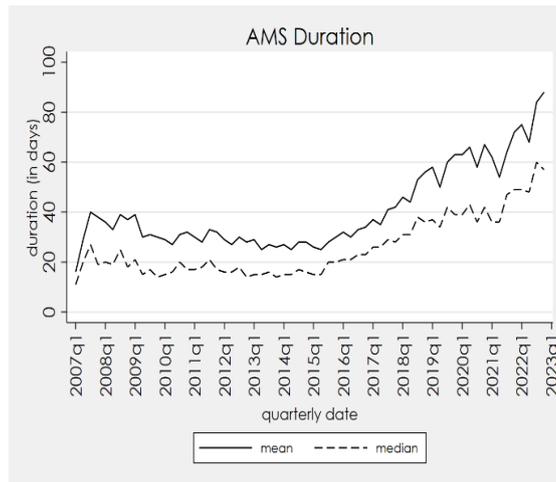
A Appendix

Figure 7: Alternative vacancy duration measures



(a) Posting duration

(b) JOLTS duration



(c) AMS duration

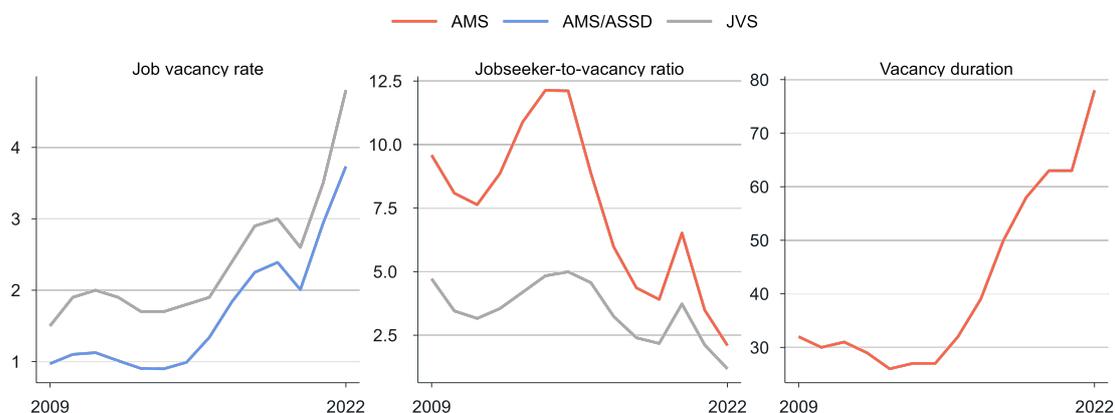
Notes: AMS duration: time between firm's desired start date (job availability) and the date when the vacancy is filled or lapses for other reasons. Posting duration: time between posting and removal of the vacancy from the AMS stock. JOLTS duration: time between posting and removal of the vacancy from the AMS stock, with a maximum of 30 days between posting and job availability.

Table 3: Full sample characteristics, 2008-2022

Variable	Mean	SD
Firm age (in years)	19.8	14.3
Firm size (no. of workers)	34.3	249.3
<i>Firm growth</i>		
Growing	53.1	49.9
Stagnating	14.5	35.2
Shrinking	32.5	46.8
Median age of workforce (in years)	36.0	7.8
Share of under-25s	14.5	15.3
Share of 55+ year olds	10.4	12.3
At least 50% women	44.4	49.7
Share of white-collar workers	50.6	38.9
At least 1 apprentice	29.3	45.5
Median gross income (in Euro, w/o extra payments)	1,912.8	810.3
25% percentile of monthly income (in Euro)	1,438.3	709.8
75% percentile of monthly income (in Euro)	2,393.5	953.9
<i>Industries</i>		
Manufacturing	11.0	31.3
Energy, water supply, waste	0.8	8.7
Construction	12.5	33.1
Trade	20.2	40.1
Transport and storage	5.3	22.3
Accommodation, food service	14.3	35.0
Information, communication	3.4	18.0
Financial and insurance activities	1.9	13.6
Real estate activities	2.5	15.7
Professional, scientific, technical activities	9.7	29.6
Administrative, support service	4.4	20.5
Public admin., defence; social security	2.0	14.0
Education	2.1	14.2
Human health, social work	5.4	22.5
Arts, entertainment, recreation	1.7	12.7
Other service activities	3.0	17.2
Turnover in previous year		
None	3.7	18.8
Low	24.6	43.1
Rather low	25.4	43.5
Rather high	21.7	41.2
High	24.3	42.9
At least 100% entry rate in previous year	26.0	43.9
At least 100% exit rate in previous year	22.0	41.4
At least 50% employed for entire year (previous year)	73.5	44.1
<i>Federal province</i>		
Vienna	24.9	43.3
Lower Austria	15.8	36.5
Upper Austria	15.8	36.5
Burgenland	2.9	16.8
Styria	12.1	32.7
Carinthia	5.8	23.3
Salzburg	8.6	28.1
Tyrol	9.4	29.2
Vorarlberg	4.6	21.0
<i>Macroeconomic development</i>		
Growth rate of real GDP (year on year)	1.1	2.8
Relative growth in labour supply (year on year)	1.0	0.6
No. of observations	1,071,954	

Notes: Unless otherwise stated, in %. Fixed region effects in the regression analyses are based on local labour market districts, not federal provinces.

Figure 8: Comparison of labour market tightness indicators by data source: register data vs. Job Vacancy Survey (JVS) of Statistics Austria



JVS: Job Vacancy Survey of Statistics Austria. Job vacancy rate: number of immediately available job vacancies/immediately available job vacancies + dependent employees (in %). Jobseeker-to-vacancy ratio: number of unemployed persons (excluding those in PES training and apprenticeship seekers) / immediately available vacancies reported to the AMS (in %). Vacancy duration: period between firm's desired start date and date of a vacancy's removal from the AMS stock.

Table 4: Influence of labour market tightness on the vacancy posting rate

	(1)	(2)	(3)
Jobseeker-to-vacancy ratio	-0.122 *** (0.035)		
Job vacancy rate		2.682 *** (0.235)	
Job vacancy duration			0.009 (0.010)
Growth rate of real GDP (year on year)	1.074 *** (0.090)	0.796 *** (0.088)	1.097 *** (0.088)
Relative growth in labour supply (year on year)	-0.725 *** (0.160)	-0.342 *** (0.120)	-1.020 *** (0.211)
COVID-19 year 2020	10.160 *** (0.856)	6.943 *** (0.753)	10.850 *** (0.873)
Further controls	Yes	Yes	Yes
Observations	1,057,600	1,064,422	1,071,471
Adjusted R ²	0.094	0.095	0.093

Notes: Estimates from linear regressions. Dependent variable: vacancy posting rate (in %). Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and further firm characteristics including workforce characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Influence of labour market tightness on the vacancy posting rate by firm segment

	Jobseeker-to-vacancy ratio	Job vacancy rate	Job vacancy duration
<i>Main results</i>			
Baseline	-0.122 (0.035)***	2.682 (0.235)***	0.009 (0.010)
2010-19	-0.115 (0.037)***	2.761 (0.301)***	0.001 (0.019)
All firms	-0.084 (0.028)***	2.508 (0.317)***	-0.002 (0.008)
Posting firms	-0.169 (0.037)***	3.091 (0.353)***	0.011 (0.011)
All hirings	-0.088 (0.021)***	2.070 (0.154)***	0.008 (0.008)
Current year	-0.160 (0.029)***	2.774 (0.219)***	0.023 (0.008)***
No season	-0.112 (0.037)***	2.687 (0.167)***	0.028 (0.011)**
No GDP/labour supply	-0.154 (0.033)***	3.212 (0.316)***	0.053 (0.009)***
<i>Firm size (no. workers)</i>			
1-9	-0.104 (0.016)***	1.909 (0.305)***	-0.009 (0.011)
10-49	-0.120 (0.021)***	2.020 (0.334)***	-0.009 (0.013)
50-99	-0.108 (0.028)***	1.745 (0.376)***	0.027 (0.012)**
100-249	-0.132 (0.050)***	2.827 (0.478)***	0.037 (0.014)***
250+	-0.082 (0.044)*	4.020 (0.371)***	0.010 (0.019)
<i>Firm growth</i>			
Growing	-0.110 (0.032)***	2.594 (0.211)***	0.005 (0.013)
Stagnating	-0.104 (0.042)**	2.637 (0.365)***	0.009 (0.011)
Shrinking	-0.164 (0.036)***	2.890 (0.317)***	0.030 (0.010)***
<i>Industry</i>			
Manufacturing	-0.184 (0.056)***	5.355 (0.768)***	0.056 (0.018)***
Energy, water, waste	-0.047 (0.037)	5.384 (1432)***	0.086 (0.030)***
Construction	-0.137 (0.021)***	2.684 (0.580)***	0.036 (0.022)
Trade	-0.249 (0.047)***	2.406 (0.199)***	0.087 (0.025)***
Transport, storage	-0.022 (0.048)	2.628 (0.464)***	0.003 (0.036)
Accommodation, food service	-0.117 (0.049)**	1.282 (0.210)***	0.013 (0.022)
Information, communication	-0.113 (0.036)***	2.444 (0.634)***	0.039 (0.012)***
Financial and insurance activities	0.047 (0.032)	2.843 (1259)**	-0.033 (0.037)
Real estate activities	-0.054 (0.029)*	0.602 (0.572)	0.020 (0.019)
Professional, scientific, technical activities	-0.169 (0.059)***	3.641 (0.803)***	0.086 (0.021)***
Admin. and support service	-0.034 (0.068)	1.952 (0.598)***	0.069 (0.036)*
Public admin., defence; social security	-0.016 (0.020)	1.832 (0.809)**	0.023 (0.012)*
Education	-0.111 (0.032)***	3.639 (0.626)***	0.079 (0.017)***
Human health, social work	-0.064 (0.032)**	2.730 (0.510)***	0.068 (0.015)***
Arts, entertainment, recreation	-0.075 (0.024)***	1.764 (0.507)***	-0.011 (0.024)
Other service activities	-0.093 (0.074)	3.095 (0.917)***	0.099 (0.047)**
<i>Firm age</i>			
<5	-0.081 (0.030)***	2.231 (0.304)***	0.000 (0.017)
<10	-0.135 (0.029)***	2.362 (0.358)***	0.017 (0.015)
<15	-0.090 (0.034)**	2.848 (0.370)***	0.001 (0.015)
<20	-0.122 (0.052)**	3.006 (0.336)***	0.011 (0.021)
≥ 20	-0.138 (0.036)***	2.723 (0.302)***	0.014 (0.012)
<i>Wage level</i>			
Low	-0.110 (0.015)***	1.880 (0.283)***	0.001 (0.012)
Medium	-0.119 (0.035)***	2.236 (0.260)***	0.004 (0.011)
High	-0.065 (0.036)*	5.026 (0.562)***	0.018 (0.015)
<i>Province</i>			
Vienna	-0.067 (0.021)***	2.364 (0.633)***	0.036 (0.020)*
Lower Austria	-0.122 (0.019)***	2.297 (0.251)***	0.059 (0.017)***
Upper Austria	-0.190 (0.042)***	2.212 (0.153)***	0.026 (0.013)*
Burgenland	-0.121 (0.034)**	2.741 (0.921)**	-0.045 (0.011)***
Styria	-0.112 (0.021)***	2.467 (0.451)***	0.006 (0.025)
Carinthia	-0.149 (0.058)**	2.592 (0.891)**	-0.033 (0.061)
Salzburg	-0.485 (0.101)***	2.066 (0.406)***	0.002 (0.039)
Tyrol	-0.316 (0.066)***	1.828 (0.476)***	0.013 (0.016)

Notes: Estimates from linear regressions with the 3 independent variables (labour market tightness indicators): vacancy posting rate in %, job vacancy rate in % and job vacancy duration in days. Dependent variable: firm's vacancy posting rate (in %). Separate regressions for each firm segment, i.e. each industry, company size, etc. Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and further firm characteristics including workforce characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Influence of labour market tightness on the firm's share of unemployed in hiring (in %)

	(1)	(2)	(3)
Jobseeker-to-vacancy ratio	0.044 *** (0.013)		
Job vacancy rate		-0.359 ** (0.144)	
Job vacancy duration			0.014 * (0.008)
Growth rate of real GDP (year on year)	0.020 (0.168)	0.062 (0.169)	-0.063 (0.153)
Relative growth in labour supply (year on year)	-1.107 *** (0.199)	-1.058 *** (0.193)	-0.736 *** (0.158)
COVID-19 year 2020	2.438 (1.751)	2.740 (1.818)	1.325 (1.550)
Further controls	Yes	Yes	Yes
Observations	1,057,600	1,064,422	1,071,471
Adjusted R ²	0.183	0.183	0.183

Notes: Estimates from linear regressions. Dependent variable: firm's share of unemployed in hirings in %. Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and firm characteristics including employee characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Influence of labour market tightness on the firm's share of unemployed in hiring (in %) by firm segment

	Jobseeker-to-vacancy ratio	Job vacancy rate	Job vacancy duration
<i>Main results</i>			
Baseline	0.044 (0.013)***	-0.359 (0.144)**	0.014 (0.008)*
2010-19	0.030 (0.015)*	-0.139 (0.165)	0.005 (0.008)
All firms	0.050 (0.013)***	-0.356 (0.114)***	0.000 (0.008)
Posting firms	0.047 (0.009)***	-0.288 (0.120)**	0.016 (0.011)
All hirings	0.052 (0.018)***	-0.413 (0.241)*	0.002 (0.011)
Current year	0.027 (0.016)*	-0.256 (0.140)*	0.008 (0.008)
No season	0.029 (0.015)*	0.013 (0.144)	0.015 (0.008)*
No GDP/labour supply	0.027 (0.016)	-0.165 (0.148)	0.020 (0.012)*
<i>Firm size (no. workers)</i>			
1-9	0.091 (0.011)***	-0.931 (0.150)***	-0.024 (0.009)***
10-49	0.087 (0.023)***	-0.977 (0.186)***	-0.016 (0.008)**
50-99	0.048 (0.023)**	-0.440 (0.348)	0.007 (0.011)
100-249	0.061 (0.023)**	-0.620 (0.324)*	0.028 (0.014)**
250+	0.003 (0.016)	0.905 (0.367)**	0.032 (0.014)**
<i>Firm growth</i>			
Growing	0.056 (0.017)***	-0.443 (0.169)**	0.020 (0.011)*
Stagnating	0.018 (0.014)	0.013 (0.176)	0.011 (0.007)
Shrinking	0.043 (0.015)***	-0.546 (0.214)**	0.004 (0.008)
<i>Industry</i>			
Manufacturing	0.045 (0.016)***	-0.429 (0.281)	0.007 (0.008)
Energy, water, waste	-0.018 (0.020)	0.582 (0.678)	0.045 (0.015)***
Construction	0.111 (0.015)***	-2.195 (0.185)***	-0.052 (0.014)***
Trade	0.134 (0.027)***	-0.680 (0.212)***	-0.029 (0.015)*
Transport, storage	0.118 (0.014)***	-1.976 (0.352)***	-0.058 (0.020)***
Accommodation, food service	0.224 (0.028)***	-1.839 (0.206)***	-0.146 (0.021)***
Information, communication	-0.024 (0.013)*	-0.472 (0.216)**	-0.014 (0.012)
Financial and insurance activities	-0.013 (0.030)	2.255 (0.953)**	0.003 (0.011)
Real estate activities	-0.010 (0.024)	-0.939 (0.346)***	-0.024 (0.014)*
Professional, scientific, technical activities	0.010 (0.016)	-0.024 (0.176)	0.003 (0.008)
Admin. and support service	0.064 (0.020)***	-1.203 (0.160)***	-0.037 (0.022)*
Public admin., defence; social security	0.051 (0.013)***	1.181 (0.581)**	-0.025 (0.021)
Education	0.073 (0.023)***	-0.888 (0.368)**	0.028 (0.017)
Human health, social work	0.039 (0.044)	0.348 (0.370)	0.016 (0.010)
Arts, entertainment, recreation	-0.005 (0.025)	-0.186 (0.321)	0.003 (0.021)
Other service activities	0.074 (0.035)**	-0.124 (0.343)	0.016 (0.025)
<i>Firm age</i>			
<5	0.070 (0.011)***	-0.482 (0.238)**	-0.005 (0.014)
<10	0.074 (0.019)***	-0.943 (0.221)***	-0.008 (0.011)
<15	0.014 (0.031)	-0.685 (0.210)***	0.024 (0.027)
<20	0.152 (0.024)***	-0.240 (0.316)	0.007 (0.015)
≥ 20	0.007 (0.013)	-0.147 (0.143)	0.021 (0.007)***
<i>Wage level</i>			
Low	0.030 (0.020)	-0.439 (0.175)**	0.002 (0.019)
Medium	0.070 (0.017)***	-0.653 (0.200)***	0.000 (0.005)
High	0.000 (0.011)	1.173 (0.256)***	0.027 (0.009)***
<i>Province</i>			
Vienna	0.000 (0.025)	-0.519 (0.525)	0.004 (0.020)
Lower Austria	0.038 (0.015)**	-0.283 (0.208)	-0.033 (0.008)***
Upper Austria	0.061 (0.029)*	0.158 (0.159)	0.015 (0.013)
Burgenland	0.066 (0.014)***	-1.108 (0.330)**	-0.041 (0.020)*
Styria	0.110 (0.020)***	-0.948 (0.313)***	-0.036 (0.017)*
Carinthia	0.082 (0.013)***	-1.021 (0.298)**	-0.053 (0.021)**
Salzburg	0.136 (0.088)	-0.847 (0.251)**	0.014 (0.018)
Tyrol	0.100 (0.022)***	-1.004 (0.343)**	-0.009 (0.008)
Vorarlberg	0.018 (0.072)	-0.594 (0.334)	0.014 (0.014)

Notes: Estimates from linear regressions with the 3 independent variables (labour market tightness indicators): vacancy posting rate in %, job vacancy rate in % and job vacancy duration in days. Dependent variable: firm's share of unemployed in hirings in %. Independent variables are measured in the previous year, in the industry and region. All regressions control for 16 industry effects, 84 region-specific effects, COVID-19 year 2020, real GDP and labour supply growth, and firm characteristics including employee characteristics and turnover in the previous year. Region-clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.