Factors influencing labour shortages in Visegrad (V4) countries with regard to difficult economic environments

József Poór
MATE University, Hungary
Faculty of Economics and Informatics, J. Selye University, Slovakia
Email: poor.jozsef@uni-mate.hu

Tímea Juhász
Faculty of Foreign Trade, Budapest Economic University, Hungary
Email: juhasz.timea@uni-bge.hu

Zdeněk Caha
Institute of Technology and Business, Czech Republic
Email: caha@mail.vstecb.cz

Marzena Stor
Wroclaw University of Economics and Business, Poland
Email: marzena.stor@ue.wroc.pl

Łukasz Haromszeki
Wroclaw University of Economics and Business, Poland
Email: Elukasz.haromszeki@ue.wroc.pl

Keywords:
labour market, employment, challenges, V4 countries, Covid-19 pandemic, the Russian–Ukrainian war

The central goal of this article was to investigate the current factors influencing labour shortages in the Visegrad Group (V4) countries, analyse the impact of external events such as the Covid-19 pandemic and the Russian–Ukrainian war on labour markets and examine how organisational characteristics contribute to these shortages. Furthermore, we aimed to identify patterns and variations in labour shortage causes across V4 countries to provide insights into the evolving dynamics of their labour markets. In the context of these research goals, we can confidently state that they have been realised. This achievement is attributable to the comprehensive analysis of the factors influencing labour shortages, the examination of the impact of external events and the exploration of organisational characteristics in contributing to labour market challenges. During our research, we examined three research questions. In doing so, we established that organisational characteristics (ownership form and size) are an important characteristic of labour market challenges. The challenges of the difficult economic situation require greater flexibility and an adaptive strategy from organisations. We also outlined that it is advisable to switch from traditional hierarchy-oriented transitive management to a more humane transformative management solution.

Introduction

Labour markets in the former socialist bloc, including the V4 countries (Czech Republic, Hungary, Poland and Slovakia) have changed significantly over the past few decades, along with workers' attitudes towards employers. Two or three decades ago, lifelong employment at companies or organisations was typical. Within the framework of the former socialist system, it was not the labour supply that was characteristic, but rather labour demand (Camara 1997, Wike et al. 2019). The negative socioeconomic phenomena of the 1990s also played a role in the current labour market situation. Labour related work was prescribed in decrees and resolutions, and in their implementations, political priorities prevailed above all, and professional aspects were almost negligible (Morley 2008, Kazlauskaite et al. 2013). Employment was centrally controlled by the state, and there was no free labour market (Letiche 1998, Zupan–Kaše 2005). Moreover, since the principle of full employment was in force, sometimes there was even an obligation to work.

After the regime change in 1989, the 'horror' of unemployment appeared on the labour markets of these countries, where this was unimaginable before. Already after 1989, high unemployment and the hope of higher income forced skilled, talented and mobile employees to migrate to better paid jobs mostly at foreign owned companies, or to leave their countries to Western Europe for work (Causa et al. 2021). Many, however, opted for early retirement where this was possible (Fultz–Ruck 2000).

Based on different sources (ILO 2020, Dorn–Zweimüller 2021), even before the outbreak of the Covid-19 pandemic, it could already be said that up to seven million workers had left the labour markets of transitioning Central and Eastern European countries – of which nearly three million represented the V4 countries. Due to deteriorating demographics and other reasons, labour shortages have developed in various areas and positions. Finding, acquiring and retaining the right human capital presents several challenges to various companies and institutions. In many Eastern European countries, including the V4 region, the indicated phenomenon also contributed to the shortage on the labour market. The labour market tightness index (number of vacancies) is 2% in the European Union and 1.9% in the Eurozone. In 2017, it was highest in the Czech Republic, at 4.1%, while in Hungary it was 2.4% and the values in Poland and Slovakia were 1.1% (Portfolio 2017). The same indicator deteriorated even more in the post-Covid period. Job vacancy was 3% in the European Union (EU) in 2022; the highest value among V4 countries was registered in Czech Republic (4.9%) (Eurostat 2022).

The phenomenon of foreign direct investment (FDI) inflow is the appearance and spread of new production, service and management technologies and methods in host countries. In the developed countries (of the western world), the proportion of people employed by foreign companies reaches 5–6%, apart from smaller countries like Ireland (50%) and New Zealand (25%). In V4, this number reached 30% in Slovakia,

22% in Hungary, 16% in the Czech Republic and 6.9% in Poland in 2018 (Levis 2005, Poór et al. 2019, UNCTAD 2016, 2023, Götz et al. 2023). These values, mainly in the case of Hungary, have decreased to 15% due to the acquisitions of the reigning government. Another new trend is that the V4 countries are starting to realise that attracting export-oriented FDI based on low wages and relatively low education is less and less successful (Hunya 2017, Lengyel 2022). We are witnessing many changes. In particular, Poland has been successful in attracting foreign investment in the information technology (IT) sector, becoming known as the 'Silicon Valley of Europe' (Morgan Philips 2021). Similarly, Slovakia has made significant strides in the automotive and electrical engineering industries, becoming known as the 'Detroit of the East' (Alfaro–Chen 2016). Hungary, often referred to as the 'pharmacy of Europe', has a strong pharmaceutical industry with elite medical technologies and a robust information and communication technology (ICT) sector (Hungary today 2022). The Czech Republic, with its strong manufacturing industry, particularly in high-tech engineering, machine engineering and automotive engineering, is often referred to as the 'manufacturing powerhouse of Central Europe' (Janicek 2023).

However, negative demographic phenomena, migration, structural transformation and wage disparities have caused a drastic rate of labour shortages, which has already threatened production in key sectors of the economy (ILO 2018). Similar to other EU countries (Guo et al. 2022), there is a significant lack of qualifications in many manual and skilled jobs and a surplus of qualifications among workers in many intellectual occupations. As we have already indicated, this trend is not a new phenomenon. Its foundations appeared in the V4 several decades ago (Lutz 2010), first in Hungary especially, and later in the other three. Additionally, new micro influencing factors such as education or religious affiliation have appeared today (Castelli 2018).

One of the key issues of human resource management (HRM) in V4 countries today is the dramatic increase in labour shortages, which has been influenced by a variety of factors, namely outbound labour migration after regime change, unfavourable demographic factors (Hardy et al. 2018), the economic downturn and wage differences within the EU (Horie–Kumo 2020, Morley et al. 2020). The labour markets of V4 countries are going to face several challenges. The demand for skilled labour is growing rapidly. Excess labour supply has largely become a thing of the past, and it is unusual for job seekers to struggle to find a job (ILO 2020). Rather, employers need to make increased efforts to find the right candidates. Consequently, it is not the improvement of selection processes that causes problems for businesses but the problem of not having enough candidates (a recruitment pool shortage).

Zielinski (2022) deals with changes in the labour markets of V4 countries from 2018 to 2021. In most of these countries, women lost their jobs relatively less often than men during the pandemic. In several cases, a decrease in employment and an

increase in unemployment among young people, people aged 55–64 and individuals with the lowest education were recorded.

Before the Covid-19 pandemic that broke out at the end of 2019, the global, regional and V4 economic situation was good. Growth data and prospects were encouraging (Matoušková 2020). Unemployment was low (HCSO 2018). By this time, the role of the automotive industry in the economy had become one of the important characteristics of the V4 countries (Chlopcik 2018, Horbulák 2022). However, the opinion is spreading, that an export-driven economic policy based on assembly plants does not help these countries innovate (Szent-Iványi 2017).

In this context, the main goal of this article is to investigate the current factors influencing labour shortages in V4 countries, analyse the impact of external events such as the Covid-19 pandemic and the Russian–Ukrainian war on labour markets and examine how organisational characteristics contribute to these shortages. Additionally, this article aims to identify patterns and variations in labour shortage causes across the V4 to provide insights into the evolving dynamics of their labour markets.

Theoretical background

According to Barnow et al. (1998), there is a shortage of professionals when the labour market balance is upset because the number of workers in demand exceeds the supply of those who are willing and able to work at given wages under given conditions, at a given place and time, with appropriate experience and education. In V4 countries, both quantitative and qualitative labour shortages are present. Quantitative labour shortage indicates a shortage of labour that can be expressed in absolute numbers, and qualitative shortage refers to 'shortages in particular skills, occupations or sectors' (Reymen et al. 2015: 21).

According to the Eures Report (2022) covering 27 EU countries and Norway and Switzerland, the imbalances (surpluses or shortages) experienced in today's European labour market can be attributed to the following reasons: dominance by one gender, new technologies, the transition to a climate neutral economy, the ageing workforce and conditions of work and employment. The dominance of certain regions in Eastern Europe, including V4 countries, such as the labour force attraction of a country's capital or the underdevelopment of eastern regions, is also an important influencing factor.

In the field of human resource management, turnover refers to the migration of the workforce – employees changing jobs or leaving the workplace (Privara et al. 2023). Fluctuation shows the number and percent of terminated employment relationships at the company within a given period. Fluctuation is one of the most important performance indicators within human resource management. Within an organisation, if this indicator begins to increase, it immediately draws the attention of

managers to individual problems and errors. These problems can hinder the successful and effective operation of the organisation in the long term. Being aware of this, serious attention must be paid to fluctuation within an organisation and, where appropriate, this phenomenon must be influenced (Staw 1980).

Determining the optimal level of turnover is not a simple process, since one would think that very low turnover is best for an organisation. However, this is not entirely true, as too low turnover implies that there is no movement, development and displacement. If everything is constant, the whole organisation can fade into this permanence. High turnover draws attention to processes that the company must make efforts to eliminate (Huselid 1995).

A thorough study of the topic includes a systematic examination of the causes and, more broadly, of the factors influencing it. According to different sources (Barnow et al. 2013, Cedefop 2015, Frohm 2019, World Bank 2023), the shortage of professionals is influenced by many factors, such as:

- poor demographic indicators,
- the demand of Western European investments for cheap labour,
- the durability of the demand for live work, the slow processes of automation and robotization,
- the salary level, and
- educational and training deficiencies.

The labour market is constantly and rapidly changing. We live in a world where there is huge competition in every market: for customers on the goods and services market, for investors on the capital market and for the best labour force on the labour market. The rise of globalisation, innovation and automation is radically changing both the demand and supply sides of the labour market. The example of the USA between 1800 and 2015 serves to illustrate the enormous changes in the labour market of the industrialised world. Currently, 1.62% of the population is employed in agriculture, 19.28% in industry and 79,1% in services (Statista, 2022). Statistical data from the European Union show similar trends: agriculture 3.8%, industry 16% and services 80.2% (Statista 2023).

The economic crisis caused by Covid-19 pandemic developed unexpectedly, fundamentally affecting human resources and requiring strong government action. Tóth et al. (2023) demonstrate the differential effect of government measures on unemployment, with their study analysing the evolution of unemployment data for 11 countries (Australia, Chile, the United Kingdom, Israel, Japan, China, Hungary, Germany, Italy, Turkey and the USA) and two groups of countries (the EU-27 and the Organization for Economic Co-operation and Development [OECD]) during the economic crisis.

Due to Covid-19 pandemic, a significant economic downturn was observed in the whole world in 2020 – except for a few countries (e.g. China, Ireland, etc.) – but this was corrected in 2021 due to the reopening of the economy, which continued in 2022.

This year's outlook shows many uncertainties. Due to the impact of Covid-19 pandemic, unemployment jumped, but it was much lower than most experts had expected (Su et al. 2021).

The most important effects of the three waves of the Covid-19 related to the labour market can be summarised as follows (Dajnoki et al. 2022):

- The coronavirus pandemic has devalued and made many jobs dangerous due to overload (e.g. healthcare).
- Employers had to retain their employees with much more complex and innovative solutions than before (e.g. well work and well-being).
- The Covid-19 resulted in the appearance of new HR functions; the pandemic plan (workplace hygiene, health protection and isolation) was transformed into an area of strategic importance. Organisations must prepare for the operation of flexible work solutions in the long term.

While the Covid-19 pandemic and its subsequent economic challenges have led to notable unemployment spikes and job devaluation, it is important to note that these events have also inadvertently slowed the growth of labour shortages in some sectors by affecting economic activities and demand for labour.

The ongoing war in Ukraine has also presented unique challenges to the global economy. After two years of Russia's war in Ukraine, it can be concluded that the majority of organisations are currently pursuing a cautious business strategy and have not yet decided to take drastic change management steps. In addition, they are looking for opportunities to exploit market changes brought about by the war (Tooze 2022). For more than a year and a half, the war has had a significant impact on the world economy, which culminated in rapidly rising inflation, raw material shortages and growing uncertainty in Europe and in the countries examined. This economic decline, coupled with the lingering effects of the Covid-19 pandemic, has played a significant role in shaping the current state of labour shortages, demonstrating the intertwined nature of global crises and labour market dynamics.

Ruiz-Marín et al. (2023) found significant differences in the spatial association of business failure processes due to Covid-19, which are further understood when the authors examined sectoral differences.

Diamond (1999) believes that we can successfully prepare for the challenges of the future if we intelligently understand everything that is possible from the past. Many historians have pointed out that plague epidemics in the Middle Ages had a significant social impact: due to the large number of deaths, the value of labour increased, and serfs and peasants were able to make agreements with their landlords under much more favourable conditions than before. Other social scientists believe that we have no idea what the labour market will look like in 2050. It is generally agreed that machine learning and robotics will change almost every field of activity – from making yogurt to teaching yoga (Harari 2019, Morgan 2022). However, it must

also be seen that new technologies are already eliminating many traditional jobs from the work process.

The impact of most technologies on jobs is expected to be net positive over the next five years. The jobs that are decreasing the fastest are office or secretarial roles, bank tellers and related clerks, postal service clerks, cashiers and ticket operators and data entry clerks (WEF 2023). According to some opinions, today's labour shortage areas will soon disappear due to the new type of robotization (Ford 2016). Based on latest research, 47% of jobs in the USA are 'at risk' due to robotization (Hess–Ludwig 2017). If we look to the longer term, then the former may also occur in expert and knowledge intensive areas (Susskind–Susskind 2015).

New technologies trigger a need for new ways of communicating in recruitment. In addition, today's generation has different expectations at the workplace. It can be concluded that the technological transformations of the past brought more structural transformations and less mass downsizing (Arntz et al. 2019).

The structure of employment in the V4 is significantly affected by technical and technological changes (Martinak 2020). The development of new technology will transform nearly three-quarters of physical jobs by 2030. However, we also need to consider that the impact of new digital technologies will mean that not only physical but also intellectual jobs will increasingly require less expertise. According to World Robotics (IFR 2023), 3.5 million operational stocks of industrial robots were in factories worldwide in 2022.

Goodhart and Pradhan (2020) believe that over the next three or four decades, many countries or regions (e.g. Japan, China, North Asia, Europe, etc.) will see a significant decrease in the number of workers. However, the number of pensioners over 65 will increase rapidly due to the rise in life expectancy. Enabling older people to stay active for longer and engage in voluntary, caring and artistic activities can have both social and economic benefits and alleviate some of the fiscal burdens associated with ageing societies (Nikolova 2016, Gratton–Scott 2016*)*.

In the world's total labour market, as well as in the labour market of the V4 countries, significant changes have taken place because of socioeconomics. One of the consequences of these changes, according to surveys, is that the acquisition and retention of talent and a skilled workforce has become critical for employers (Stor 2023). The problem is also relevant to Slovak companies (Štefánik 2018). An important new factor in the Slovak labour market until the outbreak of the crisis caused by the Covid-19 pandemic was that the unemployment rate fell to the level of the EU-28 average, which was already below the average unemployment rate before the outbreak of the economic crisis in 2008–2009. Of course, behind the favourable numbers were hidden regional differences (e.g. in Eastern and Central Europe and in Slovakia the unemployment rate is higher and around the capital negligible), generational (e.g. the unemployment rate among young people was 16% in 2019) and other factors (e.g. sectoral differences) (Stachova et al. 2020). There are also studies

that report on the gender pay gap (Harman–Bartušková 2023) or deal with the minimum wage and youth employment in V4 countries (Fialova–Mysikova 2021).

In recent years, the labour market in the former socialist bloc V4 has changed significantly, altering the relationship between employees and employers. Two or three decades ago, lifelong employment at one company or organisation was typical. Now, that's a thing of the past (Vlacseková–Mura 2017, Fedor 2021). The Covid-19 pandemic has only intensified this situation and other HR issues that already existed (e.g. working from home, flexible working hours, digital competences and working climate) (Backes-Gellner–Tuor 2010, Sheedy 2020).

Demographic processes, such as age composition and migration, have intensified in recent years. It is essential to recognize that educational structures, including vocational education, adult education and higher education, often struggle to meet the actual demands of companies. This challenge often results in a 'skill gap', referring to missing basic competencies, or a 'skill mismatch', when the composition of the workforce does not align with the requirements of the economy.

The outflow of skilled labour abroad significantly reduces the competitiveness of a local economy. This has happened in the past 25 years in the case of former socialist countries. The IMF pointed out in 2016 that 'adversely affecting growth in sending countries and slowing' (Atoyan 2016: 5).

With the accession of countries that have changed their political system, migration between member countries took on a new impetus, generating new processes. The primary purpose of this new type of migration is employment.

Industry 4.0 and robotics, which are already present in our economy, can provide answers to some of the problems, but recent research suggests that robotics will also cause new problems, putting up to 34% of jobs 'at risk'.

New digital technologies make it possible to change the workforce in areas where both physical strength and mental expertise is required, such as doctors, lawyers and other professionals. It is not a matter of whether robotization is required or not; rather, the question is when, where, how quickly and how far it will spread in V4 countries. Shortages in certain sectors and the Covid-19 pandemic can speed up this process. This direction can have an impact on both education and state programs. These above-mentioned labour market anomalies have already arisen and are still being developed in various parts of the world, including V4 countries. Without claiming completeness, the following may be mentioned:

- Improving the demographic situation, increasing the activity rate of the population (e.g. raising the retirement age).
- Educational reforms – dual education (e.g. Germany), lifelong learning, e-learning methods in education (e.g. USA) and retraining programs (Kennedy 1959).
- Hard and soft responses by companies (Backes-Gellner–Tour 2010).
- Labour exchange, Industry 4.0 and robotization, labour import.

– Organisational climates, leadership styles, development of employment relations, introduction of new incentive systems (e.g. cafeterias) and atypical employment.

We must not forget, that wage competition has also recently intensified in V4 countries. Governments, businesses, various organisations and individuals are confronting challenges in determining the direction of companies, government programmes and individuals based on international comparisons, setting priorities in national economies and finding ways for different generations of the population to sustain their employment and competitiveness in the labour market. These are the pressing issues we are currently addressing in this region. The problem of the lack of skilled labour increasingly affects enterprises, so the V4 are forced to change their strategies related to human resource management and to introduce measures that can help them fill vacant positions and retain current good employees (Bakker et al. 2004, Kozák 2019).

The general characteristics of the V4 labour markets can be described as follows (Pietschmann et al. 2016, Schwarcz et al. 2021, Horbulák 2022, 2023, Statista 2023, Astrov 2019):

– *Population* increased in Czech Republic (10.6 million) and Slovakia (5.45 million) and decreased in Hungary (9.6 million) and Poland (38.4 million) in 2022.
– *GDP* in Poland has had four periods of growth and one period of decline during Covid-19 pandemic. The Czech Republic, Hungary and Slovakia have had three periods of growth and two periods of decline. In 2023, Poland, Czech Republic and Slovakia's GDPs have increased by 0.23%, 0.18% and 1.1%, respectively, while Hungary's has declined by 0.9%.
– *Unemployment* has always been highest in Slovakia. The unemployment level of the Czech Republic has always been the lowest. Hungary has always exceeded Poland's unemployment rate. In 2023, Slovakia's unemployment was 6.4%, Poland's was 5.1%, Hungary's was 3.61% and Czech Republic's was 2.22%. The highest unemployment rate in the European Union was in Spain at 12%. But this indicator was also above 10% in Greece. In the entire EU, it was 6.4%, while now it is 6.0% as of March 2024 (Eurostat 2024).
– *Hourly labour productivity* increased in all four countries of the region in 2017 as follows: Slovakia (20.9 euro), Czech Republic (17.4 euro), Hungary (14.10 euro) and Poland (12.4 euro). *Hourly labour costs* in 2022 were as follows: Czech Republic (15.5 euro), Slovakia (14.2 euro), Poland (11.5 euro) and Hungary (10.4 euro). *Minimum wages* in 2022 were as follows: Czech Republic (651 euro), Slovakia (646 euro), Poland (641euro) and Hungary (547 euro). We only note that the minimum wage in European Union countries was between 477 and 2,571 euros in January 2024 (Kónya 2024).

– *Work from home* showed a significant gap with the EU average. The share of home office workers increased during the Covid-19 and declined again since the end of the pandemic.
– *Number of foreign workers* is as follows: Poland (1.3 million), Czech Republic (0.823 million), Hungary (0.1 million) and Slovakia (0.1 million) (Hassan et al. 2023, European Commission [Slovakia] 2023, CNA 2024).

The issues addressed and the characteristics of the V4 countries in the theoretical part of the article provide a broader context for the empirical research presented in the next section of the article.

Methodology

Attracting talent, retaining staff and robotization are current issues for which managers and HR professionals are constantly seeking new and innovative solutions to maintain a competitive advantage over rivals. To delve deeper into them, nine European universities collaborated and conducted survey research. The study was conducted as part of a project titled 'Skills Shortages, Retention, and Robotization – Challenges and Solutions 2022'.

The studies were carried out in several European countries, and this study presents the results obtained in the V4 countries (Usunier et al. 2017). The authors reached out to the organisations involved in the research through universities, which were asked to fill in a questionnaire on the topic (Evans 1977).

Responses were voluntary and anonymous, and the data were used for research purposes only, in compliance with the General Data Protection Regulation (GDPR). A total of 393 organisations from Hungary, 120 from Poland, 229 from the Czech Republic and 124 from Slovakia participated in the survey. The sample took one year to collect.

Our current questionnaire is not completely new. We developed it during several similar researches in 2017 and in 2020. The questionnaire was based on the authors' own questions and did not use questionnaires from other researchers. Before sending out the questionnaire, a test survey was carried out by researchers and, as respondents had no problems with interpretability, the questions were sent out unchanged. Organisations were reached through social media platforms and university students, so the willingness of organisations to respond could not be measured by the researchers.

In total, respondents were asked to answer 21 closed questions. The variables were nominal, ordinal and interval, the latter being based on a 5-point Likert scale, where 1 was not at all characteristic and 5 was completely characteristic. Following Joshi et al. (2015), we interpreted the Likert scale as an interval scale, not an ordinal one. We also aimed to combine all the items in order to create a composite score for an individual (Carifio–Perla 2007, Boone–Boone 2012).

The questionnaire was based on four groups of questions. The structure of the questionnaire is summarised in Table 1.

Table 1

Structure of the questionnaire

Specification of the sample	Types of crises and causes of labour shortages	Workforce selection practices of organisations	Retention practices in organisations
Country of operation; Ownership structure of the organisation; Industry sector of the organisation; Number of employees; Annual revenue of the organisation	The organisation's involvement in the Ukrainian–Russian war; The involvement of the organisation by Covid-19; Possible causes of labour shortages	Typical staff selection methods employed by companies; Influential factors affecting the practice	Types of staff retention programmes implemented in the companies under investigation; Factors that exert influence on these programmes; Tools and strategies employed for employee retention

In this study, we set out to answer the following research questions:

– What organisational characteristics influence the causes of labour shortages within an organisation?
– Does exposure to Covid-19 pandemic and war affect the potential causes of labour shortages?
– Can the V4 countries be categorized into different groups based on the reasons for their labour shortages?

Along with these research questions, we will examine the validity of the following hypotheses in the context of the study for the sample:

– H1: organisational characteristics (ownership type, size and annual revenues) influence the causes of labour shortages within an organisation.
– H2: the impact of Covid-19 pandemic on labour shortages among manual and administrative workers differs from the impact of Russia's war in Ukraine.
– H3: the V4 countries can be categorized into different groups based on the reasons for labour shortages, for both administrative and manual workers.

At this point, it is important to clarify the terminology used in our study. The term 'manual workers' refers to individuals engaged in work that predominantly requires physical labour, often necessitating the use of hands, physical skill and strength. Such tasks may include construction, manufacturing and maintenance roles. The shift from 'physical workers' to 'manual workers' in our terminology is deliberate, aiming to reflect the skill-based and hands-on nature of these roles more accurately. This distinction helps recognize the specialised skills many manual workers possess, moving away from broader implications that might not fully capture the essence of their work. Additionally, we refer to 'administrative workers' as individuals primarily involved in office-based tasks that support the day-to-day operations of an

organisation. These roles typically require organisational, clerical or managerial skills, and may include tasks such as scheduling, data entry and managing correspondence. By distinguishing between manual and administrative workers, we aim to categorize the workforce in a manner that more precisely acknowledges the different skill sets and working environments pertinent to each group.

As for the validity of the hypotheses, they were analysed using SPSS version 28. Univariate and multivariate tests, such as cross-tabulation, ANOVA, factor and cluster analyses, were conducted. In the following section, we will analyse the data in relation to the three hypotheses.

Research results

The research sample was diverse in terms of organisational size, turnover and ownership structure, as presented in Table 2.

Table 2

Sample characteristics (company size, turnover, ownership structure) by country

(%)

Characteristics		Czech Republic	Hungary	Poland	Slovakia
Organisational size	micro	8.3	13.0	20.8	24.7
	small	24.5	14.8	21.4	18.5
	medium	25.8	23.5	19.5	27.2
	large	41.5	48.7	38.3	29.6
Turnover	below euros 300,000	26.5	21.7	36.5	43.0
	between euros 300,001–3,000,000	24.3	13.0	17.6	26.6
	between euros 3,000,001–30,000,000	23.5	27.8	12.8	10.1
	over euros 30,000,001	25.7	37.4	33.1	20.3
Ownership structure	domestic private	48.2	45.3	50.3	59.8
	domestic public property	18.6	14.5	18.1	11.0
	foreign	28.8	33.3	21.9	25.6
	mixed	4.4	6.8	9.7	3.7

In the survey, the responding firms were asked to rate on a 5-point scale which factors contributed most to the shortage of administrative and manual workers. A rating of 1 indicated that the factor was not a contributing feature at all, while a rating of 5 indicated that the factor was a significant contributing feature. Table 3 presents the average ratings (mean [M]) and their variability (standard deviation [SD]) given by the surveyed firms for the two groups of workers.

Table 3

Reasons contributing to labour shortages as rated by surveyed organisations (mean, standard deviation)

Reasons	Administrative staff		Manual workers	
	mean	standard deviation	mean	standard deviation
Labour-syphoning effect of competitors	2.87	1.240	3.44	1.488
Wages too low	3.06	1.177	3.42	1.345
Lack of skilled labour	2.65	1.163	3.18	1.471
Emigration abroad	1.94	1.085	2.58	1.474
The problem of the education system	2.12	1.165	2.42	1.441
Poor working conditions	1.87	1.115	2.36	1.336
Shortcomings in transport infrastructure	1.90	1.069	2.16	1.245
Difficulties in reconciling work and private life	2.26	1.232	2.47	1.306

The data show that the respondents were not unanimous, as indicated by the high standard deviations. For administrative workers, the main reasons were low wages (M = 3.06), the drain on labour by competitors (M = 2.87) and the lack of skilled labour (M = 2.65). For manual workers, the reasons for labour shortages were the same: better offers from competitors (M = 3.44), inadequate wages (M = 3.42) and lack of skilled workers (M = 3.18). We also analysed, for both types of employees, how each reason interacts with the others. The Pearson correlation analyses revealed a number of relationships that are only presented where the correlation coefficient is above 0.4. Thus, for administrative workers, a strong positive relationship is found between the crowding-out effect of competitors and low wages (r = 0.536), and a positive relationship is also identified between more favourable offers from competitors and the shortage of skilled labour (r = 0.410). Furthermore, we find that the poorer working conditions are, the more likely they are to have an impact on the difficulty of reconciling work and private life (r = 0.445). For manual workers, the stronger the crowding-out effect of competitors, the more likely they are to have low wages (r = 0.408), and the more likely it is that an organisation offers low wages, the more likely it is to have a shortage of skilled workers (r = 0.404).

We also examined the factors that influence labour shortages among both manual and administrative workers in the light of three factors: ownership type, size and annual revenue. ANOVA results are summarised in Table 4.

Table 4

Factors leading to labour shortages for administrative and manual workers by company size, company turnover and company ownership (p = 0.05)

Reasons	Administrative workers		Manual workers	
	F-test	significance	F-test	significance
Company size				
The labour-syphoning effect	**3.307**	**0.020**	1.358	0.255
Wages too low	**3.676**	**0.012**	**2.738**	**0.043**
Lack of skilled labour	0.452	0.716	**2.797**	**0.040**
Emigration abroad	0.918	0.432	0.205	0.893
The problem of the education system	2.361	0.071	**6.041**	**0.001**
Poor working conditions	0.777	0.508	1.366	0.253
Shortcomings in transport infrastructure	1.949	0.122	**3.653**	**0.013**
Difficulties in reconciling work and private life	2.549	0.056	1.571	0.196
Turnover				
The labour-syphoning effect	2.551	0.055	**2.790**	**0.040**
Wages too low	0.718	0.542	1.087	0.355
Lack of skilled labour	1.076	0.359	**3.429**	**0.017**
Emigration abroad	1.208	0.307	0.783	0.504
The problem of the education system	1.236	0.297	1.084	0.356
Poor working conditions	**3.798**	**0.011**	0.909	0.437
Shortcomings in transport infrastructure	0.518	0.670	0.467	0.705
Difficulties in reconciling work and private life	2.131	0.096	0.462	0.709
Form of ownership				
The labour-syphoning effect	**2.719**	**0.044**	0.450	0.717
Wages too low	**7.236**	**0.000**	2.138	0.095
Lack of skilled labour	0.959	0.412	2.500	0.059
Emigration abroad	1.769	0.153	0.900	0.441
The problem of the education system	2.534	0.057	1.718	0.163
Poor working conditions	**6.080**	**0.000**	**3.101**	**0.027**
Shortcomings in transport infrastructure	0.594	0.619	0.537	0.657
Difficulties in reconciling work and private life	2.233	0.084	0.215	0.886

The data in Table 4 show that neither manual nor administrative workers had significant differences in reconciling work and private life or emigration. For the labour-syphoning effect, there are differences in administrative workers by firm size and ownership type. The situation is similar for low wages. However, when analysing poor working conditions, there is a difference by form of ownership. For manual workers, there are differences in the size, ownership and turnover dimensions for many of reasons. For example, problems with the education system by company size, shortages of skilled labour by company size and turnover, low wages by company size and ownership, etc.

Overall, we accept hypothesis H1, i.e. organisational characteristics (ownership type, size and annual revenues) influence the causes of labour shortages within an organisation.

The research also looked at how the coronavirus and the Russian–Ukrainian war have affected firms in terms of staff retention, with 37.7% of organisations not responding to both questions. Of the remaining respondents, 246 companies were affected by the Covid-19 pandemic and 17.4% by the war crisis. We analysed the probability of the factors leading to labour shortages based on Covid-19 and war exposure. We excluded firms that did not report war and Covid-19 effects from logistic regression. Table 5 presents the cases where logistic regression demonstrated significant relationships for Covid-19 exposure.

Table 5

Logistic regression results for the impact of Covid-19 pandemic and war exposure on labour shortages (p = 0.05)

Reasons		B	Standard error	Wald	df	Sig.	Exp(B)
Administration	lack of skilled labour	–0.519	0.131	15.615	1	0.000	0.595
Manual processors	transport infrastructure deficiencies (difficult access to the workplace)	–0.223	0.113	3.920	1	0.048	0.800
	difficulties in reconciling work and private life	–0.235	0.110	4.603	1	0.032	0.790

The results show that firms not affected by the Covid-19 pandemic were less likely to have a shortage of administrative staff, and that manual workers were less likely to be affected by the pandemic than firms due to a lack of transport structure and problems in reconciling work and private life. The firms not affected by Covid-19 were in a better position than those affected, especially for shortage of administrative staff.

We looked at the impact of the Russian–Ukrainian war. For manual workers, the logistic regression was not significant in either case, while it was for administrative workers, as shown in Table 6.

Table 6

Logistic regression results for the impact of war exposure on labour shortages among administrative workers (p = 0.05)

Reasons		B	Standard error	Wald	df	Sig.	Exp(B)
Administration	labour-syphoning effect of competitors	–0.506	0.141	12.795	1	0.000	0.603
	wages too low	0.304	0.149	4.145	1	0.042	1.355
	poor working conditions	0.304	0.150	4.115	1	0.043	1.356

The data show that firms not affected by the war are more likely to be affected by wage issues and poor working conditions, while firms affected by the war are less likely to be affected by the strong syphoning effect of competitors. In the light of the above, we cannot unanimously accept H2, i.e. the impact of Covid-19 on labour shortage-inducing factors affecting manual and administrative workers was not fully demonstrated to be different from the impact of the Russian–Ukrainian war.

Finally, we examined if V4 countries could be categorized into distinct groups based on labour shortages for both administrative and manual workers. To do this, we grouped the variables examined in Table 3 into separate factors for the two groups of workers. For administration, we formed three factors with the following data: KMO and Bartlett test: 0.763, Varimax rotation and explained coefficient of variance: 65.150%. For manual workers, the KMO and Bartlett test was 0.665 and Varimax rotated factors were 63.035 %. The lack of skilled labour was not suitable for factorisation and was removed.

Table 7 summarises the factors constructed for the two types of workers with Cronbach's alpha values, with more reliable factors for administrative workers. In both cases, three factors were constructed.

Table 7

Factor analysis results for labour shortage reasons by type of worker

Factors	Items	Component			Cronbach's alpha
		1	2	3	
Administrative workers					
Wages	wages too low	0.860			0.685
	labour-syphoning effect of competitors	0.835			
	lack of skilled labour	0.534			
Expatriation and education	the problem of the education system		0.770		0.625
	emigration abroad		0.732		
	transport infrastructure deficiencies (difficult access to the workplace)		0.563		
Workers' well-being	difficulties in reconciling work and private life			0.868	0.614
	poor working conditions			0.712	
Manual workers					
Factors affecting the well-being of workers	difficulties in reconciling work and private life	0.798			0.589
	shortcomings in transport infrastructure	0.767			
	poor working conditions	0.592			
Wages	Wages too low		0.846		0.578
	labour-syphoning effect of competitors		0.785		
Expatriation and education	emigration abroad			0.827	0.471
	the problem of the education system			0.725	

These factors were then used to cluster the organisations for each of the two types of workers. Following Sajtos–Mitev (2007), we considered two factors in determining the number of clusters: the experience of the researcher and the relative size of the clusters. Since the sample was larger, we used non-hierarchical cluster analysis (K-means procedure). The cluster centres were created as shown in Table 8.

Table 8

Cluster analysis results for labour shortage factors by type of worker

Labour shortage	Cluster	
	1	2
Administrative employee		
Wages	–0.02963	0.01646
Expatriation and education	0.64650	–0.35916
Workers' well-being	0.95022	–0.52790
Manual worker		
Workers' well-being	–1.60852	2.10816
Wages	3.22239	–1.18071
Expatriation and education	2.38842	–1.02809

Based on the reasons for the administrative labour shortage (A), we have created two clusters:

– Cluster 1A: comprises organisations that attribute labour shortages more to issues related to employee well-being than to wage problems.
– Cluster 2A: comprises organisations that attribute labour shortages slightly more to wage issues.

For manual workers (M), there were also two clusters:

– Cluster 1M: primarily comprises firms that attribute their inability to retain their workforce to wages, emigration and education.
– Cluster 2M: comprises organisations that attribute labour shortages more to issues affecting the well-being of employees.

Finally, we looked at whether there were differences in clustering by country. A significant difference was confirmed for administrative staff (chi-square: 8.122, df: 3 sig: 0.44, $p < 0.05$). Czech (65.6%), Polish (73.2%) and Hungarian (62.3%) organisations were more in the second cluster, while 54.1% of Slovak organisations were in the first. No significant difference was found for manual workers (chi-square: 1.910, df: 3, sig: 0.591, $p > 0.05$). Three countries had a higher proportion of firms in the first cluster: Czech Republic (51.0%), Poland (50.7%) and Hungary (59.7%), while Slovak organisations were more in the second cluster (51.4%). In the light of the above results, it was not clearly demonstrated that the V4 countries can be categorized into different groups according to the reasons for labour shortages, both for administrative and manual workers, and therefore H3 is rejected.

Research summary

In this section, we will revisit the main goals of our study and evaluate whether we have successfully achieved them based on the presented findings. Additionally, we will provide answers to our research questions and relate them to the corresponding hypotheses. Finally, a short evaluation of our study and recommendations for the future research will be provided.

Our first research question outlined the influence of organisational characteristics on the causes of labour shortages within an organisation. Such variables in the Central European region have already been investigated, including factors like organisation or revenue size and ownership type (Brunello–Wruuck 2021), but also encompassing similar variables simultaneously (Szeiner et al. 2023). Our findings affirm that factors such as ownership type, size and annual revenue play a significant role in shaping the causes of labour shortages. This aligns with H1, which states that these characteristics would influence labour market challenges.

In our second research question, we explored the impact of external events – specifically, the Covid-19 pandemic and the Russian–Ukrainian war – on the potential causes of labour shortages. As demonstrated by other researchers, the pandemic (Ando et al. 2022) and Russia's invasion of Ukraine (Botelho 2022) are two external environmental variables that have significantly altered the European job market (Report 2023). Concurrently, they have the most influence on shaping what is referred to as the 'wandering context of events' (Stor 2022) that contemporary managerial staff deals with (Haromszeki 2022). These crises have underscored the fragility of economic structures, leading to a nuanced slowdown in the growth of labour shortages across various sectors. However, our analysis revealed nuanced insights. While these results partially support H2, which states that these events have different impacts on labour shortages, they also highlight the complicated ways in which external events affect labour markets, underscoring the need for adaptable strategies. The data indicate that organisations untouched by the war tend to face challenges related to wages and unfavourable working conditions, whereas organisations impacted by the war are less sensitive to the intense competitive pressure.

Finally, the third research question aimed to categorize the V4 countries into different groups based on their reasons for labour shortages. However, the study's findings did not conclusively establish such distinct categories, and thus H3 cannot be fully supported. Nevertheless, our study identified four clusters of organisations based on the reasons for labour shortages among administrative and manual workers. For administrative labour shortages, two clusters were established: one where matters of employee well-being were more significant and the other where wage problems played a slightly larger role. Similarly, for manual workers, two clusters were formed: one primarily attributing labour shortages to wages, emigration and education and the other focusing more on issues affecting employee well-being. Moreover, this research findings resonate with the broader discussions in the field. While our study may not

directly address the specific categories of labour shortages among administrative and manual workers as in other studies, it does underscore the importance of shifting from a performance-centred to a human-centred approach. As the situation in Ukraine stabilises and the aftermath of Russia's invasion comes to an end, the current dynamics in the V4 labour markets may shift. The influx of refugees from Ukraine, who have filled the gaps in labour shortages in many cases, presents a variable that could change. Should a significant portion of these individuals decide to return to their homeland, V4 countries might see an increase in labour shortages. This potential scenario highlights the need for strategic planning and adaptability in workforce management within these countries. Existing studies have consistently shown that focusing solely on achieving results can have adverse effects on both employee well-being and organisational performance (Boccoli et al. 2023). The significance of fostering a supportive organisational climate and receiving backing from superiors for sustaining employee well-being and job satisfaction, as highlighted in our work, has been a common thread in recent research (Zeidan–Itani 2020, Reinwald et al. 2021). Additionally, elements such as employer branding, revised compensation structures, empowerment, work autonomy, effective communication, training programmes, incentives and technology support, have been identified as critical factors in enhancing employee well-being and job satisfaction (Agarwal et al. 2022, Pass–Ridgway 2022), which are also identified in this study.

Final conclusions

In conclusion, this research has successfully addressed its primary goals and research questions. It is essential to highlight that this research not only contributes to the academic understanding of labour shortages in V4 countries but also holds practical value for policymakers, businesses and HR professionals. As for the scientific contribution, this study offers a nuanced understanding of labour shortages in V4 countries. It provides empirical evidence of the various factors that influence labour shortages, including organisational characteristics, external events like the Covid-19 pandemic and the Russian–Ukrainian war, and their different impacts on administrative and manual workers. Additionally, the research identifies patterns and variations in labour shortage causes across the V4, shedding light on the evolving dynamics of their labour markets. These findings enrich the existing literature on labour economics and human resource management.

Beyond its academic contribution, this research offers valuable insights for practical applications as well. Policymakers can use the findings to formulate targeted strategies for addressing labour shortages, considering the specific challenges faced by administrative and manual workers. Businesses and HR professionals can benefit from the analysis of organisational characteristics that influence labour shortages, enabling them to tailor their recruitment and retention practices accordingly. Moreover, the study's identification of country-specific patterns in labour shortage

causes can guide multinational corporations operating in V4 countries, helping them adapt their HR strategies to local conditions. Overall, the research bridges the gap between academia and practice, offering actionable recommendations for stakeholders navigating the complex landscape of labour shortages in the V4 region.

While the conducted research holds scientific and practical value, it is by no means free from certain limitations. The first of these limitations is associated with the issue of sampling and responses. The study relied on voluntary and anonymous responses from organisations, which exposed it to response bias. The recruitment method through social media and university students may not accurately represent the entire population of organisations, and their willingness to participate was also not measured, both of which can introduce sampling bias. Another limitation lies in the data collection timeframe, which spanned a year and could potentially introduce temporal bias. Economic, political or social conditions may have evolved during that time, affecting factors related to labour shortages differently. It is also essential to acknowledge that the research primarily identifies associations between variables but does not establish causality, and further studies would be needed to explore causal relationships. While cluster analysis was employed to categorize organisations based on labour shortage factors, the results did not clearly demonstrate distinct clusters for both administrative and manual workers, demonstrating the complexity of the issue. This limitation highlights the need for more comprehensive analyses in future research. Furthermore, since the study examines the impact of Covid-19 pandemic and the Russian–Ukrainian war on labour shortages, it may not fully account for all external factors influencing the labour market in V4 countries during the study period. Lastly, the research faced limitations in terms of hypothesis confirmation; while some hypotheses were supported by the data, others were not clearly confirmed, suggesting that the relationships between certain variables may be more complex than initially hypothesised.

In light of the comprehensive analysis presented in this study, there are several promising avenues for future research to further advance our understanding of labour shortages in V4 countries. To address the limitations identified in this research, longitudinal analyses should be conducted to track evolving trends and changes in labour shortages and their influencing factors over an extended timeframe. Expanding the scope of the study to include a broader set of countries beyond the V4 can enable cross-country comparisons and shed light on how regional, cultural and political contexts influence labour market dynamics. Moreover, exploring causal relationships between identified variables and labour shortages using advanced statistical techniques or experimental designs can help uncover the underlying mechanisms driving labour market challenges. The influence of specific industries or sectors on labour shortages deserves dedicated attention, as these sectors may face distinct challenges. Future research can also delve into the impact of emerging technologies, global supply chain disruptions (Francis 2020) and the ethical and social dimensions of labour shortages, all while developing evaluation frameworks to assess

policy effectiveness. In summary, we feel that, despite its limitations (Mason 2002), our research has increased and improved our knowledge of the labour market of the Eastern European region and the V4 countries within it. Our recommendations aim to build upon the findings and conclusions of this study, bridging the gap between academia and practice to provide actionable insights for stakeholders navigating the complexities of labour markets in the V4 region and beyond.

REFERENCES

AGARWAL, T.–ARYA, S.–BHASIN, K. (2022): Evaluating the impact of coronavirus disease-2019 pandemic on employer branding, employee engagement and employee performance: a moderation study of Indian information technology firms *Global Business Review* online first. https://doi.org/10.1177/09721509221119014

ALFARO, L.–CHEN, M. X. (2016): Location fundamentals, agglomeration economies, and the geography of multinational firms *Working Paper* No. 17–014., Harvard Business School, Boston, MA.

ANDO, S.–BALAKRISHNAN, R.–GRUSS, B.–HALLAERT, J.–JIRASAVETAKUL, L.–KIRABAEVA, K.–KLEIN, N.–LARIAU, A.–LIU, L.–MALACRINO, D.–QU, H.–SOLOVYEVA, A. (2022). *European labor markets and the Covid-19 pandemic: fallout and the path ahead* IMF: International Monetary Fund. Washington.

ARNTZ, M.–GREGORY, T.–ZIERAHN, U. (2019): Digitalization and the future of work: macroeconomic consequences *IZA DP* 12428. Institute of Labor Economics, Bonn.

ASTROV, V. (2019): Labour market trends in Visegrád countries: implications for Austria *Policy Notes and Reports* No. 33., The Vienna Institute for International Economic Studies, Vienna.

ATOYAN, R. (2016): *Emigration and its economic impact on Eastern Europe* International Monetary Fund, Washington.

BACKES-GELLNER, U.–TUOR, S. N. (2010): Avoiding labor shortages by employer signaling: on the importance of good work climate and labor relations *ILR Review* 63 (2): 271–286. https://doi.org/10.1177/001979391006300205

BARNOW, B. S.–TRUTKO, J.–LERMAN, R. (1998): *Skill mismatches and worker shortages: the problem and appropriate responses* Urban Institute, Washington.

BARNOW, B. S.–TRUTKO, J.–SCHEDE PIATAK, J. (2013): *Conceptual basis for identifying and measuring occupational labor shortages, in occupational labor shortages: concepts, causes, consequences, and cures* W. E. Upjohn Institute for Employment Research, Kalamazoo (MI).

BAKKER, A. B.–DEMEROUTH, E.–VERBEKA, W. (2004): Using the job demands-resources model to predict burnout and performance *Human Resource Management* 43 (1): 83–104. https://doi.org/10.1002/hrm.20004

BOCCOLI, G.–GASTALDI, L.–CORSO, M. (2023): The evolution of employee engagement: towards a social and contextual construct for balancing individual performance and wellbeing dynamically *International Journal of Management Reviews* 25: 75–98. https://doi.org/10.1111/ijmr.12304

BOONE, H. N.–BOONE, D. A. (2012): Analyzing Likert data *Journal of Extension* 50 (2): Article 48. https://doi.org/10.34068/joe.50.02.48

BOTELHO, V. (2022): The impact of the influx of Ukrainian refugees on the euro area labour force *Economic Bulletin* vol. 4. European Central Bank, Frankfurt am Main.

BRUNELLO, G.–WRUUCK, P. (2021): Skill shortages and skill mismatch: a review of the literature *Journal of Economic Surveys* 35 (4): 1145–1167. https://doi.org/10.1111/joes.12424

CAMARA DE LA, C. (1997): The labor market in Central and Eastern Europe: transformations and perspectives *Eastern European Economics* 35 (1): 76–93. https://doi.org/10.1080/00128775.1997.11648613

CARIFIO, J.–PERLA, R. J. (2007): Ten common misunderstandings, misconceptions, persistent myths and urban legends about Likert scales and Likert response formats and their antidotes *Journal of Social Sciences* 3 (3): 106–116. http://dx.doi.org/10.3844/jssp.2007.106.116

CASTELLI, F. (2018): Drivers of migration: why do people move? *Journal of Travel Medicine* 25 (1): tay040. https://doi.org/10.1093/jtm/tay040

CAUSA, O.–LUU, N.–ABENDSCHEIN, M. (2021): Labor market transitions across OECD countries: stylised facts economies department *Working Papers* No. 1692. OECD, Paris.

CEDEFOP (2015): Skill shortages and gaps in European enterprises: striking a balance between vocational education and training and the labour market *Cedefop reference series* No. 102. European Centre for the Development of Vocational Training, Luxembourg. http://dx.doi.org/10.2801/042499

CHLOPCIK, T. (2018): Automotive industry in the Visegrad group *7th Business & Management Conference* 05 June 2018, IISES, Budapest. https://doi.org/10.20472/BMC.2018.007.001

DAJNOKI K.– PATÓ, B. SZ. G.–KUN, A. I.–VARGA, E.–TÓTH, A.–KÁLMÁN, B. G.–KOVÁCS, I. É.–SZABÓ, SZ.–SZABÓ, K.–MAJÓ-PETRI, Z.–DÁVID, L. D.–POÓR, J. (2023): Impact of the three waves of Covid-19 pandemic on the HR practices of Hungarian organizations – experience from an empirical study *PLoS ONE* 18 (6): e0283644. https://doi.org/10.1371/journal.pone.0283644

DIAMOND, J. (2019): *Upheaval: turning points for nations in crisis* Kindle, New York.

DORN, D.–ZWEIMÜLLER, J. (2021): *Migration and labor market integration in Europe* IZA – Institute of Labor Economics, Bonn.

EURES (2022): *EURES-report on labor shortages and surpluses 2022* European Labor Authority, Luxembourg. https://doi.org/10.2883/50704

EVANS, I. S. (1977): The selection of class intervals *Contemporary Cartography* 2 (1): 98–124. https://doi.org/10.2307/622195

FEDOR, R. A. (2021): Job satisfaction in Hungary – comparative study *Economics and Sociology* 14 (2): 331–349. https://doi.org/10.14254/2071-789X.2021/14-2/18

FIALOVA, K.–MYSIKOVA, M. (2021): Minimum wage and youth employment in regions of the Visegrad countries *Eastern European Economics* 59 (1): 82–102. https://doi.org/10.1080/00128775.2020.1816474

FORD, M. (2016): *Age of robots* (In Hungarian) HVG book, Budapest.

FRANCIS, J. (2020): Implications for supply chain management *Frontiers of Health Services Management* 37 (1): 33–38. https://doi.org/10.1097/hap.0000000000000092

FROHM, E. (2019): Low labor shortages can help explain sluggish wage growth *Sveriges Riksbank Working Paper Series* No. 394., Sveriges Riksbank, Stockholm.
FULTZ, E.–RUCK, M. (2000): Pension reform in Central and Eastern Europe: an update on the restructuring of national pension schemes in selected countries *ILO-CEET Report* No. 25., ILO-CEET, Budapest.
GOODHART, CH.–PRADHAN, T. (2020): *The great demographic reversal: ageing societies, waning inequality, and an inflation revival* Palgrave Macmillan, London.
GÖTZ, M.–ÉLTETŐ, A.–SASS, M. (2023): Still attractive for FDI? Location advantages of Visegrád countries in the digital era – the case of Poland and Hungary *European Journal of International Management* 20 (1): 66–88. http://dx.doi.org/10.1504/EJIM.2023.130383
GRATTON, L.–SCOTT, A. (2016): *The 100-year life: living and working in an age of longevity* Bloomsbury, London.
GUO, Y.–LANGER, CH.–MERCORIO, F.–TRENTINI, F. (2022): Skills mismatch, automation, and training: evidence from 17 European countries using survey data and online job ads *EconPol Forum* 23 (5): 11–15.
HARARI, Y. (2019): *21 Lessons for the 21st century* Vintage, London.
HARDY, W.–KIEŁCZEWSKA, A.–LEWANDOWSKI, P. A.–MAGDA, I. (2018): Job retention among older workers in central and Eastern Europe *Baltic Journal of Economics* 18 (2): 69–94. https://doi.org/10.1080/1406099X.2018.1514562
HARMAN, J.–BARTUŠKOVA, L. (2023): The gender pay gap in the Visegrad groups *Journal of Economic Studies* https://doi.org/10.1108/JES-02-2023-0072
HAROMSZEKI, Ł. (ed.) (2022): *Leadership, employee and competency development for better talent management in the face of the dynamics of environmental changes* Publishing House of Wroclaw University of Economics and Business, Wrocław. https://doi.org/10.15611/2022.987.0
HASSAN, E.–SIÖLAND, L.–AKBABA, B.–CINOVA, D.–GASPERINI, M.–GERACI, M. (2023): *Annual report on intra-EU labour mobility 2022* European Commission, Brussels.
HESS, D. E.–LUDWIG, K. (2017): *Humility is the new smart rethinking human excellence in the smart machine age* Berrett–Koehler Publishers Inc., Oakland.
HORBULÁK ZS. (2022): The labour market situation in the Visegrad countries *The EUrASEANs: journal on global socio-economic dynamics* 6 (37): 114–126.
HORIE, N.–KUMO, K. (2020): Human resource management in transition. In: IWASAKI, I. (ed.): *The economics of transition: developing and reforming emerging economies* pp. 239–262., Routledge, London.https://doi.org/10.4324/9780429264979
HUNGARIAN CENTRAL STATISTICAL OFFICE [HCSO] (2018): *Main indicators of the Visegrád group countries* HCSO, Budapest.
HUNYA, G. (2017): Conditions for an investment revival in Central and Eastern Europe. In: GALGÓCZI, B.–DRAHOKOUPIL, J. (eds.): *Condemned to be left behind? Can Central and Eastern Europe emerge from its low-wage model?* pp. 25–46. ETUI, Brussels.
HUSELID, M. A. (1995): The impact of human resource management practices on turnover, productivity, and corporate financial performance *Academy of Management Journal* 38 (3): 635–672. http://dx.doi.org/10.5465/256741
INTERNATIONAL FEDERATION OF ROBOTICS [IFR] (2022): *World robotics report* Frankfurt am Main.

INTERNATIONAL LABOR ORGANISATION [ILO] (2018): *World Employment and Social Outlook: Trends 2018* Geneva.

INTERNATIONAL LABOR ORGANISATION [ILO] (2020): *World employment and social outlook trends 2020* Geneva.

JOSHI, A.–KALE, S.–CHANDEL, S.–PAL, D. (2015): Likert scale: explored and explained. *Journal of Applied Science & Technology* 7: 396–403. https://doi.org/10.9734/BJAST/2015/14975

KAZLAUSKAITE, R.–BUČIŪNIENĖ, I.–POÓR, J.–KAROLINY, Z.–ALAS, R.–KOHONT, A.–SZLÁVICZ, Á. (2013): Human resource management in the Central and Eastern European region. In: PARRY, E.–STAVROU, E.–LAZAROVA, M. (eds.): *Global trends in human resource management* pp 103–121., Palgrave Macmillan, London.

KOZÁK, A. (2019): Organizational reactions and employee behavior in the labor shortage environment: summary thoughts in the light of the results of an empirical research, (In Hungarian) *Magyar Tudomány* 180 (9): 1376–1385. https://doi.org/10.1556/2065.180.2019.9.12

LETICHE, H. (1998): Transition and human resources in Slovakia *Personnel Review* 27 (3): 213–226. https://doi.org/10.1108/00483489810210624

LEVIS, P. C. (2005): *How the East was won* Palgrave, New York.

LUTZ, W. (2010): *Emerging population issues in Eastern Europe and Central Asia: research gaps on demographic trends, human capital and climate change* UNFPA. 7., New York.

MARTINAK, D. (2020): The impact of technical change on employment structure in the Visegrad group countries *Politicka Ekonomie* 68 (1): 42–61. https://doi.org/10.18267/j.polek.1265

MASON, J. (2002): *Qualitative researching* Sage Publications, Thousand Oaks.

MATOUŠKOVÁ, E. (2020): Cyclical fluctuations in the economies of V4 countries *The EUrASEANs: journal on global socio-economic dynamics* 6 (25): 25–36.

MORLEY, M. J. (ed.) (2008): *Managing human resources in the transition economies of Central and Eastern Europe* Routledge, London.

MORLEY, M. J.–POÓR, J.–KAZLAUSKAITĖ, R.–KABALINA, V.–BLŠTÁKOVÁ, J. (2020): Human resource management in the post-socialist region of Central & Eastern Europe. In: PARRY, E.–MORLEY, M. J.–BREWSTER, C. (eds.): *The Oxford handbook of contextual approaches to human resource management* pp 239–264., Oxford University Press, Oxford.

PASS, S.–RIDGWAY, M. (2022): An informed discussion on the impact of Covid-19 and 'enforced' remote working on employee engagement *Human Resource Development International* 25 (2): 254–270. https://doi.org/10.1080/13678868.2022.2048605

PIETSCHMANN, I.–KAPSOS, S.–BOURMPOULA, E.–SAJAIA, Z.–LOKSHIN, M. (2016): *Key labor market indicators: analysis with household survey data* International Labour Organization, Geneva.

POÓR J.–ENGLE, D. A.–BLŠTÁKOVÁ, J.–JONIAKOVÁ, Z. (2019): *Internationalisation of human resource management: focus on Central and Eastern Europe* Nova Science Publishers, Hauppauge (NY).

PRIVARA, A.–GAVUROVA, B.–RIEVAJOVA, E.–STOFKOVA, Z. (2023): Labour market and immigration nexus in V4 countries: using panel data analysis for the period of 2000–2020 *Migration Letters* 20 (3): 465–476. https://doi.org/10.47059/ml.v20i3.2909

REINWALD, M.–ZIMMERMANN, S.–KUNZE, F. (2021): Working in the eye of the pandemic: local Covid-19 infections and daily employee engagement *Frontiers in Psychology* 12: 654126. https://doi.org/10.3389/fpsyg.2021.654126

REPORT (2023): *Report on labour shortages and surpluses 2022* European Labour Authority. Publications Office of the European Union, Luxembourg.

REYMEN, D.–GERARD, M.–DE BEER, P.–MEIERKORD, A.–PASKOV, A.–DI STASIO, V.–DONLEVY, V.–ATKINSON, I.–MAKULEC, A.–FAMIRA-MÜHLBERGER, U.–LUTZ, H. (2015): *Labour market shortages in the European Union study* European Union, Brussels.

RUIZ-MARÍN, R.–MATÉ-SÁNCHEZ-VAL, M.–NOGUERA-VENERO, J. (2023): Did Covid-19 modify the spatial concentration of business failure? *Regional Statistics* 13 (2): 201–213. https://doi.org/10.15196/RS130201

SAJTOS, L.–MITEV, A. (2007): *SPSS research and data analysis handbook book* (In Hungarian) Alinea Publishing House, Budapest.

SCHWARCZ, P.–KOVÁČIK, M.–VALACH, M. (2021): The development of economic and social indicators in V4 countries *Acta Polytechnica Hungarica* 18 (2): 47–68. http://dx.doi.org/10.12700/APH.18.2.2021.2.3

STACHOVA, K.–STACHO, Z.–RAIŠIENĖ, A. G.–BAROKOVA, A. (2020): Human resource management trends in Slovakia *Journal of International Studies* 13 (3): 320–331. https://doi.org/10.14254/2071-8330.2020/13-3/21

STAW, B. M. (1980): The consequences of turnover *Journal of Occupational Behavior* 1 (4): 253–273.

ŠTEFÁNIK, M. (2018): *Labor market in Slovakia, 2019* Centre of social and psychological sciences, Slovak Academy of Sciences (CSPS SAS), Institute of Economic Research, Slovak Academy of Sciences (IER SAS) and Faculty of Arts, Comenius University in Bratislava (FA CU), Bratislava.

STOR, M. (2022): Preface. In: STOR, M. (ed.): *Human capital management in the wandering context of events – challenges for the managerial staff* pp. 8–10., Publishing House of Wroclaw University of Economics and Business, Wrocław.

STOR, M. (2023): *Human resources management in multinational companies: a Central European perspective* Routledge: Taylor & Francis Group, New York & London.

SU, C.-W.–DAI, K.–ULLAH, S.–ANDLIB, Z. (2021): Covid-19 pandemic and unemployment dynamics in European economies *Economic Research-Ekonomska Istraživanja* 35 (1): 1752–1764. https://doi.org/10.1080/1331677X.2021.1912627

SUSSKIND, R.–SUSSKIND, D. (2015): *The future of the professions: how technology will transform the work of human experts* Oxford University Press, Oxford.

SZEINER, Z.–JUHÁSZ, T.–HEVESI, E.–POÓR, J. (2023): HRM challenges in Slovakia generated by the Covid-19 pandemic *Central European Management Journal* 31 (2): 258–273. https://doi.org/10.1108/CEMJ-02-2022-0024

SZENT-IVÁNYI, B. (2017): *Foreign direct investment in Central and Eastern Europe post-crisis perspectives* Palgrave-Macmillan, Cham. https://doi.org/10.1007/978-3-319-40496-7

TÓTH, A.–KÁLMÁN, B. G.–POÓR, J.–PAPP, I. C. (2023): Impact of the Covid-19 pandemic on unemployment in selected countries and country groups *Regional Statistics* 13 (3): 451–486. https://doi.org/10.15196/RS130304

UNITED NATIONS TRADE AND DEVELOPMENT [UNCTAD] (2016): *World investment report* United Nations, Geneva.

UNITED NATIONS TRADE AND DEVELOPMENT [UNCTAD] (2023): *World investment report* United Nations, Geneva.

USUNIER, J. C.–VAN HERK, H.–LEE, J. A. (2017): *International and cross-cultural business research* Sage, Los Angeles.

ZUPAN, N.–KAŠE, R. (2005): Strategic human resource management in European transition economies: building a conceptual model on the case of Slovenia *International Journal of Human Resource Management* 16 (6): 882–906. http://dx.doi.org/10.1080/09585190500120525

VLACSEKOVÁ, D.–MURA, L. (2017): Effect of motivational tools on employee satisfaction in small and medium enterprises *Oeconomia Copernicana* 8 (1): 111–130. https://doi.org/10.24136/oc.v8i1.8

WIKE, R.–POUSHTER, J.–SILVER, L.–CORNIBERT, S. (2019): *European public opinion three decades after the fall of communism* Pew Research Center, Washington.

WORLD BANK (2023): *Migrants, refugees, and societies* World Bank, Washington, DC. https://doi.org/10.1596/978-1-4648-1941-4

WORLD ECONOMIC FORUM [WEF] (2023): *Future of jobs report 2023* Cologne/Geneva.

ZEIDAN, S.–ITANI, N. (2020): Cultivating employee engagement in organizations: development of a conceptual framework *Central European Management Journal* 28 (1): 99–118. https://doi.org/10.7206/cemj.2658-0845.18

ZIELINSKI, M. (2022): The effect of the Covid-19 pandemic on the labor markets of the Visegrad countries *Sustainability* 14 (12): 7386. https://doi.org/10.3390/su14127386

INTERNET SOURCES

CNA (2024): Number of foreign workers rises by 30,700 to 823,900 in 2023 *Brno Daily.* https://brnodaily.com/2024/01/22/news/business/number-of-foreign-workers-rises-by-30700-to-823900-in-2023/ (downloaded: March 2024)

EUROPEAN COMMISSION [EC] (2023): *Slovakia: continued growth in the employment and economic activity of migrants.* https://migrant-integration.ec.europa.eu/news/slovakia-continued-growth-employment-and-economic-activity-migrants_en (downloaded: March 2024)

EUROSTAT (2022): *Job vacancy statistics.* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Job_vacancy_statistics&oldid=576938#Job_vacancies_between_2019_and_2022 (downloaded: March 2024)

EUROSTAT (2024): *Unemployment statistics.* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Unemployment_statistics#Unemployment_in_the_EU_and_the_euro_area (downloaded: March 2024)

HUNGARY TODAY (2022): *Pharmaceutical industry is key sector of Hungary's economy.* https://hungarytoday.hu/the-pharmaceutical-industry-is-a-key-sector-of-hungarys-economy/ (downloaded: November 2023)

JANICEK, K. (2023): 3 energy companies compete to build a new nuclear reactor in the Czech Republic *The Washington Post.* https://www.washingtonpost.com/business/2023/10/31/czech-energy-security-nuclear-dukovany-tender-bid/58c327e4-77de-11ee-97dd-7a173b1bd730_story.html (downloaded: November 2023)

KENNEDY, J. F. (1959): *Remarks of Senator John F. Kennedy, convocation of the United Negro College fund Indianapolis, Indiana, USA, April 12, 1959.* https://www.jfklibrary.org/archives/other-resources/john-f-kennedy-speeches/indianapolis-in-19590412 (downloaded: November 2023)

KÓNYA, Á. (2024): This is where the Hungarian minimum wage is in the EU (In Hungarian). https://haszon.hu/megorizni/piacok/minimalber-europai-union (downloaded: March 2024)

LENGYEL, I. (2022): In a medium development trap (In Hungarian) *Magyar Narancs* June 23, 8–9. https://magyarnarancs.hu/belpol/kozepes-fejlettsegi-csapdaban-249916 (downloaded: March 2024)

MORGAN, J. (2022): *Yuval Harari nn the future of jobs & technology, intelligence vs consciousness, & future threats to humanity.* https://www.linkedin.com/pulse/yuval-harari-future-jobs-technology-intelligence-vs-threats-morgan (downloaded: March 2024)

MORGAN PHILIPS (2021): *Is Poland the new Silicon Valley of Europe?* https://www.morganphilips.com/en/insights/is-poland-the-new-silicon-valley-of-europe (downloaded: November 2023)

NIKOLOVA, M. (2016): Two solutions to the challenges of population aging *Brookings.* https://www.brookings.edu/articles/two-solutions-to-the-challenges-of-population-aging/ (downloaded: March 2024)

PORTFOLIO (2017): The labour shortage affects not only Hungary, but the entire EU *Portfolio* (In: Hungarian). https://www.portfolio.hu/gazdasag/nemcsak-magyarorszagot-az-egesz-eu-t-sujtja-a-munkaerohiany.271333.html (downloaded: June 2022)

SHEEDY, CH. (2020): *Covid-19 has accelerated, not disrupted, HR trends.* https://www.hrmonline.com.au/covid-19/covid-accelerated-hr-trends/ (downloaded: March 2024)

STATISTA (2022): *Distribution of the workforce across economic sectors in the United States from 2012 to 2022.* https://www.statista.com/statistics/270072/distribution-of-the-workforce-across-economic-sectors-in-the-united-states (downloaded: November 2023)

STATISTA (2023): *Number of employees in the European Union in quarter 1 of 2023, by sector.* https://www.statista.com/statistics/1195197/employment-by-sector-in-europe/ (downloaded: November 2023)

TOOZE, A. (2022): Ukraine's war has already changed the World's economy *Foreign Policy.* https://foreignpolicy.com/2022/04/05/ukraine-russia-war-world-economy/ (downloaded: April 2022)