INVESTIGATION OF THE VISEGRAD GROUP LABOR MARKET IN TERMS OF ROBOTIZATION

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Abstract

The purpose of our study is to present a real and up-to-date picture of the state of robotics and artificial intelligence. We approach the topic primarily from a theoretical point of view and outline the research area in detail. As we research this topic, we portray robotics as a new phenomenon, with its particular characteristics, and how it is really to be imagined. After the theoretical aspects, we extend the topic to the countries of Central and Eastern Europe, including the Visegrad Four, namely the situation of Hungary, Slovakia, the Czech Republic and Poland. We will present in more detail the areas under study, what they really mean, where they can be useful, and what economic problems they can provide. Based on these factors, we outline the situation of the examined countries separately in terms of robotization and artificial intelligence. We discuss the most important elements and finally compare the situation of the countries examined. Finally, we draw conclusions for the research area and outline the guidelines for the future.

Key words: Visegrad group, robotization, labor market, labor shortages

JEL Code: J21, J23, E24

Introduction

As Poór et al. (2017) states Eastern Europe is characterized by a growing labor shortage. Skilled workers are not satisfied with their domestic employment circumstances. Labor mobility is enhanced by a combination of reduced legal and regulatory barriers, increased information on employment opportunities due to the internet and more transparency on terms and conditions of employment outside of an employee's native country. They increasingly choose to move away or commute and offer their services in another country where the pay and working conditions are better. According to experts 18 million or about 6 percent of population, migrated from Eastern Europe in 1992 – 2015. Specific to the V4 nations, this number is estimated at more than 3 million employees. Consequentially it is not surprising that the unemployment level is low in those countries and large companies in Eastern European are lacking in skilled workers. Therefore there is a growing demand for the well trained professionals (Poór et al., 2017).

According to Harari (2018) today´s modern economy shares a growing problem of labor shortages and maintaining a sufficient work force. In industry after industry, nation after nation, firms are dealing with this issue. Regional companies are facing serious challenges, the pressure is building for leaders inside these companies, as well as the human resources managers and technical experts of the companies to respond to these patterns. In case of labor shortage the companies have to increase salaries, because competition for recruitment of the skilled workers is increasing as labor markets become regional and not merely national. Increasingly we find the lack of a capable work force within the population, a contributing factor to a critical labor shortages. In such cases one potential future solutions to the deficit could be the robotization. As a result of these technological changes lower value added work that lends itself to automation can be pursued via automation and robotization, a strategy to decrease demand for the unskilled workers and the eliminate job vacancies. Automation at the same time increases demand for more highly skilled employees. (Harari, 2018)

1 Theoretical background

1.1 Robotics in general

Over time, we've grown reliant on automated technology. It's found in almost every part of our life

As History of automation (2019) states the early life of automation begins, then, with the industrial revolution and industrial machinery between 1790 and 1840. Then, like now, people feared the impact of automation on their jobs. As for artificial intelligence (AI), well that needs a computer.

Early on, the concept and development of robots, automation and AI went unrecognised by most of the world. The robot word was conceived in the beginning of 1920 by the Czech writer and playwright Karel Čapek and was introduced in his drama R.U.R. (Rossum's Universal Robots) published in November 1920. Since then and almost immediately the robot word has become a universal expression in most languages for artificial-intelligence machines, invented by humans. By 1939, the first physical robot, Elektro, went on display at the World's fair, marking a key point in the history of automation. With human commands, he could walk, smoke cigarettes, blow up balloons and became the most famous robot of the 1930s.

After this, in the early 1940s, Isaac Asimov created the three laws of robotics, which he used in his own works of fiction. The three rules dictate the ways a robot must act with regard to humans:

- A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- A robot must obey orders given it by human beings except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Following the Asimov laws the first AI technology was created by Alan Turing. In 1950 Turing evised a way to measure the intelligence of a machine, which tested the machine's ability to think. It is known as The Turing Test and is still used today.

Following this, the history of automation saw something of a subdued and stagnant period. The 70s and 80s came to be referred to as the AI winter. Interest in the development of AI decreased, dwindled and people became more pessimistic about its chances of success. There was also fear that AI would soon replace all human jobs. This didn't mean that AI research was on hold, only that it stepped out of the limelight for a while.

Computerised automation started to develop around this time and the 90s would mark the start of AI development moving away from physical bots to digital programs. This period also marks the time when the history of automation fully intertwined with business process management. The growth of processes in business management and computerised automation led to the 90s being known for large business management systems. In 2011, the release of Apple's Siri broke the radio silence period regarding automation breakthroughs. Siri triggered a new age of automation and AI driven assistants. This embodied the move away from physical robots and into the development of computerised automation, and AI software that had begun in the late 80s and early 90s. (History of automation, 2019)

As Richter et al. (2018) states business process automation is becoming more and more refined and efficient. In the present day, automation software has become a necessity rather than a luxury. Its widespread use is optimising employee time and work and leading to enormous resource savings. (Richter et al., 2018)

We experience the wonder of AI daily, be it on Facebook, on Twitter, in emails, in our video games or elsewhere. We have artificial intelligence assistants in our cars, in our phones and in our homes. All this in the youth of the technology, too. The history of automation, despite a few bumps along the way has seen a lot of success in a short period of time. It

continues to grow and evolve today, providing us with more innovative solutions, interactive AI and assistance in unravelling the secrets of the universe. (Richter et al., 2018)

1.2 Robotization in labor market

Firtstly what is robotization? According to Sharif and Huang (2018) even those skilled in the art do not know how to describe and interpret the phenomenon of technology on a broader horizon. Some people are thinking of Industry 4.0., some who are describing the era as the third or fourth technological revolution, while others see a bright future in machine learning, and especially in artificial intelligence. (Sharif, Huang, 2018)

As Lasi et al. (2014) states economists around the world are building digital business models in their businesses and around their businesses, looking at the platform economy's achievements so far, and preparing for the next three to five years. And the individual is slowly moving into a world in which increasing numbers of purchases and consumption are based on digital developments. Although workplace robotization is for economic reasons, it can have the most profound social consequences. (Lasi et al., 2014)

According to Lasi et al. (2014) thinking about positive impacts in positive scenarios or conversely negatively, it is certain that we believe in either scenario, not only will low-status jobs change, but those in high-skilled and high-prestige jobs will also be forced to innovate. (Lasi et al., 2014)

As Cho and Kim (2018) states the new type of knowledge capital and access to it can not only rewrite job roles, but also bring new inequalities into the labor market. Since the lowest jobs can now be replaced (not by 2020, but by 2030) with machinery and technology, this can inadvertently lead to social problems that need to be addressed. Not only then, but already by framing the frames. It is also natural that employees are already setting expectations to mitigate future concerns. But it is also an opportunity and a responsibility for those involved. Including companies and the state. Humans who have lost their jobs due to robots are the most common response to eliminate negative effects. (Cho, Kim, 2018)

As Chagnon (2011) states that competition between organizations is increasing and they need to rely on more and more motivational tools like higher salaries, benefits, etc. Automated systems can enable you to save valuable working time within your organization and use that time for development and advancement. This will make real knowledge even more vital. According to experts, V4 countries are assembly centers, not knowledge centers. For the future, it would be extremely important for more and more companies to move towards more and more automation of their processes. (Chagnon, 2011)

2 Aim and research methodology

We conducted a secondary research in our study. The necessary resources were provided by Eurostat, the IFR - International Federation of Robotics and many other official statistical offices of the countries under investigation.

The results of the research show the situation of labor market trends and robotization in Hungary, Czech Republic, Slovakia and Poland. We studied the research of International Federation of Robotics, who surveyed the number of industrial robots per 10,000 employees in 2017 and future changes in robotics. The Eurostat database provided data on job vacancies and labor shortages. Further important data was provided by statistical pages and materials from labor market experts and professionals.

3 Labor market trends in V4

3.1 Hungary

As Tóth and Nyírő (2018) states in Hungary the labor shortage is similar to the situation in the other V4 countries. The industry representatives believe that the evolved labor shortage could be alleviated with 200-300 thousand foreign workers. Some 20 percent of visiting foreign workers – thousands of people - only stay in Hungary for a short period of time using this country as a springboard to get in to other Western European countries. As Budapest Business Journal (2018) states the opportunities offered by the country are attractive mostly among the unskilled or manual workers. (BBJ, 2018; Tóth, Nyírő, 2018)

As Budapest Business Journal (2018) and Eurostat (2017) states in the country the labor market tightness indicator is reported at a steady pace 2,9 percent, while more than 5 percent of the population works abroad. (BBJ, 2018; Eurostat, 2017)

According to Eurostat (2017) the number of vacant positions, i.e. the percentage ratio of the labor market tightness indicator in the European Union is 2 percent, while at the Euro zone is 1,9 percent. In the diagram above we can see the percentage ratio divided into countries. The highest rate is in Czech Republic, but also note that Hungary is above the EU ratio. (Eurostat, 2017)

A study by McKinsey & Company showed that 49% of the working hours in Hungary can be automated with the already existing technologies. This does not necessarily mean that these jobs will be lost forever, but they are going to be transformed. (McKinsey & Company, 2018)

According to the study, in the average scenario, 24% of jobs will be automated until 2030, and 60% of existing jobs will be affected by automation. This means almost 2.2 million employees will face new working conditions in the future only in Hungary. (McKinsey & Company, 2018)

3.2 Slovakia

According to Karšay (2018) the labor shortage is caused by high economic growth (around 4%) and lower newcoming labor force, students progressing into the labor market (a demographical reason). The analysis predicts further labor shortage in the years 2018-2023. (Karšay, 2018)

As Poór et al. (2017) and IFR (2017) states Slovakia is the leading Central and Eastern European country in terms of robotics innovation and robot density. With 151 robots per 10.000 employees in the manufacturing industry, Slovakia outranks all neighboring states, as well as countries like France, Finland and China, and takes the 15th spot worldwide. Slovakia is also well above European average (106 robots per 10.000 employees). (Poór et al., 2017; IFR, 2017)

According to IFR (2017) analysis with the use of industrial robots rising globally, the average worker in Slovakia - the world's top car producer per capita - faces a 62 percent median probability that his or her job will be automated in the near future. According to the IFR report, the small landlocked Central European country is the most vulnerable country in the world to automation and robotization.(IFR, 2017)

3.3 Czech Republic

As Novakova (2018) states currently there are 215 000-220 000 vacancies in the country, although only 1.8% of the population is working abroad. According to the world economy´s survey and data in the European Union the Czech Republic has the highest the labor market tightness indicator at 4.1% (Novakova, 2018)

As Novak (2016) states in the Czech Republic there are 101 robots for every 10,000 employes and the country is far behind world leader South Korea, which employees 631 robots in the manufacturing sector for the same number of workers. According to the

International Federation of Robotics the number of newly installed robots in the Czech Republic grew by 40 percent between 2010 and 2015, but experts say it's not fast enough. (Novak et al., 2016)

According to McKinsey (2018) for the Czech Republic and its neighbors, the calculus is one of survival. A new generation of robots is needed not just to confront the labor squeeze, but also to increase flexibility and output as consumers demand a wider range of products. (McKinsey & Company, 2018)

3.4 Poland

As Kelly and Florkiewicz (2018) states some 8% of the Polish population is working abroad, while a shrunken" generation is entering the labor market and a generation characterized by a low birth rate. The nation's fertility rate was 1.32 in 2016. (Kelly, Florkiewicz, 2018)

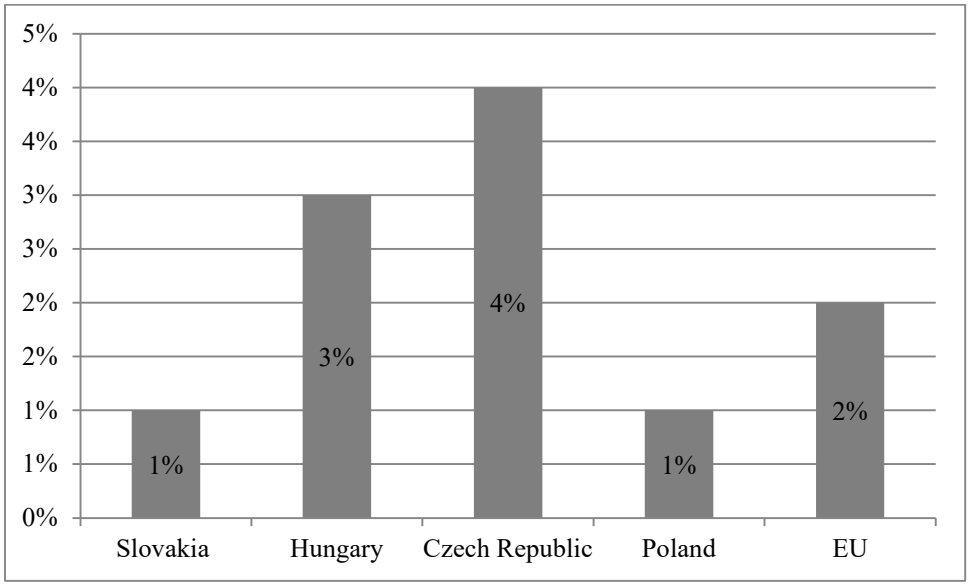
According to IFR (2017) at the end of 2017 the total number of robots installed in Polish factories to be around 11 400 units. As Kelly and Florkiewicz (2018) states the Polish market is attractive for the industrial robot industry, especially with regards to production in the automotive, chemical, metal and machinery sectors. The number of robots per 10 thousand employees in the industry keeps growing in the Polish industry, but it remains lower compared to the Czech Republic, Slovakia or Hungary and currently stands at 36 units per 10 thousand employees. (Kelly, Florkiewicz, 2018; IFR, 2017)

3.5 Labor market and robotization indicators

The following is a comparison of the V4 countries in terms of key labor market indicators and automation indicators. Our main results are illustrated in two figures and two tables.

Based on the survey in the V4 countries, the labor shortage situation in the countries is very similar. According to Eurostat (2017) and a World Economy Surveys, the Czech Republic has the highest labor market tightness in the EU with 4.1%.. In Hungary, the tightness of the labor market is 2.9 percent, while more than 5 percent of the population is working abroad. In Slovakia the current shortage of labor is at its peak at 1%, but still much lower compared to other V4 countries, while 6% of the population is working abroad. (Eurostat, 2017)

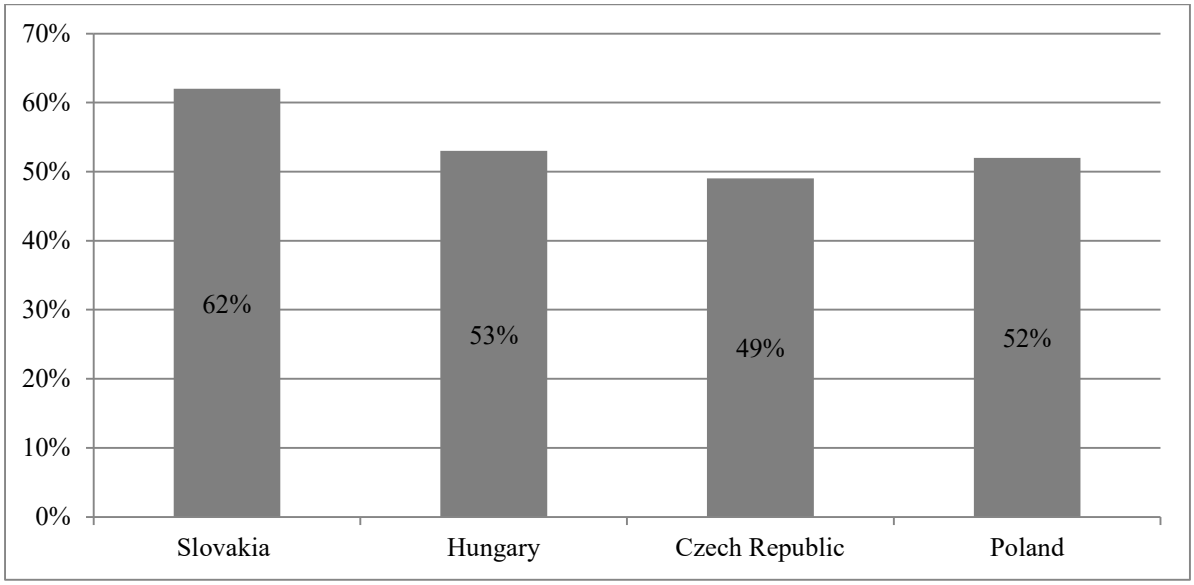
Fig. 1: Job vacancy rates, 2017



Source: Own editing based on Eurostat (2017)

The following Figure 2 shows how many workstations can potentially become automated in the near future thanks to robotization. We can see that all V4 countries can be heavily determined by robotization and many jobs can be replaced by these automated processes. Slovakia is the country most exposed to this process with a potential robotic workplace of 62%. Slovakia is followed by Hungary and Poland with 53% and 52% respectively, while in the Czech Republic it is close to 50%. We can say that Slovakia's number one position is not surprising, as there are many car factories in the country. The processes of robotization and automation are already at an advanced stage in car industry. Overall, automation will be able to replace the work of many people in all 4 countries, but in parallel, new jobs will be created as a result of the need to co-ordinate processes and machines and the importance of maintenance.

Fig. 2: Number of potential automated jobs



Source: Own editing based on IFR report (2017)

The following Table 1 summarises labor market movements (in and out-flows) in CEE-V4 countries.

Tab. 1: Immigrant labor in and outflow in V4 countries

Countries	Immigrant labor inflow	Immigrant labor outflow	Job vacancy
Slovakia	45 000	339 000	65000
Hungary	60 000	250 000	250000
Czech Republic	2 000 000	2 500 000	220000
Poland	500 000	100 000	350000

Source: Own editing based on Eurostat (2017), Poór et al (2017)

Hungary, Slovakia and Poland are characterized by a net regional decrease in labor. Only the Czech Rpublic is characterized by more labor coming in than going out. Note also that the scale of labor mobility (in and out) also varied by nation – Poland showing labor flows totaling 4,500,000 persons while the Slovakian flow total is 310,000 persons.

In Table 2 we surveyed the four countries examined in terms of where the industry in each country is concentrated, because the spread of robotization is currently mainly in the industry. For this reason we examined the number of robots, industrial robots associated with industry in each country. We can see that in Slovakia and Hungary the automotive industry is prime, in the Czech Republic it is mainly the engineering industry, mechanical engineering and in Poland agriculture is prime. As a result, Poland remains a little behind in its industrial robots with its 32 industrial robots projected to 10000 people. In other three country, namely in Slovakia, in Czech Republic and in Hungary the number of industrial robots is much higher due to the mechanical engineering and automotive industries. Slovakia and the Czech Republic outnumber 100 industrial robots with 132 and 101.

Tab. 1: Industry and robots in V4

Countries	Industry focus	Number of industrial robots
Slovakia	car industry	135
Hungary	car industry	57
Czech Republic	mechanical engineering	101
Poland	agriculture	32

Source: Own editing based on IFR (2017

Conclusion

In our study, we examined the labor market and robotization in Visegrad Group countries. Overall, we can conclude that the labor shortage has increased also in the surrounding countries and it is more difficult to keep the workforces in the researched organizations. The reducing turnover puts the organizations to an increasing number of tasks.

Robots are no longer just characters in humorous films that we laugh at on television, but are a part of our lives, and this will become even more so in the future. It is up to us to suffer the disadvantages or enjoy the benefits.

As Richter et al. (2018) and Ruzsa (2019) states in the future the organizations will have to pay great attention to these problems because the competition for the skilled workers will rise. Those organizations which will be able to keep the valuable skilled workforces and will be able to decrease the turnover inside the organization, will gain a huge advantage in the market. Those organizations can make great progress, which will be able to renew, and will be opened for innovation, and will be brave enough to start a new path in the robotization and automatization. (Richter et al.,2018; Ruzsa, 2019)

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