

ROBOTICS AND ITS IMPACT ON EMPLOYMENT: A PROPOSAL TO ADDRESS MASSIVE UNEMPLOYMENT

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ABSTRACT

This article analyzes the overwhelming changes that robotics and Artificial Intelligence will bring to our lives, many of which are already with us. It explains how robots were born, and the difficulties of assessing the productivity of new technologies are underlined. Next, a distinction is made between the effects of robots when used as human aids and as a substitute for human labor. In the second case, the threatening question arises of how to solve the problem of mass unemployment, which will surely be caused, as there will no longer be any kind of work, as demanding as it may be, that cannot be executed by robots. The answer is that, in fact, the real problem is the way wealth is distributed, not unemployment. Given that new technologies are the legacy of the long-term development of the whole of mankind, it is unacceptable for their beneficial consequences to be monopolized by a small group of people owning the robots. Therefore, in the next few years state intervention will prove absolutely necessary in order to impose an adequate mode of income distribution. Finally, the article highlights the unknown risks associated with Artificial Intelligence and refers to measures that could mitigate them.

Keywords: robots, Artificial Intelligence, globalization, full employment, Democracy, mass unemployment, income distribution, inequalities, state intervention

INTRODUCTION

The invasion of robots and Artificial Intelligence is predicted to radically change our everyday life. New technologies, which in many cases already apply on a relatively large scale, bring revolutionary changes on all levels. The main problem of the dominant economic theory is its inability to interpret the way they operate. It could be argued that the initial post-industrial stage has come to an end, and a new stage of capitalist development is rising, into the international economic front, through the old one, namely the stage of automation. *The agonizing question logically put forward here, is whether these radical changes to society and the economy will be for better or worse.* The easy and quick answer would be that they will be for the better, as these new technologies are expected to considerably relieve mankind from routine and heavy work. The human race could therefore free up time to engage in what it most prefers, and could not previously extensively enjoy.

It is clear, however, that this answer perceives robots as human associates and not as substitutes. However, the danger that a large and increasing part of the activities of the new technologies will not simply co-operate with man but will replace and even threaten him, is visible and perhaps already present. This is why it unfortunately seems that these optimistic predictions are not absolutely realistic. On the contrary, what is already happening, and what is certainly about to happen in this field seems to justify the pessimists. *The major threat of automation for human societies is the creation of uncontrollable technological unemployment, accompanied by a worsening of the already unacceptable inequality of income and wealth distribution, unless the necessary measures are taken to counteract it.*

In addition to the impact of new technologies on employment, on which the quality of life as well as mankind's survival depend, new technologies include other risks that refer to dangerous and undesirable changes in behavior, choices and human psychology (Brooks, 2017). There seems to be a new human species which spends endless hours of each day on "smart phones", which rarely goes out with friends, which is better informed than in the past but has no time and especially no interest in thinking, analyzing and going to the bottom of things and which presents frequent and sometimes dangerous depression tendencies. This is a transition from too many working hours to the work of "smart phone".

In the following three paragraphs, I will first address the content and consequences of new technologies on employment, secondly the content of Artificial Intelligence and its threats to humanity, and thirdly, I will propose a solution to the problem of unemployment and to some of the other visible risks – a solution that I have been supporting for a long time.

The content and impact of new technologies

What are robots and how they were created

Robotics has been born through the advancement of many technologies, with the result that robots were initially able to distinguish objects, move them, imitate simple human movements, learn simple skills, work as a team, and work with other robots. Up to this point, robots would represent valuable human assistants, would free up time and allow man to work less hours and enjoy more time for leisure, personal development and entertainment, while the robots would be totally dependent on him.

This was exactly what happened initially, and these expectations were, obviously, the basis of the original idea behind their creation. Over time however, the robot's evolution became almost uncontrollable. That is why it is almost naive now to refer to robots exclusively as assistants. This is because it is no longer possible for man to be sure that when he leaves the robots alone in the evening, he will find them in the same state in the morning. No matter how unbelievable, the newest developments in the field of robotics prove that, after a critical learning limit, human teaching is no longer enough for the robots, who proceed to develop their knowledge by teaching each other. *The most striking but also the most scary fact is that robots converse in a language that is inaccessible to humans* (Wilson, 2017).

The simplistic interpretation of the method used for the achievements of robotics is, by analogy, imitation of the function of the human brain. The learning method is based on the repetition of a large number of data, such as images, voice, credit cards, which have been fine-tuned over time, ensuring almost 100% successful results. Robot programs are based on algorithms that are customized and constantly refined by dedicated scientists sought out by the major platforms of Facebook, Google, IBM, Alibaba, Tencent, etc. Tencent invests huge amounts of money in robotics and ferociously competes with each other to conquer the robotics market, promising huge profits.

The basic theoretical problems of new technologies

Measurement of labour and capital productivity

An important and unresolved problem at present is the inability to measure the productivity of the two key factors of production, labour and capital. This is because, in this new stage of capitalist evolution, the importance of both main factors of production, labor and capital is decreasing and a third, or even fourth production factor emerges, if land is taken into account. This new factor of production is automation which embodies the ultimate form of innovation, and promises significant profits in the future. These profits are no longer predicted to favor capital, in its classical form, nor labor, both of which represent traditional factors of production. *On the other hand, a small group with new ideas, innovative and creator of new products, new services and new business models, is emerging and imposing itself as the beneficiary of these significant profits.* The mode of distribution, thus set for the future, is that of the well-known Pareto curve, in which a small number of players earn a disproportionately large portion of the profits (Brynjofsson, McAfee, and Spence, 2014). *This new factor is innovative ideas, which are more scarce than work, but also than traditional capital.* Ultimately, however, innovative ideas can also be perceived as a form of special capital whose increased remuneration will continuously reduce the share of labor in GDP.

Measuring total productivity

Difficulties arise, however, not only in the calculation of the productivity of the two main traditional factors of production but also in the assessment of total productivity in this new evolutionary stage of capitalism.

Thus, M. Kalecki's predictions (as cited in Robinson and Wilkinson, 1977) are justified, according to which, contrary to the second industrial revolution which was accompanied by a more equitable income distribution necessary for the absorption of mass production, the third stage of the capitalist process has caused unemployment and poverty in humanity. A few years ago there was talk of a 2/3 society, and the healthy reaction was that it should be avoided in every way. *The society, however, that is now expected, is at risk of being 1/10, which represents a hellish future for most of the population as only 10% of it will assure a satisfactory living.*

The difficulty of measuring overall productivity resulting from this new form of technical progress is due to the fact that it concerns qualitative rather than quantitative data (Gordon, 2016). Obviously, mobile

phones, the internet, decreasing computer prices, etc., are in the interest of consumers, but they do not increase GDP, in accordance to Solow's paradox which has become the focus of numerous interpretive efforts on what might be happening at the AI stage, and one may explain the fact that it results in low productivity.

Indeed, although companies invest astronomical amounts in robotics, productivity growth is steadily decreasing. According to Jean-Hervé Lorenzi, chairman of the Economics Cycle: "Everywhere in Europe, the US and China, productivity gains are divided by two over a decade" (Gordon, 2016). In the United States, the annual productivity growth rate was 3% for the 1920-1970 period, 1.8% for the 1970-2006 period and 0.9% for the last decade (Mathieu, 2017). But without increasing productivity there is no growth.

The effects on employment

Regarding the effects of robotics on employment and on income and wealth distribution, there are optimists and pessimists. Both categories agree on the following:

- first that full-time employment is ultimately a thing of the past, and
- second, that globalization has already created a situation with a few winners and many losers.

I will argue here that the difference between the optimists and pessimists mainly refers to their respective time frame. More precisely, the optimists believe that robots will always be people's helpers and will depend on them, while possible problems relate to the distant future, while pessimists see further towards a time when robots will be substitutes for human labor and will have surpassed human intelligence.

The optimistic version - Robots as human aids

Scientists, in the optimistic category (better qualified as less pessimistic), argue that the major problems for workers will not be pressing for the next ten years. They also hope that they will be able to deal with them in time. This relative optimism was expressed in an early 2017 study by the McKinsey Institute (Mathieu, 2017). It questions the very pessimistic conclusions of a previous study, according to which 47% of employment is in danger of being automated. In principle, the McKinsey study also supports that 49% of working time can be substituted by automation. The optimism, however, of these studies lies in the assumption that the future of employment will not only be determined by what is technologically possible but also by other factors. The McKinsey study states that cars with no driver are expected to abolish the employment of 1.7 million truck drivers. However, the replacement of the trucks will require an investment of one trillion dollars, and it is expected to take time. Excessive optimism seems to be justified by similar developments in the past that did not verify pessimistic predictions, including those by John Maynard Keynes, 80 years ago. Keynes then referred to a "new epidemic", which he named "technological under-employment," and which fortunately did not materialize. An additional problem, resulting from the massive substitution of workers by robots, is the drastic reduction of government tax revenue. There are thoughts that robots should be taxed as normal human workers. Optimists, regarding the impact of robots on our lives, highlight the side of the help that they will provide to humans, arguing that robots will replace personal computers.

One of the most important robot services is unmanned cars, which are expected to reach consumers by 2020, limiting the circulation of traditional cars by about 80%, greatly reducing the duration of trips, as well as atmospheric pollution (Rus, 2015). Robots are also predicted to offer significant services to housewives in transporting their groceries. More precisely, in the housewife's help area, a robot, named GITA (The Economist, 2017a), will follow its owner on the way back from the supermarket, laden with the latter's shopping and communicating with him or her when needed. Automated airplanes are furthermore being planned for the US Air Force, with a system designed to reduce the relative cost of each aircraft by \$800,000 (The Economist, 2016a) The activities, which are predicted to be mostly affected by robots as human assistants, are shipping, medicine, hospitals and the war industry (Fitzpatrick, 2016).

The pessimistic version of robots as substitutes for human labor

Unfortunately, the optimistic outlook concerning the impact of robotics on employment has proven to be utopian and has never materialized. Robots did not come to help, but to replace human labour, and not only. Substitution of human labour by robots is progressing in many sectors at an accelerated pace, and it

is burdening the already difficult situation prevailing in advanced economies, where the form of full-time employment accounts for an ever-lower percentage of the total, to the benefit of informal work. In 2013, robots were used on a global basis at around 1.2 million. In 2015, their number reached 1.6 million and is projected to reach 2.6 million in 2019 (World Robotics, 2016, and Executive Summary World Robotics, 2017).

Their capabilities are improved and multiplied by astronomical speed, conquering human skills in rapid succession, even those considered the most difficult and complex. Even worse, in many cases robots prove to be more "able" and more "endowed" than humans.

Following are a few references and examples on the substitution process of humans by robots:

Those already happening

Unfortunately optimism is dramatically overruled on a daily basis, as evidenced by the few, if any, following references:

* Note that already today, 101 robots are used for every 10,000 employees.

* In the first place, I choose in particular a recent announcement referring to a large hospital bed manufacturing facility in Prague, Czech Republic, with exports all over the world (Alderman, 2018). This company, Linet, was unable to secure workers despite offering higher wages, and had to resort to robots. And it is neither the first nor the only enterprise in the Czech Republic employing robots, since automation in the country has increased by 40% in the period 2010-2015 (International Federation of Robotics). In addition to making beds, robots in the Linet company perform other tasks such as sewing, painting, welding. 30 robots do jobs that would require 200 employees. Although the case of the Czech Republic is excellent, representing the highest rate of growth and the lower unemployment in the EU, as well as a ban on the admission of refugees / migrants to its territory, the decline in growth or even recession in the future will raise there, as well, the general problem created by the use of robots, i.e. unemployment.

* Let me also mention the case of a new hotel in Japan called Henn-na, where customers are welcomed, registered and bid farewell to by robots. The robots in the hotel in question, are also able to accompany customers to their rooms, speaking their preferred language, and adjust room temperature. In their rooms, hotel guests have access to voice instructions concerning lighting, as well as weather and time information (West, 2015).

* Always, by way of example, as the list of substitution possibilities for human work is already long and enriched daily, let me quote an Amazon experiment aiming to see whether robots would be able to automatically select items from a warehouse shelf, which employs 50,000 people, and move them around. During the experiment, a robot managed to perform 10 of the 12 tasks in total. The company, located in Berlin, "hired" 15,000 robots, and plans to hire more in the future.

* Very recently, a robot very successfully completed an extremely delicate surgery, joining veins, which only a handful of surgeons would be able to do. And although it was the first time a robot was recruited for this fine job, there was no problem (Wehner, 2017).

Coming changes

British scientists have developed a new Artificial Intelligence system that can diagnose heart disease in a timely manner, better than doctors. A second system does something similar concerning lung cancer. This is the first system, developed at Oxford's John Radcliffe's hospital, which can "see" critical details in the diagnostic tests that go beyond the doctor's eye.

Artificial Intelligence is estimated to significantly reduce health costs as, among other things, many patient interventions could be avoided thanks to the most timely and accurate diagnoses. According to researchers, the effectiveness of robots seems to exceed that of doctors in the diagnosis and the assessment of the likelihood of each patient suffering a heart attack in the future. Ultromics was originally trained in the study of the medical archives of the 1,000 patients who had been hospitalized over the past seven years, along with the analysis of additional information on whether each patient eventually developed heart disease. Along the way, the system was taught to diagnose on its own. A similar Artificial Intelligence system was developed for the early diagnosis of lung cancer. The system detects the pulmonary nodes and distinguishes harmless from dangerous ones.

Very recently, the Americans built a tiny robot, intended to enter the human body, control its functions and secure the necessary drugs. It eventually dissolves within the human body (Corman, 2018).

A recent report, referring to employment in banks, predicts that over the next decade, the latter will cut employment by 30% due to the use of new technologies (Citigroup, 2016). Economist Martin Ford predicts that all middle-class jobs will disappear, economic mobility will cease, and plutocracy will flee to fenced communities or special cities guarded by automated military robots and unmanned airplanes (The Economist, 2017b). At the University of Berkeley, California,, much more complex machines than before are being manufactured which, in addition to industry, will be used in the near future for housework (Metz, 2017).

Catalytic changes are also envisaged in the wider area of education (The Economist, 2014), where digital new technology is already replacing traditional teaching through on-line teaching without human participation. Moreover, in several cases, personal secretaries have already been substituted by robot Alexa, who is available at all times to serve her boss, has a calm and almost warm voice and is able to serve every request.

Robots, on the other hand, recognize the human voice and are able to speak, but are still unable to take part in a conversation. Stunning advances have also been made by robots who are now able to mimic voices (The Economist, 2017c). Researchers in Singapore have created the first two robots in the world to do something difficult and unpleasant for humans: furniture assembly. These are the robots belonging to the Nanjing Technological University, which have arms, sensors and 3D cameras and were able to assemble an IKEA "Stefan" chair in about 20 minutes.

Robots are everywhere! They displace man and take his place. These few aforementioned cases are enough to convince that robots have already pushed many workers out of the labour market, as well as predict a truly daunting future for human employment, in which unfortunately there is no room for optimism. A future where uncontrollable unemployment will prevail, leaving no job untouched, even those requiring knowledge, specialization and planning.

The unseen and uncontrollable possibilities of Artificial Intelligence

Material hazards

The dangers surrounding the growing ability of robots to substitute for human employment as a whole are nothing compared to those threatened by Artificial Intelligence, many of which are already among us. There is a dark side to the Internet, which refers to "possibilities of gaining benefits through access to previously unknown software vulnerabilities," offered for purchase at the cost of thousands of dollars. *It is estimated that the loss of business caused by hackers and cyber war, amounts to \$400 billion per year* (Shmidt and Cohen, 2017). "One can easily imagine a scenario in which non-governmental players - terrorists, militias, political centers - start a cyber war, faking its origin as belonging to a country-specific government" (Shmidt and Cohen, 2017). Hazards that are inconceivable, which can not be predicted, but could perhaps be prevented. The billionaire businessman Elon Musk, who founded SpaceX and Tesla, expressed his fears concerning the threats by artificial intelligence, with the following statement: *"With Artificial Intelligence we are summoning the demon"* (McFarland, 2014), while philosopher Nick Bostrom of Oxford University believes that *Artificial Intelligence is more dangerous than nuclear weapons* (Griffiths, 2015/2018).

Not long ago, robots were able to perform relatively simple planned tasks they had been taught by humans, such as grasping and moving objects they had been shown. They are now already functioning in much broader fields, have significantly developed speech imitation, and most importantly, something that creates unpredictable future risks is their new ability to teach one another (Markoff, 2016), with no human intervention and to communicate with each other in a language unknown by man. The associated risks are well-known by the expansion of malware programs, which are increasingly available on the Internet, known as Blackshades. In addition, several computer security experts support that Internet criminals have been using Artificial Intelligence in a criminal way for more than a decade (Markoff ibidem).

The threats posed by robots start and end with the assumption that their learning curve follows a geometric progress and nothing prevents them from surpassing humans in intelligence. A hypothetical scenario is the occupation of the planet by pro-intelligent robots, deciding on their own future and

crowding out or even exterminating humans (as in the Karel Capek play of 1920).. Experienced scientists in Artificial Intelligence, such as Stephen Hawking and Elon Musk, suggest the need for research aiming at avoiding such, no longer improbable developments.

Just like human intelligence often leads to actions that cannot be understood, Artificial Intelligence can cause unpredictable, unthinkable, and threatening situations for man. Particularly because, as in many cases, robot actions go beyond the limits of human teaching. But this dimension of robots means that man is unable, and in the future even less so, to control robots. Their own intelligence already presents evidence of being different and alien to human intelligence, and therefore, there is a very possible risk that any form of communication between humans and robots may prove impossible in the future. *Furthermore, on the assumption that the nature and extent of robot knowledge follows uncontrolled paths, after a critical point, it is reasonable to assume that their actions will also be unpredictable.* In addition, with the assumption that Artificial Intelligence is progressing faster than human intelligence, the submission of the human race to robots may in a few years no longer be part of the field of science fiction.

In many areas, robots perform better than humans, although their performance is due to their human education and repetition. In 1977 Gary Kasparov, the world chess champion, was defeated by an IBM computer. Dr Demis Hassabis from Google (The Economist, 2016b), with his own chess program, had an unbelievable result so far, when in March 2016, his AlphaGo system defeated him by 4: 1 in Seoul. Mr. Hassabis and his team at Google are already trying to create a "General Artificial Intelligence," capable of solving many problems, so as to abolish the need for specific programs for each (The Economist, 2016b). Artificial Intelligence programs are used on a daily basis by the major platforms of Google, Facebook, Microsoft, IBM, and so on, to improve service to users. Another area where artificial intelligence is predicted to be a great success is prediction of consumer behavior, and this has already been investigated by RTB House. The study took into account how users responded to two different posters, the first of which was man-made and the second based on algorithms. The question was to clarify whether intuition hinders on-line advertising success and whether Artificial Intelligence can have better results. *After a test week, it turned out that the algorithm campaigns had better results than the corresponding human efforts.* This is because in a split second it is possible to segment potential customers, create targeted ads for each of them, and to determine the change in their behaviour.

The frightening side of Artificial Intelligence is that, in fact, even the scientists involved in it do not know its potential, and therefore the potential dangers it involves. There are dark secrets at the heart of Artificial Intelligence, which at present nobody is able to explain and which Carlos Guestrin summarizes as follows (Knight, 2017): "We have not completed the dream, which is the Artificial Intelligence conversation with you or able to interpret it" and adds: "We are still far from being able to give a true interpretation to Artificial Intelligence" A simple but satisfactory definition of Artificial Intelligence has been attempted in the context of research as follows: "Artificial Intelligence is any technology that can perform work as would be done by man" (Chokshi, 2018). *Reference is made to the article by Will Knight, which invokes incredible experiences from the use of Artificial Intelligence in a hospital, showing man's inability to understand the way of thinking of machines he himself created.* In particular, at the Mount Sinai Hospital in New York, a research team implemented a program called "Deep Patient". This program, which was trained to use data from 700,000 people, discovered hidden hospital data that predicted which patients were predisposed to certain diseases, such as liver cancer, without receiving any order to do so. But what left the programmers surprised, and which was not called for by the program, is that the latter proceeded to forecasts which are very difficult even for psychiatrists. In other words, the program indicated which people were predisposed to schizophrenia. The head of the research team, Joel Dudley, made the following statement: *"We can build these models, but we do not know how they work."* Furthermore, an algorithm, capable of determining the day of our death, has been announced in the infinite and largely indecipherable sphere of Artificial Intelligence. This feature should preferably not be used for obvious reasons.

There is a moral problem raised by robots, made so perfect that they do not differ from human beings, with the question as to whether they can gain a conscience. Philosophers and scientists not only do not exclude this possibility, but also consider it very likely, although they have not yet found the way to "create consciousness. " *These robots will be machines that will hurt, love, rejoice, wish, be disappointed and hope.*

Those who fear the future capabilities of robots follow two directions. The first one refers to the dark aspects of the results often caused by algorithms, to the "black box" of their consequences. As to the future which they do not see as distant but quite near, they imagine Terminator disasters, and support the need for precautionary measures. *It is, however, quite unlikely that robots will rise against humans of their own accord. On the contrary, it is very likely that they may be used by terrorists, villains or even dictators, and thus endanger humanity.* The possibility of a robot war, with unpredictable and terrible consequences, can also not be ruled out. I would endorse Stephen Hawking, Max Tegmark, and Elon Musk's "request" to ban Artificial Intelligence weapons. Because, as robo-sceptics argue "it's easier to turn an Artificial Intelligence machine towards destructive purposes than a nuclear reactor" (Musgrave and Roberts, 2015). *According to Elon Musk's projections, the evolution of Artificial Intelligence will begin to threaten mankind in 2024 and by 2060 one million people will have settled permanently on Mars.*

"Machines are overpowering and replacing us. The big question is whether they will go as far as subjugating us according to the Israeli prophet, and "Homo Deus", which is the gospel of guru Yuval Noah Harari (Proto Thema, 2018). Especially for China, which is expected to be the leader in the field of Artificial Intelligence in 2030, there are fears from the West that it will try to secure Artificial Intelligence findings in order to monitor its citizens. Note that the West is not innocent of similar approaches. The only difference between China and the West is that the monitoring is less secretive in the second case, though not always. And in particular, not signing security terms on the use of confidential data will most likely prove dangerous to the world outside China. An additional area of Artificial Intelligence, which raises justified fears, is the possibility of its future combination with faked news, which will be impossible to distinguish from reality.

Artificial Intelligence and Democracy

Even beyond the unfathomable dangers portended by the generalized use of robots, lies a very important unaddressed issue which the West, at least theoretically, seems to be very interested in, namely the effect of robots on democracy. Capitalism and democracy are indeed based on the following hypothesis: "If well-informed citizens behaving rationally are able to express their free will, the combination of their individual preferences will result in the best possible outcome for society as a whole. Capitalism and democracy are therefore based on two conditions: the people must have access to information and the people must have the privilege of choice" (Nourbakhsh, 2015). Robotic technology, however, threatens to deactivate both of these aforementioned conditions. Here is an example of this happening, and in many cases already happening (Nourbakhsh, 2015). Google, and not only, is conditioning consumers' wishes, gathering a lot of information about them, and then informing businesses of its findings. I would also like to mention the recent Facebook scandal, through which private data on 87 million users were sold to Cambridge Analytica (Granville, 2018).

A scheme, which at first glance would be easily characterized as satanic, and which has already been implemented in a few cases in a rather simplistic form, aspires at mingling the human mind with Artificial Intelligence.

Proposals for addressing the risks of new technologies

It is time to overcome the fears that are clouding our judgment about new technologies and, in particular, robotics, and to try to look at the problem at its core, without being affected by the prevailing viewpoint. We should try to see the exact nature of the problem in question and the form of the threats against human labor, whose manifestation is the most probable. It seems to be a fact that very soon, virtually all types of employment, not just routine jobs, will be possible to be executed very fast by properly trained robots. And it also seems a fact that almost all skills, even scientific ones, will be implemented by robots in ways that will prove more satisfying than human labour.

Human labour will be almost useless with the exception of training and directing the work of robots. Let's see, then, how panic addresses the labour of robots. "We will have no jobs, how will we make a living?" is panic's obvious response to the above (at first glance) naive question. But, I think that the question is not at all naive, because these are two completely different problems, which are inextricably linked in the pre-robotic era, but are completely separated in robotics.

In the pre-robotic economy, human labour, combined with capital and land (the three factors of production), generated the production of goods and services. A portion of the wealth so produced

belonged to labour and this portion amounted to about two-thirds based on the Cobb-Douglas function's interpretation until the 1980s, but was then reduced due to the peak of inequalities, caused by globalization. People were obliged to work in order to secure an income that would allow them to survive. The problem of unemployment and underemployment is not new to the global economy and especially to Europe, but is perpetuated with no solution, and obviously worsens the problem of distribution inequalities. The evolution of robotics however, to the point of replacing human labour, not only alters the terms of human labour, but leads to radical changes. In fact, nothing remains the same in relation to the pre-robotic era.

Although it does not yet represent a major problem, perhaps due to the false impression that "we still have time", "that radical changes are not imminent", "that we need to solve more urgent problems", the new reality that is already upon us is in the meantime overthrowing the whole of economic science. *And it is incomprehensible how this problem which should normally prevail over any other problem, has not yet become a major concern of trade unions, the left, sociologists and economists, philosophers, theologians and humanity as a whole.* Some of the currently unanswered questions are as follows:

- * Who will be the beneficiary of the robot labor productivity? Since robots represent neither "labour" nor "capital".
- * How will the produced output be distributed, since the two main factors of production, "labour" and "capital" will have disappeared?
- * Who will be the owners of the robots and how, and by whom will the quantity and type of robot production be regulated?
- * What will be the relationship between robots and scientists (who will be among the few whose labor is indispensable) who will plan and oversee the work of the robots and how and by whom will they be paid?
- * What kinds of monopolies, contrary to economic theory, could be created, and how could they be avoided?

Furthermore, above all else comes the big question of how the population will survive without working. In my opinion this is the problem that seeks immediate solution, with the increasing power of robotics, not the implications of substituting human labor with robots.

Putting the same question more directly: "Do we live to work or work to live?" We, undoubtedly work to live, so if we do not have to work in order to survive, the problem will perhaps be more of a psychological rather than a survival problem. That is, we will need to organize our time, liberated from obligatory work for survival, channelling it into constructive, collective and private activities. In the robotic era, production will, of course, continue with productivity constantly on the rise, but only due to robots. The mistake, therefore, is to consider robots as our competitors (as we seem to think of them), instead of our servants and slaves who will provide us with earthly paradise. We will be able to travel to the ends of the Earth, and soon the end of the universe; develop any kind of skill; take walks with our children and give them more time than ever before. Thanks to their slaves, our ancestors were able to develop arts and literature as few peoples on earth. Now, we are given a unique opportunity to have slaves without the moral concern of exploiting human beings. So what is our problem concerning robots? *Certainly not the loss of jobs, which we are, however, focusing on. This is a pseudo-problem.* Fear about the results of new technologies and robotics in particular, is theoretically absurd. Because if the ability of robots to replace human labour grows together with the production and wealth of nations, all people can live like kings, having slaves of a special nature to serve them. So where is the problem, and why is there such a debate about job loss? *New technologies and robots belonging to them represent neither capital nor labour. They represent the evolution of humanity, which belongs to the whole of humanity, and not to certain groups.*

Substituting labour with robots will provide tremendous profits for the companies that created Artificial Intelligence, as well as for those adopting it. At the same time it will create mass unemployment. Again, it is clear that the real problem with robots is a problem of distribution of income and wealth, as in the near past, and the problem of unemployment that preceded robotics still remains. *In particular, unemployment, which has not been addressed in either a rational or even humane manner, as it should have been, namely by reducing compulsory working hours, is a precursor to the abolition of employment.*

It is a matter of life and death, for tomorrow's societies, to find ways to provide humanity with positive instead of negative consequences of new technologies. Although the problem wrongly appears as complex and hard to solve, we should note however that it is we the humans who will decide on developments, that solutions are real and simple, and that we therefore still have the power to prevent our planet from being transformed into hell.

Let me start with the solution to the problem of unemployment that preceded the problem of robotics and observe that it would be relatively easy if excessive individualism, the unlimited accumulation of wealth by a small elite and the culmination of corruption at all levels had not prevailed at such an unacceptably high degree. I have been arguing here for years that unemployment is, in fact, a pseudo-problem, while the real problem is income distribution (Negrepointi-Delivanis, 1995). This is because unemployment is a consequence of the peaking income and wealth distribution inequality that has accumulated 45% of world GDP in the hands of an elite of 62 tycoons. To continue with unemployment, let us remind ourselves that it has been successfully addressed in the past, a fact that has been forgotten. Indeed, the problem is not new, as by analogy it emerged and was successfully dealt with after the end of the Second World War, with a large number of women entering the labour market. The problem of unemployment was then addressed in the only rational way that should be adopted in modern times. That is, with a radical reduction of official weekly working hours, by about 35%, then, compared to the corresponding pre-war level. It is clear that the catalytic changes in the labour market marked in the late 20th and early 21st century require greater instead of lesser government intervention so that unemployment is no longer used as the vehicle to achieve ever greater distribution disparities and to halt the transformation of the labour market into an increasingly wild jungle.

To avoid turning the 21st century into hell, we should speedily accept and understand that improved human knowledge is a heritage of the past and belongs to the whole of mankind. That is why it is inconceivable that it should be monopolized by capital / or by a small group of innovators, with the sole justification the lack of laws and rules of income distribution, in this new development stage presently witnessed by mankind. It is therefore necessary to achieve full employment through a drastic reduction of working hours, as was the case in the post-war economy. Indeed, while in 1840 the average weekly work amounted to about 70-80 hours, since the Second World War it has been reduced to about 40 or even fewer hours. There was full employment both with increased and lesser working hours, while the significant post-war reduction in working hours in no way prevented the rapid pace of progress in the then advanced economies and the realization of the 30 glorious years, thanks to them.

A similarly bold decision should have long been adopted to avoid the worst, especially in the area of distribution. Obviously, this initiative should be taken on a global level, so as to avoid jeopardizing any economies adopting it with a deterioration in their competitiveness. The reduction in working hours would have to go as far as restoring labour and capital shares in GDP, as prevalent in the Cobb-Douglas production function. These conditions in the labour market are a guarantee for the maintenance of a relative macroeconomic equilibrium and ensuring adequate effective demand for new products/services, in order to encourage the implementation and adoption of innovations.

The solution to the problems raised by robotics should follow the same direction as the solution to unemployment. That is, to the diffusion of the benefits brought by robots and not to the accumulation of the problems they create. *It would be non acceptable for tomorrow's societies to tolerate the accumulation of the uncontrollable wealth created by robots, in the hands of the few who will own or control them.* This wealth, on the contrary, should be distributed to the masses that will be unemployed precisely because the whole of mankind has reached such unpredictable heights that it does not need to work, or need to work hard, because it will have "slaves" to replace its labor. Unlike capital, at the industrial stage, robots are made up of ideas born out of the evolution of mankind and which therefore cannot possibly become the possession of the few who have managed to accumulate wealth during the previous stage of capitalism, the basic specifications of which they are attempting to extend to the new stage. *In the capitalistic stage preceding robotics, wealth was combined with inequality and poverty, while in the robotics stage the combination will be wealth for very few and death for many, in the absence of a solution.*

Competition between businesses or individuals will be irrelevant, since the wealth generated by the work of robots will suffice for the entire human population, and all that needs to be done will be to ensure that it is distributed in such a way that everyone may live satisfactorily. *In order to achieve a smooth*

operation of the robotic world, the uncontrolled accumulation of wealth must be eliminated; the latter would be meaningless anyway, as long as the creation of ever greater wealth would be secured without any need for human effort. In the era of robotics, the generalization of the consequences of which will naturally take time, the active presence of the State is more necessary than ever. The state should study new ways of distributing the newly generated wealth so as to avoid the immense inequalities of previous periods and to ensure a decent living for the entire population. The state will also need to employ creative imagination so that the unemployed due to robotics may engage in constructive work, as idleness is at the core of all evil.

However, supposing that humanity has the intelligence to overcome the problems that robotics will create in the purely economic field, another much more frightening question remains unanswered. It could be formulated as follows: "What will be the impact of the generalized use of robots on the human psyche?" An article has come to my attention titled *The Course Toward Post-Humanity* (Lamendola, 2016), which does not directly refer to the consequences of robots in our lives but which probably includes them, and which outlines a mechanic man without sensibilities and with no soul, who is unable to love, and unable to communicate with the world of yesterday.

CONCLUSION

It is obviously not a solution to the problems of the 21st century economies to attempt to curb new technologies, since their implementation is linked to a number of positive results, which signify progress. However, as there have been bad experiences of mass unemployment, as a consequence of innovations in the past, it is imperative to take radical and effective measures to minimize the adverse effects of new technologies. Apart from the self-evident need to adapt new technologies to the specific conditions of individual economies, with an emphasis on emerging economies, the difficulty or inability to exploit them in an austerity environment or, even worse, in an environment of deflation is still to be highlighted. This is because new technologies are a vehicle for faster growth, which requires adequate liquidity and a better / more equitable income distribution to ensure sufficient demand for the products and services of new technical progress. The austerity imposed by the EU, with no expiration date, does not lend itself to adopting new technologies.

The adoption of new technologies, moreover, should be done with moderation and not uncontrollably. Taking some form of protective measures so that the economy is able to gradually exploit new technologies and not crash under their weight, is seen as a *sine qua non* choice of the economic policy to be followed.

State intervention will prove extremely important in this difficult stage of development, with the aim of reducing inequalities caused by technical progress. In addition to drastically reducing working hours, which is considered to be the most important measure to avoid the adverse effects of new technologies, the State will have to invest in large-scale investments to ensure high-standard education for all, linked to the requirements of new technologies. This measure is not a panacea but is expected to help in several cases. Also, instead of further reducing the welfare state, which has long been happening in Europe, the state should ensure an adequate number of hospitals free of charge, put limits on privatization, especially utilities, and intensify structural changes, in particular, in the field of employment, in order to make better and more efficient use of all workers.

The tolerance of peak unemployment in modern economies coupled with the practical refusal to adopt the only appropriate measure to deal with it (that is, the drastic limitation of working hours) is an irrefutable proof that humanity, in spite of its revolutionary advances in the field of technology, did not, unfortunately, improve the aspect of ethics. The other facet of unemployment is the refusal to diffuse the increased productivity of new technologies to the whole of mankind, where it is rightfully owned.

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