

# Review of the Theoretical Mechanism of Artificial Intelligence Affecting Employment

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## Abstract

As an important factor of scientific and technological innovation, artificial intelligence has an important impact on employment. The rapid development of artificial intelligence has brought great opportunities and challenges to employment. This paper constructs a theoretical framework, systematically sorts out relevant literature, and analyzes the substitution and promotion effects of artificial intelligence on employment in detail. Studies have shown that artificial intelligence has activated potential related industries through its penetration, collaboration, substitution and creativity, and its impact on employment is all-round and multifaceted, which may not only replace employment in traditional sectors, but also promote employment in new fields. As a disruptive technology, the impact of artificial intelligence on employment cannot be simply asserted with “increase” or “decrease”, and there is a profound mechanism behind it.

## Keywords

AI, Penetration, Collaboration, Substitution, Employment

## 1. Introduction

Artificial Intelligence (AI) is an important driving force for a new round of scientific and technological revolution and industrial transformation. China's 14<sup>th</sup> Five-Year Plan and Outline of Vision Goals 2035 (referred to as the “14<sup>th</sup> Five-Year Plan”) emphasize to promote the deep integration of digital technologies with the real economy, enable the transformation and upgrading of traditional industries, and give birth to new industries, new forms of business, and new models. At present, with the rapid development of China's digital economy, the maturity of artificial intelligence technology and related products continues to improve, and AI

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applications radiate from consumer, Internet and other fields to traditional industries such as manufacturing and electric power (Wang & Xiong, 2022). In July 2024, the Institute of Scientific and Technological Information of China and Peking University jointly released the 2023 Global AI Innovation Index Report, showing that China's AI comprehensive level ranked 2<sup>nd</sup> in the world. In terms of development indicators, as early as 2019, seven out of ten AI patents were filed in China. As for government strategy indicators, China invests 1.5 times more public funds in the AI industry than the rest of the world combined. According to the China Internet Development Report (2024)<sup>1</sup> released by the Internet Society of China, the scale of China's artificial intelligence core industry has reached 578.4 billion yuan in 2023, an increase of 14% over 2022. China's artificial intelligence industry has made positive progress in technological innovation, industrial ecology, integration and application, and has entered the world's first echelon.

With the rapid development of artificial intelligence technology and its deep integration with the real economy, more and more work will be automated, and its division of occupations is constantly refined. Some people believe that artificial intelligence will replace many traditional jobs, leading to an increase in unemployment (Liu et al., 2024). Others believe that more jobs will be created and that a large number of people will be needed to advance this technology (Zhang, 2023). Artificial intelligence affects employment by affecting economic scale expansion and job thinning, which brings new challenges and opportunities for humanity. Therefore, studying the mechanism of artificial intelligence affecting employment can provide a decision-making basis for the "employment priority strategy" in China's "14<sup>th</sup> Five-Year Plan", and also has strategic significance for China to maintain its own competitiveness and creativity in the era of intelligence, and achieve the common development and progress of individuals and society.

## 2. The Impact of Artificial Intelligence on Employment

### (1) The Impact of Artificial Intelligence on the Size of Employment

The biggest advantage of artificial intelligence is that it can help people save a lot of time and better manage all kinds of information, especially in text generation, intelligent question and answer, automated text analysis, etc., which can make the value exchange of the whole society more detailed and more efficient. Professionals will find those things they want to do, but do not have the will to do, under the "blessing" of artificial intelligence, it is possible to achieve. Generative AI can greatly improve the efficiency and creativity of mental labor, make human work faster and more productive, and thus help enterprises or organizations improve their overall productivity and achieve efficient operation and development (Chen, 2023). As a result, with the development of artificial intelligence technology, some jobs are at risk of being replaced by machines. The McKinsey Global Institute said in a report released in April 2019 that 100 million Chinese will face career changes by 2030 as technology advances, 800 million people worldwide will be replaced by robots<sup>2</sup>.

<sup>1</sup><https://baijiahao.baidu.com/s?id=1804342065672818248&wfr=spider&for=pc>

<sup>2</sup><https://www.51cto.com/article/601307.html>

However, studies have also shown that creative and interpersonal occupations cannot be replaced by artificial intelligence due to their high requirements for non-fixed technical abilities (Zhu, 2023). Such as health care workers, social workers, educators, business development personnel, tour guides, etc. The essence of these occupations is to directly serve others, pay care and love to people, and the work content is to communicate and contact with others directly, and the work needs to be completed after involving human emotional experience and social interaction. Therefore, whether it is now or in the future, these occupations cannot be truly replaced by AI. At the same time, AI is currently not suitable for careers that require creative thinking, such as artists, designers, writers, etc., because it lacks the inspiration and creativity that art practitioners have. Although the current AI can synthesize paintings, it is also a data stacking operation according to the needs of the user. Therefore, creative thinking jobs will not be easily replaced.

The rise of artificial intelligence means that the skill entry threshold of the original industry will be lowered, and once more new people enter a certain industry, it will drive the upstream and downstream industries related to the industry, so that the entire industrial chain can operate more effectively, thus creating more demand and generating more related jobs (Zhu et al., 2018). For example, the E-commerce industry, on the surface, has caused a huge impact on offline retail consumption, but at the same time, the development of E-commerce has greatly reduced the threshold of participation, more people join, fully driven its upstream factory manufacturing, brand, supply chain, downstream logistics, warehousing and other industries, the consumer industry has not been eliminated, but changed to a more prosperous form, so that there are more jobs in the job market. In addition, the development of AI technology will also produce a number of professional new positions, such as intelligent robot developers, natural language processing experts, information retrieval engineers, intelligent robot product managers, etc. At the same time, it will also help the original traditional industries to create more subdivided jobs, such as data mining, consulting analysts and other positions in various enterprises, which provide more intelligent and efficient employment opportunities.

The emergence of new technologies and new industries will generate a large number of new jobs and employment needs, and workers who are unemployed due to technological progress will also find suitable jobs again with the strengthening of job training and skill upgrading (West, 2022). The effect of AI on the size of employment depends on the “combined net effect” of substitution and creation effects, and the net effect in the long run may increase employment (Cheng & Peng, 2018). The results of the three industrial revolutions have confirmed that the increase in labor productivity and the expansion of consumption brought about by technological progress will produce a fuller demand for labor. Therefore, we should fully understand and comprehensively evaluate the impact of artificial intelligence on the scale of employment in our country.

## **(2) The impact of artificial intelligence on employment structure**

The development of artificial intelligence has subverted people's way of

production and life. The change of labor employment structure brought by the rapid development of artificial intelligence has long been a hot issue that has attracted wide attention. The relevant analysis of China's provincial panel data from 2010 to 2019 shows that the impact of artificial intelligence on the employment structure reflects the particularity of China, and promotes the employment structure of China's labor force to a higher level, which is more significant in eastern regions and technology-intensive areas. Artificial intelligence has a nonlinear effect on labor employment structure, and the higher the development of artificial intelligence, the more obvious the optimization effect on labor employment structure. Based on the innovation-driven perspective, artificial intelligence also promotes the optimization and upgrading of labor employment structure through two indirect mechanisms: technological innovation effect and innovative talent agglomeration effect (Cong & Yu, 2023).

The influence of artificial intelligence on employment structure has significant industry heterogeneity and skill heterogeneity (Wang & Dong, 2020). In other words, the "employment polarization" brought by technological progress will cause a large number of middle-skill groups to face a high risk of unemployment, while there will be a certain employment demand for high-tech employment groups and low-skill groups. Therefore, when assessing the impact of artificial intelligence on employment, it is necessary to fully recognize the structural effect of artificial intelligence on employment, and focus on analyzing the impact of artificial intelligence on employment in different industries.

The phenomenon of "machine replacement" threatens employment, changes the employment structure, and indirectly affects the industrial structure. A study based on relevant data from 2005 to 2018 analyzed the impact of the development of artificial intelligence on the coordinated development of employment structure and industrial structure (Song & Huang, 2021). The results show that the number of employment in the primary and secondary industries will gradually decline with the progress of technology, while the number of employment in the tertiary industry will gradually increase, changing from the original "primary-tertiary-secondary" to "tertiary-secondary-primary". The development of artificial intelligence plays a positive role in promoting the coordinated, stable and consistent development of employment and industrial structure, and the degree of impact on employment and industry is inconsistent, so the coordination rate of the three industries has a certain gap from the optimal level, that is, the speed of industrial output increase or decrease is unbalanced with the speed of labors transfer. Among them, the increase speed of the output of the secondary industry is less than the decrease speed of its labors, and the increase speed of the output of the tertiary industry is less than the increase speed of its labors.

The influence of artificial intelligence on the employment structure is not overnight, but a gradual long-term process, which is divided into three stages: introduction, expansion and prosperity (Liang et al., 2018). In the introduction period, because the substitution rate of capital to labor is on the rise, artificial intelligence

will have a certain impact on the employment structure. In the expansion period, artificial intelligence will profoundly affect the employment structure and bring about a large-scale restructuring of the shuffling style. In the boom period, under the accumulation of scale effects, artificial intelligence will have a positive feedback effect on the employment structure.

### **(3) The Impact of Artificial Intelligence on Employment Quality**

Employment not only has the concept of quantity and structure, but also has the meaning of quality. The 14<sup>th</sup> Five-Year Plan for Employment Promotion issued by The State Council takes “promoting higher quality and fuller employment” as the most important goal of China’s employment work in the new era, aiming to fully promote the expansion, optimization of the structure and improvement of the quality of employment in China, so as to achieve an overall improvement of the level of employment in the new era.

Existing studies generally define and measure high-quality employment from macro and micro levels. From the macro level, high-quality employment generally refers to the upgrading of the employment structure, including the gradual transfer of the employed population from the primary industry to the secondary industry and the tertiary industry, and from the traditional industry with low labor productivity to the knowledge and technology-intensive emerging industries. Some scholars believe that high-quality employment at the macro level should also include the improvement of the job market environment and the perfection of the employment security system. From the micro level, high-quality employment is generally discussed from the perspective of workers, that is, high-quality employment mainly refers to the fact that workers can achieve stable income growth, achieve relatively high job satisfaction, live in a relatively good working environment, improve their own work efficiency, or have relatively impressive career development prospects.

There are few researches on the impact of artificial intelligence on employment quality. Some literature has studied the impact of the digital economy on the quality of employment, and believes that the digital economy can promote the optimization of the employment structure, promote the further improvement of labor remuneration and labor protection, and promote the continuous improvement of the job market environment and the continuous enhancement of the employability of the labor force, providing a new opportunity for achieving higher quality employment. However, it is worth noting that there is a difference between the smart economy represented by artificial intelligence and the digital economy in terms of its effect on the quality of employment (Liu & Qi, 2023). Digital economy is the stage economic form of the development of intelligent economy. According to the development stage theory of artificial intelligence by Stuart Russell and Peter Norvig, the current artificial intelligence is still in the stage of “weak artificial intelligence”, in which artificial intelligence can only complete the designated work in a specific field and a small number of deterministic tasks in related fields, without cognition and consciousness, and there is a large intersection with the

concept of digital economy in practical economic applications. However, with the development of the overall development level of artificial intelligence toward the stage of “strong artificial intelligence”, the improvement of artificial intelligence cognitive ability will make it competent for more complex cross-field work, and its mechanism to promote the improvement of employment quality will be more complex and profound compared with the existing digital economy.

The impact of artificial intelligence on the quality of employment is mainly reflected in the aspects of labor remuneration, employ-ability, employment environment, family-work balance and labor security. *Graetz and Michaels (2017)*, after examining the balance panel data of 18 countries, believe that the application of industrial robots will significantly increase the hourly wage of labor. From the perspective of home-work balance, AI significantly improves life satisfaction. This is because artificial intelligence can significantly reduce weekly working hours and promote the increase of leisure time, thus improving life satisfaction (*Su & Xia, 2020*). In addition, the improvement of employment environment and employ-ability is also direct evidence of the positive effect of artificial intelligence on employment quality (*Kong & Xie, 2024*). In other words, the impact of AI on the quality of employment can be divided into subjective and objective aspects. On the subjective side, the application of artificial intelligence can significantly improve individual job satisfaction and career development planning. From an objective point of view, artificial intelligence can improve the quality of employment through wage treatment, employment environment and working hours.

### 3. The Theoretical Mechanism of Artificial Intelligence Affecting Employment

#### (1) The development level of artificial intelligence

Artificial Intelligence (AI) is a new technical science that studies and develops theories, methods, techniques and application systems used to simulate, extend and expand human intelligence. Artificial intelligence industry is usually divided into seven development levels<sup>3</sup> and three development stages. The seven levels of AI development are rule-based AI systems (Level 1), context-aware and retention systems (Level 2), domain-specific system mastery (Level 3), thinking and reasoning abilities (Level 4), General Artificial Intelligence (AGI) (Level 5), Super-artificial intelligence (ASI) (Level six) and Artificial intelligence Singularity (Level seven). Artificial intelligence singularity is a future, highly forward-looking and controversial concept, representing the integration of human brain and intelligent AI or the stage when AI exceeds human understanding and control, at this time, the development of AI will reach an unpredictable and rapid evolution point, which may bring great changes to human society. At present, it is more of a theoretical assumption and discussion. These seven levels of artificial intelligence seem to indicate the future fate of mankind. Up to now, we are still in the process of developing from the third level to the fourth level.

<sup>3</sup><https://zhuanlan.zhihu.com/p/651354692>.

The three development stages of artificial intelligence are narrow artificial intelligence, strong artificial intelligence and super artificial intelligence (Guo, 2021). Narrow AI, also known as weak AI, focuses on solving problems in specific tasks or domains, such as voice assistants, image recognition, recommendation systems, etc., all fall under the category of narrow AI. These systems are able to process and analyze large amounts of data and perform pattern recognition and reasoning on it to perform specific tasks, but their performance in other fields or tasks is relatively limited, and they do not have the broad adaptability and versatility of humans. Strong AI, also known as general Artificial intelligence, refers to intelligent systems that have the ability to think, learn, and understand like humans. Strong AI can not only handle specific tasks, but also adapt to new environments and tasks, and reason and make decisions in human-like ways. At present, strong artificial intelligence is still a theoretical and technical challenge that has not been realized, but it is an important goal and long-term development direction of artificial intelligence research. Super AI, also known as super intelligence, refers to systems that far exceed human intelligence. With more powerful processing power, intelligence and creativity than humans, super AI can surpass human capabilities in multiple fields and even solve complex problems that humans cannot currently solve. However, the development of super AI may raise complex ethical, moral, and social issues, so it has also attracted widespread discussion and attention, and is currently the domain of theory and future development. Artificial intelligence at this stage, whether it is the “machine literati” who can write poetry and can write a financial press release a minute, or the sports player who can play chess and drive independently, is still only in the realm of weak artificial intelligence, because they can only exceed humans in some aspects.

## **(2) Economic Characteristics of artificial intelligence technology**

Artificial intelligence technology has the economic characteristics of penetration, collaboration, substitution and innovation, which is an important basis for the impact of artificial intelligence on employment (Guo & Fang, 2021). Penetration refers to the characteristics that artificial intelligence can be integrated with all aspects of life and production, and bring profound changes to economic operations and production methods. The permeability attribute of artificial intelligence can change the technical requirements and skill needs of the post, and the permeability characteristics determine the ability and potential of artificial intelligence to have a broad and global impact on the economy and employment. Collaboration means that in the field of production, the application of artificial intelligence can improve the matching degree between capital, labor, technology and other elements, strengthen the collaboration between various production links such as upstream technology research and development, midstream engineering realization, and downstream application feedback, and produce more man-machine collaborative jobs, thereby improving operational efficiency. Substitution means that artificial intelligence can realize the direct substitution of labor elements. From simple work to complex work, artificial intelligence will continue to

play the substitution effect, and while accumulating as an independent factor, it can replace other capital elements and labor elements. The innovation of artificial intelligence can produce “additional” knowledge and increase the total amount of human intelligence, thereby promoting technological progress and improving economic efficiency. The automation of production brought about by innovation can replace some high-intensity and difficult continuous labor, and the reason why artificial intelligence causes people to worry about the employment prospects is that it can realize the replacement of human mental work and creative activities.

### **(3) The theoretical mechanism of artificial intelligence affecting employment**

① Artificial intelligence has penetrated deeply into various industries, production links and sales links, and exerted a profound impact on employment through the transformation effect of skill demand (Huang & Ye, 2023).

As a universal technology, artificial intelligence can be widely integrated into every industry and every link of life in the economic society, and this permeability has changed the traditional production and work mode. The skill demand transformation effect of artificial intelligence stems from its declining demand for traditional skills and rising demand for new skills. With the penetration and popularization of artificial intelligence technology, some traditional low-skill and repetitive labor positions are gradually eliminated, and the related skill demand is also weakened. For example, the demand for simple data entry clerks, document archivists, general assembly workers, etc., has been greatly reduced. At the same time, the deep penetration and development of artificial intelligence has spawned the need for a new set of highly skilled talents, such as data analysis, AI development and maintenance, machine learning, data science and other professional skills. These fields require people with deep technical knowledge and innovative ability to carry out complex algorithm design, model training, and data analysis.

② Artificial intelligence affects employment through powerful synergies.

Firstly, artificial intelligence can improve the matching degree among capital, labor, technology and other factors, and promote the synergy among various factors, thus improving the efficiency of economic operation (Chai, 2023). In the production and operation of enterprises, artificial intelligence technology can be deeply integrated with the management system and production process of enterprises to achieve optimal allocation of resources. In terms of employment, workers are required not only to have professional skills, but also to have good teamwork skills, communication skills, and interdisciplinary knowledge to adapt to the environment of working with AI. At the same time, it also encourages enterprises to pay more attention to the diversification of talent structure, increasing the demand for compound talents who understand both technology and business.

Secondly, artificial intelligence improves the work quality and efficiency of workers through man-machine collaboration effect. In some work scenarios, the cooperation between artificial intelligence and humans can give play to their respective advantages, thus improving the work quality and efficiency (Wang & Liu,

2023). For example, in the medical field, doctors can quickly and accurately analyze the condition with the aid of artificial intelligence diagnosis system to improve the accuracy and efficiency of diagnosis. In the financial sector, intelligent risk assessment models can help analysts assess risks more comprehensively and provide stronger support for decision-making. On the other hand, artificial intelligence changes the way and content of workers' work through man-machine collaboration effect: man-machine collaboration also changes the way and content of work, and human employees need to effectively communicate and collaborate with artificial intelligence systems and learn how to use artificial intelligence tools to complete work tasks. This requires employees to have new skills and capabilities, such as data interpretation ability, machine operation ability, human-computer interaction ability, etc., which promotes the upgrading and transformation of employment skills.

③ Artificial intelligence can replace labor elements. From simple repetitive tasks to some complex mental tasks will be affected.

One aspect of the substitution effect is that automation replaces human work, and the development of artificial intelligence has automated many traditional human-intensive jobs, thus reducing the need for human labor. For example, in the manufacturing industry, intelligent robots can undertake a large number of repetitive and highly programmed tasks, such as assembly and handling on the production line, which makes the workers who originally engaged in these jobs face the risk of unemployment. On the other hand, substitution effect greatly improves production efficiency. Through automation and intelligent technical means, artificial intelligence can complete more work tasks in a shorter time, improve production efficiency, and thus lead to a relative reduction in the demand for labor. For example, in some office scenarios such as data processing and file organizing, automation software and intelligent tools can quickly and accurately complete tasks without requiring a large amount of labor input.

④ The creativity of artificial intelligence promotes technological progress through knowledge production, and inhibits employment substitution effect and enhances job creation effect through automation deepening effect and intelligence.

Artificial intelligence has shown a strong ability to create and innovate, not only to achieve high-intensity and difficult continuous labor replacement, but also to be given the right to analyze and make decisions and even create innovation in many fields such as scientific research, finance, and art, bringing new impetus and opportunities for economic and social development. For example, in drug research and development, artificial intelligence can quickly screen a large number of compounds and accelerate the discovery process of new drugs; in terms of artistic creation, music, painting and other works generated by artificial intelligence are also gradually emerging. From the perspective of the job market, innovation has spawned a series of new jobs and employment forms. The development of artificial intelligence has created many new job opportunities and career types

(Zhong, 2023). For example, professionals are needed to design, develop, and optimize AI systems, as well as analyze and interpret the data they generate. In addition, it has spawned new positions such as data scientist, machine learning engineer, AI ethics consultant, AI product manager and so on. In addition to traditional full-time jobs, AI is also facilitating the generation of new employment forms, such as the gig economy, remote work, freelance work, and so on. For example, some people can provide AI-related consulting, development, training and other services to enterprises or individuals through online platforms, regardless of the restrictions of traditional working hours and locations.

The creativity of artificial intelligence has promoted the adjustment of industrial structure and the upgrading of traditional industries (Zheng et al., 2024). The application of artificial intelligence technology in traditional industries has promoted the adjustment and upgrading of industrial structure, thus changing the structure and distribution of employment. For example, in the manufacturing industry, the introduction of artificial intelligence technology to achieve intelligent production and management has improved product quality and production efficiency, and also prompted enterprises to reduce their dependence on low-skilled labor, increase the demand for high-skilled talents, and promote the development of the industry to the high-end and intelligent direction. At the same time, the development of artificial intelligence has also spawned many emerging industries, such as artificial intelligence medical treatment, artificial intelligence education, intelligent transportation, intelligent home, and so on. The rise of these emerging industries has brought a large number of new opportunities to the job market, attracted a large influx of talents, and promoted the diversification and optimization of the employment structure.

#### 4. Conclusion

The development speed of artificial intelligence technology is linear, but the impact of technological progress on labor employment is non-linear (Zhang et al., 2024). The impact of artificial intelligence on employment cannot be simply asserted with “increase” or “decrease”, and there is a profound mechanism behind it. As a disruptive technology, artificial intelligence has activated potential related industries through its penetration, synergy, substitution and creativity, and has also played an important driving role in the employment of related industries while achieving creative growth. Many industries that were originally unrelated to digital technology have been “activated” under the help of product output, service output, technology output, paradigm output, and business model innovation in the artificial intelligence industry, and the number, employment structure, and employment quality have been affected. In the foreseeable future, emerging technologies of artificial intelligence will continue to emerge, and people’s confusion about the development prospect of artificial intelligence and its impact on employment will not stop, and the impact of technological progress on employment has always been a hot topic in political and economic life.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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