ROBOTIZATION ATTITUDES IN HUNGARY IN REGIONAL CONTEXT

László Csonka

Abstract

In the past five years the notion of Industry 4.0 has brought into the forefront of research interest the diffusion of cyber-physical production systems. These are based on the observation that the trends of digitalization, automation, robotization are converging and creating a fundamentally new production system. This change has not only technical or economic implications for the companies that are implementing these new cyber-physical systems, but it gives rise to significant social challenges by directly influencing the labour market. There is a growing amount of international and Hungarian literature which provide experts' estimations about the nature and directions of the impact of these changes. However, these estimations are in many cases conflicting or at least indefinite and take a far too general view. Nevertheless, now it is – or should be – apparent for the broad public, that digitalization, automation, robotization will have some kind of influence on where and how people will work in the near future. These changes might be general but not universal. We lack studies and empirical analyses that look into the details how the society or the employees in certain regions perceive the diffusion of robotization and its impact on their everyday life and work. This paper would like to fill this gap. It is based on a quantitative survey conducted in Hungary which focuses on the attitudes towards robotization. The research sheds some light on the fact that the society's interest in robotization is stronger than their actual knowledge. There are certain regional patterns in the awareness and preparedness of the workforce for the coming changes which seem to be related to the presence of industries with the highest share of robotization. It becomes also evident that various stakeholders should take steps to clarify the various ethical, legal and other related issues in order to responsibly support the additional diffusion of robots. Employees seem to be remarkably uninformed about the future diffusion of robots in their own workplace and they seem to be unprepared for this challenge.

Keywords: robotization, survey, Hungary, labor market, regions, Industry 4.0

1. Introduction

The technological development of the past few decades has brought significant changes in practically all aspects of our current life. Knowledge and learning have become the basic building blocks and activities in the current era (Lundvall, 1992). Knowledge economies have started to take shape which are based on the development, diffusion and utilisation of knowledge and information for improving performance and for the general welfare of the society (OECD, 1996). The development of information technology, or more broadly the third industrial revolution has played a key role in laying the ground for the knowledge economies bringing a new technological paradigm (Smith, 2002). In this new paradigm new scientific fields are emerging, previously

boundary fields are becoming central for further development and various independent scientific fields are becoming increasingly interconnected. Knowledge-intensive fields are becoming key areas for economic development and competitiveness. Not only high-tech sectors are responsible for an ever growing share of GDP in the developed economies, but also in 'low tech' industries the role of accumulated and utilised knowledge is becoming crucial. In this era innovations have become a key factor of success. Innovations are not only demonstrations of what the technology is capable of, but they are the most important factor of economic competitiveness, while re-drawing the economic framework itself, too. Based on the various digital technologies developed during the past five decades, it seems that a new industrial revolution is starting to take shape.

As the WEF (2016) puts it, the fourth industrial revolution is already here, characterized by the fusion of technologies that is blurring the lines between the physical, digital and biological spheres (see also Dengler – Matthes, 2015). This new industrial revolution is largely built on the previous one, although it has some distinct characteristics, like the speed and the scope of changes or the variety of systems that are impacted by this current revolution. The breadth and depth of changes brings the transformation of entire systems of production, management and governance.

This also means that firms are not only innovating their products and services but also need to rethink their production processes. This trend has been labelled as Industry 4.0 following the German high-tech strategy initiative in 2013. Industry 4.0 is representing a bunch of technological trends vertically and horizontally integrated, such as 3D printing, big data, robotization, simulation, cloud computing etc.. Industry 4.0 offers a more comprehensive, interlinked, and holistic approach to manufacturing. It connects the physical with the digital, and allows for better collaboration and access across departments, partners, vendors, product, and people. Industry 4.0 empowers business owners to better control and understand every aspect of their operation, and allows them to leverage instant data to boost productivity, improve processes, and drive growth (Epicor, 2019). If these technologies are employed, than we can speak of a smart firm which is relying on cyber-physical systems, where the various technologies are strongly interconnected with human workers. The introduction of such changes creates a huge challenge for the companies. One of the most important prerequisites to implement these changes is the availability of workers who can face the requirements of Industry 4.0 or the fourth industrial revolution more broadly.

This paper investigates the preparedness of the Hungarian society to the introduction of such changes into the economy. More specifically, it examines how the robotization is perceived by the society and the employees. What are their main views, concerns and hopes in relation to the diffusion of robotization and automation at the workplaces. The investigation puts into the focus the potential regional differences within Hungary. It looks at the potential link between the industrial structure within the country and employees' readiness for more robots. Next, the paper shortly characterises the main features and challenges in the digital economy and digital society together with the current labour market situation in relation to robotization. The third section summarizes the methodological approach and the fourth presents the results of a survey conducted among Hungarian employees to get to know their views in relation to robots. The responses will be analysed from a regional perspective. The paper finally summarizes the main findings on the regional characteristics of the labour market's preparedness for more robotization in the near future.

2. Digital Economy, Digital Society

One of the main features of digital economy is the central role of digitalized information. The digitally codified knowledge transforms into strategic resource defining competitiveness and success. The economy and the society are organized more and more along various networks which is the basis of information society or networked society. Since the second half of the 1990s, the availability of information has become cheaper and cheaper and the technologies of data storage and transfer has become widely used in the society and in the economy. Based on the general use of information and data, various types of innovations were generated, like organisational, marketing, social or even legal innovations. In turn, these innovations started to transform the labour market, the world of work and finally our private life (EC, 1997). Utilising the results of the third industrial revolution, the amount of available information is larger than ever. This information represents value and profit for the enterprises not only in the digital, but also in the 'traditional' economy. The digital technologies now used in practically all segments of the economy and of the social life after the diffusion of interactive and mobile technologies during the past decade (Valenduc – Vendramin, 2017). At the same time, A. Giddens (2015) warns that due to the growing impact of digitalization, robotization and automation the social model of industrialized states as an all-encompassing and efficient system of social insurance combined with the aspiration to equality and inclusiveness is deteriorating.

In the course of the development of digital technologies, dating back to the 1970s, the 21st century brought numerous new opportunities. The big data analytics and the cloud computing – or even more the fog computing – make it possible to analyse a huge amount of data within a reasonable time. They are also making it possible to collect data from an unprecedentedly large variety of sources: smartphones, GPS data of computers, immaterial goods and services produced in the economy etc. are all potential sources of data for economic utilisation. This vast amount of data is the new basis of the evolving business model in the digital economy. The need to collect and store the available information contributes to the development of data mining and data modelling software, too. The software and various algorithms are developed in order to be able to create economic value out of raw data by analysing the customers' profiles, modelling their behaviour, predicting engine failures and so on. Computer programmes, data utilisation and the development of artificial intelligence also creates way of new types of robots that are capable of conducting complex tasks or capable of collaborating and interacting with humans. So this wave of digitalization is much more than the digitization of the last decades of the 20th century, it is now a transformation of an analogue into a digital era. This rise of digital technologies, or digitalization also influences the whole society (Kieslich, 2019). Not only enterprises, but individuals and the society as a whole have to adapt to the new framework conditions, influencing not only the economic domain, but other societal fields, such as education, politics or private life.

The use of these new, complex technologies, the increasing pace of technological developments makes it necessary for the firms to strengthen their knowledge base. In this effort they not only rely on their research and development (R&D) activities, or that of other partners but they also have to rely on other, non-technological sources of knowledge, like the (tacit) knowledge of the employees. People have to adapt to new tasks and routines as the content of certain jobs, positions is changing (Hirsh – Kreinsen, 2015).

One of the trends that attracts the most interest among scholars, consultants, professionals, is the one that relates to the labour market impacts following the diffusion of digitalization, robotization and automation.

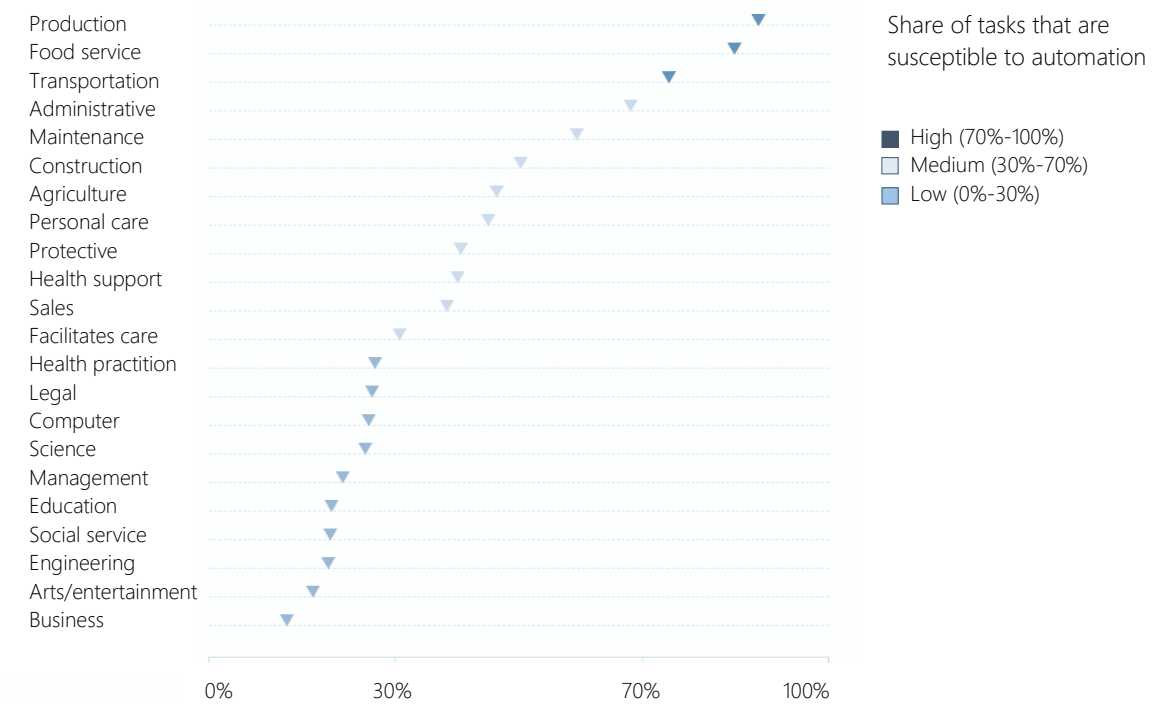
2.1. Labor Market Trends

The quick changes brought about by these technological trends will inevitably bring some negative effects as well in the labour market. The problem is that our technologies are advancing at a very quick rate whilst our skills and organizations are lagging behind. It is crucial for everyone to understand the phenomena and to come up with new strategies so humans do not race against but rather race ahead of machines (Degryse, 2016).

This situation poses great challenges for the individuals and not everyone can cope with those challenges equally successfully. Employees need further education to get a better understanding of technology and the competence to work with them. Sometimes they have to adapt to a serious change in their job profile, since machines can take over a huge portion of their job (Kollmann – Schmidt, 2016; Poschmann, 2015; Kieslich, 2019).

In recent years a debate has been fuelled by studies in the US and Europe arguing that a substantial share of jobs is at risk of digitalisation. Some of these studies follow an occupation-based approach proposed by Frey and Osborne (2013), meaning that they assume that whole occupations rather than job-tasks are automated. Frey and Osborne (2013) analysed the endangering of 702 job profiles in the US through computerization. Building three risk groups (low, medium, high), they conclude that up to 47% of the job profiles in the US belong to the high-risk group. Looking at the jobs, they state that mostly jobs in transport, manufacturing industries but also administrative jobs are highly affected by digitalization (Kieslich, 2019). What they also found was that the risk of automation is a lot higher for low-skilled workers and for low wage occupations, meaning that automation could disproportionally affect these groups of people. According to Muro, Maxim and Whiton (2019), in professions where the requirement in education is less than a BSc, the automation potential is 55%. Positions that do not require higher education face a double risk of loss through digitalization than occupations that do (see Figure 1).

Figure 1:
Automation potential of occupations, 2016



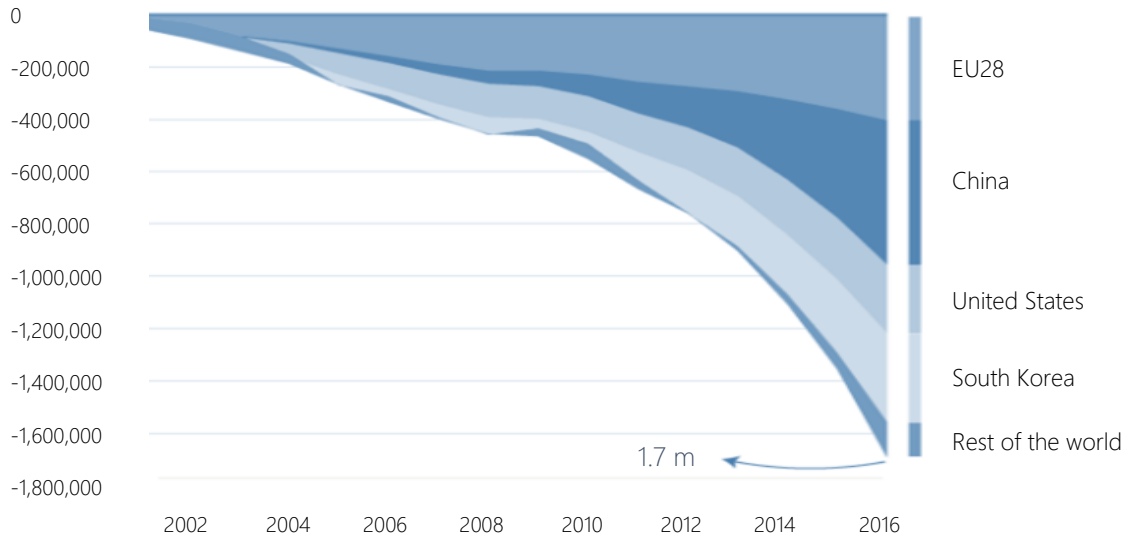
Source: Muro et al., 2019.

Another way to analyse the job market potential of digitalisation is to follow a task-based approach, which is based on the idea that the automation of jobs essentially relies on how easily its tasks can be automated. According to this approach the replaceability of jobs by robots is lower in jobs with higher educational requirements – in line with the findings of Frey and Osbourne – or in jobs that require cooperation between multiple people in-person and where people spend more time influencing others. When taking into account the various tasks within occupations, the results are much less frightening than in Frey's and Osbourne's data. It shows that only 9% of individuals in the USA are subject to high automatability (automatability of at least 70%). This result differs a lot from the previous figures, because if we do not take into account interactive tasks such as group work and face-to-face interactions with customers, clients and so on, it exerts an extensive impact on the estimation (Arntz et al., 2016).

Anyhow, by 2022 more than 54% of workers will require re-skilling or upskilling according to the World Economic Forum's study (Brende, 2019).

Currently, each industrial robot replaces 1,6 human workers on average. Moreover, this number could reach 20 million in total by 2030. This is a serious concern for both less and more developed economies (Figure 2). Countries have to balance between deindustrialization and reindustrialization in the era of post-industrial production. Automation may create opportunity for the developed economies to bring back manufacturing jobs, and the growing interconnectedness of industry and services are also offering new job opportunities in those countries. At the same time, this situation may create new opportunities also for developing economies, if they are able to catch up and elevate their positions in the global value chains.

Figure 2:
Cumulative job loss attributed to automation since 2000



Source: Oxford Economics, 2019.

At the same time, statistical data do not support all these estimations. Currently, industrial robots are overwhelmingly deployed in sectors with middle or higher skills requirements and their penetration is very limited in low-tech manufacturing sectors (e.g.: textile, food, beverage) where the majority of low-skilled are employed and the tasks carried out are easily replaceable by robots also at the current level of technology (OECD, 2019; UNCTAD, 2017).

A growing number of studies on the current deployment of industrial robots emphasize the economic benefits of automation and robotization (IFR, 2018; OECD, 2017; UNCTAD, 2017), while they believe that labour market challenges will not pose such a big problem and will rather bring a shift in the labour market positions than anything else (Craglia, 2018; European Commission, 2018). Today, a new consensus is emerging in the literature, that adoption of industrial robots considerably increases productivity and contributes significantly to economic growth (Cséfalvay, 2019). According to Graetz and Michaels (2018), robot densification increased the annual growth of labour productivity between 1993 and 2007 by 0.36 percentage points across the 17 developed countries analysed. This is a magnitude similar to the contribution of steam engine technology to annual labour productivity growth in Britain during the first industrial revolution. The CEBR (2017) report estimates that between 1993 and 2015 investment in robots contributed to almost 10% of cumulative GDP per capita growth in the majority of the OECD countries. The increase in robot density (measured as number of robots per million hours worked) by one unit was associated with a 0.04% increase in labour productivity. Dauth, Findeisen, Südekum, and Wössner (2017) found that in Germany, the country with by far the highest number of industrial robots installed in Europe every additional robot per thousand workers raised the growth rate of GDP per person employed by 0.5% over the period between 2004 and 2014. What is more, according to their calculation, while in Germany in the last two decades each robot installed has destroyed on average two manufacturing jobs, this loss was entirely offset in the total employment by job gains outside manufacturing.

If the use of robots brings GDP growth and improved productivity, it is crucial for Hungary (and other countries in similar situation) to take part in this process, and take the benefits of digitalisation, robotization and automation. To a large part this depends on the preparedness of the enterprises, individuals and governments.

In this paper the focus is on the individuals' situation in Hungary; whether they are aware of these technological trends, whether they are prepared for the challenges, and how they are facing the fear of job loss. International evidence suggests that employees are not really aware of the potential of job losses because of robotization or automation. According to an international survey, the fear of a job loss caused by technology advancement is in general relatively low (Statista, 2016); though, it is noteworthy that there are some differences regarding to the field of employment. Especially employees in industry report some concerns that their jobs might be substituted due to technology advancement (Kieslich, 2019).

2.2. Labor Market and Automation in Hungary

In Hungary, the labour market has been benefiting from a very positive trend since 2013. The employment rate at that time was below 60% while in the third quarter of 2019 it reached a level above 70%, which is around the European average. At the same time, the unemployment level has been shrinking from an above 11% to a 3.5% level by 2019. During these years the economy has evolved into a situation where the main problem is not unemployment but the lack of sufficient workforce. The potential labour reserve has been depleting at an increased rate and now businesses are forced to employ those who were previously deemed unsuitable. This can be seen also in the average duration of unemployment which has drastically dropped to 13.9 months (GVI, 2016). Hungary has almost emptied its potential labour reserve and is left to use whatever workforce is left on the market, which can be a struggle since this workforce is most likely low skilled with no experience. This can be a significant factor when it comes to large multinational companies investing in the country and thus decreasing its economic growth (Nábelek, 2017).

Currently (2018), there are more than 4.4 million employees in Hungary, of which 32% is employed in industrial sectors (manufacturing, energy, public utilities, construction), 63% in various service sectors and the rest in the primary sector. Within the manufacturing industry the vehicle industry is the main employer with more than

172 thousand people, followed by the food industry (144 thousand) and the metal industry. In the construction industry there are more than 332 thousand workers. In services, trade/retail trade (together more than 548 thousand), public administration (424 thousand) and education (344 thousand) are the largest employing sectors (Hungarian Central Statistical Office, 2018).

According to the European Union's statistics, the employment in knowledge-intensive activities (as a share of total employment) is around 34%, which is slightly below the EU average of 36%. The employment in medium-high and high-tech manufacturing is 9.9% of the total employment which is well above the EU average of 5.8% (European Commission, 2018). This is clearly the result of the many multinational subsidiaries which have settled in Hungary since the transition. (Their impact can also be seen on the share of high-tech export within the total export which is the highest in Hungary among all EU member states.) However, it also has to be seen that in many cases the technologies used by these multinational companies are only superior compared to the technological level of domestic companies, and the employees working at these subsidiaries are performing low value added, assemble-types of work. It is a real threat that these jobs can be replaced in the future by robots as there have already been some news in Hungary that certain companies are laying off employees because of technological developments.

According to a recent study by McKinsey (2018, p. 7), "automation arrives at an appropriate time for Hungary to achieve long-term productivity improvements that are indispensable to its economic competitiveness and ability to sustain growth. The immediate benefit of automation will be to reduce the growing labour shortage that is creating a bottleneck to its economic growth." They state, that while automation could boost economic growth in the country by 0,8-1,4 percent in the next decades, it also means that 49% of Hungarian working hours could be automated with already available technologies, which is around the global average. As in other countries, those jobs are at highest risk that involve predictable and repetitive tasks. At the same time, this trend may create additional job opportunities in high-quality services (Ibid.).

There will be further efforts to be made by the Hungarian economy to be able to benefit from the potential advantages of robotization. Recent Eurostat data shows, that largest shares of enterprises using industrial or service robots were recorded in Spain (11%), Denmark and Finland (both 10%), and Italy (9%). At the same time, the lowest shares were noted in Cyprus (1%), Estonia, Greece, Lithuania, Hungary and Romania (all 3%). In general, enterprises tend to use more industrial robots (5%) – and especially manufacturing robots (16%) – than service robots (2%). The mostly penetrated industries are warehouse management, transportation, cleaning or waste disposal and assembly work. Despite Hungary is generally lagging behind EU countries in the adoption of robots, in certain cases the use of robots are around or above the EU average, as in the case of service robots for transportation or for cleaning/waste disposal.

Hungary includes 19 counties (plus the capital city) and 7 regions. The Hungarian governance (and economy) is rather centralized therefore the regions do not have real power. Economically Budapest (the capital city) is the largest, most important region of the country, 37% of the GDP is produced here, and a further 10% in Pest county which is around the capital. Other counties have very limited economic power, the next largest producer being Győr-Moson-Sopron county, part of Western Transdanubian region, which is responsible for 5% of the national GDP. (This region and county is home to the largest multinational subsidiary, Audi Motor Hungary Kft. There is a strong business ecosystem around this company, which evolved in the past few years.) In Budapest, the service sector is much more important than the national average. 85% of the value added generated here comes from the services, while in other counties their share is below 65%. (In counties with strong industrial basis, like Győr-Moson-Sopron, or Komárom-Esztergom, the share of services in value added is only around 40%.)

Figure 3:
Regions of Hungary

Source: Regions of Hungary. (copyright-free; Wikipedia)

Among the regions, Western Transdanubia and Central Transdanubia and Central Hungary (Budapest and Pest county) are the most industrialized, while in Southern Transdanubia, the Southern and Northern Great Plains agriculture is proportionally more important than in national average. The least developed region of Hungary is Northern Hungary. The development of the peripheral regions in Hungary, like Northern Hungary is hindered by the aging population, the re-settlement of the young habitants to the central region, and, as a result, the spatial segregation of these regions.

Based on these information we may assume that people will be more familiar with and more positive towards robotization in Central Hungary or in Western and Central Transdanubia, where industrial development and penetration are more advanced. However, it may be that even in those places employees are more negative about current technological developments.

3. Research method

Although a relatively large number of estimates on the labour market impacts of robotization, digitalization or automation have been published, we still know very little about the society's or individuals' thoughts, ideas, hopes and fears related to these trends. Therefore in 2018 a representative survey was conducted in Hungary to assess the employees' and the society's attitudes towards robotization and to have an idea about their perceptions on the impact of robotization – impact on life in general and on their jobs. This survey was an online and personal hybrid (CAWI and CAPI) national data collection. It represents the Hungarian population aged between 15 and 69 by gender, age, region, and education. Out of the 1000 respondents 720 are employed currently. Their responses will be referred to as the employees' opinion, in other cases the results show the society's views. This paper focuses on the responses in regional dimension. The survey concluded two main parts. The first section asked general questions about robotization, such as their interest in and understanding of a robot, the acceptance of their distribution in various fields of life, their views on potential impacts, pros and cons of using robots and responsibility for problems caused by these machines. The second part focused on the employees' views. Questions focused on whether they have been already using robots in

their work, and what their impact will be in their workplace, and what they are doing to prepare for the diffusion of robots. Due to some limitations in the raw data in this case the paper will analyse the responses using basic statistics. The main aim is to highlight whether there are any significant differences in the answers and thus in the preparedness of the employees, and whether it has anything to do with the (geographical) industrial structure of Hungary. Does the presence of high tech companies in certain regions mean that the employees are more aware of technological trends and are better prepared?

4. Discussion

Although a recent Eurobarometer poll (2017) found that 38% of Hungarian citizens view automation negatively, this was only partially confirmed by our own survey. When we asked about the potential impact of robotization on European competitiveness, 61% responded positively, and 52% were positive about its impact on Hungarian competitiveness. In the first case 20% and in the latter case 30% were neutral, and only 6% and 11% were negative. It is, however, a very interesting difference, that regarding the impact on their own work and salary, only 19% saw the positive and 27% the negative impact. Regionally, people in Pest county (part of Central Hungary) are the most positive about the robotization's impact on their work followed by Western Transdanubia, where 25 and 26% expect positive changes, respectively. In other regions the share of positive responses were between 19 and 25%, except for Northern Hungary, where only 14% of the respondents expected positive changes in relation to their working situation.

It was interesting to see the general interest of the respondents towards robotization. In total, 73% of the respondents reported that they are interested – 22% were very interested, and 51% somewhat interested – in news related to this topic. Higher-than-average interest was recorded in Pest county (81%) and Budapest (77%), and the lowest interest was in Northern Hungary (64%). In Central and Southern Transdanubia the interest was also somewhat smaller (69-69%), which is particularly interesting in the case of Central Transdanubia, a rather industrialized region of Hungary. However, there is a different ranking of the regions if we look only at the share of those respondents, who are very interested in this topic. In this case, the Northern Great Plain shows the greatest interest (28%) followed by Western Transdanubia (27%) and Pest county (26%). It has to be noted, that in the most developed region of Hungary (Budapest) the interest towards robotization is rather average, and the expectations are not outstanding, either. This result might be influenced by the higher share of services in the economy where robotization is not yet that obvious. In none of the regions do the respondents feel particularly well informed about robotization (despite their interest). Again, it is in the Northern Great Plains where people are the most confident about their knowledge (21% know something about robots) and in Northern Hungary the least confident (only 4% know something about robots). People from Western Transdanubia and Pest are also more informed than the national average.

The research also tried to highlight the source of information of respondents about robots. In general, 61% of the respondents have never seen a robot, but 14% did so on an exhibition, and 8-8% in the workplace and during travelling. When looking at the regional data, one may find that in Central Transdanubia 17% of the respondents have seen a robot in their workplace. In Pest county, an even higher share of respondents, 24% reported to 'meet' a robot in healthcare, and a further 15% during travelling. In the most industrialized region (outside Central Hungary), in Western Transdanubia only 5% or the respondents reported to have seen a robot in the workplace, which is the lowest share among all regions. Southern Transdanubia, Northern Hungary and Western Transdanubia are those regions where the highest share of respondents claimed that they have never seen a robot.

When the respondents were asked whether they accept the diffusion of robots in various places, industrial robots proved to be the most accepted type of robots (68%). Other robots are expected in agriculture (59%) and transportation (61%). At the same time, only 26% of people would accept robots in elderly care, 31% in healthcare and 33% in customer service.

In general, 45% of the respondents expect that robots will take on human jobs to a large extent, while 32% believe they will take on only a small part of the jobs. In Northern Great Plains, 14% are expecting that robots will work instead of humans, and 54% expect that they will take a large part of the jobs – both values are the highest among the regions. In Western Transdanubia, also 14% are expecting robot work instead of humans. In the capital city, only 8% expect that robots will work everywhere and 34% believes that they will take a large part of the human jobs. This latter share is the smallest among the Hungarian regions.

There is a more or less general agreement among the respondents, that robots will or need to take over jobs that are dangerous (75%), repetitive or physically exhausting (71-71%). A minor difference can be seen in Western Transdanubia, where people expect robots to work in repetitive (74%), high precision (73%) and dangerous (71%) positions. It is also a general view that people doing blue collar work and less educated are in the most risky positions. In Central Transdanubia and in Pest county, respondents believe that people living in smaller towns are also endangered by the diffusion of robotization.

More than 60% of the respondents believe that those, who lose their jobs because of the technological development need to be supported in re-training, but also 40% would like to ban the use of robots in certain positions. Similar share (39-39%) of the respondents mentioned the need for education about robots in the school and the provision of a base salary. Education was relatively more important in Central Hungary, while in Western and Central Transdanubia a relatively larger share of people (45 and 48%) would ban the use of robots.

In general, employees are totally uninformed whether the diffusion of robots will bring benefits or dangers for their position. 28% of the respondents see both, 13% see more opportunities and 14% see more dangers with more robotization. This balance takes a negative direction in Northern Hungary, in Southern and Central Transdanubia and in Northern Great Plains. People see more opportunities in Central Hungary and in the Southern Great Plains. Among the potential advantages of robotization, people mention less repetitive jobs (55%), higher productivity (54%) and less unhealthy jobs (43%). People from all three Transdanubian regions place higher productivity at the first place, while in Central Hungary the less repetitive jobs was the most important opportunity. Practically, three quarters of the respondents have fears from job loss. This share is highest in the less developed regions, and below average in Budapest (65%), Western Transdanubia (64%) and, somewhat surprisingly, in Southern Transdanubia (69%). There was no clear pattern in the question, who should be responsible for the preparation of the imminent challenges by robotization. Responses were divided between the individuals, the companies and the government. It is a thought-provoking result at the same time, that 51% of the respondents are not preparing for the potential challenges, and only around 16% take part in any kind of education or training. People in Northern Hungary and Pest seem to be the less forward looking, and even in the most industrialized regions only less than 14% of the respondents are engaged in any kind of learning activities, while in Northern and Southern Great Plains the share of respondents is above 24%. This means that the better knowledge or a more industrialized environment does not necessarily mean that employees are becoming interested in learning, obtaining new digital skills or preparing themselves in any other ways for more robotization and digitalization.

5. Conclusions

Hungary is now in a very fragile economic situation. She has been deeply integrated in the global value chains but in positions that are generating less value added. Many multinational corporations have established subsidiaries in the country but the value added and productivity of these plants do not seem to be evolving over time. In the 21st century, the unprecedented speed and scope of technological development bring new challenges when both the most developed countries and the developing economies (like in Asia) are becoming competitors. There is an opportunity for reindustrialization in the developed economies while due to technological upgrading, many more developing countries are able to climb up in the global value chains and obtain new, more advanced tasks.

In this situation, it is crucial for Hungary to be prepared and to successfully take part in technological development in order to be able to maintain international competitiveness. In this task, human resources play a crucial role. The availability of a capable workforce with adequate digital skills might be an attractive asset for all multinational players to maintain and improve activities within the country. Therefore, it is not enough if firms are ready to introduce the innovations of Industry 4.0 or the fourth industrial revolution, but it is equally important to prepare the human workforce for the future world of work.

This paper analysed the current knowledge and preparedness of the Hungarian society and, partly, the employees with regard to robotization. Although during the past decade, or even more in the past 5 years there have been a lot of information published on the potential impact of robotization globally, people in Hungary seem to be less aware of the importance of this change. Although most of the respondents are interested in the topic, their actual knowledge is rather insufficient. This picture is not really modified by the economic environment. Even in regions which are more industrialized, more developed, there are no significant differences in the level of information or awareness. This might be the reason that while globally they see this trend as positive, in their personal life and work position they do not. People are simply not well informed to be able to judge, whether robotization will bring more opportunities or more threats. Interestingly, it seems that in regions that are less developed and where people have fewer opportunities to witness the spread of robots in the economy, a darker future is envisaged and negative effects are expected more than positive ones. However, on the other side, we cannot say that the more developed, more industrialized regions automatically generate a better environment for robotization. Even in these regions employees are not really prepared for the imminent challenges, and in general it is not true that people educate themselves to be able to meet the higher requirements of the future workforce, that is to become capable of working together with robots.

The research shows that an exclusively technological and industrial development does not create a beneficial environment for catching-up and improving the human workforce. The Government has to take active steps in order to share information on robotization, improve the involvement of the local economy in technological development and elevate the quality and capabilities of the human workforce in all the regions of Hungary.

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