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The Fourth Industrial Revolution. Global Risks, Local Challenges for Employment

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ABSTRACT

The authors are convinced that humankind is at the beginning of a new revolution that is fundamentally different from all previous industrial revolutions. This fourth revolution is characterized by the rise of new technologies which impact all disciplines, economies and industries. The new technologies could improve dramatically economic efficiency at the industry level and could change the workforce behaviour. In this article, we try to emphasize how societies can adapt the new technologies to the actual human needs, in order to capture their benefits and, at the same time, regenerate the natural environment. We also argue that information technologies and robotics are within the control of all of us, and man is able to dialogue with intelligent machines without any need to change the basic idea about what means to be a human.

INTRODUCTION

The 46th Annual Meeting of the World Economic Forum (WEF, 2016a) held in January 2016 at Davos, Switzerland, addressed an extremely important issue concerning the Fourth Industrial Revolution. Starting from the report presented by K. Schwab (2016a), many leading figures of the world's financial elite dealt at length with the impact that the *Fourth Industrial Revolution*, still in its infancy, might have on global business and on human society in general. Most addresses revolved around the following question: Is the world economy prepared to cope with this phenomenon or not?

So far, the literature (Hermann et al., 2018, p. 1) has not adopted a unanimously accepted definition of this complex phenomenon in full swing. However, it is believed (Dombrowsky and Wagner, 2014, p. 100) that this industrial revolution is the combination of economies and scale and economies of scope to generate a fusion of new technologies which, to a great extent, turn

into production processes monitored by computers, internet of things and cloud computing. Their greatest effect is the development of smart factories (Schwab, 2016b, par. 6.11), which amounts to fundamental changes in all sub-markets of the world economy, starting with the labour market. Therefore, it is believed (WEF, 2016b, p. 1) that in the near future over seven million jobs are to go worldwide and the tasks will be completely carried out by industrial robots. The most affected will be the developed, highly industrialized countries. On the other hand, one cannot overlook some positive effects of the new industrial revolution, namely, the creation of another two million jobs in sectors such as building and programming robots and industrial machines as well as process digitalization and supervision. The scope of this phenomenon is even wider since in the second half of 2015 the manufacturing sector in Europe alone totalled about 2 million companies providing 33 million jobs (European Parliament, 2015, p. 2). In light of these facts, the consequences of job losses could be even greater due to connections in the value chain with the other upstream and downstream stakeholders in each branch of industry and due to the streamlining of various in-house activities.

It is quite difficult to foresee what the world economy will look like in 2040-2045 in light of the rapidly changing IT sector and of the fact that the line between the work done by robots and the work done by man becomes increasingly blurred as the two coexist in integrated production systems in the form of smart factories and smart production systems (WEF, 2016b, p. 1). The first industrial revolution started around 1780 (Schwab, 2015) and lasted almost a century, its main invention being the steam engine created at the beginning of the 18th century and later improved by James Watt. The second industrial revolution started in the second half of the 19th century following the discovery of new sources of energy (the electric power, in particular) and the improvement of oil and gas technologies (Pearson and Foxon, 2012). These sources of energy fostered the rapid development of important branches of industry such as electrical engineering, the chemical industry, the automotive industry etc. Consequently, at the beginning of the 20th century Henry Ford set up the first assembly line which triggered the industrial mass production (Alizon et al., 2009).

This was followed by the third industrial revolution, which is now on the wane. The third industrial revolution was characterized by the phase-out of energy intensive industries and the appearance of new sub-branches such as electronics, mechanical engineering, precision mechanics, advanced processing of raw materials, and, in particular, the appearance of information technology, the Internet and the interdependence created by IT in the world economy, changing the international environment into a real “global village” (Fitzsimmons, 1994, pp. 295-297). This evolution set the stage for the use of digital technology and computerization of the manufacturing industry, leading to the concept of “smart factory” (MacDougall, 2014, p. 10). This enables the provision of personalized products and services and the ongoing adaptation of the offering to new market realities and to customers’ needs and demands. The technical conditions created by the third industrial revolution paved the way for the *digital economy*, which consists in reindustrialization based on automation and cybernetics (Vătămănescu et al., 2017; Vătămănescu et al., 2018). This laid the ground for the appearance of the fourth industrial revolution.

It is digital technologies that enabled this leap in quality, which revolutionized entire business sectors. Digital technologies operate in the manufacturing industry as well as in other fields of advanced research (medicine, aviation, spatial missions etc.). The new industrial revolution will use digital technologies on a large scale, with robotics contributing greatly to the increase of work efficiency and productivity (Berger, 2019, p. 8). The effect of these changes will be seen in the substantial reduction of production costs and of the period between the approval of a patent and its application in the manufacturing processes. It is true that, due to their complexity, the new technologies are expensive in the beginning. However, they will pay for themselves much faster due to their higher economic return and to the higher added value given to the new products. Moreover, digital technologies are *contagious* as the transfer of know-how takes place almost simultaneously across enterprises.

The present study aims to highlight the aspects related to, as well as the relevance and importance of the implementation of the new industrial revolution from a theoretical and a practical perspective. The literature is both scarce and unsure as to the approach to the concept of industry 4.0. The approach so far has been somewhat futuristic, with authors with positive expectations and also with researchers who foresee a general collapse of the labour market. Being aware of these shortcomings, the authors deal objectively with the industry 4.0 concept, stressing not only its evolution, but also its multiple challenges and implications. The second section of the paper addresses the evolution of the industrial revolution from an economic and societal perspective. The third section describes the link between Industry 4.0 and the "smart factory" concept and, finally, the fourth section deals with the role of jobs in the context of Industry 4.0, with focus on companies' challenges and responsibilities against a backdrop of technological advancement. The paper ends with conclusions and theoretical and managerial implications.

1. THE NEXT INDUSTRIAL REVOLUTION: AN ECONOMIC AND SOCIETAL APPROACH THROUGH THE LENS OF CURRENT THINKING

In his book *The Fourth Industrial Revolution*, presented at the World Economic Forum in January 2016, K. Schwab (2016b, p. 1) strongly asserts that mankind is at the beginning of a new industrial revolution (the fourth in chronological order) which will fundamentally alter how people live. The fourth industrial revolution is different from the previous ones not only because it is characterized by a range of new technologies, completely different from the already known technologies, but also due to its capacity to put together all breakthroughs in natural sciences. Schwab (2016b, par. 7.7) analyses in a historic context the profound and systemic changes occurring over the years, which fostered the appearance of supercomputers. He also deals with the impact of these inventions and innovations on economic growth, employment and the nature of human work (labour substitution) (Schwab, 2016b, par. 13.5). This leads to an increase in consumption while using fewer resources, a fundamental principle of sustainability and responsible consumption (Dabija and Bejan, 2018). Today, collaborative innovation in fields such as artificial intelligence, robotics, the Internet, nanotechnology, biotechnology, materials science etc. is about to give rise to an important landmark, namely, the fusion of all technologies and the reformation of the entire production system. There are at least three reasons why Schwab believes we witness the beginning of a new industrial revolution different from the previous ones, and these are (Schwab, 2016b: par. 5.3ff.):

- *Velocity:* unlike the previous industrial revolutions, this one is evolving at an exponential rather than linear pace;
- Breadth and depth: we will have to reconsider an entire range of paradigms that we are familiar with;
- Systems impact on society as a whole.

In an interesting book titled *The Industries of the Future*, another author, A. Ross (2016), provides a fascinating picture of the future of the industry where new technologies will change the world. Certainly, it is almost impossible to accurately predict what will happen in the immediate or the distant future. However, by adopting the author's systemic and strategic thinking, we can glimpse certain future trends and clearly understand the economic, political and social forces behind these trends. From this perspective, Ross makes a detailed and exciting presentation of the profound changes about to take place by the large-scale use of industrial robots in the various stages/processes of the industrial production, as well as of the possible impact of their use on economic development, employment, distribution of wealth and global trade. Without making explicit reference to the appearance of a fourth industrial revolution, the researcher skilfully describes the main technology trends and explains the implications of the new technologies in the technological advancement of the future decades. At the same time, the author anticipates some

opportunities that human society can take advantage of with its entry into a new information age (Ross, 2016) and into a new wave of innovation. Certainly, future prospection raises many questions and even arouses feelings of unease or disquiet. However, Ross indicates that mankind/society has the capacity to survive without difficulty in a cyber-dimensional world that we have to prepare ourselves in advance to meet, understand and adapt to so as to get the best advantages as fast as possible (Ross, 2016, 186ff).

A similar opinion is expressed by Zittrain in his book *The Future of the Internet – And How to Stop It*. The author believes that the progress in terms of the spread of the Internet in people's lives is unstoppable (Zittrain, 2008, p.153) as it is one of the main drivers that will alter completely future technologies and will serve as foundation of the fourth industrial revolution. Zittrain (2008, p. 84) believes that the Internet is "generator of technologies" as it can be used in many creative ways and within strategies for the future development of society (Zittrain, 2008, 175ff.). As regards the future of professions against the background of the use of new technologies, R. Susskind and D. Susskind (2015, pp. 46-100) predict the disappearance of many of today's professions and provide an approximate description of the systems that will replace them. They believe that current professions are obsolete, opaque and inaccessible in the long term, and develop parallel scenarios according to which certain professions will evolve under the impact of the new industrial revolution.

In his book *Rise of Robots: Technology and the Threat of Jobless Future*, M. Ford (2015) addresses the complex issue of the jobs of the future and seeks to identify the profile of those who will perform these jobs. He states that artificial intelligence changes even the best jobs into obsolete professions. For instance, even programmers will be replaced by robots and various software versions (Ibid., p. 16). The continuous progress in this field will put an end to the blue- and white-collar jobs (Ibid., p. 83), leading to huge unemployment and economic inequality. Consequently, the question is, what will the future bring: prosperity and social welfare or catastrophic inequality along with economic insecurity (Ibid., p. 284), imbalances and societal upheavals.

The negative and positive aspects of the new technologies in the near future are analysed by E. Brynjolfsson and A. McAfee (2014). According to them, the new digital technologies will be able to diagnose diseases more accurately than do physicians themselves, and carry out tasks which so far have only been viewed within human competence. As all types of professions will change substantially, companies will have to adapt to the new requirements. Education will play a major role in finding the best strategies for survival in a highly competitive environment because it will be able to train individuals to cope with the demands typical of the new economy (Ibid., pp. 187; 249-255). In general, the two authors convey a more optimistic view than does Ford (2015, p. 176) who states that we are in an era of technological optimism blended with deep sociological pessimism likely to impact negatively on society and its development.

Dobs et al. (2015) make an ample analysis of the main forces behind the present accelerated technological changes. They state that mankind goes through a transition period in which economic and social forces operate to change the traditional production patterns and to produce fundamental changes in all fields with the aid of the technologies that we will have to get accustomed to and work with in the near future. M. Anissimov (2015) attempts to answer some questions about the development of artificial intelligence in the future, the extent to which it will represent a threat to mankind and/or to various societies, the importance of nanotechnology etc.

2. A NEW INDUSTRIAL ERA

The fourth industrial revolution has lately been known as *Industry 4.0*, a commonly accepted name given by German practitioners and researchers (Rojko, 2017, p. 80) who aimed to increase the competitiveness of the current manufacturing industry by integrating cyber-physical systems into the production processes. Cyber-physical systems are represented by smart machines connected to the Internet (Monostori et al., 2016, p. 621) and their raison d'être is based on the fact

that many industrial units waste a lot of energy during week-ends and non-working days. This is the opposite of the concept of *smart factory*, whose purpose is the fusion of the virtual and the real world by means of cyber-physical systems with the result that technological processes are integrated with new forms of business organization (GTAI, 2018, p. 10).

The potential of the *smart factory* production system is undeniably greater than that of any previous industrial system. This production system with wholly integrated cyber-physical parts is able to change the very nature of the human work by performing all the simple and repetitive operations calling for less skill. There is nothing new about automated systems as they have been in operation until now. This time, however, it is about programming an entire set of machines able to communicate between themselves. Due to the huge power generated by such systems, many voices have expressed concern that manpower will be put in the shade with dire consequences for employment. The fear of job losses has been echoed for many years and much debated throughout the third industrial revolution. J. Rifkin (2011, p. 22) demonstrates how the wide spread of automation has led, not to job losses, but to the creation of tens of millions of new jobs. Further arguments in support of this thesis are provided by the International Labour Organization (ILO, 2013, p. 24), which shows that total manpower for the global economy as a whole has not decreased, but, on the contrary, increased.

In the new technological era ushered in by the fourth industrial revolution, workers will be completely freed from boring and repetitive jobs and, instead, will perform creative activities typical of a smart era in which machines communicate between, and coordinate each other. Based on this reality, it is believed that mankind is heading for "*a world without work*" (Thompson, 2015), which, of course, is an exaggeration. J. Barrat (2013, p. 392) expresses himself in a similar vein, eager to herald "*the end of the human era*" as a result of the large-scale use of artificial intelligence. So far, artificial intelligence has had a rival: the human being. However, their coexistence seems no longer possible (Ibid., p. 531) as the new industrial revolution increases significantly the quality of work and brings about profound structural changes in all fields. However, it seems absurd to believe that human work will disappear altogether. This would mean that all members of society will be left unemployed one day. International Labour Organization (ILO, 2013, p. 10) shows that in 2013 there were 3 billion employed people worldwide and only 202 million registered jobless people. Statistics (ILO, 2018, p. 6) mention that global unemployment rate in 2017 remained steady at about 5.6%, which represented about 192.7 million people. This was a clear decrease in unemployment by comparison with previous years. Current reality contradicts the authors' futurist vision about the changes in the social structures, but this does not rule out rapid changes caused by the adoption of new ways of production organization based on the *Industry 4.0* principles.

The extent to which the fourth industrial revolution (*Industry 4.0*) has already started cannot be stated with certainty. It is, however, in a period of transition and represents a new field which, in part, has been insufficiently explored both theoretically and practically. The trend towards *humanizing* the virtual environment and towards the creation of hardware structures followed by software adaptation and diversification calls for periods of adaptation and joint efforts to understand the potential advantages of the technological evolution. Therefore, it is premature to state how the human-machine relationship will evolve in the future. However, several trends begin to take shape. The real world of production is about to change into a *huge information system* able to redefine the values regarded hitherto as fundamental, and to evolve from the "knowledge economy" to a "global market of scientific information" (Brătianu and Vătămănescu, 2018). This only seems applicable at the moment to certain fields of scientific progress, with trends towards generalization mostly in the case of industrial systems.

The new industrial revolution will likely reduce manufacturing *outsourcing*, that is, the relocation of industrial activities to other geographical areas will taper off because cheap labour force will no longer be a competitive advantage in the production proper (Postelnicu and Dabija, 2017). Instead, outsourcing tends to continue as a means of harnessing the available talents in fields like

software resources development, engineering and services associated with production (Davila, 2018). Smart machines will boost productivity to a level where labour costs no longer matter.

Industry 4.0 targets not only the industry but also the entire global socio-economic system. For the first time since the appearance of *sustainable development*, which has recently been dealt with at length in the literature (Cîrstea et al., 2018; Dabija et al., 2018b; Stock et al., 2018; Tiron-Tudor et al., 2018), an optimal solution has been found for the concept of industrial revolution 4.0, without being called in question because of opposing or disturbing factors. However, it is difficult to foresee whether the technical and scientific progress will be able to prevent excessive wealth concentration and maintain the gaps in the global economy. The revolutionary technology of the 21st century will unavoidably produce an increase in economic inequality even for the mere fact that many current professions will become obsolete, leading to a new type of division of labour between highly skilled people and those stuck in outdated professions (see also Jabbar, 2017). This process will extrapolate at international level, deepening the already existing gaps between national economies. Gaining scientific and technological knowledge depends crucially by investments in research and innovation. Consequently, the most developed countries have at the moment almost exclusive ownership of the technological means by which to create a real fusion of the virtual and the real world. The so-called *smart factory* is a cornerstone of all traditional industries known so far. In other words, the key element of this evolution will be the presence of *integrated engineering* into all production processes, more precisely, a self-regulatory (Berkeley, 2019) and self-improving cyber-physical system. This will enable machines not only to interact with one another, but also to make choices free from human intervention.

In his book titled *Makers. The New Industrial Revolution*, C. Anderson (2012, pp. 12; 174) mentions the appearance of the *digital culture* or the *Web culture* which is about to change the future of mankind. The spread of the Internet and social media (Dabija et al., 2017; Dabija et al., 2018a) over the last years paved the way for a new industrial era in which inventions and innovations occur at a breathtaking pace. Most of the changes in the production system were triggered by great scientific breakthroughs which surprise through their effects and implications. The new industrial revolution, however, opened the door for a long range of inventions and innovations that will change radically the entire system of material production. We also have in mind the fact that current inventions and innovations have fostered the appearance of artificial intelligence and the digital revolution. Del Monde (2013) wonders if artificial intelligence will truly benefit people and if machines will become more intelligent than man. In our opinion, such concerns are essential in the context of social and economic changes brought about by the application of the principles of the new industrial revolution which is about to start. Essentially, the effects of the new *Industry 4.0* production systems will, from a certain perspective, produce changes not only in the man-artificial intelligence relationship but also in the very concept of "robot" as the new types of professions become feasible.

Due to the speedy advancement of the technical and scientific progress, the capacity of machines to make decisions by themselves will render them somewhat autonomous in the relationship with man (Chen, 2013; Hozdic, 2015). L. Muehlhauser (2013) claims that in the not very distant future, artificial intelligence will evolve very quickly and surpass human intelligence. The peril is that mankind might not be prepared for such a radical change of paradigm. However, it is impossible for artificial intelligence to be completely separated from the human intelligence, at least as long as humans will be the main providers of material and intellectual resources able to feed this interaction. The new revolution was furthered, from its infancy, by the individual's economic needs, in his or her attempt to solve the increasingly complex problems of the physical reality. D. Mindell (2015) proposes a somewhat opposite approach and makes convincing arguments according to which man will be able to control the robots of the future and their artificial intelligence, no matter how sophisticated, will not be able to surpass human intelligence (Ibid.). Thus, the so-called autonomy of robots seems to be a mere myth and continues to serve as a source of inspiration and innovation. Similar opinions are expressed by J. Heaton (2013, pp. 2-4) who shows that artificial

intelligence has been created for people, not against them. S. Armstrong (2014, pp. 6-7) starts from the same question: what will happen when machines become smarter than people? Pondering over this question, the researcher concludes that, should machines happen to become (almost) as smart as humans, then many ethical and technological problems will arise and need solving. However, we are not yet prepared for this (Ibid., p. 7) as the very concept of intelligence is still being debated.

3. THE FUTURE OF JOBS

In addition to other important documents, the World Economic Forum also issued the report on the future of jobs (WEF, 2016b) in close connection with the debates on the main theme of the industrial revolution 4.0. The appearance of artificial intelligence will have an unprecedented impact not only on the future business models, but also on the labour market (WEF, 2016b, p. 1). Consequently, the report was titled in agreement with the topic being discussed, that is, the level of skill and the workforce strategy in the context of *Industry 4.0*. Thus, while some professions face the threat of becoming redundant, others will rapidly become very important. In many countries and industries, the most in-demand occupations did not exist ten years ago. According to some estimates (WEF, 2016b, p. 1), about 65% of children entering primary school today will end up working in new types of jobs that don't yet exist. Therefore, it is highly important for decision-makers to be able and even bold enough to find the most appropriate solutions to anticipate how the future job landscape will change and to prepare the new generations so as to cope with these radical changes. This does not mean, however, that the transition to a new level of workforce qualification will be free from risks and difficulties. The future of jobs depends strongly on other social, economic and demographic factors, such as the disruptive changes to business model in almost all industrial sectors and the increase in demand for highly skilled labour force. To this effect, the International Labour Organization (ILO, 2013) estimates that, by 2020, more than 300 million new highly skilled jobs will have to be created in order to provide the new generations with job opportunities. *The Future of Jobs Report* (WEF, 2016b, pp. 1-2) stresses very clearly that current trends could lead to a net employment impact of about 5.1 million jobs lost due to disruptive labour market changes, especially over the period 2015-2020. Added to this is the effect of losing 7.1 million jobs, two thirds of which are concentrated in office and administrative roles. At the same time, the forum also mentions that about 2 million jobs could be created in the fields of IT and advanced technologies. Given the World Forum officials' concern for the consequences of this new revolution in the context of mankind's undergoing full changes triggered by the start of this global-scale phenomenon, a similar report was issued in 2018, where the fundamental changes about to affect jobs and professions are stressed again. Thus, during the 2018-2022 period, the share of emerging professions of the total labour market is set to increase from 16% (in 2018) to 27% (in 2022), whereas the employment share of declining jobs is set to decrease from 31 % to 21% for the same period (WEF, 2018, p. 8).

The report on the labour market changes and the characteristics of the new industrial revolution is based on current data, but the forecasts and, in particular, the effects of these changes on the evolution of labour force are only now being perceptible. We believe that the technologies of the future will not undermine the creation of new jobs, but rather they will foster the appearance of new forms of entrepreneurship and cause a shift in the working patterns of current generations. There is, of course, the fear that robots will *steal* people's jobs because they will have a certain degree of autonomy. In reality, this is a flawed reasoning because artificial intelligence should not be equalled with the sovereign intelligence which only the human being possesses. Man will still control the incorporation of artificial intelligence into machines. Moreover, whether these machines will borrow some moral values is debatable, it's an idea still belonging to the realms of fantasy. Should it happen, it will of necessity have to be harmonized with the ethical principles of the modern society. The creative potential of robots will be limited by the software created by men. The so-

called *robopsychology* according to which robots will be able to carry out intellectual work in the future is pure fantasy (Chen, 2013; Hozdic, 2015; Nitsch and Popp, 2019). No matter how sophisticated they become, robots will only be able to increase humans' capacity to think and create, not to remove it entirely. The human cognitive potential will remain superior to that of any *intelligent/smart* machine. Robots will never be able to share values such as ethics, empathy, emotions, affinity and antipathy typical of the human being only. Likewise, they will never become physical persons with legal rights. All these aspects are just pure science fiction speculation. Over the years, there were many significant and revolutionary landmarks in the history of natural sciences. However, man could not be sidelined by his own machines.

Finally, the simplest question that needs answering is the following: does the new industrial revolution (the fourth according to current calculation) create more jobs or destroy more jobs? The answer is not as simple because our choice is between the pessimistic outlook according to which new technologies increase unemployment because the machines of the future will replace people in the production process, and the optimistic outlook according to which the new industrial revolution will create more jobs that it will destroy. We can only choose the second and our choice is based on the following arguments:

- computers and industrial robots will only operate based on, or following the interaction with people;
- the so-called *tacit* knowledge about an individual's experience over the years cannot be transferred to robots and computers;
- for many years to come, robots will only perform simple and repetitive tasks, whereas operations calling for more complex knowledge and involving a high level of creativity and innovation will be conducted by man alone;
- for the reasons above, there seems very little likelihood of machines replacing the human being in such operations.

The pessimistic outlook of the 2016 report on the future of jobs is more pronounced in its final part (WEF, 2016b: 8-9) where it mentions the impact of new technologies on labour force. The envisaged result will be the creation of a limited number of new jobs and the loss of another 7 million obsolete jobs, which, according to estimates, leads to a negative balance of jobs. However, the new 2018 report puts forward the notion of offset, bringing the balance of jobs on a much more optimistic side, at least up to the year 2022. We dare say that such positive adjustments are not new in the global economy as they are used in various fields, not only for the global labour market. Long before the World Economic Forum (the 2016 meeting and documents, in particular), the economic literature featured some papers in which "the end of work" was being announced. Among others, we have first in mind Rifkin's book (1995) bearing this very title *The End of Work*, in which the author starts from the fact that many "obsolete" professions disappeared and reaches the conclusion that mankind entered an "end of work" era (Rifkin, 1995, pp. 3-15). In a globalized world, more and more countries have to cope with growing unemployment. However, Rifkin turns more optimistic towards the end of the book, avoiding a conclusion in terms of a looming social and economic catastrophe. He only explains how the economic collapse could be avoided by using the technological potential existing in various locations (Rifkin, 1995, pp. 221-293). Such notable contributions are typical of the transition period of the global economy in parallel with the implementation of the principles of the new industrial revolution.

International Labour Organization (ILO, 2018, p. 15) shows that unemployment rate remains relatively high in developed states such as those in North America (USA and Canada), with 8.3 per cent in 2018 and 8.5 per cent in 2019, or in Northern, Southern and Western Europe (ILO, 2018: 24), with about 17.7 per cent in 2018 and 17 per cent in 2019. These data are not the outcome of austerity policies alone or of the effects of a not yet completely defused economic crisis, but also of the new industrial revolution well underway. In fact, an older ILO report showed that in 2019 about 45 per cent (ILO, 2016, p. 17) of the global labour force might become vulnerable because of the

new technologies. The same percentage, with slight variations, appears in subsequent reports of the organization. As expected, most of the relatively high percentage of vulnerable workforce is attributed to developing countries. Given that every year about 40 million people worldwide are expected to get a job, then about 600 million new jobs should be created in the global economy by 2030 (United Nations, 2015; ILO, 2016). This is very unlikely to be achieved in the context of the current mechanisms of the global economy.

The internationalization of the labour market has brought about an increase in unemployment and labour force migration. Currently, hundreds of millions of workers migrate from country to country seeking work, many of them having no papers and no social protection. These migrants are the product of economic underdevelopment, and not the outcome of the new industrial revolution which in principle creates technological unemployment in developed countries. In these developed countries the dilemma between economic growth and employment is a topic which has featured highly on the agenda of academics for many years. Therefore, in the context of the fourth industrial revolution, unemployment will continue to be the "hidden trap" of the economic growth and a social scourge against which appropriate solutions must be identified. This is even more imperative as unemployment takes multiple forms in modern economies as well. Some of these forms of unemployment are not reflected in official statistics. This is the case of the so-called *hidden unemployment* affecting mostly the people in rural areas who often live below the level of subsistence, or the people who work significantly fewer hours than they had wished (the underemployed).

FINAL CONSIDERATIONS

All the previous succeeding industrial revolutions improved in some way the welfare of the population, giving consideration to the historical context in which these revolutions took place. Today's fourth industrial revolution takes forward the uninterrupted flow of inventions and innovations designed over the last decades, and capitalizes on them at a superior level. Thus, a sudden shift took place from the heavy industry to the almost *invisible* industries based on high capacity microprocessors. However, the consequences of the new technological revolution are a source of unease for both the economically advanced societies and the less developed countries. We believe that the careful analysis of these consequences, depending on the level of economic development, is a challenge for the economic theoreticians faced with the need to consider new variables whose influence depends on societal transformations. As expressed by some World Economic Forum participants (WEF, 2016a), mankind is about to enter insufficiently explored territory. The impact of this new revolution on the various activity sectors is yet uncertain. It will certainly produce both positive and negative effects. Therefore, one of the problems on the agenda of most researchers and which could represent one of the limits of current economic research is this: what will the new industrial revolution offer—welfare opportunities for all people or greater economic inequality? Excessive globalization with unpredictable consequences on the human beings is already looming. How this system will change our 21st century working pattern and how people will be able to take advantage of this process, which will affect fundamentally the economic practice, remains to be seen. The studies have shown so far (Spinelli and Luke, 2018) that the failure to anticipate in time the demand for new professions leads to heavy toll taken by the changes occurring in society.

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