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ECONOMIC OPPORTUNITIES AND RISKS OF INTRODUCING ARTIFICIAL INTELLIGENCE

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Original Article

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ABSTRACT

Artificial intelligence (AI) refers to a set of techniques that enable machines to imitate human intelligence. Its development is a technological revolution, which, like previous technological revolutions, can cause serious economic shocks. Although the work to quantify the effects of AI is still exploratory, it provides some insight. The purpose of the study is to study the impact of artificial intelligence on the economy, identify the main trends and assess the prospects for the development of this connection. Research Problem: Artificial intelligence can bring significant benefits to the economy, but it can also cause uneven distribution of benefits and create new economic problems. Research methods: analysis, statistics, correlation method, factorial, logical, generalization, systematization, comparative methods. Results and conclusions: The long-term impact of AI on aggregate employment fits within the theoretical framework of creative destruction. According to the IMF, 60% of jobs in advanced economies could be highly impacted by AI: 27% of jobs will be highly complementary and, therefore, are able to benefit from AI, while it could replace 33% of jobs. Moreover, from a global point of view, one of the key risks in the development of AI can be considered the possibility of an increase in the technological gap between the least developed countries and the most advanced economies of the world.

Key words: *artificial intelligence, economic development, labor market, opportunities, risks*

1. INTRODUCTION

Historically, the birth certificate of artificial intelligence corresponds to a two-month program of meetings with 10 speakers, organized at Dartmouth College (Hanover, New Hampshire, USA) in the summer of 1956, in particular on the initiative of two young researchers who, in different entries, subsequently strongly marked the development of the discipline : John McCarthy and Marvin Minsky (Eloundou et al., 2022), the first to advocate a purely logical view of the representation of knowledge; the second of which favors the use of structured representations (called “frameworks”) of situation stereotypes that can include different types of information.

It was on the occasion of these meetings that the phrase “artificial intelligence” (championed by McCarthy) was first systematically used to refer to the new search field. However, it was far from unanimous among the researchers present; some see it only

as complex information processing; this was notably the case of Alan Newell (1927-1992) and Herbert Simon (1916-2001), who were also particularly influential for the development of AI (Corrado et al., 2021).

A study of the economic impact of artificial intelligence depending on the level of economic development shows and confirms the existence of heterogeneity of consequences. As a result, advanced economies that are leaders in the adoption of artificial intelligence are most affected by structural changes in job and wage structures. These mutations may be associated with several of the effects presented in the manuscript, providing support for a postulate that does not take into account that artificial intelligence is creating new jobs for humans, but it also does not address in detail the speed at which these effects may occur, nor the type of use computers.

At the macroeconomic level, it is too early to empirically determine the impact on growth, but early microeconomic research suggests significant positive impacts of some specific AI applications on individual worker productivity. In this position, these benefits fall particularly heavily on the least productive workers, causing them to fall behind the more productive ones. On the other hand, the measured impact of AI on business productivity is currently small. This can be explained by the still limited and uneven adoption within companies, stronger for large digital technology companies.

The theoretical impact of AI on employment is unclear. In the short term, they will depend on the speed of AI deployment, the transition from certain professions to additional tasks, and the reallocation of the workforce towards growing professions. On the other hand, early empirical assessments agree that the tasks and occupations affected by AI will not be the same as those affected by previous technological revolutions. AI will be more relevant to skilled trades due to its ability to take on abstract and non-routine tasks, while previous waves of mechanization and computerization concerned unskilled and mid-level jobs, respectively.

These various findings call for strengthening training in science in primary and secondary schools and artificial intelligence in higher education, targeting continuing education in transforming professions, and removing certain barriers to the spread of artificial intelligence, in particular through competition policies tailored to its features.

As with advances, theoretical delineation of the socio-economic implications of artificial intelligence will be the subject of this article to determine the distribution of various theoretical findings in the context of the impact on macroeconomics and human resources, and on society as a whole.

The purpose of the study is to study the impact of artificial intelligence on the economy, identify the main trends and assess the prospects for the development of this connection. Research Problem: Artificial intelligence can bring significant benefits to the economy, but it can also cause uneven distribution of benefits and create new economic problems.

2.METHODS

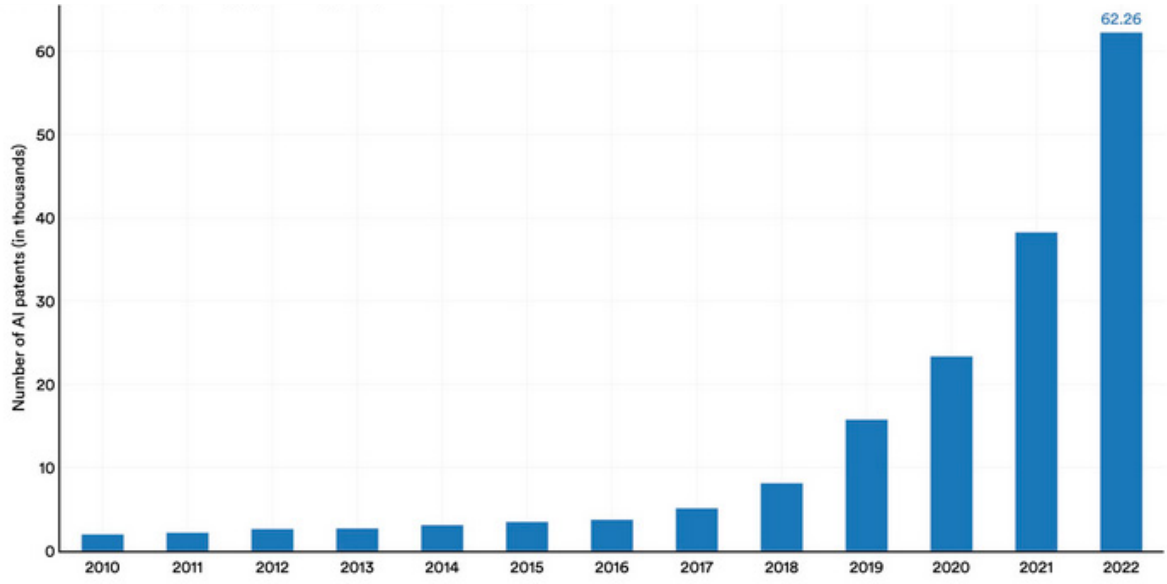
The methodological basis of the work is represented by the basic provisions of the dialectical method of cognition, which allows us to reflect the relationship between theory and practice. The work uses general scientific research methods: analysis, statistics, correlation method, factorial, logical, generalization, systematization, comparative methods. Quantitative, qualitative and econometric analyzes were also carried out.

3. RESULTS

Since their inception in the 1950s, artificial intelligence (AI) systems have performed an increasingly diverse range of tasks, some with levels of performance comparable to or even superior to humans. Over the past ten years, advances in artificial intelligence research and computing infrastructure have accelerated and enabled the emergence of various types of models that represent significant technological advances, including so-called basic artificial intelligence models. These are general-purpose models that can then be specialized to perform a variety of tasks, like the general purpose technology (GPT) models known to the general public after the success of ChatGPT. So-called generative fundamental models, in particular, are capable of generating text, visual or audio content in response to an operational request (Besiroglu et al., 2022).

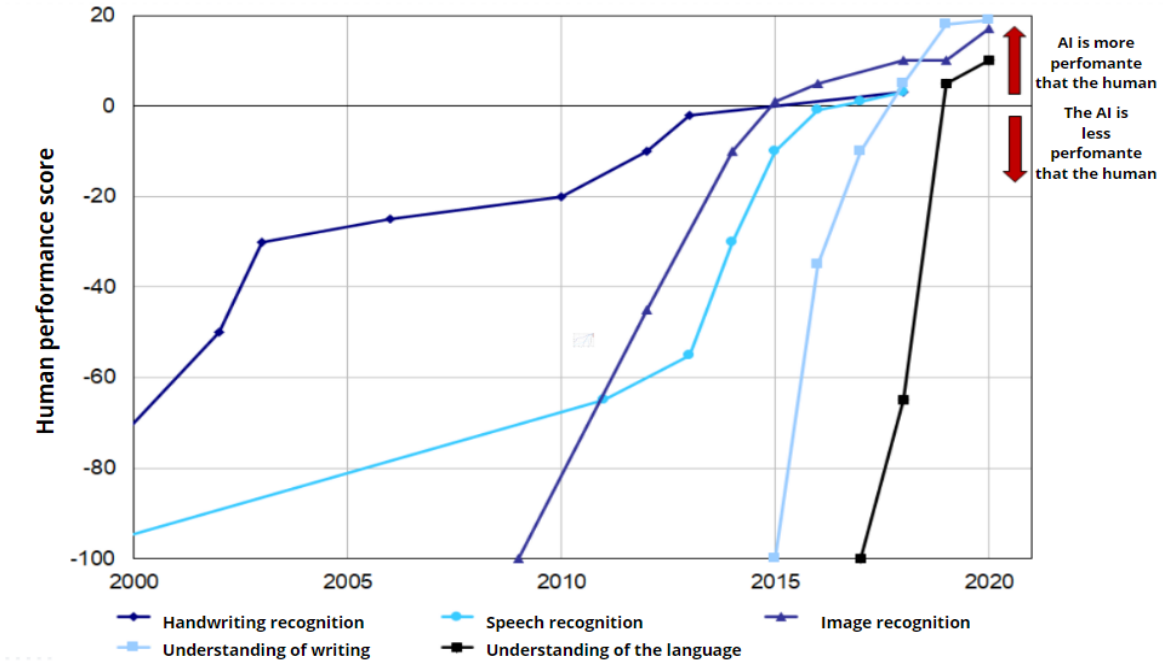
Artificial intelligence can lead to significant improvements in productivity and increased production of goods and services. It is considered by the OECD (2023a) to be a GPT, meaning it can have a significant impact on society and work through its application to many occupations and industries. While earlier technological development tools included, for example, the steam engine, electricity or information and communication technologies (ICT), artificial intelligence (AI) is now leading to long-term growth in overall productivity through innovation in products, processes or organizations (e.g. computer assisted production).

Figure 1. Number of AI patents granted, 2010-2022



AI also differs from waves of previous innovations in that it allows for increased productivity in the production of ideas. AI models, especially so-called "core" ones, accelerate the innovation process because they are able to extract patterns from extremely large and complex databases (e.g., text, audio, image) (Figure 2). For example, artificial intelligence models are used to speed up the discovery of new drugs. These models can also speed up the research process by making it easier to generate research propositions. Thus, AI models can change the nature of the innovation process in certain fields and constitute an "invention of the method of invention".

Figure 2. Capabilities of artificial intelligence systems for language and image recognition

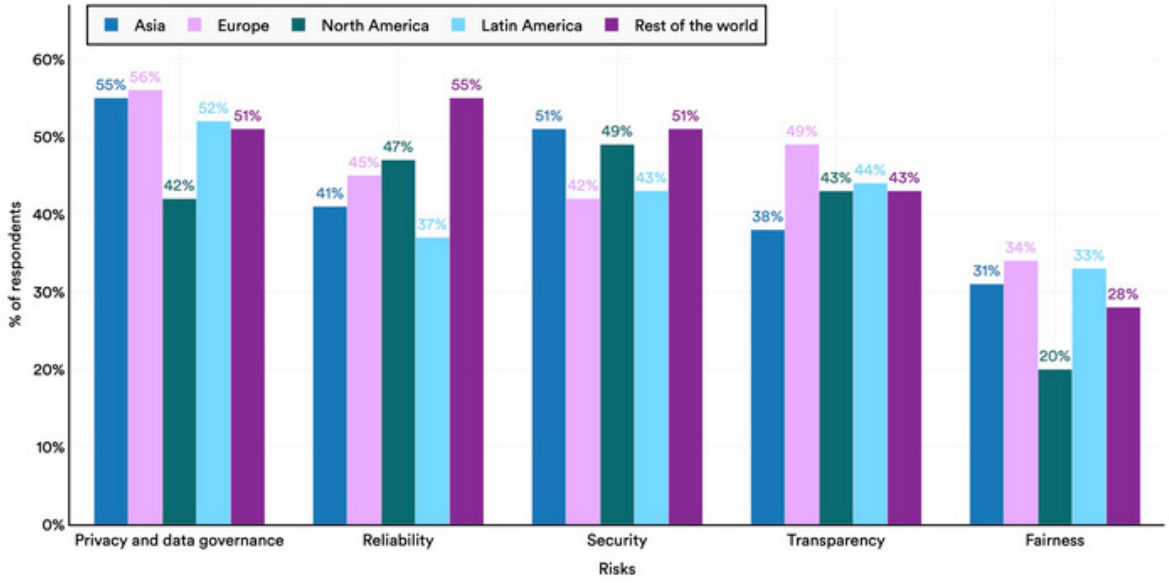


Source: OECD (2023a)

Existing empirical work has not found a statistically significant effect of AI on growth. There may be different explanations for this:

- AI remains relatively poorly integrated into manufacturing processes, with strong differences between sectors. Until the recent development of basic models, the adoption of technologies related to artificial intelligence seemed to have even reached its limit. On the other hand, AI development is uneven across companies, with profits concentrated in companies that are early adopters of these technologies.
- The benefits associated with AI will still not exceed the initial costs associated with its implementation. As with previous projects, AI requires reorganization of companies, reconfiguration of work methods and skills, as well as additional investment, which has a delayed impact on productivity. Thus, the effect of AI will follow as follows: J-shaped curve on a macroeconomic scale.

Figure 3. Revelance of selected responsible AI risks for organizations by region



Several preliminary studies have attempted to quantify the potential impact of widespread AI adoption on GDP. Pending the democratization of fundamental models, some studies estimate that this could lead to an increase in global activity of about $13,000 billion, implying an additional average GDP growth of about 1.2 points per year between 2018 and 2030 (Venturini, 2022).

A more recent study found that generative AI alone could increase annual productivity growth in the United States by nearly 1.5 percentage points over the 10-year period following its widespread adoption. By comparison, annual labor productivity growth in the United States was 1.3 points over the period 2005-2018. And 0.8 points for the period 2010-2018. These estimates often depend on very strong and forward-looking assumptions (e.g., a chronicle of analytics investment and mass adoption that is relatively rapid and with limited friction), which weakens their conclusions (Goldman Sachs, 2023).

In addition, the selected methodologies do not always allow for complete macroeconomic closure, since they are based on extrapolation of microeconomic results. On the other hand, some features of AI may have mixed effects on innovation. On the one hand, by facilitating imitation and copying of products and technologies (for example, reverse engineering of existing products and services), AI can promote technology diffusion and increase competition, ultimately increasing the conditions of the innovation race. On the other hand, such ease of copying can discourage innovation, reducing its potential benefits.

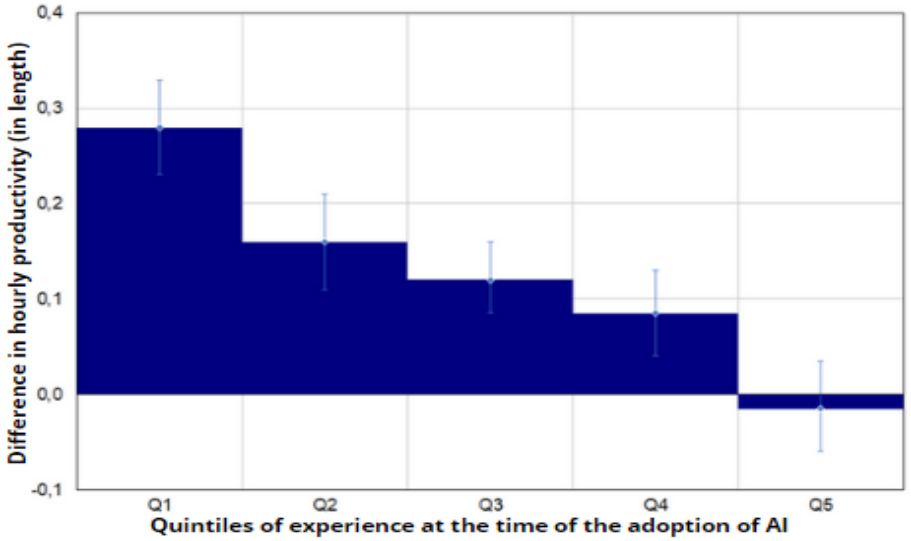
Thus, AI adoption appears to have a modest (statistically insignificant) effect on performance, which can be explained by the temporal shifting of effects and the joint adoption of multiple technologies preventing AI adoption from being specifically imputed. There is also selection bias, with the largest and most productive companies being the most likely to adopt AI. These larger companies also have more resources to deploy assets that complement AI, allowing them to extract maximum benefit from it.

The first empirical microeconomic studies focusing on specific use cases highlight the large individual productivity gains associated with adoption and use and, in particular, the fundamental patterns. For example, in the IT field, a programming assistant powered by artificial intelligence technologies could improve coding productivity by 55%. With the development of next-generation artificial intelligence models, this finding could be extended to many other industries. Thus, for basic writing jobs (e.g., applying for grants, writing essays), professionals using an AI-based conversational agent will see an average productivity increase of 37%. These benefits are likely to be concentrated on the least productive workers, leading to a narrowing of the productivity gap between workers.

For example, implementing artificial intelligence technology that helps taxi drivers find customers by suggesting routes improves the productivity of the least productive but not the most productive drivers, reducing the productivity gap between the two groups by 14%. The customer service advisory profession has seen an average productivity increase of 14% for advisors with access to conversational agents, largely focused on less experienced workers. The artificial intelligence model used in this way allows the transfer of tacit knowledge from more experienced workers to other workers, which reduces the productivity gap due to the initial deficit of experience of the latter compared to the former (Figure 4). This catch-up effect is also evident in more skilled

professions: for example, the use of AI by consultants at a consulting firm to perform (Brynjolfsson et al., 2021).

Figure 4: Impact of AI on the productivity of US client advisors based on their initial productivity



Source: OECD (2023b)

4.DISCUSSION

Increasing productivity, reducing human errors, making faster decisions, predicting customer preferences and maximizing sales are among the main benefits of automation, cognitive technologies and data analysis using artificial intelligence algorithms.

Artificial intelligence technologies are likely to provide new market opportunities and competitive advantage. Savvy organizations are investing and conducting technical validation studies to determine whether they can benefit from AI. AI technologies will require a different set of skills and new thinking to develop solutions to problems that we cannot solve with current technology. It's not about individual technologies, but the merging of multiple cutting-edge technologies with innovative approaches to solving problems that can have a significant impact on business and society.

As AI moves from science fiction to edge technologies that change the world, there is an urgent need to systematically develop and implement AI to see its real impact in the next generation of industrial systems, namely Industry 4.0.

The emergence of artificial intelligence and its integration into enterprise systems reflects the growing maturity of largest companies. As the customs around AI become more intense and diverse, its cumulative impact on AI will change the economy to a greater extent than all other technologies before it, including the Internet.

With AI as a new factor of production, there is an opportunity to increase growth through various channels. First, unlike traditional automation solutions, AI-based innovations automate complex physical tasks that require adaptability and flexibility, and AI is capable of self-learning. Existing labor and capital can then be used much more efficiently as AI allows workers to focus on what they do best: imagination, creativity and innovation (Acemoglu et al., 2022).

Finally, one of the least discussed benefits of AI is its ability to drive innovation as it spreads throughout the economy. It should be noted that the theoretical advances con-

tradict the conventional wisdom that high AI technologies will improve people's lives and create new jobs and skills, since huge industrial applications will do little to help poor countries that cannot compete in a world that is much more more technically advanced than they actually are. This would help make poorer countries, and especially third world countries, even less financially stable, leaving them with little except the production of cheap raw materials and agricultural products, given that they are completely unable to compete in a society based on high levels of computer science and connections.

On the other hand, at the global level, financial sectors have begun to use artificial intelligence throughout the banking value chain to increase their revenues, reduce their costs, improve their productivity and better understand their strategy. Financial industries around the world are already implementing elements of artificial intelligence technologies, including software robots to streamline and automate processes that use AI to enable interactions that enable banks to increase their reach to non-bank individuals and improve their profitability. This requires understanding artificial intelligence technologies and then analyzing the bank's existing operating model (including business processes, talent development models, existing systems, data assets and markets) to determine how to maximize profits. Artificial intelligence can improve communication with staff and clients, analyzing data in multiple different places to look for patterns or connections that prevent a human from finding and answering investment-related questions in real time using natural language.

Regarding the impact of AI on the labor market, estimates of the overall impact of AI on employment are few, but they suggest that the effect remains limited for now, without heralding any major changes. The OECD notes that empirical studies using differences in the impact of AI between countries or between local labor markets do not show a statistically significant decline in aggregate employment. Likewise, recent surveys of workers and businesses or case studies of companies that have adopted AI show little change in employment. However, one study suggests that AI adoption may be associated with increased employment and income in sectors where companies have adopted AI. These results have only limited predictive coverage in an environment where AI adoption is still limited, although growing markedly, and where its impact is still too small relative to the size of the labor market to be seen in employment models beyond hiring in the field of AI development.

The workforce dedicated to artificial intelligence in OECD countries is still relatively low (less than 0.3% of employment in 2019), but it is growing rapidly: its share of employment has almost tripled in less than a decade. The number of AI-related jobs grew rapidly between 2010 and 2018, accelerating around 2015-2016.

Companies implementing and distributing artificial intelligence systems are changing the types of skills required, both extensive (new skills) and intensive (a higher level of the same skill than before). As companies invest in AI, they tend to grow their workforces more specialized in science, technology, engineering and mathematics (STEM) fields. Workers with such skills are indeed especially useful for data analysis and computing, which rely on scientific knowledge or critical thinking.

Some AI skills are inherent to certain jobs (IT professionals, CIOs, data scientists, etc.), but in OECD (2023b) countries the demand for AI skills has spread to a wider range of jobs, and this faster than demand for mid-level skills between 2012 and 2019. The high demand for specialized skills in artificial intelligence is driven in part by the creation of

new jobs in the field of artificial intelligence itself. As a result, and without any assumption of future changes, although highly skilled workers are more exposed to the impact of AI, at the moment some of them, paradoxically, would have better job prospects since the introduction of AI.

The long-term impact of AI on aggregate employment fits within the theoretical framework of creative destruction. According to the IMF, 60% of jobs in advanced economies could be highly impacted by AI: 27% of jobs would be highly complementary and therefore most are able to benefit from AI, while it could replace 33% of jobs (Cazzaniga et al., 2024).

According to the International Labor Organization, in developed countries, the number of jobs with the potential to be improved by AI (13.4%) is much higher than the number of jobs with the potential to be replaced by AI (5.1%). Other estimates, more specifically related to the emergence of basic models, are that if 80% of American workers could see at least 10% of their jobs replaced, only 19% of them could see that share reaching at least 50%, and, therefore, will face a significant risk of replacement (Ojiyi et al., 2023). However, these results should be interpreted with caution. Indeed, the approach adopted does not take into account either the evolution curve of AI or the changing costs of its development for business, while these two elements largely determine the long-term impact of the technology on employment.

Thus, if 36% of US jobs (excluding agriculture) have at least one of their tasks exposed to computer vision, only 8% overall (or 23% of posted jobs) are likely to see their companies effectively automate this task. This low automation rate is the result of implementation and development costs that are still too high to be cost-effective (Hang & Chen, 2022).

In the long term, the impact of AI on aggregate labor demand will depend on mechanisms similar to those observed during previous technological revolutions, in particular the efficiency and timing of the Schumpeterian mechanism of "creative destruction."

New general-purpose technologies destroy jobs in some sectors only to create them in others over decades. The net effect on total employment depends on the balance between the two opposing forces. On the one hand, the demand for labor for certain tasks or professions (where capital can replace the labor factor) decreases. On the other hand, new technologies provide gains in productivity (by replacing labor with more efficient capital or by increasing the return on capital already used) and income, which increase the demand for labor. The latter also increases due to the emergence of new tasks or professions, where the employment factor remains relevant.

In the very long run, after adjusting employment and wages across sectors, there would be no reason for AI to have a significant impact on labor supply or equilibrium unemployment except indirectly. Some research suggests, for example, that AI will improve advice to job seekers distant from the labor market, which could help reduce persistent unemployment and improve productivity.

Overall, the impact on aggregate employment is uncertain and variable, depending on the rate of adjustment in relative wages and workers' compensation between old and new jobs, and the magnitude of each effect varies over time—likely following a J-shaped curve.

Unlike previous revolutions, artificial intelligence may have a greater impact on the most skilled occupations. Previous technological revolutions of the 20th century were at the origins of technological progress biased against the most skilled workers, which

could increase economic inequality. Mechanization at the beginning of the 20th century, and then robotization at the end of the century, thus disfavored unskilled manual workers, while skilled industry professionals and managers benefited. Computerization, for its part, has led to a polarization of the labor market, particularly harming semi-skilled workers engaged in everyday cognitive tasks and benefiting more skilled workers, for whom demand has surged, while unskilled workers performing non-standard manual tasks have suffered. insignificant (Noy & Zhang, 2023).

Unlike these earlier revolutions, the introduction of AI will pose a greater threat to the most skilled occupations (college graduates with high wages) as they will replace some highly skilled workers in tasks that require advanced skills. This is because AI is capable of taking on abstract and extra-software cognitive tasks and therefore expanding the range of tasks that can be replaced (e.g. translation, reporting, etc.). However, at the same time, these professions may be most likely to benefit from the productivity gains achieved through AI adoption. On the one hand, they contain the majority of jobs that are most complementary to AI (Green &. Lamby, 2023). On the other hand, the most skilled workers have a greater ability than others to exercise mobility to move from endangered to growing jobs.

Low-skilled occupations will also be affected, but to a lesser extent. Among the skilled trades, not all need to be affected to the same extent. For example, companies may further reduce their workforce in writing and programming-oriented occupations as they are more at risk of being replaced by generative models.

In addition to different expected effects depending on skill level, the OECD suggests that employers are more likely to identify older workers as likely to be adversely affected by AI developments. These workers tend to be more skeptical of AI technologies, making them less likely to adapt to changes and participate in training programs.

Finally, the industry approach shows that information processing industries exhibit high exposure to fundamental patterns in their tasks, while manufacturing and agriculture exhibit much lower exposure to fundamental patterns.

By changing the nature of the tasks workers perform, AI can have a direct impact on their satisfaction or their sense of dignity and pride in their work. According to initial research, surveyed employees and companies in the manufacturing and financial sectors are positive about the impact of AI on their working conditions. When looking at a set of indicators related to working conditions (job satisfaction, physical health, mental health, fairness in management practices), AI users are four times more likely to say that AI has improved their productivity and working conditions than to say that it has made them worse.

It looks like AI will allow workers to focus on the tasks they prefer, especially those involving customer contact or creativity. However, other studies provide further insight into this finding: some workers exposed to AI are reported to be less satisfied with their lives and their jobs, and more concerned about their job security and their personal economic situation. There are twice as many people who are concerned that AI will lead to lower wages in their industry than those who hope for a rise. However, no significant impact of AI was found on workers' mental health, anxiety or depression.

In this regard, government agencies have a role to play in promoting AI in society and ensuring its impact to optimize its economic potential. A significant part of artificial intelligence training activities can be carried out at the initial stage of training. Primary and secondary education should indeed provide basic knowledge of mathematics and

computer science useful for understanding AI in order to use it, while specialized skills in AI require vocational and higher education. In addition to data science skills, developing and deploying AI models requires technical skills in computing and data management. In addition, training that combines AI with other disciplines (e.g., healthcare, law) is needed to apply AI methods to various scientific and industrial fields and to support research (Borgonovi et al.,2023).

Finally, developing social-behavioral skills (e.g., collaboration, critical thinking, coping) in the school environment is necessary to benefit from the productivity gains associated with AI adoption. The impact of AI on employment will also depend on the adaptation of lifelong learning policies to new needs to facilitate labor reallocation. This includes people whose employment may be changed or even threatened by this technology shock, as well as those who may acquire new skills in the occupations created by this shock. Training policies can facilitate the occupational mobility of workers at risk of displacement into more complementary sectors.

Thus, in addition to the need for increased time spent on vocational training due to the introduction of new technologies, the way training itself may change in practice, relying more on work situations, which seems particularly suitable for the use of AI.

5. CONCLUSION

On a theoretical level and due to the inclination of artificial intelligence towards economic and social dimensions, it is identified at the level of several structures such as the market, business and even the human component; this can be felt at the level of economic sectors (financial, agriculture, industry) (Bughin,2023; Manca, 2023). These consequences are classified as positive if they are related to business and the market, and classified as negative if the topic is considered in connection with the human component.

With this in mind, this article fits into a perspective that attempts to highlight the current and potential economic impacts of AI adoption on the human component in companies, as well as in the financial services industry and society at large.

This analysis found that in all professions studied, a larger percentage of their activities are at risk of augmentation by AI. While some activities will potentially be replaced, according to this analysis, most activities within the financial services profession will benefit more from AI. Thus, access to better tools will enable professionals to be more effective in their respective professions.

The adoption of AI in the financial services sector is currently in its infancy and its impact on labor demand is therefore marginal, but in the medium to long term AI is set to increase demand for certain types of jobs. The authors also highlight that the existing workforce, especially mathematicians, statisticians, and computer scientists, must undergo additional training to gain the skills needed to use artificial intelligence solutions in financial services.

Thus, the development of information and communications technology (ICT) is an example of a new technology whose diffusion and potential for productivity improvements may have been limited by a relatively concentrated competitive situation. Historically, ICT has benefited primarily a small number of so-called “superstar” companies that have been able to develop structuring digital platforms, as well as accumulate capital, data, and attract top talent. These elements could create significant barriers to entry,

limiting other companies' access to technology and innovation. Similarly, AI can help increase industrial concentration and the rise of business "superstars".

The most effective AI models are currently developed primarily by or in partnership with a few large digital companies. These large companies have indeed made significant progress in accessing the resources needed to develop these AI models (e.g., computing power, data, skilled labor) and benefit from their vertical integration across the value chain. These resources can create barriers to entry, particularly limiting the diffusion of technology and the associated economic benefits that will then accrue only to these large companies.

Faced with these risks, the mobilization of competition policy instruments (e.g. abuse of dominance, concentration controls) will therefore play a critical role in anticipating, identifying and addressing at the best time competitive, behavioral or structural problems that may arise in the future. However, the emerging and evolving nature of the market, as well as the economic benefits to consumers associated with network effects and economies of scale, complicate cost-benefit analysis.

Thus, public authorities will have to face a trade-off between immediate benefits for consumers and long-term dynamics of innovation.

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