Study on the Impact of Artificial Intelligence on Employment and Income Inequality, Based on Technological Determinism Theory

Qiran Yue[(✉)]

Shanghai Ocean University, Shanghai, China
elizayue0428@126.com

Abstract. With the advent of the fourth industrial revolution, the rapid development of Chinese artificial intelligence industry has impacted the existing social stratification structure to some extent. This paper combs the impact of AI on employment and income inequality, mainly in the substitution and creation of employment, "emotional exploitation", digital divide issues, and the confrontation between the code elite and the "cyber working class". For the problems faced in the era of artificial intelligence, this paper deeply analyzes the human-machine relationship, employment and income inequality in the digital era, and puts forward a prospect based on the existing research on the impact of AI on employment.

Keywords: Artificial intelligence · Inequality · Technological determinism theory

1   Introduction

Four hundred years ago, the English philosopher Hobbes described a horrible sea monster named Leviathan, referring to a powerful modern state and the supremacy of an absolute monarchy. Leviathan has since been remembered as the death of freedom and the nightmare of dystopia [1]. Unexpectedly, four centuries later, this monster came to the world again with the help of technological power, and its combat effectiveness was upgraded, not only can penetrate people's hearts, insight into everything, but also accurately lock and intelligently control. "Digital Leviathan" has once again become a lingering shadow in the minds of modern people.

Today, with the advent of the Fourth Industrial Revolution, AI has created great contributions to society while also causing various social problems, such as digital divide, social exclusion, class differentiation, etc. Without restraint and governance, AI could evolve into a new era of "digital Leviathan," which poses enormous challenges to the social structure. Among them, the impact of artificial intelligence on employment and income systems has aroused widespread academic attention. By combing through the relevant literature, this paper explores the directions in which artificial intelligence affects employment and income inequality, and puts forward relevant suggestions, thereby improving the social stratification structure in the era of AI, contributing to maintaining social stability and promoting common prosperity.

2 Theoretical Overview of the Impact of AI on Employment and Income Inequality

2.1 Technological Determinism Theory

As early as 1929, Thorstein Veblen first explained the concept of "technological determinism" in his book The Engineers and the Price System, arguing that it was based on two important foundations; First, technology is autonomous; Second, technological changes lead to social changes. On this basis, Li Shuo further put forward that technological determinism can be divided into the hard technological determinism and the soft technological determinism. The hard technological determinism is extreme, which believes that technology is the only factor determining social development, and denies or underestimates the social constraints on technological development. Its representative is the Ogbum School. The soft technological determinism believes that technology produces and acts on society. Therefore, it has more arguments and is supported by more scholars, such as Eruel and Meyer.

With the rise of AI, the connotation of technological determinism has become more obvious. Studies have shown that with the advent of the Fourth Industrial Revolution, advances in computer speed, data collection, data storage, and algorithms have led to a rapid increase in the human-like intelligence degree (Agrawaletal, 2019), affecting human employment more thoroughly. At the same time, the contradiction between the slow growth of labor productivity and the change of employment demand is increasingly deepening, and various social issues such as class differentiation and income inequality are further sharpened. Therefore, it can be seen that technology is profoundly affecting human life and even determining the trend of social development.

2.2 The Debate Between Technological Optimism and Technological Pessimism

Sociologist William Ogburn once said, "Technology is like a mountain peak. Viewed from different sides, it looks different." The academic circles hold two different attitudes towards technology determinism, namely technology optimism and technology pessimism. Among them, technology pessimists believe that the process of technology has brought endless social crises and global dilemmas, so they are averse to technology. Representative figures include Jacques Ellul and J. Rifkin of the United States [2]. On the contrary, technological optimism advocates improving productivity to promote economic growth, creating new tasks to increase labor demand, and emphasizing the positive significance of AI in increasing labor share (Acemoglu and Restrepo, 2020) [3]. Thus, technology pessimists view technology in a negative and critical way, while technology optimists view technology in a positive way, believing that it is the development of artificial intelligence that promotes the process of social civilization.

However, both views ignore the importance of AI types. The use of the wrong type of AI will lead to a misalignment of resources in the market, which in turn will exacerbate the replacement of labor by machines, leading to severe unemployment and income inequality. Subsequently, many scholars have put forward different views. Fleming (2019) believes that there are obvious organizational boundaries in the influence of

AI on employment, and unemployment is more from the threat of macroeconomic pressure on low-skilled occupations. Pettersen (2019) further adds that AI does not threaten knowledge work. Some scholars put forward that artificial intelligence does not have an absolute favorable or harmful tendency to employment, and a series of relevant economic factors should be considered (Rotman, 2018). Therefore, we cannot generalize about AI with optimism or pessimism. Because in this process, there are many factors such as economy, ideology, technology type, etc. that affect the final result. AI may become a benefit to mankind and lead to a better digital life; But if not used properly, it can become a ferocious and terrifying "digital leviathan", devouring people's freedoms and exacerbating social inequality, such as the "high-tech, low-life" world under the cyberpunk space.

3   The Impact of AI on Employment

The rapid development of technology has brought a series of incredible singularities to human history. The era of big data has shown a multi-dimensional picture from information disclosure to data evolution, "machine substitution" has become the norm, and low-cost and high-efficiency artificial intelligence has replaced high-cost jobs in production, which inevitably has a negative impact on workers' employment. For every 1% increase in the size of robots, about 4.6% of jobs will be replaced. In the next 20 years, 76% of workers will be at risk of being replaced [4].

3.1   Change of Employment Structure: Substitution and Complementation of Artificial Intelligence for Employment

The application of artificial intelligence has decomposed and reorganized the employment structure, and more and more jobs have been eliminated and substituted. Specifically, the level of substitution of AI for workers with different education and skill levels is also different. Among them, Kong Gaowen (2020) found that low-quality and low-skilled workers are at greater risk of being substituted, which will lead to "technical unemployment" [5]. Specifically, Binder, Ariel (2019) proposed based on the theory of dynamic structure of labor force that AI-induced employment restructuring will be more conducive to technical jobs than repetitive administrative positions. Under this phenomenon, low-educated, middle-skilled blue-collar workers and white-collar administrative positions are gradually disappearing, especially the employment prospects of low-educated men are shrinking sharply [6]. Agrawal (2019) argues that the key reason for this phenomenon is that low-educated, low-skilled workers do not have the core skills to compete with the technology premium [7]. Therefore, the development of AI has caused a tremendous impact on low-skilled intensive industries, and the employment situation of low-educated and low-skilled workers has been challenged.

At the same time, the development of artificial intelligence optimizes the industrial structure, gives birth to new formats and new jobs, and has a creative effect on employment, which has also aroused academia's widespread attention. He Qin (2020) believes that enterprises will increase their investment in AI research and development to bring more job opportunities [8]. Hui Wei (2020) proposed that the complementary effect of

AI on employment is divided into two types: recombination and complementarity, and it is stronger than the substitution effect, which helps to supplement jobs [9]. Xue Jiliang et al. (2022) further propose that the employment creation effect plays a leading role between low-level skills and high-skilled labor, increasing its employment share, while the employment share of middle-skilled labor force has declined due to the impact of the destructive effect [10].

It can be seen that the impact of AI on employment is polarized, and the "substitution" and "creation" of employment will occur simultaneously in different groups. From the perspective of different industries, the substitution effect of AI on labor-intensive industries is more significant, and the creative effect on highly educated and high-skilled industries is more reflected. As a general-purpose technology, the advantages of future artificial intelligence such as wide penetration, data-driven, and system intelligence have triggered profound changes in traditional production methods and development models. On this basis, we should take into account the " substitution" and "creation" of employment by AI to avoid large-scale unemployment that AI may cause. Specifically, we can develop jobs through multiple channels, promote the transformation and upgrading of traditional industries, vigorously develop modern service industries, actively cultivate new formats such as healthy pension, cultural tourism, and housekeeping services, improve employment assistance systems such as public welfare job placement, and timely absorb "overflowing" personnel for employment, so as to achieve balanced development of different educational backgrounds and different strata of working people.

3.2 Labor Alienation: From Traditional "Physical Exploitation" to "Emotional Exploitation"

With the development of algorithms and big data, artificial intelligence has had a decisive impact on the labor market. Compared with the noisy flow of people in traditional factory, today's working environment is beyond imagination: high-tech, Intelligent technology has realized unmanned production, and some mechanized work has been greatly simplified or even completely replaced. However, in some fields, such as the AI industry, due to the difficulty of specialization and the shortage of talents, the labor intensity of workers engaged in the research of AI has increased significantly, and new "exploitation" is surging in a subtle form. Compared with the sweatshops in the British industrial era, capitalists exploited workers with manual labor, making them work non-stop, and being abused and whipped if they were lazy, and now social surveillance and voluntary overtime in the Internet industry have brought a new discipline system to workers.

In the era of artificial intelligence, with the further fanatical pursuit of capital, the issue of emotional labor and emotional exploitation has gradually become prominent. Therefore, many scholars have made in-depth discussion and research on the phenomenon of emotional exploitation. According to Richard Edwards, capitalists' management control over laborers can be divided into three levels: simple control, technical control and bureaucratic control, which will eventually harm the psychological health of laborers, that is, emotional exploitation [11]. Wang Wei (2021) believes that "emotional labor" enables workers to improve their indicators directly related to labor income, thereby changing personal social tendencies, emotional control and personality. Gandini (2021) further pointed out that many platforms use data to "evaluate the reputation" of

workers, such as performance appraisals (KPI), ranking feedback, and ratings, which will affect the status and future development of employees, thus making them feel emotional pressure [12]. Liu Yunxiu and Xia Qingbo (2022) put forward more specifically that under the repeated occurrence of Internet bubble and economic crisis, unstable working environment and exploited work bring great pressure to the physical and mental health of workers, leading to emotional anxiety and panic [13]. It can be seen that different scholars analyze the problem of emotional exploitation from various angles, and propose that in the digital era, workers are still subject to "alienation", and this alienation is more hidden and difficult to find, which provides a theoretical basis and reference for us to further explore the impact of artificial intelligence on employment.

4   The Impact of AI on Income Inequality

With the rapid development of the Internet, the gap between users to obtain information through the Internet is getting wider. The development of artificial intelligence technology has exacerbated this process, forcing different groups to use technology to widen and even stimulate the division of society into two different levels, code elites and cyber working class [14], and the digital divide has trapped vulnerable groups in information silos and unable to act for their own rights, thus further exacerbating social inequality.

4.1   The Widening of the Digital Divide and the Silence of Vulnerable Groups

Under the impact of the digital divide, artificial intelligence has led to a "polarized" trend in the employment structure, which in turn has led to changes in the income of different workers, which has also aroused widespread concern in the academic community. The concept of the digital divide first emerged in US government announcements in the 1990 s, which was defined as the gap between technology access owners and technology access deficiencies. In addition, Autor (2017) believes that AI will improve production efficiency, which will continue to improve the rate of return on capital factors and widen the return gap between labor factors and capital factors [15]. Huang Xu (2022) believes that artificial intelligence is a biased technology. AI will increase the wages of high-skilled workers and reduce the wages of low-skilled workers, so that the labor income share of high-skilled workers remains unchanged, while that of low-skilled workers decreases, and income inequality is aggravated [16]. Therefore, under the trend of "polarization", AI will lead to some middle-skilled workers entering low-skilled positions, expanding the competition for low-skilled jobs, leading to a decline in their real wages, and ultimately widening the income gap between high-skilled people and low-skilled people [17]. Overall, highly skilled workers with higher education levels and technical expertise will benefit, while low- and medium-skilled workers with lower levels of education in alternative industries will face greater loss of status and wealth.

In addition, the digital divide creates information silos, besieges the expression of free will, and forces the vulnerable to mute. Due to age, income, cognitive patterns, education and other factors, vulnerable groups are generally at a disadvantage in the process of receiving and distributing information content, so they are often trapped in information silos and do not know what is happening in the outside world. At the same

time, due to the relatively closed environment for a long time, the discourse issues related to themselves have been repeatedly manipulated by the digital elite, which in turn hinders the digital public's expression and pursuit of their own interests. As some scholars have pointed out, people who are affluent in their lives tend to be more transformative and adept at using smart media to change agendas and influence vulnerable groups [18].

4.2 Code Elites and the Ununited Cyber Working Class

Marx pointed out in The Poverty of Philosophy: "Social relations are closely linked to the productive forces. When it comes to acquiring new productivity, people change their mode of production; And when they change their mode of production and means of livelihood, they change all their social relations. Handmade mills provided for the society of feudal lords; Steam mills provided a society of industrial capitalists." The equivalent of technology today is artificial intelligence, which is driven by data and algorithms and provides us with a society of software capitalists.

After the boom and bust of ".com", a new production model driven by big data and analytics is emerging. Rising incomes have sent property values soaring, and one working-class neighborhood after another has been emptied out, leaving behind homeless hangouts. The coexistence of extreme urban wealth and poverty is the most obvious feature of the new economy, and the algorithmic society is built on this characteristic. The new elite occupies the upper echelons of digital society: what we call the code elite. The code elite is a group of people who make up software developers, technical CEOs, investors, computer science and engineering professors, and often effortlessly switch between these influential roles. At colleges and universities across the country, the gap between academia and industry is small, with professors juggling back and forth between startups, key positions at large corporations, government-funded labs and university classrooms.

Underneath the fetishism of AI, however, is a global digital assembly line of silent, invisible people. A new working class stands in opposition to the code elite: the cyber working class. First, digital companies scale their workforces through platforms and break down their work into countless microtasks, a process known as "pre-automation." These workers are being advertised to work for AI system, and their contributions are deliberately obscured. Second, a platform-based workforce, whether online or offline, is often optimized in real time based on market, distance, or compensation. The resulting precarious work experience: job uncertainty, irregular schedules, suffocating surveillance, constant high-scrutiny and erratic wages, which lead to a host of social problems. For example, many temps or content providers have experienced abrupt cuts from the platform that is their main source of income due to a drop in their rating or working hours.

Thus, unlike the factory workers of Marx's time, with the rise of online platforms, members of the cyber working class have become increasingly individualized and isolated from each other, making collective action and solidarity more difficult. Compared to the sweatshop period of the past, the working class united marched against the exploitation of the capitalists, for freedom, bread and milk. Today's cyber working class appears silent and helpless, not physically exploited, but real-time surveillance, precarious jobs, and a distant future have further widened the income inequality between them and the

"code elite" that continues unabated than ever. If these phenomena are left ungoverned, when the repression and suffering of the online working class accumulate to a certain extent, the "digital leviathan" will bring challenges to the world order, which will bring us unimaginable disasters, so we urgently need to explore solutions to the inequality caused by AI.

5   Measures to Address the Impact of AI on Employment and Income Inequality

Since the mid-20th century, AI has developed rapidly. Contemporary social reality shows that online platforms are gradually replacing some traditional functions of the state and government, algorithms have become the backbone of influencing and controlling ideology, and the inequality brought about by digitalization is quietly occurring. Tech companies are diminishing the possibility of independent thinking — an invaluable treasure unique to humanity. Through the accumulation of data, digital giants paint our minds and invisibly guide mass behavior to increase their economic benefits. So, "The phone is an extension of our memory; We outsource basic mental functions to algorithms; We leave our secrets to the server and let the computers dig them up [19]". Therefore, with the continuous breakthrough of intelligent technology and the rapid upgrading of robots, the shortcomings and weaknesses of human beings relative to intelligent machines continue to become prominent, and the risk of employment and income inequality has intensified, driving the further solidification of class. In this way, the era of "digital leviathan" has arrived, and these phenomena are all vaguely telling us that we need to act.

In response to this phenomenon, many scholars have proposed different solutions. Ge Peng (2021) proposed to strengthen refined research on the employment impact of AI, optimize fiscal and taxation social security policies, build an inclusive policy participation mechanism, so as to promote the transformation of China's labor market structure [20]. Huang Xu (2021) further proposed that government can increase investment in education and promote more equitable education opportunities for the labor force. In addition, to promote social equity, the government can also tax capital and transfer payments to workers. [21] Dong Zhiqiang (2021) also holds a similar view, arguing that government should delay education selection or extends universal education, adjusts income tax rates, and changes the proportion of investment in education and new infrastructure [22]. Wang Linhui (2020) proposed that the government should improve the employment training mechanism, improve the level of labor skills in an all-round way, and formulate appropriate regional development policies based on the difference in the impact of AI technology on the distribution of labor income in different regions, so as to actively guide the development of AI technology in the direction of "human-machine collaboration". [23].

Therefore, it can be seen that academics have put forward the importance of tax policy and universal education in AI governance. Specifically, the government should do a good job in industrial transfer and undertaking between regions, and need to adopt a more active redistribution policy, on the one hand, actively cultivate compound professionals, and improve the adaptability of labor to new industries and technologies. On the other

hand, the labor income tax can be gradually reduced and the capital income tax can be increased. Therefore, in the development of artificial intelligence, we must not only promote economic growth, but also take into account social equity issues.

6 Conclusions

Through combing, it is found that many scholars' research on the inequality caused by AI mainly focuses on employment and income inequality. In terms of employment impact, this paper deeply analyzes the substitution and complementary effects of artificial intelligence on employment, and the problem of "emotional exploitation" caused by it becomes more prominent. In terms of income inequality, this paper proposes that the development of AI has widened the problem of the digital divide, weakened the expression rights of vulnerable groups, and triggered new class antagonisms, namely the code elite and the cyber working class, further aggravating social inequality. In addition, this paper reviews the solutions to the impact of artificial intelligence on employment and income inequality, puts forward the importance of tax policy and education investment in AI governance, enriches the theoretical and empirical research of artificial intelligence research, and provides reference for us to promote the harmonious development of society.

Although the theoretical and empirical research of artificial intelligence on social inequality has made great progress, we can find that there are still many limitations in existing research through literature combing. First, existing AI paradigms and concepts are not yet uniform. What exactly is artificial intelligence and is a sweeping robot artificial intelligence? Are industrial robots artificial intelligence? If the relationship between these concepts is not clarified in actual research, it may eventually lead to certain deviations in research conclusions. Secondly, from the perspective of research area, the existing research is mainly aimed at developed countries, and there is a lack of research on developing countries. Developed countries have leading artificial intelligence technology and sufficient research funds. Developing countries started late and small research on artificial intelligence, coupled with the large gap between the rich and the poor, and the labor skills themselves are insufficient, so the impact of AI on the labor market in developing countries is much greater than that of developed countries. Finally, the academic community focuses more on the study of manufacturing and lacks research on agriculture and services. At present, the application in finance, medical care, retail, education, news media, network security and other service industries is the most common, artificial intelligence has greatly improved the production efficiency and service quality of these industries, may reshape the competitive landscape of these industries, may lead to the replacement of jobs and tasks in these industries, so it is urgent to strengthen research on these industries.

Artificial intelligence is always a double-edged sword. It can bring peace, but it can also lead to war; It can drive progress and it can lead to disaster. Artificial intelligence has opened a window for mankind, but beyond the window lie a a variety of new contradictions and problems such as digital inequality, employment substitution, digital security and so on. If these problems are solved well, the future will naturally be smooth and prosperous; If not handled properly, you can end up in the prison of "digital leviathan".

All in all, it is urgent and necessary to explore the problems facing the era of artificial intelligence. Only when we understand the present can we look to the future; Only by foreseeing risks can we sustain development.

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