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**THE FEASIBILITY OF
USING ONLINE JOB
ADVERTISEMENTS IN
ANALYSING UNMET
EU DEMAND**

Joanna Napierala

The **European Centre for the Development of Vocational Training** (Cedefop) is the European Union's reference centre for vocational education and training, skills and qualifications. We provide information, research, analyses and evidence on vocational education and training, skills and qualifications for policy-making in the EU Member States.

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CHAPTER 1.

Introduction

The limitations of traditional data push researchers towards searching for alternative sources of information. The abundance of open and big-data sources on almost any aspect of our life is creating opportunities for analysis and can bring new knowledge for which traditional data did not suffice (see Bircan et al., 2021). A good example is the Web Intelligence Hub – Online Job Advertisements ([WIH-OJA](#)) database, which contains information from the content of online job advertisements scraped from public websites helping employers to fill vacancies. The current joint endeavour of the European agency for development of vocational training (Cedefop) and Eurostat, part of the pillars of Trusted Smart Statistics, began as a project ⁽¹⁾ with the aim of building skills intelligence to support policy-makers in better designing labour market policies (Cedefop 2019).

Migration is another research area where the use of big data in analysis is quite common (Bosco et al., 2022). The analysis of labour mobility flows within the EU is constrained due to the incompleteness of the registry data. Geo-tagged big data (e.g. from Twitter, Facebook) were used to gain more knowledge about workers using freedom of movement (EC, 2020). Nevertheless, the focus of studies has been to understand the stocks and flows of migrants rather than more detailed characteristics of the phenomenon (Bosco et al., 2022).

This paper focuses on presenting some insights from exploratory research using big data based on online job advertisements to identify vacancies that target foreign workers. Labour migrants often use networks and word of mouth to find employment (e.g. for seasonal work in agriculture, domestic services, construction); this specific demand for foreign workers will not be observed in this type of data. Yet, next to the social networks, the recruitment agencies play a key role as intermediaries and facilitators in the matching process between employers and foreign workers. Barriers such as language, cultural differences and lack of knowledge about workers' credentials make it more difficult for employers to recruit workers across borders, and migrant networks might not always be as efficient. The analysis of online job advertisements, especially the identification of occupations for which is it difficult to find local workers, has the potential to bring more understanding about the shortages of workers and skills in the EU.

⁽¹⁾ [Cedefop project: Skills in online job advertisements.](#)

CHAPTER 2.

Role of online job advertisements in the matching process

Two decades have passed since economist David Autor (Autor, 2001) predicted that the internet would change the way employer-employee matches are made on the labour market. Online job advertisements are playing an increasing role in the matching process as employers use online job advertisements more to reach out for potential candidates and the number of people using the internet to look for new jobs increases. Globally, in 2018 every fifth vacancy was filled through online job advertisement (Cedefop et al., 2021).

The increasing use of online search technologies was enabled by the increase in the proportion of households with access to high-speed internet (Denzer et al., 2021). The use of online job advertisements (OJAs) is perceived as a cheap search method for jobseekers, but the lack of digital skills may hinder people from using this method when searching for a job. There is a high country and sectoral variation in usage of OJAs in the recruitment process in the EU (Napierala et al., 2022). Yet, overall reliance on the internet in applying for jobs is expected to grow; the online job advertisements market in Europe is predicted to rise by 8% between 2021 and 2028 ⁽²⁾.

Online job advertisements are attractive to jobseekers; browsing websites grants them access to more job offers than do traditional 'help wanted' ads in newspapers or magazines, or social networks. Access to OJAs makes information gathering easy, especially for employed individuals who search for a new position (Stevenson, 2009). Moreover, the search is more efficient when AI-based filter mechanisms show jobseekers suitable vacancies based on their skills and prior experience. Similarly, the introduction of OJAs has enabled more efficient matches, reducing firms' recruiting effort and decreasing the costs of recruiting by removing geographical barriers (allowing recruitment of workers from abroad), reducing response times (the websites offer better screening of applications) and enabling a high volume of applications. Additionally, for employers, databases of the CVs of potential candidates offer the option of passive job search. The use of online job advertisements is also associated with better matches, which also leads to better use of workers' skills (Mang, 2012).

⁽²⁾ [Europe online recruitment market forecast to 2028: COVID-19 impact and regional analysis by job type \(permanent and part-time\) and application \(finance, sales and marketing, engineering, IT, and others\)](#).

CHAPTER 3.

Different ways to identify advertisements targeting foreign workers

The real-time labour market intelligence based on big data, such as online job advertisements, can provide more detailed information that complements information coming from conventional labour market analysis. We acknowledge that non-discriminatory policies make it illegal for an employer to mention ethnicity in OJAs; it is not straightforward to identify shortage occupations for which employers struggle to find local workers. Therefore, in this paper, the focus is on understanding ways that OJAs can be used to understand such unmet demand that employers try to address by recruiting foreign workers.

Not every opening in a company is advertised online. We have few reasons to believe that employers who are struggling to find workers on local markets will be more likely to advertise online. One is related to the mechanism of labour market tests ⁽³⁾. In some countries, companies are legally obliged to report a vacancy to the public employment services before offering it to any foreign workers. We may expect that advertisements targeting foreign workers will be increasingly published online simply because the public employment institutions use the internet to reach out to potential unemployed people more often than they did a decade ago. It is common for the employment offices to have their own databases of vacancies. In cases where the employment offices are not digitalised, the advertisements may still become published online when passed by national employment services to the European Employment Services (EURES), the portal designed to facilitate the free movement of workers across Europe. The potential increase in outreach is another reason for the higher chance of observing posts for shortage occupations being advertised online. Employers expecting difficulties in finding an adequate worker on the local market may turn to the intermediaries, such as employment agencies and head-hunters, who will support them in recruitment. The posting information about a vacancy online is expected to increase the pool of potential candidates. To increase the outreach, employers may also post an advertisement on websites in other countries as well as on national websites. Targeting a specific group of migrants ⁽⁴⁾ may also influence the

⁽³⁾ [European Commission. *European migration network glossary: labour market test.*](#)

⁽⁴⁾ Before the war in Ukraine, many job advertisements in the main receiving countries were already being published in the Ukrainian language.

choice of language of the advertisement (e.g. advertising in English rather than in the particular national language). In the rest of this chapter, the application of the approaches mentioned above will be tested and discussed in the context of analysing online job advertisements to identify occupations for which employers struggle to find local workers.

3.1. Using information about vacancies posted by private employment agencies

The employment agencies that deal with providing staff under temporary employment contracts play an important role as labour market intermediaries and facilitators of migration (Piore, 1979). Identification of advertisements posted directly by employment companies would allow identification of the shortage occupations for which companies seek intermediaries' help in the recruitment process. Taking such an approach would require the registry of names of employment agencies that provide such services and the information about the company name ⁽⁵⁾ to be included in the content of advertisements.

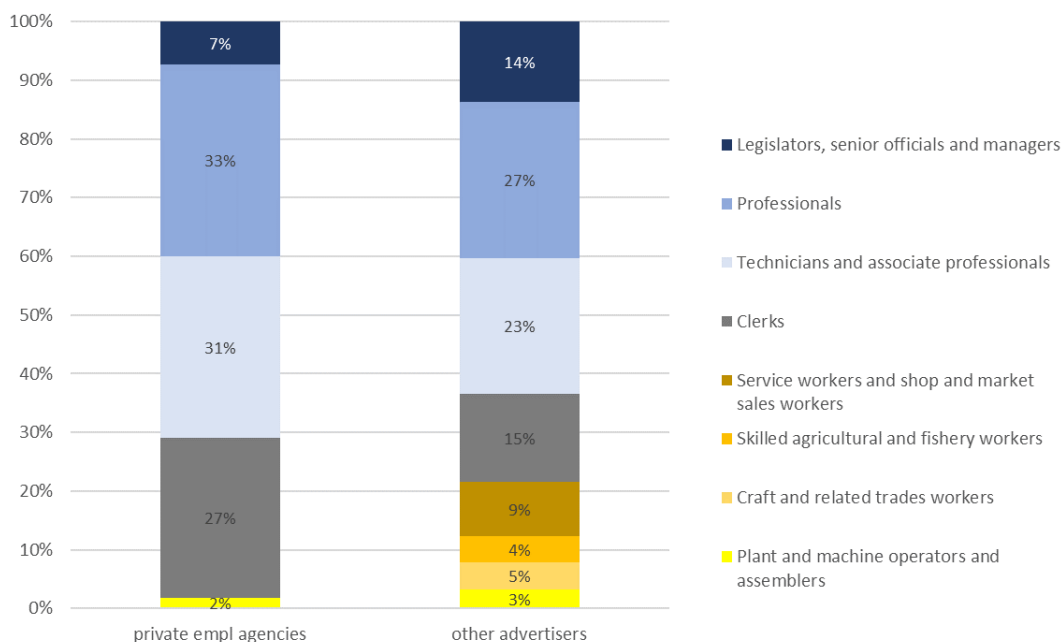
For the purpose of this paper, we have used the registry of licences given to private employment agencies in Malta. Malta was chosen for illustrative purposes and because information about the employment agencies is made publicly available by the Maltese Department of Industrial and Employment Relations (DIER). According to this registry, the number of private recruitment agencies increased in Malta from 13 in 1995 to around 236 in Q4, 2021 ⁽⁶⁾. Most of these agencies offer financial services and/or act as consultancy firms, which either provide head-hunting services for top jobs or help with recruitment for positions where there is a shortage of workers. Only a few recruitment agencies are entirely focused on and offer their recruitment services to all levels of jobseekers and cover all occupations. The final list of names matched between the WIH-OJA database and companies from the registry totalled 41. The occupations advertised by private employment agencies differed from the other postings in Malta (Figure 1), with more advertisements seeking highly skilled workers. These results corroborate survey results indicating that 66% of companies in Malta struggled to find the required specialised skills in the local labour market ⁽⁷⁾.

⁽⁵⁾ For data protection reasons, this information is not publicly available.

⁽⁶⁾ The list downloaded for analysis from the website in November 2022 included 180 different names.

⁽⁷⁾ [EY Malta \(2022\). Malta attractiveness survey.](#)

Figure 1. **Job advertisements posted by employment agencies and other advertisers in Malta (Q1-Q2 2022)**



Source: Own calculations based on WIH-OJA data.

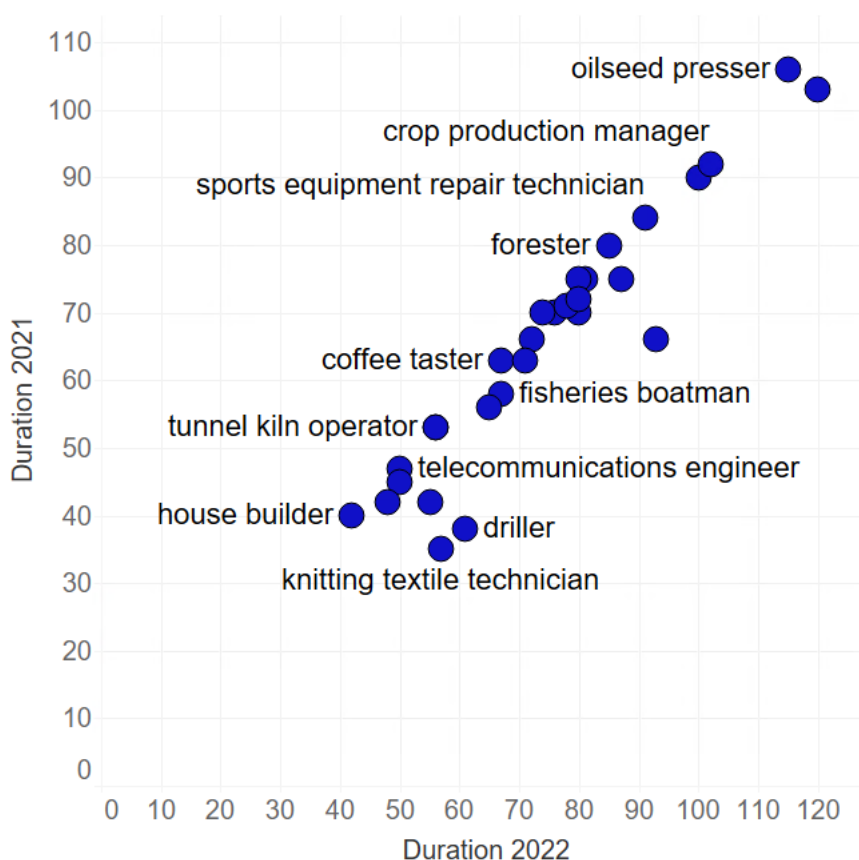
The potential bias in this type of analysis is related to the availability of information about the company name in the content of online job advertisements. The analysis is also restricted by the limited availability of national registries with the names of licensed employment agencies. Although the text-matching algorithms have improved, some errors could also be generated during the matching procedure. Moreover, some employment agencies may be playing a double role in the migration process, being involved in recruitment of both foreign workers for local employers and local workers for foreign employers. The latter situation can only be determined by checking the information about the place of the posting, if such information exists in the content of the advertisement. Finally, some companies may also use employment agencies for other reasons than seeking help in recruiting foreign workers (e.g. when it is cost-efficient).

3.2. Duration of the job postings

The length of duration of online job postings could be a proxy of the difficulty of finding suitable local workforce, and can be used as another proxy of unmet demand. We can assume that the longer the duration of an advertisement, the more difficult it is to recruit a person for the position.

Analysis of changes in the duration of posting could point to the occupations for which the average time has significantly increased or decreased compared to the previous year. For example, the analysis of duration of OJAs published in the two first quarters of 2022 compared to the similar period in 2021 shows few occupations for which the duration increased significantly; for example, that for poultry sexers, with average time already long in 2021 (more than 100 days), increased to 120 days. Similarly, the average duration of advertisements for air traffic safety technicians increased from 63 days in 2021 to 71 in 2022.

Figure 2. **Occupations for which duration of posting increased between 2022 and 2021**



NB: Only occupations with increase of 5% or above in duration displayed.

Source: Own calculations based on WIH-OJA data.

The potential bias in this type of analysis is related to the fact that some websites offer a pre-set period for which employers can post OJAs; for example, 30, 60 or 90 days. As well, the employer can keep the advertisement online despite the post being filled, so the observed duration will not match the actual vacancy period. Another bias in this type of analysis arises from the fact that, when the duration of some advertisements is not evident in the OJA content, it needs to be

computed. For example, if the release date is not given, it can be replaced by the date of first indexing ⁽⁸⁾. Similarly, if the information about the due date is not mentioned in the OJA, it might be replaced by the date of last indexing ⁽⁹⁾. Calculating the posting duration is also problematic as the platform providers do not delete online job advertisements ⁽¹⁰⁾. However, especially for jobs with a high turnover, employers may keep the advertisement online for a whole year.

3.3. Language of job advertisements

The analysis of languages in which the advertisements are written could be another way to identify the demand for foreign workers based on OJAs ⁽¹¹⁾. We may expect that, especially in countries with high inflows of migrants, employers who struggle to find workers among the local labour force may advertise in English ⁽¹²⁾. Excluding Cyprus due to its past connection with the United Kingdom, the share of OJAs written in English is quite high; the highest rate was observed in Luxembourg, followed by Greece, Portugal and Romania. However, we observe, with no exception, that the chance of job advertisements for IT roles being written in English was in all Member States much higher than for other occupations; for example, in Romania almost 80% of advertisements for IT occupations were written in English compared with just 25% for other occupations. The higher ratio of advertisements for IT occupations in English may be related to the fact that around 55% of companies in the European Union reported having difficulties in recruiting workers due to the shortage of skilled professionals ⁽¹³⁾.

⁽⁸⁾ The moment when the OJA was observed for the first time in the data collection system.

⁽⁹⁾ The moment when the OJA was observed for the last time in the data collection system.

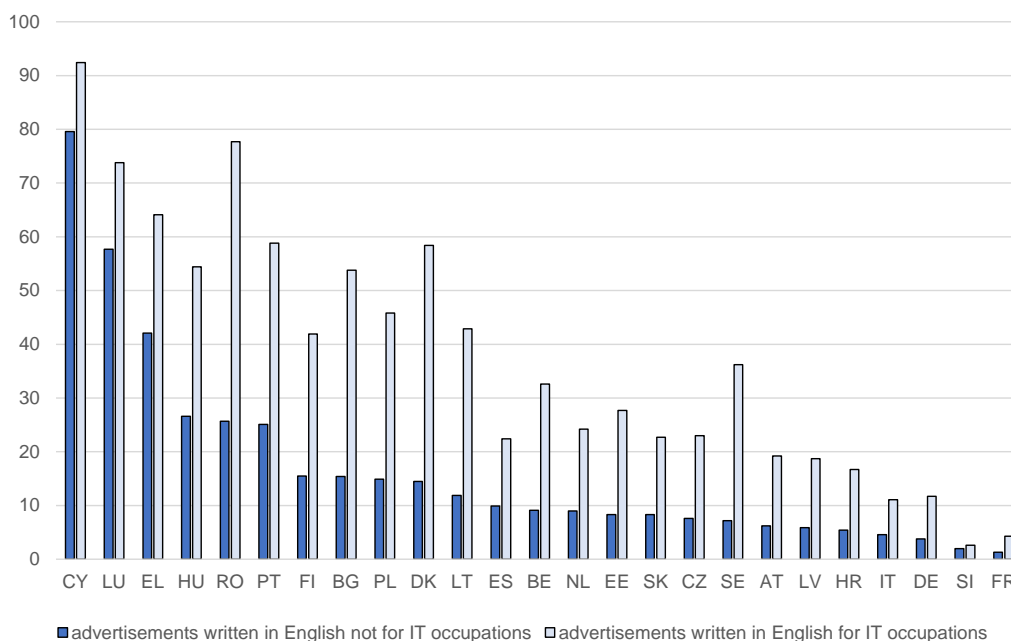
⁽¹⁰⁾ In WIH-OJA the due date is set to a maximum of 180 days.

⁽¹¹⁾ It may happen that, under the return campaigns, employers targeting workers in receiving countries write OJAs in their own language (e.g. Polish employers advertising Polish jobs in Ireland or Germany). We control for such situations by only including advertisements about vacancies in the same country; e.g. OJAs published on German websites about vacancies in Germany.

⁽¹²⁾ This part of the analysis was not carried out for Ireland, Malta and the UK, where all advertisements are published in English.

⁽¹³⁾ Eurostat (2021). *Statistics explained: ICT specialists: statistics on hard-to-fill vacancies in enterprises*.

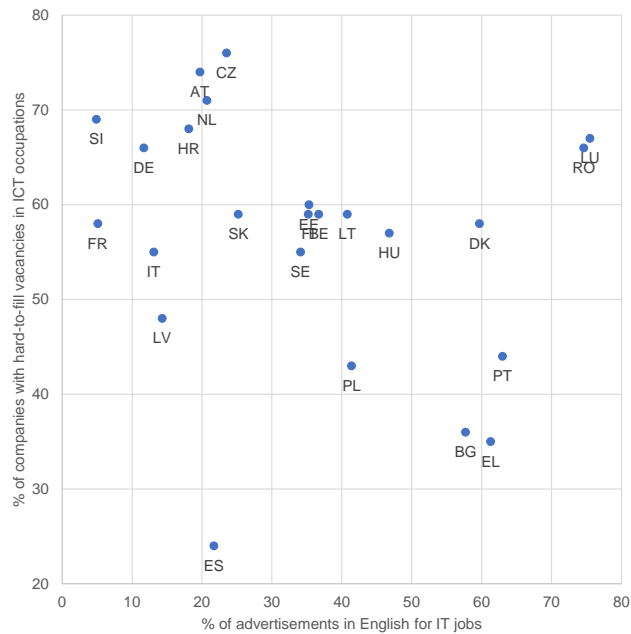
Figure 3. **Job advertisements written in English for IT and other occupations**



Source: Own calculations based on WIH-OJA data.

The comparison of information about the shares of companies with hard-to-fill vacancies for IT occupations across Member States with information about the shares of advertisements to recruit such workers published in English shows a lack of correlation. This may indicate that there are other reasons for employers posting advertisements in English. The survey of Dutch employers showed that advertisements were written in English for screening reasons because the organisation was looking for an English-speaking person, or English was the corporate language (van Meurs et al., 2015). Employers might also post advertisements in English when they think that the job title will sound more gender-neutral than in their native language, that doing so may attract more candidates who speak English, or to create a global image of the organisation (ibidem).

Figure 4. **Share of companies with hard-to-fill vacancies for IT occupations and % of IT advertisements written in English (2020)**



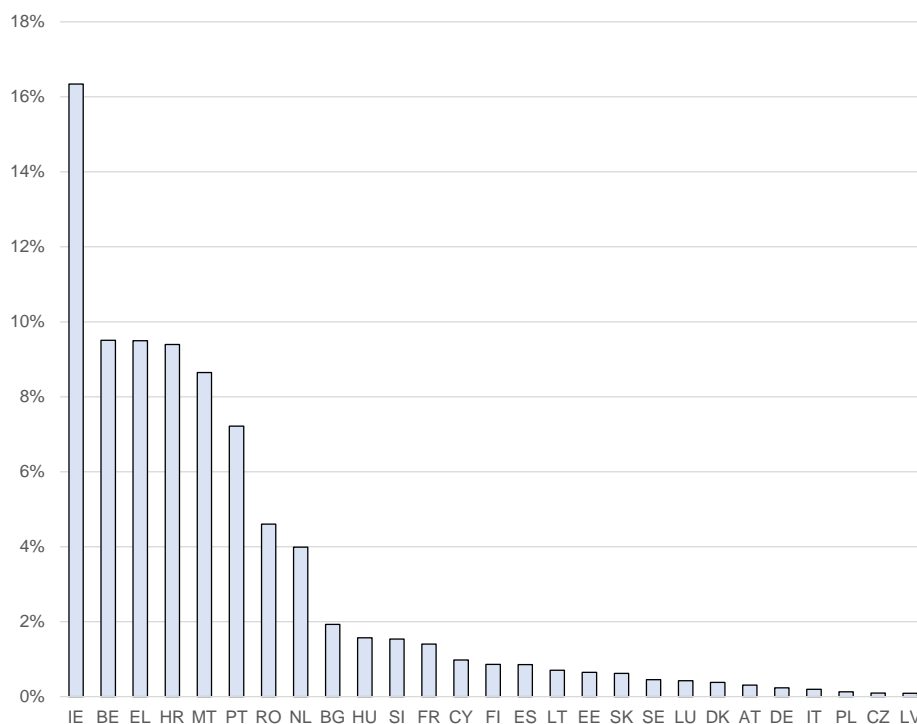
Source: Eurostat (isoc_ske_itspen2, isoc_ske_itrcrn2 and isoc_ske_ittn2), own calculations based on WIH-OJA data.

3.4. Job advertisements posted on foreign websites

The content of an OJA together with metadata can provide two additional pieces of information which jointly can help in identification of unmet demand. That is, information about the website from which the OJA was obtained can reveal the country the advertisement comes from. It is also possible to see the origin country of the vacancy when the location of the workplace is mentioned. For example, if we find an advertisement on a Polish website about a vacancy from a company in Germany, we know that the German employer is trying to find workers in Poland. Looking at advertisements for IT occupations, it was observed that employers from the UK tried to recruit workers from Ireland (16% of all adverts for these occupations in Ireland were coming from the UK) (Figure 4). Companies from the UK also advertised vacancies in Belgium, Greece and Croatia (around 10% of IT advertisements). This type of analysis can be biased due to problems with potential misclassification of information about the workplace, in particular when, in the content of the OJA, more than one possible workplace is mentioned. This can happen when a company has vacancies in more than one location, and it is up to the successful candidate to decide in which place to take up employment. Misclassification of workplace location can also occur when the vacancy is offered

by the branch, and the locations of both the branch and the company headquarters are mentioned.

Figure 5. **Share of advertisements for IT occupations posted on national website advertising a position in the UK**

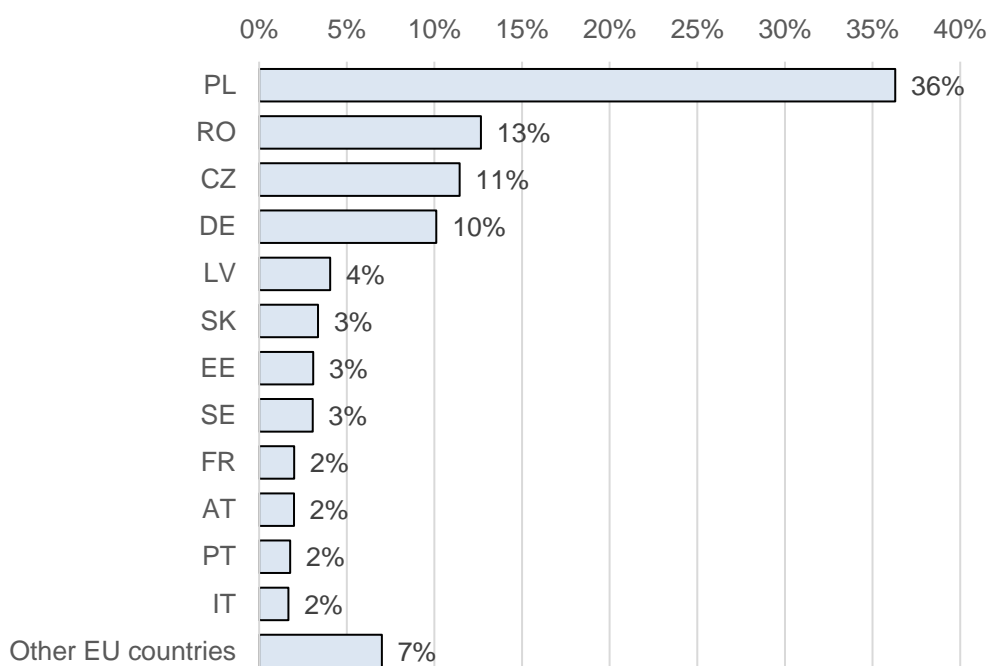


Source: Own calculations based on WIH-OJA data.

3.5. Job advertisements tagged by employers

Although non-discriminatory policies make it illegal for an employer to mention ethnicity in the content of an advertisement or to show any preference for or discourage someone from applying for a job, the companies providing recruitment platforms may help in the identification of unmet demand. The recent unprecedented situation with Ukrainian refugees in the EU showed that recruitment platforms could introduce a feature allowing employers to label job advertisements for which they would considered employing migrants. The platform providers can have a separate section with advertisements targeting Ukrainians, or may enable labelled advertisements to be filtered more easily. This additional information allowed us to identify potentially unmet demand for which employers struggle to find local workers. Our analysis shows that, in May 2022, more than 20 000 OJAs were marked as targeting Ukrainians.

Figure 6. **Shares of OJAs targeting Ukrainian workers, by country**



Source: Skills OVATE microdata. Own calculations.

3.6. Tightness of the labour market

Another way to look at demand potentially targeting migrants is to analyse labour market tightness. According to the Eurofound definition, ‘A tight labour market is one in which demand for labour is at least as strong as supply’ ⁽¹⁴⁾. It is a situation where an economy is close to full employment and employers need to compete for workers. Lack of access to migrant workers might lead to upward pressure on wages. According to this measure, the labour market is tighter the greater the number of firms seeking to fill jobs relative to the number of would-be workers looking for jobs.

We used the numbers of job postings observed in 2021 as a proxy for the number of firms seeking to fill jobs, and the average number of unemployed as a proxy for would-be workers in each region.

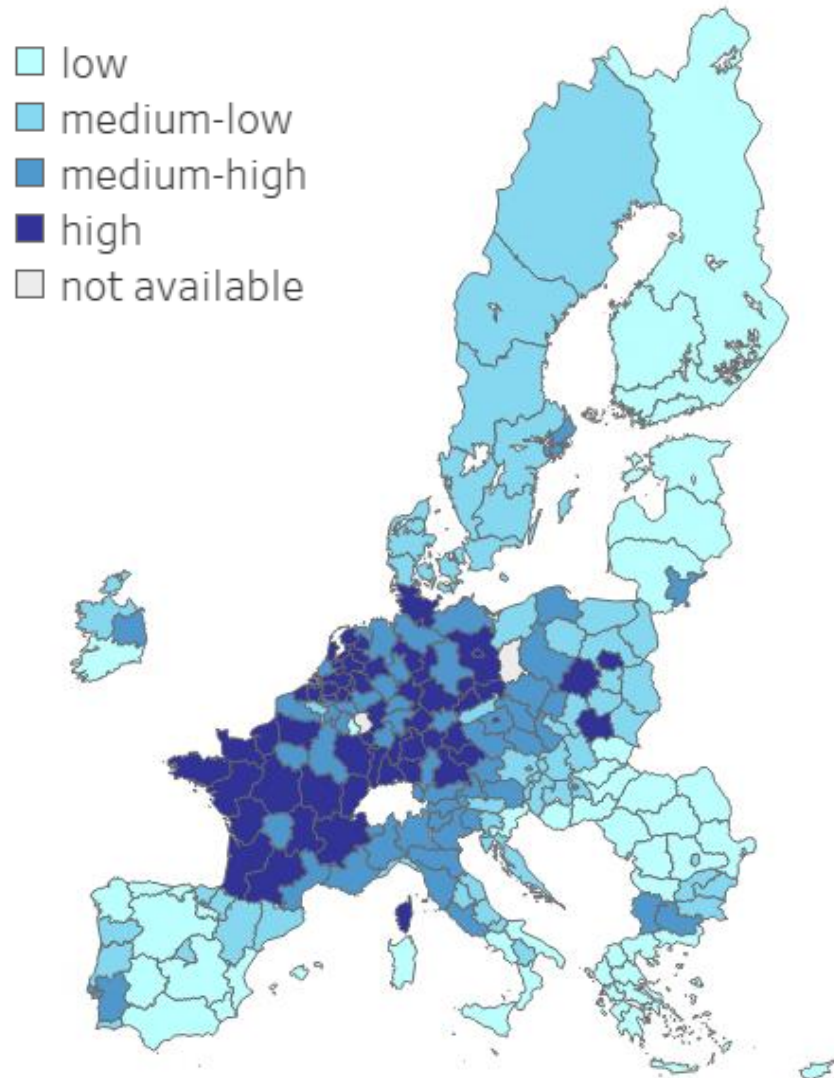
The results obtained for the regions were used to divide them into four quartile groups: lowest, medium-low, medium-high and highest values of tightness. In the first group, of lowest tightness, containing a majority of regions in Greece, Spain,

⁽¹⁴⁾ Eurofound (2020). *Eurwork European Observatory of Working Life: industrial relations dictionary: labour market slack*.

Estonia, Latvia, Finland and southern Italy, there were on average more than 10 unemployed individuals per one job posting. The second group of regions, with medium-low tightness, there were on average up to five unemployed people per one job posting. This group included Denmark, Sweden, eastern regions in Poland, and a few regions in Austria, Bulgaria and Portugal. The third group of regions, with medium-high tight labour markets, with on average up to 10 unemployed people per job posting, included some regions in France and Germany, and western Poland, a few regions in Bulgaria and the northern part of Italy. The fourth group, with the highest tightness, included the majority of regions in France and Germany, the Netherlands and some regions of Poland; there were shortages of workers as the average number of unemployed people to the average number of job postings was below one.

This type of analysis points at imbalances in terms of the numbers of workers at aggregate regional level. The lack of supply-side data with granularity similar to that in OJAs means it is not possible to estimate tightness at occupational or even skills level. Other biases in this analysis come from the fact that the information about the region of the potential vacancy is classified based on the information included in the job advertisement, which is sometimes missing. We also know that more industrialised regions have better coverage than rural regions in terms of the number of vacancies being posted online (Napierala et al., 2022).

Figure 7. Tightness of the labour market by region in EU-27



NB: Average numbers for 2021.

Source: WIH OJA database, LFST_R_LFSD2PWN.

CHAPTER 4.

Discussion

The six approaches presented in the previous chapter show that analysis of OJAs offers a variety of options to understand better the unmet demand for workers in the EU. However, no single approach is free of biases and challenges related to missing data (e.g. names of companies, due dates of vacancies) or deficiencies in algorithms used to identify and classify information (e.g. names of workplaces). Therefore, all approaches presented may be used only as a proxy of unmet demand.

The great potential of using online job advertisements for analysis lies in the granularity of the information they provide and the timeliness of data collection. Yet the potential of big data cannot be fully realised when the calculation of indicators is not based solely on these data. For example, the measure of tightness of a labour market depends on the data about the numbers of unemployed obtained through the labour force survey (LFS). Although the LFS is carried out each quarter, some information is available only on a yearly basis. Also, we can only calculate the aggregated tightness at regional levels as information about the characteristics of the unemployed (e.g. level of education) is not available.

Despite all the challenges with application of the discussed approaches, careful use of these data might help support shaping the EU economic migration policy based on the demand-led approach. As the European Training Foundation (ETF) is setting up the OJAs system in third countries (e.g. Ukraine, Tunisia, Morocco), the created databases offer a similar possibility for identifying occupations advertised by European employers outside the EU. Further potential lies in the use of information that the EURES portal collects about employers interested in recruiting from abroad. However, right now, transmitting information about the vacancies for which employers struggle to find workers to the EURES database is not obligatory, which reduces the usefulness of these data ⁽¹⁵⁾.

⁽¹⁵⁾ The latest available information shows that, for countries for which this information was available, only 75% of the job vacancies published by employment services was passed to EURES (EC, 2021).

Acronyms

Cedefop	European Centre for the Development of Vocational Training
CV	curriculum vitae
DIER	Department of Industrial and Employment Relations
ETF	European Training Foundation
EURES	European Employment Services
Eurostat	European Statistical Office
IT	information technology
LFS	labour force survey
OJA	online job advertisement
VET	vocational education and training

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THE FEASIBILITY OF USING ONLINE JOB ADVERTISEMENTS IN ANALYSING UNMET EU DEMAND

Understanding the characteristics of vacancies for which employers seek to recruit foreign workers could help to support the EU's economic migration policy, based on the demand-led approach.

This working paper presents discussion of six potential approaches to using online job advertisements in analysing unmet demand. Specifically, it seeks to understand the challenges of using online job advertisements for identifying worker shortages.



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