

A Study on Impact of Artificial Intelligence on Global Economy

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Abstract

Purpose: The purpose of this article is to investigate the diverse effects of artificial intelligence (AI) on the global economy, with the aim of offering a comprehension of its consequences on different industries and socio-economic factors. This research endeavours to enhance understanding of the transformative impacts of AI on global economies by investigating the correlation between the adoption of AI and economic dynamics, thereby providing valuable insights. **Methodology:** The research paper utilizes an interdisciplinary methodology that integrates approaches to examine the diverse impacts of artificial intelligence on the economy. **Findings:** The article presented a nuanced analysis of the multifaceted consequences of adopting AI technology in various aspects including macroeconomics, industry-specific implications, labour market dynamics, socio-economic factors, and policy considerations. The research outcomes emphasized the significance of a comprehensive and equitable approach to the integration of AI, considering ethical considerations, policy frameworks and targeted initiatives aimed at ensuring the fair distribution of the advantages and opportunities created by AI. **Limitations:** The relationship between the adoption of AI and macroeconomic factors may require a more complex analytical framework. Investigating the possible harmonization and joint efforts between AI and human workers is an avenue that should be explored in future research. To achieve a more thorough comprehension of the multifaceted effects of AI on the economy, upcoming studies should aim to overcome these limitations. **Value:** The article offers a distinctive perspective by employing a comprehensive and interdisciplinary approach, as well as by considering the broad socio-economic implications. Its significance lies in providing guidance to policymakers, businesses, researchers, educators, and the wider public, facilitating a more profound comprehension of the impact of AI on economies, and ultimately promoting responsible and fair integration of AI technologies.

Keywords: Artificial Intelligence, Economy, Labour Market, Socio-economic Factors.

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Introduction

Artificial intelligence plays an increasingly important role in our lives and economy and is already having an impact on our world in many different ways. Worldwide competition to reap its benefits is fierce and global leaders – the US and Asia has emerged on the scene. AI is seen by many as an engine of productivity and economic growth. It can increase the efficiency with which things are done and vastly improve the decision-making process by analyzing the large amounts of data. It can also spawn the creation of new products and services, markets and industries, thereby boosting consumer demand and generating new revenue streams. However, AI may also have a highly disruptive effect on the economy and society. Some warn that it could lead to the creation of super firms – hubs of wealth and knowledge – that could have detrimental effects on the wider economy. It may also widen the gap between developed and developing countries, and boost the need for workers with certain skills while rendering others redundant; this latter trend could have far-reaching consequences for the labour market. Experts also warn of its potential to increase inequality, push down wages and shrink the tax base. While these concerns remain valid, there is no consensus on whether and to what extent the related risks will materialise. They are not a given, and carefully designed policy would be able to foster the development of AI while keeping the negative effects in check. The EU has a potential to improve its standing in global competition and direct AI onto a path that benefits its economy and citizens. In order to achieve this, it first needs to agree a common strategy that would utilise its strengths and enable the pooling of Member States' resources in the most effective way.

The use of artificial intelligence for day-to-day tasks has increased rapidly over the last decade. The May 2023 CfM-CEPR survey asked the members of its European panel to predict the impact of AI on global economic growth and unemployment rates in high-income countries over the upcoming decade. Most panellists think that AI is likely to boost global growth to 4–6% per annum (relative to an average of 4% over the past few decades). Most of the panel also believes that AI is unlikely to affect employment rates in high-income countries, with the remainder split between predicting an increase and a decrease in unemployment rates. Notably, most panellists indicate a great degree of uncertainty regarding their predictions, because AI is still in its infancy.

1. Review of Literature

Frank et al. (2019) classify current literature on the labour market implications of AI into two broad categories: a doomsayer's perspective and an optimist's perspective. Doomsayers believe that labour substitution by AI will harm employment. Frey and Osborne (2013) estimate that 47% of total US employment is at risk of losing jobs to automation over the next decade. Their research reveals that a substantial share of employment in service occupations – where most US job growth has occurred over the past decades – are highly susceptible to computerization. Bowles (2014) uses Frey and Osborne's (2013) framework to estimate that 54% of EU jobs are at risk of computerization. Acemoglu and Restrepo (2017) provide a historical example of excessive automation negatively affecting the labour market due to weak productivity and reinstatement effects, finding that areas in the US most exposed to industrial automation in the 1990s and 2000s experienced large and robust negative effects on employment and wages.

AI is also expected to have a disruptive effect on the composition of the labour market. Autor (2015) presented evidence that the labour market has become polarised over the last few decades towards low-skilled and high-skilled jobs and away from medium-skilled jobs, due to the advent of computers. However, he stated that this polarisation is likely to be reversed, as some low-and-medium skilled jobs are likely to be relatively resistant to automation, while some highly-skilled but relatively routine jobs may be automatable (potentially with technologies like AI). However, Petropoulos and Brekelmans (2020) concluded that unlike the computer and robotic revolution, the AI revolution is unlikely to cause job polarisation as it will affect alter low-skilled, middle-skilled and high-skilled jobs.

Optimists believe that AI's productivity and reinstatement effects will be more than enough to compensate for the substitution effect. Some opinion pieces project that AI and robotics will have created up to 90 million jobs by 2025, indicating a strong positive labour market impact. The World Economic Forum concluded in October 2020 that while AI would likely take away 85 million jobs globally by 2025, it would also generate 97 million new jobs in fields ranging from big data and machine learning to information security and digital marketing.

Acemoglu and Restrepo (2018) provide a theoretical framework to understand the impact of new technologies on the labour market. They decompose the effect of new technologies on labour into three broad effects: a *displacement* effect, a *productivity* effect and

a *reinstatement* effect (new technologies can serve as a platform to create new tasks in many service industries, where labour has a comparative advantage relative to machines, boosting labour demand).

Nakamura and Zeira (2018) build a task-based theoretical model that shows that automation need not lead to unemployment in the long run. Somers et al. (2022) conduct a systematic review of the empirical literature on technological change and its impact on employment and find that the number of studies that support the labour substitution effect is more than offset by the number of studies that support the labour-creating/reinstating and real income effects of new technologies. Moreover, they find that studies that analyse the net employment effect of technological change suggest the net impact of technology on labour to be rather positive than negative, reaffirming this narrative. Bholat (2020) further notes that job losses in specific sectors due to new technologies have historically been counter-balanced by broad-based gains in aggregate real income as these technologies create higher quality and lower priced goods and services. This leads to higher disposable income which boosts demand for new products, which in turn, boosts labour demand in such sectors. Alan Manning notes that some of the direst predictions about the impact of automation on employment during the past decade have not come to pass (Bholat 2020). This may indicate that concerns about the impact of AI on employment are slightly exaggerated.

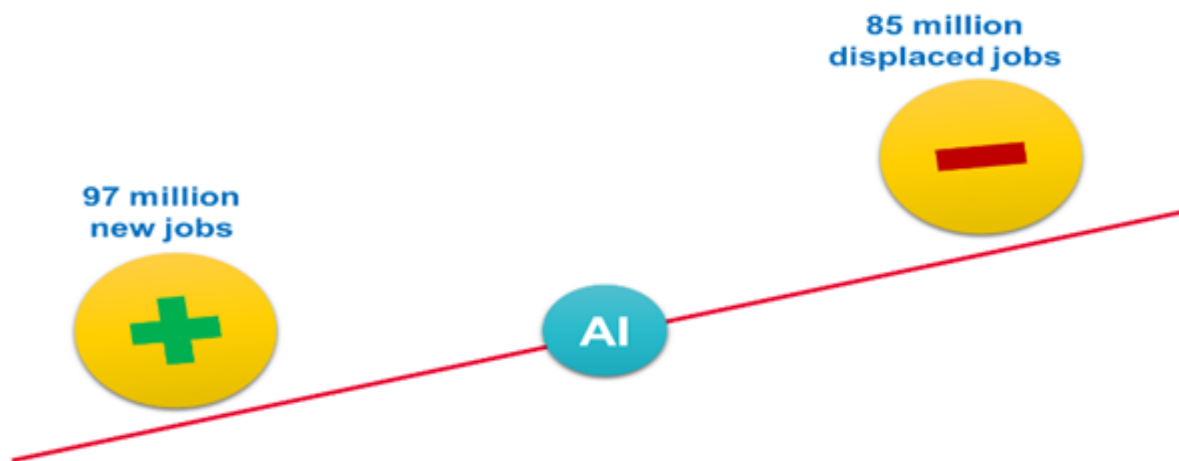
Lawrence et al. (2017) argue that AI automation is unlikely to negatively impact the employment market due to its large positive spillover effects (reinstatement effect), which would counteract the negative direct effects of substitution in the labour market and can be seen as a Schumpeterian 'creative destruction'. They believe that automation is likely to transform, rather than eliminate, work. In contrast to other studies finding larger negative effects, Arntz et al. (2016) estimate that only 9% of jobs in the UK are susceptible to automation in the next decade. They argue that instead of substitution, transformation is more likely to occur, with 35% of jobs would change radically in the next two decades.

The May 2023 CfM-CEPR survey asked the members of its panel to forecast the impact of AI on global economic growth and unemployment rates in high-income countries over the upcoming decade. The survey contained two questions. The first asked the panellists to forecast the impact of AI on global economic growth over the upcoming decade. The second asked them to predict the impact of AI on unemployment in high-income countries in the upcoming decade.

2. Impact of AI on the Future Jobs

The long-term impact of AI on the society is expected to be positive overall across a host of fields, including manufacturing, education, healthcare, and public safety. However, as the adoption of AI grows and automation continues to enter the workforce, many traditional jobs stand to get replaced. As Figure-1 highlights below, the World Economic Forum (WEF) predicts that by 2025 around 85 million jobs will be displaced due to AI. Most of these jobs will revolve around routine and or repetitive tasks such as data entry, assembly line manufacturing, or customer services. However, freeing human resources from mundane tasks will allow people to focus on more engaging and compelling tasks, which the advent of AI will create. The WEF report also predicts that AI will help create 97 million new jobs by 2025 in categories such as data science, RPA (robotic process automation) specialists, and software developers.

Figure 1: AI's Impact on Jobs by 2025



Source: WEF

Thus, AI-induced job losses are expected to be more than compensated by new jobs and job categories as a result of the economic boost that AI is expected to deliver. In fact, the IDC forecasts that skills development powered by generative AI will lead to productivity gains of US\$1 trillion by 2026. In conclusion, AI will not only boost economies, it will also create new jobs and open the opportunity for employees to upskill. In fact, to be ready for the new AI world, about 50% of the global workforce will need to reskill or upskill by 2025 to remain

relevant and ready for the workplace of tomorrow. Various industries have already started to use AI in their operations. Part three of this series will discuss a few examples of how telecom operators have made an early foray into integrating AI into operations and services.

One of the most significant concerns surrounding AI is its potential impact on employment. With the rise of automation and AI-powered robots and machines, there is a growing fear that many jobs will be lost to machines. While it is true that some jobs may become obsolete, it is important to note that the overall impact of AI on employment is likely to be more nuanced. On one hand, AI is likely to automate repetitive and mundane tasks, freeing up human workers to focus on more complex and creative work. This could lead to an increase in productivity and a higher standard of living for many workers. However, it is also possible that some jobs may become obsolete entirely, particularly in industries such as manufacturing and transportation. To mitigate the negative impact of job displacement, governments and businesses must work together to provide training and education for workers to adapt to new job opportunities in emerging fields such as data analysis, cybersecurity, and AI development.

3. Impact on Manufacturing Sector

AI is one of the cornerstones of the growing digitalisation of industry ('Industry 4.0'). Technologies underpinning this process – such as IoT, 5G, cloud computing, big data analytics, smart sensors, augmented reality, 3D printing and robotics – are likely to transform manufacturing into a single cyber-physical system in which digital technology, internet and production are merged in one. In the smart factories of the future, production processes would be connected and AI solutions would be fundamental in linking the machines, interfaces, and components (using, for example, visual recognition). Large amounts of data would be collected and fed into AI appliances, which would in turn optimise the manufacturing process. The OECD reckons this use of AI can be 'applied to most industrial activities from optimising multi-machine systems to enhancing industrial research'. Deployment of AI in production is likely to increase over time, due to the development of automated learning processes. Fundamentally, it is likely to boost the competitiveness of the manufacturing sector through efficiency and productivity gains enabled by data analysis, and supply chains would be based on these gains. AI would also boost automation; ensure stronger quality control of products and processes, and preventive diagnostics of machinery status, while also ensuring timely maintenance, near-zero downtime, fewer errors and defective products. Manufacturers would

be able to access new markets, since their products would be more customised, varied and of higher quality. Although the building blocks already exist, Industry 4.0 may not be realised before the middle of the next decade, as it demands a combination of various technologies, which, according to some, will take 20-30 years to mainstream. The OECD forecasts that in the long-term, AI may lead to scientific breakthroughs that could even create entirely new, unforeseen industries

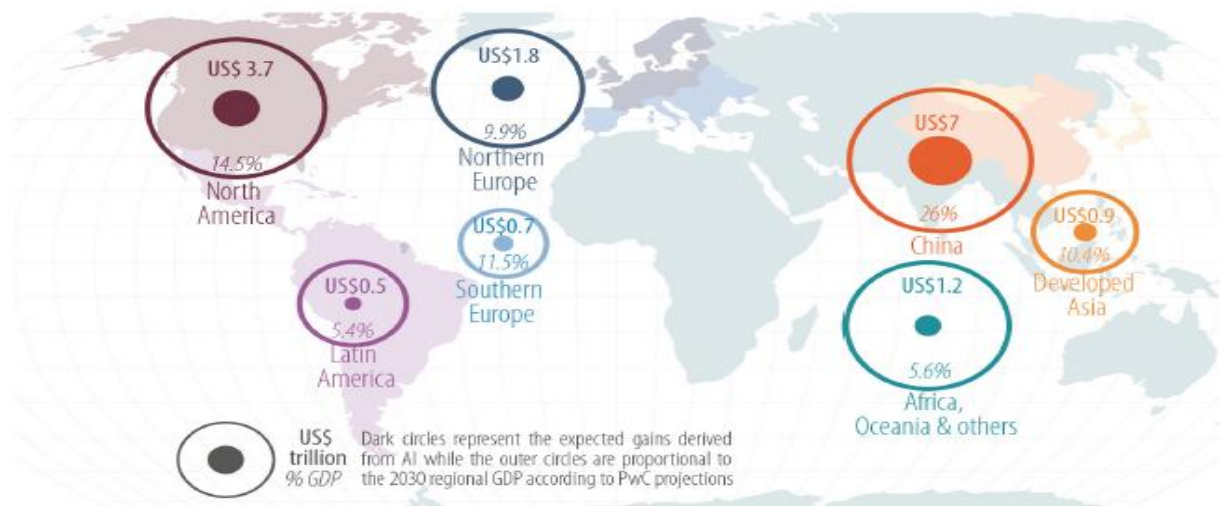
4. Economic Potential of AI

The majority of studies emphasise that AI will have a significant economic impact. Research launched by consulting company Accenture covering 12 developed economies, which together generate more than 0.5 % of the world's economic output, forecasts that by 2035, AI could double annual global economic growth rates. AI will drive this growth in three important ways. First, it will lead to a strong increase in labour productivity (by up to 40 %) due to innovative technologies enabling more efficient workforce-related time management. Secondly, AI will create a new virtual workforce – described as ‘intelligent automation’ in the report – capable of solving problems and self-learning. Third, the economy will also benefit from the diffusion of innovation, which will affect different sectors and create new revenue streams. A study by PricewaterhouseCoopers (PwC) estimates that global GDP may increase by up to 14 % (the equivalent of US\$15.7 trillion) by 2030 as a result of the accelerating development and take-up of AI. The report anticipates the next wave of digital revolution to be unleashed with the help of the data generated from the Internet of Things (IoT), which is likely to be many times greater than the data generated by the current ‘Internet of People’. It will boost standardisation and consequently automation, as well as enhancing the personalisation of products and services. PwC sees two main channels through which AI will impact on the global economy. The first involves AI leading to productivity gains in the near term, based on automation of routine tasks, which is likely to affect capital-intensive sectors such as manufacturing and transport. This will include extended use of technologies such as robots and autonomous vehicles. Productivity will also improve due to businesses complementing and assisting their existing workforce with AI technologies. It will require investing in software, systems and machines based on assisted, autonomous and augmented intelligence; this would not only enable the workforce to perform its tasks better and more efficiently but would also free up time allowing

it to focus on more stimulating and higher value-added activities. Automation would partially remove the need for labour input, leading to productivity gains overall.

Eventually, the second channel – the availability of personalized and higher-quality AI-enhanced products and services – will become even more important, as this availability is likely to boost consumer demand that would, in turn, generate more data. Or, as PwC puts it: 'in turn, increased consumption creates a virtuous cycle of more data touch points and hence more data, better insights, better products and hence more consumption'. Although the benefits will be felt globally, North America and China are expected to gain the most from AI technology (see Figure 2). The former will likely introduce many productive technologies relatively soon, and the gains will be accelerated by advanced readiness for AI (of both businesses and consumers), rapid accumulation of data and increased customer insight.

Figure-2 Expected gains from AI in the different regions of the world by 2030



Source: The Macroeconomic impact of artificial intelligence, PwC, 2018

It is likely to take more time for China to feel the full effect of AI, but this effect will eventually occur in the country's huge manufacturing sector and then move up the value chain into more sophisticated and high-tech-driven manufacturing and commerce. Europe will also experience significant economic gains from AI, while developing countries are likely to record more modest increases due to lower rates of adoption of AI technologies.² The McKinsey Global Institute expects that around 70 % of companies would adopt at least one type of AI technology by 2030, while less than half of large companies would deploy the full range. McKinsey estimates that AI may deliver an additional economic output of around US\$13

trillion by 2030, increasing global GDP by about 1.2 % annually. This will mainly come from substitution of labour by automation and increased innovation in products and services. On the other hand, AI is likely to create a shock in labour markets and associated costs needed to manage labour-market transitions; this shock would be incurred as an effect of negative externalities such as loss of domestic consumption due to unemployment. A 2016 study by Analysis Group (funded by Facebook), considers that AI will have both direct and indirect positive effects on jobs, productivity and GDP. Direct effects will be generated by increased revenues and employment in firms and sectors that develop or manufacture AI technologies, which may also create entirely new economic activities. Indirect ones will come from a broader increase of productivity in sectors using AI to optimise business processes and decision-making, as well as increase their knowledge and access to information. Altogether they envisage much more modest gains (US\$1.49-2.95 trillion) over the next decade.

Other sources argue that AI will have limited impact on growth, as exemplified by sectors enjoying the highest productivity growth rates, yet witnessing a decline in their overall share in the economy. Despite progress brought by AI, some areas of the economy would remain essential yet hard to improve, retaining human labour that would be well remunerated. Ultimately, this would constrain new technologies from having an impact on the overall economy. AI may even partly discourage future innovation by accelerating imitation, which would limit the return on innovation.

5. AI and the Future of Productivity

According to a well-known productivity paradox, we are experiencing low productivity in an age of accelerating technological progress. One possible explanation for this is that the diffusion of those capabilities of AI that can spur productivity remains limited. Even with their broad uptake, their full effect may only materialise with ensuing waves of complementary innovations. On the contrary, some experts say that the ICT revolution has reached maturity and that research productivity is declining sharply, having diminishing impacts on the economy. Taking into account the low rate of increase in physical and human capital, which can have a stronger effect on overall productivity compared with innovation, they foresee only a gradual evolution of productivity due to AI. According to opposing views, AI will significantly improve human capital by offering novel ways of teaching and training the workforce. Some consider that in reality, technological progress has a much greater impact on

productivity than shown by many estimates, as a result of mis-measurement. The OECD expects that through detection of patterns in enormous volumes of data, AI will significantly improve decision-making, cut costs and optimise the use of production factors and consumption of resources in every sector of the economy. Overall, it seems likely that, while AI has significant potential to boost productivity, the final effects will depend on the rate of AI diffusion across the economy and on investment in new technologies and relevant skills in the workforce.

6. Impact on Manufacturing

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7. Effects on Firms, Industries and Countries

McKinsey argues that AI and automation may on one hand facilitate the rise of massively scaled organisations, and on the other will enable small players and even individuals to undertake project work that is now mostly performed by bigger companies. This could spawn the emergence of very small and very large firms, the end result being a barbell-shaped economy in which mid-sized companies lose out. Other likely effects are increased competition, firms entering new areas outside their previous core business, and a deepening divide between technological leaders and laggards in every sector. 'Early adopters', that is, companies that fully absorb AI tools over the next five to seven years, will most probably benefit disproportionately. At the other end of the spectrum would be the slow adopters or non-adopters, which are likely to experience some economic decline. The market share is likely to shift from the laggards to the front-runners, which would be able to gradually attract more and more of the profit pool of their industry. This would lead to a 'winnertakes all' phenomenon, similar to what is currently observed on tech markets. Advances in AI and technology could enable front-runners to make a decisive break from the pack and become 'superstars' enjoying the highest productivity levels. This can have significant consequences. For example, the OECD has raised the question as to why apparently non-rival technologies are not diffused to all firms. It may well be that the widening productivity gap between firms can be attributed to the highly uneven process of technological diffusion, which favours global frontier firms over laggards. This may occur because global frontier firms can better protect their advantages; this could eventually even contribute to a slowdown in aggregate productivity growth in the economy. These widening productivity and innovation gaps are surely going to attract a lively policy debate on the unequal distribution of the benefits of AI.

In this context, it is useful to look at the industries that are moving to the forefront of AI deployment. McKinsey sees AI as already having a significant impact and great commercial potential in sectors such as marketing and sales, supply chain management, logistics and manufacturing. A 2018 survey by the Boston Consulting Group points to the transport, logistics, automotive and technology sectors as already being at the forefront of AI adoption. It also reveals that process industries (such as chemicals) are lagging behind. PwC expects that thanks to AI all sectors of the economy will see a gain of at least 10 % by 2030. The report says that the services industry is to gain the most (21 %), with retail and wholesale trade as well as

accommodation and food services also expected to see a large boost (15 %). Current AI adoption levels across the world vary, making it possible that the gap between advanced and lagging countries will widen. AI front-runners, located mostly in developed countries, are likely to increase their lead over their counterparts in developing countries. This potential effect is likely to be compounded by the fact that high wages in developed economies create a stronger incentive to substitute labour with AI than in lower-wage economies. Moreover, AI may make it economical for some manufacturers to bring back production from poorer countries.

8. AI impact on labour markets and redistributive effects of AI

If indeed technologies, such as AI, robotics and automation, are widely deployed across the economy, there will be job creation (as a result of demand in sectors that arise or flourish due to this deployment), as well as job destruction (replacement of humans by technology). As a 2018 metastudy of results shows, there is no consensus among experts, with predictions ranging 'from optimistic to devastating, differing by tens of millions of jobs even when comparing similar time frames. 4 A forecast by think-tank Bruegel warns that as many as 54 % of jobs in the EU face the probability or risk of computerization within 20 years. The effect is likely to be more nuanced, and there seems to be a consensus among researchers that there will be significant workforce shifts across sectors of the economy, accompanied by changes in the nature and content of jobs, which would require reskilling.⁵ Furthermore, job polarisation is probable: lower-paid jobs that typically require routine manual and cognitive skills stand the highest risk of being replaced by AI and automation, while well-paid skilled jobs that typically require non-routine cognitive skills will be in higher demand. Studying the patterns of previous industrial revolutions indicates that job destruction will be stronger in the short and possibly medium term, while job creation will prevail in the longer term. Nonetheless, labour relations may alter, with more frequent job changes and a rise in precarious work, self-employment and contract work, which would possibly weaken workers' rights as well as the role of trade unions. The disruptive effects of AI may also influence wages, income distribution and economic inequality. Rising demand for high-skilled workers capable of using AI could push their wages up, while many others may face a wage squeeze or unemployment. This could affect even mid-skilled workers, whose wages may be pushed down by the fact that high-skill workers are not only more productive than them thanks to the use of AI, but are also able to complete more

tasks. The changes in demand for labour could therefore worsen overall income distribution by affecting overall wages. Much will depend on the pace, with faster change likely to create more undesirable effects due to market imperfections. Theoretically, the more AI solutions replace routine labour, the more productivity and overall income growth will rise and the more sharply inequality will increase. This may lead to a 'paradox of plenty': society would be far richer overall, but for many individuals, communities and regions, technological change would only reinforce inequalities. There are indeed fears that the current trends of shifting the distribution of national income away from labour, which leads to deeper inequality and the concentration of wealth in 'superstar' companies and sectors, will indeed only be exacerbated by AI. On the other hand, many economists are positive, saying that it will be hardest for AI to replace the 'sensor-motor skills' required in non-standard and non-routine jobs, such as that of security staff, cleaners, gardeners and chefs. Others add that automation always has an ambiguous impact on inequality: low-skill automation always increases wage inequality, and high-skill automation always reduces it. In conclusion, it is therefore uncertain that at least over the short to medium term, the rise in inequality due to AI automation will be significant.

9. Selected Policy Implications

AI has significant potential to boost economic growth and productivity, but at the same time it creates equally serious risks of job market polarisation, rising inequality, structural unemployment and emergence of new undesirable industrial structures.

EU policy needs to create the conditions necessary for nurturing the potential of AI, while considering carefully how to address the risks it involves. A recent economic paper shows that if labour income does not benefit from the economic gains generated by AI, consumption may stagnate and restrict growth, thereby having an adverse effect on the economy. Questions about distributing the gains from AI are therefore fundamental in managing its outcomes. Tax policies could help to rebalance the shift from labour to capital, and shelter vulnerable groups from socioeconomic exclusion. The European Political Strategy Centre describes the internal and external challenges the EU is facing. The former include low investment and a slow uptake of AI technologies by companies and the public sector, and the necessity to establish a regulatory framework that does not stifle technological progress, while at the same time adhering to key fundamental EU principles. The latter include fierce global competition, with other jurisdictions benefitting from structural advantages. The centre suggests that the EU

should address these by developing an investment-conducive framework and becoming a leader in setting global AI quality standards. A precondition to successfully harness the potential of AI is to develop relevant skills in education and work as well as funding research and pooling resources to deliver true EU added value. Importantly, the EU has the necessary tools, such as a powerful competition policy, to address market distortions and power asymmetries. Issues, such as responsibility and liability, security and safety of AI-driven decisionmaking, raise many questions that need to be addressed in the near future. While public authorities are starting to focus on AI and national AI strategies are being developed, the need for a common EU-level path becomes more urgent than ever.

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