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The Impact of Artificial Intelligence on Employment in the European Economy

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Abstract

In recent years, the influence of artificial intelligence on economic systems has garnered considerable attention. The current state of the scientific literature on the topic shows that artificial intelligence has effects on productivity, employment, income distribution, and economic growth. It also influences several economic sectors, including manufacturing, transport, customer service, finance, and banking. On the one hand, artificial intelligence has the potential to significantly increase productivity and efficiency, which can result in economic growth. However, artificial intelligence also has the potential to disrupt employment and lead to income inequality. This paper examines the effects of artificial intelligence on employment by using the qualitative methods of the case study and document analysis. Moreover, data mainly sourced from Eurostat is analysed. The findings indicate that artificial intelligence has the potential to considerably boost productivity and economic growth, but may also result in job displacement and wealth disparity. In addition, the results show that artificial intelligence contributes to the automation of jobs and the creation of new ones. Furthermore, the impact of artificial intelligence on employment depends on the economic sector in which it is implemented.

Keywords: artificial intelligence, employment, European economy, productivity, income distribution, economic growth.

JEL Classification: E24, O31.

1. Introduction

Throughout the previous years, a marked escalation in artificial intelligence has emerged that has significant implications for global financial structures. Diverse assessments have scrutinised how this technological innovation influences productivity increase and marketable opportunities while equally regulating income distribution as well as economic growth overall. Analysts of all sorts, from academia

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to governmental sectors alongside businesspersons, are meticulously watching over the integration of artificial intelligence across various industries.

As the progression of artificial intelligence technology persists, concerns about its influence on jobs and wealth disparity has become substantial. Artificial intelligence has the opportunity to greatly increase productivity and proficiency, which may lead to economic growth. Despite this possibility, it also presents a chance to lower employment rates and augment inequality in income distribution. The effect of artificial intelligence concerning work opportunities is not consistent amongst sectors of activity; thus, policymakers must analyse individualised impacts within each sector to proceed appropriately with intervention plans.

This paper analyses the impact of artificial intelligence on employment in the European economy, proving that artificial intelligence has the potential to considerably boost productivity and economic growth, but may also result in job displacement and income inequality.

Moreover, the paper shows that artificial intelligence contributes to the automation of jobs and the generation of new ones and that the impact of artificial intelligence on employment depends on the economic sector in which it is implemented.

This paper also comes forward with a case study on the effects of artificial intelligence in the manufacturing sector, namely, Siemens' Factory of the Future.

2. Problem Statement

The swift progression of artificial intelligence holds significant consequences for global economic welfare. Researchers have been extensively studying how it can impact employment, income allocation, productivity, and overall financial expansion. Multiple evaluations conducted by experts such as Acemoglu and Restrepo (2019) and Brynjolfsson et al. (2018) conclude that diverse industries can benefit from increased productivity levels of employees alongside enhanced profitability, leading to boosted economics through artificial intelligence utilization.

As per academic research, the utilization of artificial intelligence technology has led to certain professions being rendered obsolete, particularly those that require monotonous and repetitive tasks (Autor, 2015; Frey, Osborne, 2017). Workers who may lack adaptability skills could face grave difficulties in discovering new employment opportunities, persistently widening income inequalities, and increasing job losses along the way (Arntz et al., 2016; World Economic Forum, 2018). Furthermore, it should be noted that artificial intelligence's impact on various sectors is not uniform or proportionate; some are more susceptible to displacement than others (Brynjolfsson et al., 2018).

It is imperative for policymakers, business leaders, and academics to comprehend the implications of artificial intelligence on employment opportunities, as well as income distribution. Several research studies have explored policy measures such as training programs aimed at helping workers adapt better to changing job markets while simultaneously reducing inequality in wages (Frey, Osborne, 2017; World Economic Forum, 2018), recognising that inclusive growth necessitates

active intervention from national governments. Others (Acemoglu, Restrepo, 2019; Brynjolfsson et al., 2018) highlight how vital it is for authorities to undertake steps proactively that promote development across all sectors while ensuring that the advantages of artificial intelligence are widely disseminated.

Artificial intelligence is making a formidable impression in pivotal domains, specifically manufacturing, transportation services, customer services, the financial sector and the banking sector.

The manufacturing sector has incorporated artificial intelligence to streamline production by adopting automated quality control measures, predicting equipment maintenance requirements, and managing inventory in real time. Consequently, the application of artificial intelligence leads to increased productivity rates coupled with reduced costs while maintaining an increased level of product quality, as outlined by Renner (2020).

Within the transportation sector, artificial intelligence has become a valuable tool for improving safety and optimising traffic management. With this innovative technology at their disposal, autonomous cars can now operate with greater efficiency while minimising fuel consumption. Furthermore, intelligent transportation systems have been developed using artificial intelligence in various sectors, such as smart traffic control mechanisms to predict vehicle maintenance issues in advance and provide immediate demand-responsive transport services, among others (Gray, 2022).

The employment of chatbots, virtual assistants, and recommendation systems that harness artificial intelligence is becoming more widespread in customer care to heighten customisation while expediting service delivery in a bid for enhanced interaction with customers (Chinn, 2023).

The use of artificial intelligence has also been increasingly observed in the banking and financial sectors, primarily for purposes such as customer relationship management, risk evaluation, fraud identification, and investment choices. This utilisation of artificial intelligence-based algorithms leads to improved precision levels and efficacy ratios while simultaneously boosting client satisfaction rates. Real-time monitoring protocols can track financial transactions seamlessly; credit scoring standards can also be discharged expeditiously through these mechanisms. Investment portfolio supervision activities have thus become more methodical due to swift responses hinged on automatic decision-making processes fuelled by artificially intelligent systems (Joshi et al., 2022).

The report "Future of Jobs" by the World Economic Forum (2018) highlights that artificial intelligence is increasingly being utilised in various economic domains, which could lead to alterations in employment opportunities and skills development. Also, a statement titled "Artificial Intelligence for Europe" (European Commission, 2018) reinforces how artificial intelligence can have an immense influence over multiple sectors of the economy and urges responsible use aligned with ethical standards pertaining to this technology.

Despite thorough research on the effects of artificial intelligence on employment and income distribution, there is a gap in understanding its precise implications for

the European economy. It is crucial to conduct specialised investigations into artificial intelligence's repercussions specific to Europe since most available literature focuses either globally or at country levels.

The purpose of this paper is to address the research gap on the impact of artificial intelligence on employment and income inequality in Europe. The focal point will be identifying which sectors are most affected by artificial intelligence as well as its influence on job creation and displacement within the European landscape. By exploring these topics through a European lens, this article contributes knowledge that offers valuable insights into how artificial intelligence elicits outcomes within this context.

The article's focus on the European economy renders it significant. This examination will impart a more intricate perspective of artificial intelligence's impact within Europe in contrast to earlier studies that examined its influence at either global or country-levels with regard to earnings and job distribution.

3. Aims of the Research

Through the synthesis of primary sources and the pinpointing of areas for further exploration, this paper aims to furnish a thorough analysis regarding the influence of artificial intelligence on job opportunities and income distribution in Europe.

Furthermore, its purpose is to discern the sectors within the European economy that experience detrimental or advantageous effects caused by artificial intelligence. These impacts are described in terms of job losses and employment generation.

Finally, this paper seeks to analyse the impact of progress in artificial intelligence on employment and income distribution within specific industries.

4. Research Methods

This paper examines the effects of artificial intelligence on employment by using the qualitative methods of the case study and document analysis, as well as statistical data.

The utilisation of the qualitative case study approach in research offers several benefits, including the provision of an in-depth perspective on a specific scenario and adding a valuable example to affirmations made beforehand.

To collect data, a diverse range of literary sources, scholarly articles, and research articles were used as corroborative evidence.

The statistical data utilised in this paper was primarily sourced from Eurostat (2022), the World Economic Forum (2017, and 2018), and the European Centre for the Development of Vocational Training, shortened CEDEFOP (2021). Subsequently, the data was analysed to identify the underlying patterns.

5. Findings

The World Economic Forum (2017) states that artificial intelligence is transforming industries and affirms that this technology is projected to add

\$16 trillion to the global economy by 2030. Thus, artificial intelligence has the potential to greatly contribute to economic growth.

The potential impact of artificial intelligence on wages, income distribution, and economic inequality is a topic of concern due to its potential for disruption.

The increasing demand in sectors that develop or thrive due to the use of artificial intelligence leads to the need for proficient personnel with artificial intelligence proficiency. This may result in a growth in their remuneration, whereas a considerable number of individuals could encounter a reduction in wages or even experience joblessness. The impact of artificial intelligence on mid-skilled workers is a concern, as their wages may be subject to downward pressure (Korinek, Stiglitz, 2017). This is due to the comparative advantage of high-skilled workers, who not only demonstrate greater productivity by using artificial intelligence but also possess the ability to perform a greater number of tasks. The alterations in labour demand may potentially exacerbate the distribution of income by influencing aggregate wages. As artificial intelligence solutions increasingly replace repetitive labour, there is potential for a concomitant increase in productivity and overall income growth, albeit with a corresponding rise in inequality.

According to the report "Use of artificial intelligence in enterprises" published by Eurostat (2022), the implementation of artificial intelligence within commercial organisations situated in the European Union has undergone a magnified trajectory during recent years, with 8 % of businesses in the European Union having incorporated artificial intelligence technologies in 2021.

Moreover, large businesses in the European Union employed artificial intelligence technologies in 28 % of cases in 2021, and businesses in the technology and communication sectors used artificial intelligence the most in the same year.

Furthermore, 53 % of businesses in the European Union that employed artificial intelligence in 2021 bought commercial ready-to-use artificial intelligence systems or software. Thus, there is a high interest in new technologies in the European Union.

According to Eurostat (2022), certain economic activities exhibit a higher degree of reliance on artificial intelligence compared to others. This observation suggests that artificial intelligence may be of greater significance in specific tasks or endeavours.

The year 2021 witnessed a noticeable prevalence of enterprises utilising artificial intelligence in the information and communication sector, accounting for 25 %, and professional, scientific, and technical service activities, accounting for 18 %. In all other economic activities, the proportion of enterprises utilising artificial intelligence was less than 10 %. The percentage values varied across different sectors, with the highest being 9 % for electricity, gas, steam, air conditioning, and water supply, and the lowest being 5 % for transport and storage, as well as construction.

Some occupations are more susceptible to automation than others. Occupations that are highly susceptible to automation are those that involve a substantial proportion of tasks that can be automated, such as the operation of specialised technical equipment, routine tasks, or non-autonomous tasks. Additionally, occupations that place less emphasis on communication, collaboration, critical

thinking, and customer service skills are also at greater risk of being taken over by artificial intelligence. This would be the main cause of job destruction.

As per a recent report by CEDEFOP (2021), the European Union observed a significant automation risk in certain occupations in the year 2020. The top three occupations that were identified as being at high risk for automation were subsistence farmworkers, handicraft and printing workers, and other manufacturing workers. In contrast, the jobs that were found to be the least prone to automation were those of business managers, CEOs, officials and legislators, and technical managers.

Additionally, as reported by CEDEFOP (2021), the European Union's top three occupations with a high risk of automation between 2020 and 2030 are represented by cleaners and helpers, construction workers, and sales workers. Some of the occupations with the lowest risk of automation between 2020-2030 are ICT technicians, forest and fishery workers, CEOs, officials, and legislators.

The main conclusion that can be drawn from these statistics is that jobs in the manufacturing sector are more susceptible to automation than others.

As of late, the manufacturing sector has seen swift transformations owing to state-of-the-art technologies. Among these advancements is one that stands out: artificial intelligence being integrated into factories.

Siemens AG (Siemens) is a multinational technology corporation. Its activities encompass the fields of electrification, automation, and digitalisation. The firm creates, develops, and manufactures items, as well as installs complicated systems and projects. It also offers a wide variety of customised solutions for specific needs. Siemens spearheads the revolution of artificial intelligence's integration into factories with their "Factory of the Future" (Ohr, 2021).

The Siemens Factory of the Future embodies a transformational deviation from customary manufacturing practices, where artificial intelligence is utilised to empower independent and self-educating mechanisms that refine production procedures and augment efficiency. An imminent outcome of artificial intelligence implementation in this factory involves its capability to harness voluminous data sets along with machine learning algorithms for actionable insights as well as predictive analytics. Through real-time analysis applied to extensive pools of information obtained via sources like machines, sensors, and/or production lines, artificial intelligence can recognise patterns and trends while detecting anomalies, fostering proactive decision-making, and outputting preventative measures optimised towards minimising downtime and enhancing productivity effectively.

Moreover, cognitive capabilities embedded in artificial intelligence have revolutionised the Siemens Factory of the Future. Robots and machines are now able to perceive their surroundings, reason logically, and make informed decisions based on the facts presented before them. This has given rise to a new age of collaborative robots, or cobots, that can operate safely alongside humans by helping with various tasks such as assembly work, packaging activities, and quality control assignments with ease. Cobots that feature artificial intelligence integration possess dynamic learning abilities through human interactions, allowing them to adapt appropriately

while handling changing production requirements. This results in enhanced precision levels and flexibility within manufacturing processes, thus always leading to very good performance outcomes.

One notable influence of artificial intelligence within the Siemens Factory of the Future is its capacity to attain elevated degrees of customisation and personalisation in manufacturing. By means of digital twins – computer-generated duplicates that capture all physical properties and procedures and are endowed with intelligence coming from artificial intelligence – production scenarios can be simulated, tried out for new designs, and performance validated before actualising them physically. Consequently, reducing waste material and increasing tailor-made products while meeting client requirements simultaneously results in improved consumer satisfaction levels along with augmented competitiveness on the part of manufacturers.

Nevertheless, the Factory of the Future's employment of artificial intelligence technology creates ethical issues that must be addressed regarding data confidentiality, safeguarding sensitive information from privacy invasion, and its effects on labour. It is imperative to secure trust by making certain that these systems are transparent and accountable while ensuring compliance with regulations and standards in order for them to gain extensive acceptance in manufacturing circles.

6. Conclusions

In conclusion, the implementation of artificial intelligence has the capacity to significantly enhance productivity and foster economic expansion; however, it can also lead to the displacement of jobs and the exacerbation of wealth inequality.

Furthermore, artificial intelligence plays a role in both job automation (which leads to job losses) and the creation of new jobs.

The influence of artificial intelligence on labour depends on the sector in which it is integrated. The manufacturing sector is more prone to automation than other sectors, a fact that is also supported by the example of Siemens' Factory of the Future.

The limit of the results of this paper is that the data employed come from years other than 2023 (the year in which this paper was written), but the results are still pertinent, as this paper offers an overview of the impact of artificial intelligence on employment in the European economy, an impact that must be measured over multiple years.

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