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Work and New Technologies in Western Societies

Carlo Carboni[1]

1. Job replacement and new technologies

Social literature shows the positive effect new technologies have on productivity and growth, thanks to the gradual application of artificial intelligence and automation to the manufacturing of traditional and new goods and services (Brynjolfsson and McAfee 2011 and 2014). *Minds, media, and ideas* have created a new technological society[2], which is populated by machines that are able to listen, talk, operate, and even learn. They offer precision, quality, and efficiency in the carrying out of business activities, but they are taking away human jobs. This trend will become increasingly pronounced in our technological future. Technology is already in our daily life and the Davos powerful leaders said in 2016 that a new wave of family robots is going to take place.

It has been estimated that the United States will run the risk of computerizing 47% of current jobs in the next fifteen years. This will relate to about 700 types of jobs (Frey and Osborne 2013). The same will happen in Europe in the next twenty years when half of the current jobs will incur the same risk according to an evaluation of the Bruegel Foundation. A fast replacement of white and blue-collar workers with robots and automated machines has been already underway for twenty years in North America and Europe. Within information technology, in recent years, Google bought Youtube (65 employees) for $ 1.65 billion (25 million per employed) and Facebook both Instagram (13 employees) for one billion dollars (77 million to busy) and, in 2014, WhatsApp (55 employees) for $ 19 billion (345 million to busy). These purchases reveal that new technologies require Internet intake of human labor and, at the same time, propel wealth in a few hands.

In a medium-term perspective, the estimated acceleration of biomedical engineering will also affect non-routine professions (Clifford and Clifton 2012), which are very delicate and powerful in social systems. This is already happening with the processing of information and the diagnosis of diseases through artificial intelligence. Many jobs have been eliminated and replaced by new technologies in the industry, logistics, financial and commercial intermediation. From this point of view, Keynes's prediction about technological unemployment (which was described as the disease of the future over eighty year ago) appears to be more truthful than the theory of Solow residual (outlined over sixty years ago and stating that 80% of economic growth in the USA was due to technological progress, the protagonist of the new economy)[3].

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[1] Full Professor of Sociology of Economy and Sociology of Entrepreneurship at the Department of Economics and Social Sciences, Università Politecnica delle Marche, Italy, he is currently visiting Professor at the ISSn in New Delhi and at the Department of Sociology of Mumbai University.

[2] This is not the right place for a reflection on the concept of technological society as a structure of rational action with regard to the purpose of Max Weber, with which Jurgen Habermas (1967, Chapters VII and VIII) deals critically. He states that technical-scientific progress is not only the first productive force on which economic growth depends, but it also represents the base of the system's legitimacy. For details on the technological society, see Carboni (2002).

[3] One of the worries Keynes (1930) underlined was a "new disease": technological unemployment. This means the lack of jobs due to technological changes. People are replaced by devices and machinery since it makes the job easier, quicker and also more productive. Keynes wrote that there is substantially a difference between the short run and the long run. A rapid technological change may produce short-term temporary unemployment, a phase of maladjustment which you have to manage.
Solow (1970) highlights that productivity depends upon technology. His "Residual Theory" offers a measure of productivity growth in an industry or macroeconomic over comparable time periods. It is called "residual" because it refers to "the part of productivity growth which is not explained by capital accumulation or any increase in labor". Solow thought that technology increasingly propels productivity of labor, which in turn is the factor driving long-run GDP increases.

In North America and Europe, *technological change* (Acemoglu, 2002) has also influenced social stratification: the use of new technologies has expanded the gap between those people who are able to use them and those who are not. "Computerisation" has led to the inevitable deterioration of routine workers' average remuneration. A large part of the middle class has had to bear the brunt of it: their work requires routine *brain power*, which has been already replaced or is now being replaced. Instead of labor, the greatest beneficiaries of the digital age have been shareholders. According to a recent estimate in the USA, the three leading companies of Silicon Valley employed some 137,000 workers in 2014 with a combined market capitalization of $1.09 trillion.4. By contrast, in 1990 the three largest companies in Detroit had a market capitalization of $36 billion while collectively employing about 1.2 million workers.

2. Tug of war between apocalyptic and integrated views.

However, researchers have conflicting hypotheses on the impact that new technologies may have on employment in a medium and long-term perspective. Many of them even think that there is no empirical evidence showing that they have destroyed more jobs than they have created. Occupation appears to be more influenced by institutional shocks than the technological ones (Saltari and Travaglini 2006). This uncertainty leads to two opposing opinions: on the one hand, people state that technologies will give them more job opportunities than in the past, as it happened during technical-industrial revolutions; on the other hand, it is deemed that the past is not a credible reference because our economies and societies will be full of robots and artificial intelligence by 2030. They will enable people to save human work in every sector: a never experienced situation related to technological society.

However, there is also a "third way" of interpretation that does not reject the *labor-saving* effect of new technologies, but also states that the negative impact on employment, especially in the short-to-medium term, should be managed with specific policies focusing on the growth of *high-skill workers* and supporting jobs. In *Race against the Machine*, Brynjolfsson and McAfee show that, in the second half of the twentieth century, productivity (which depends on technological progress) and occupation in the USA grew together until 2000, the year when an evident decoupling took place. From 2000 to 2012, American productivity grew in an uncontrollable way, while employment stagnated or decreased. According to the two professors, the accentuation of this trend will be unavoidable in the future, but governments will be able to manage the transition to a technological society. In an open letter about digital economy, which was posted in *MIT Technological Review* on 4th June 2015, Erik Brynjolfsson, Andrew McAfee, Steve Jurvetson et al. reject the idea that we cannot do anything to alter the effects of *technological change*. They suggest a set of public policies, a transformation of entrepreneurship with more inclusive functions and a careful study of technical, social, economic phenomena in the long term. The aim is to extend unemployment by postponing it in the future. It is necessary to get ready to deal with a huge amount of redundant workers. Welfare initiatives will have to be completely reviewed with regard to the following issue: how to maintain people who cannot find a job. Solutions depend on the expertise and *vision* of our ruling class and on the resulting transformation of democratic capitalism in Europe and the United States.

3. Technological change in Western societies

The future of work appears to be more uncertain in the largest continental European countries that are completely industrialized in terms of technology and manufacturing quality but are later with regard to *high technology* than the Anglo-Saxon countries. Germany, France, and Italy were not the protagonists of the information technology and telecommunications revolution affecting Anglo-Saxon countries (the "innovators" of the end of the century). The United States took advantage of their dominant position in this technical-scientific revolution and partly retrieved employment in the processes of deindustrialisation and de-intermediation. Manufacturing employment rate in the United States, for example, has decreased from 22.5% in 1980 to current 10% and will be just below 3% by 2030. Thanks to new innovative technological systems, the USA were the first to retrieve what was lost during the crisis in terms of income (-5.6%) and unemployment (in March 2017, it decreased up to 4.4%, compared to 9.5 % 7in EU and 11.5% in Italy). The United Kingdom also benefitted from the information technology and telecommunications revolution, since its financial, commercial, insurance, and cultural activities were the first to ride the wave of innovation in the '90s, with large margins of expansion in terms of value, occupation, and efficiency. In spite of austerity programs applied to public policies in these years of crisis, a fast retrieval of values related to income and employment before the crisis is more promising (unemployment rate is 4.5% in 2017).

On the contrary, the Economic and Monetary Union lived the information technology revolution as if it were "colonized" in terms of domestic consumption, and got to know the *labour-killing* effect of automation in manufacturing, logistics, intermediation, and data processing, which are gradually losing employees. New technologies (such as mobile devices, computers, iPad, etc.) have given consumers "personal superpowers" (individual *empowerment*, even though it has limits due to the current situation of individual independence under surveillance). For the European economy, on the contrary, metabolizing new technologies has not led to new products and jobs as in the USA. It took place in traditional sectors and increased productivity and growth potentials, but reduced employment. The EMU, compared to the USA, has not been able to innovate and create new professions and jobs, seize the new opportunities offered by the *technological change*. Today, in the EU, high-technology sectors include almost due million jobs, which will increase to five million in 2018. The *super skilled* workforce in the EU accounts for about 10% and every unit is supported by 4 routine jobs. The value produced in the European high-tech sector will go from current 7.5 million euros to 63 million in 2018 (however, the European GDP is already over 13,000 billion euros, of which 71% refers to the five largest countries). The unemployment rate is excessive in weak countries such as Italy and Spain, where technological unemployment (due to insufficient demand) is a significant issue and the information technology revolution has never taken place. A lot of young people from Italy (and from southern Europe in general) go abroad to find a job: every year, about fifty thousand young people, who are mainly graduates, leave Italy (as if every year a Siena full of youth disappeared!).

4. The threat of economic growth without work.

The western countries had already faced a *jobless growth* in the '80s when the first wave of automation involved the most important sectors of manufacturing industry. Youth unemployment in Italy reached 40%, a little less than current levels. While they are currently coming out of the crisis, the risk is a new *jobless growth*, a new wave of work-related deindustrialization and de-intermediation in countries such as Italy, Germany, and France. This may be accentuated by the delayed information technology revolution and creation of new *high-skill jobs*. In Italy, this may result in young people's technological unemployment. In Germany, this appears to be statistically hidden by a "full underemployment", due to the diffusion of mini-jobs, especially in the youth labor market. The social situation seems to be hard, especially in Italy, where public protection of long-term structural employment is weak and fragmented. It is unlikely that manufacturing industry in countries such as Italy and Germany will manage to maintain the creation of additional jobs in the next twenty years, as it happened in the second half of the twentieth century.

Italy, France, and Germany have had to face *technological change* in the last twenty years, and conditions have been similar to those following the Taylorist and Fordist revolution in the first two decades of the twentieth century in the United States. The best way leading to industrialization - *"one company, one town"*- was adopted by Europeans on a large basis only after a few decades, but not before tackling radical events such as the great crisis and a world war. The information technology and telecommunications revolution of the '90s did not have Europeans as protagonists, but the financial bubble that started in the USA involved their economies and public policies. The manufacturing sector, which is their strength from a production and employment point of view, was severely affected by this crisis (about -25% in Italy) and, at the same time, appears to be more and more influenced by new forms of automation and artificial intelligence, with a resulting reduction in occupation. It is difficult to manage this transition period with high levels of unemployment: technological and organizational *turnaround*, which a lot of companies may require in order to maintain competitiveness, will not certainly create additional jobs in the short and medium term.

5. How could human work exist in a technological society?

The European Commission is well aware that preventing technological unemployment is a hard task, especially for governments among countries. In this context, different positions and economic conditions of the Member States are reflected in the decisions to adopt. Technological unemployment in Europe has different intensity and aspects, according to national and regional contexts. The most affected countries are in the south of Europe and are weakened by the crisis. They may be late in the next years, increasing their distance from the technical-economic border. Furthermore, researchers take an increase in *high tech* levels for granted by 2030, when artificial intelligence, automation, and the upcoming biological and biomedical revolution will have had a strong impact.

In brief, people wonder how human work could exist in a world that is highly populated by robots and artificial intelligence in the medium and long term. European countries are not the only ones that are late and are affected in terms of employment. In the USA, the fast reduction in unemployment is due to (and somehow concealed) the extraordinary increase in part-time contracts and phenomena of discouragement in the offer of potential work. According to the World Bank, we will lose 2 million jobs by 2030, while 1 billion people will enter the labor market within the next ten years. According to the International Labour Organization, unemployment will affect 215 million people in the world by 2018.

If what has been predicted by world organizations came true and employment rate decreased, what would the rest of people do for a living? What type of balkanization of the labor market would take place, especially in those countries where longevity is expected to increase (this refers to the deferment of the retirement age), in particular in the "old" European countries such as France, Germany, and Italy? Should we take care of an excessive unemployment in the medium term, especially among young people? What type of welfare would be necessary for a labor world that is fragmented because of age and expertise? What should be done to prevent unavoidable social and income inequalities between those are technologically active and productive (*race* with *the machine*) and those who are underemployed with routine jobs or unemployed?

However, it is to be hoped that the awareness of the risk in which Western countries may incur encourages European governors to adopt an expansive policy of the *high-tech* sectors. They could make a choice in order to stimulate the potential of new jobs in these sectors and encourage their ability to create additional employment, especially for services, intermediation, logistics, etc.[4] We are approaching a scenario in which, thanks to the countries' initiatives, an information technology revolution may also spread to Europe. This will result in creating and mobilizing work, in particular, self-employment. In a few years, entrepreneurs will deal with digital natives. There will be no work *displacement*, but high technology will lead to new jobs in cascade and to a new entrepreneurship, also in other fields such as spare time, culture, environmental sustainability, etc. Synergies and Coordination connections will be more necessary than the competition. As Rifkin has stated for a long time (1994), access will have the priority over *ownership*. Likewise, an enigma of today capitalism is the insurgence of large global companies that do not possess the goods and the means available to them. They have spread with deep roots in our daily lives. Facebook (worth $59 bn) does not own the content posted; the world's largest taxi company, Uber (worth $40 bn), owns no taxis; a large accommodation provider, Airbnb (worth 25,5 bn) owns no real estate; the largest communications companies (Skype, WhatsApp, Facebook Messenger) own no infrastructure; the world's largest movie houses (Netflix, Sky Go, and YouTube) own no cinemas. Similar phenomena occur in most of the e-commerce. Nobody is able to predict, but we have to build (and deserve) a (better) future, by understanding that it can influence our present as well as out the past.

6. A doubtful roadmap for the future.

However, even in a long-term positive scenario (partly compensated employment), uncertainties will continue. First, we wonder whether technical-scientific innovation will allow us to increase not only the demand for *super skill workers* but also for ordinary supporting work, as it happens in call centres or e-commerce. Secondly, even in this positive scenario, there is a gap between a *super skilled* minority world and an ordinary supportive one. The second doubt is nourished by underemployment, with low remunerations due to the pressure exerted by increasingly globalized labor markets. Segmentation would particularly insist not only on salaries but also on the quality of work, which will be better for the narrowest groups.

[4] For example, during the spring of 2017, the Italian government made policies in order to encourage private investments on 4.0. industry, that this the on Fourth industrial revolution. I would like just to remind that theFirst industrial revolutiontook place from the 18th to 19th centuries in Europe and America (from mostly agrarian and rural societies to industrial and urban by developing iron and textile industries, steam engines). The Second Industrial Revolutionwas the scenario between 1870 and just before World War I (from pre-existing industries to mass production of new ones, such as steel, oil and electricity, telephone and light bulb, phonograph and motor engines). The Third Industrial Revolution, named the digital one, attains the advancement of technology from electronic and mechanical devices to the digital technology available in today algorithm society. The digitalization started during the 1980s (personal computer, the Internet, and ICT) and it is ongoing as the above-mentioned case of Italy shows in trying to digitalize its industry.

Thirdly, if productivity keeps growing and employment is stagnant, this results in an increasing social crisis leading to unpredictable phenomena. Economic and social inequality would increase[5] In the event of declining occupation, the large part of benefits of the productivity growth would go to the rich, as it has happened in the United Stated for the last eight years. As far as the above-mentioned doubts are concerned, even the positive prospects would require a re-centring of the labour and welfare policies. Quality and methods – more than quantity – of new jobs should be included in the agenda of governments. Policies should encourage vocational work, which, in turn, should be stimulated by the introduction of new production systems for the rise of *self-employment*. For this reason, we could say that the world in the future will be more entrepreneurial than the industrial one in the past and the transitional one today. It is necessary to adopt new policies for *young business entrepreneurs*, education, infrastructures, immigration, and basic research (Erik Brynjolfsson, Andrew McAfee, Steve Jurvetson et al. 2015). The diffusion of a minimum (basic) income will be considered more positively than it is today, as an aid (Martin Ford 2015): it will be an opportunity in order to create a job that could be related to people's inclinations and vocations. Reducing the working week should be also encouraged.

7. A maze of technological challenges to the social order

All in all, even though with the required recommendations, *roadmaps*, and strategies, this scenario may appear positive and desirable, but it depends on the decisions of the *superclass,* of which David Rothkopf in 2009 wrote about, and on the evolution that the crisis of the democratic capitalism will have. Apart from the question of how many people will enable the operation of robots and how many people, on the contrary, will suffer competition, there is another issue that must not be overlooked: *Who owns the robots?* However, this question concerns the relationship between new technologies and socio-economic inequalities that would require further analysis.

Maybe the digitalization of our economies will not create long-term technological unemployment, but perhaps in the short term (using Keynes' words). Likewise, it is easy to predict that it is just the beginning of the Fourth industrial revolution, which includes family robots and biomedical progress, among other things. These represent new ways in which technology becomes embedded within societies and day bay day life[6]. The Fourth industrial revolution may expand in all fields and activities within our life[7], until it begins to kill jobs and further increase social inequalities. Jobless economic growth and increasing socio-economic inequalities[8]- in other words, the impoverishment of society and the domestic markets – would marry with the hypothesis of secular stagnation, which has been pointed out by Summers (2016). Growing inequality could lead to a period of secular stagnation although it does not represent the only force that may cause a fall in investment and stagnation.[9]This situation can be destructive because it might threaten long-term growth. So the future seems filled with that could boost it. It is a global problem against which we have to fight and manage, knowing that there is nothing more mistaken than to resign ourselves to its inevitability.

[5] The richest 85 people on the planet owned as much as the poorest half of humanity.; over the past three decades, the top 1% income share has more than doubled. See Atkinson (2015) and Piketty (2013).

[6] The Fourth Industrial Revolution is characterized by emerging technology breakthroughs in a number of fields, including robotics, artificial intelligence, biotechnology, nanotechnology, Internet of Things, 3D printing, autonomous vehicles and more (Schwab 2016).

[7]. Schwab (2016) highlights that it is a different revolution from the previous three, which were marked mainly by advances in technology.

[8]Inequalityis a consequence of a distributive system (Piketty 2013), which is in favour of few rich owners of new technologies

[9] On one hand, up to now the digitalization has had a limitedinfluence on economic productivity growth. In fact it was largely applied to finance, retail trade, and to the hardware production. On the other hand digitalization is widening to other fields by expanding its potential applicability (new tools, new processes, new materials). This digitalization development so could allow toavoid the secular stagnation predicted by Summers (2016).

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