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Influence of Artificial Intelligence in the Labor Market

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Abstract. The rapid development of artificial intelligence is profoundly reshaping the global labor market landscape. This article is based on a systematic literature review and summarizes the four core theoretical mechanisms of substitution, complementarity, new task creation, and skill mismatch. It analyzes the direct impact of artificial intelligence on employment structure, occupational tasks, and skill demand, as well as its indirect effects on job mobility, cross-border and industry differences, and policy interventions. Research has shown that artificial intelligence is primarily driven by substitution effects in the short term, but will generate complementary and creative effects in the long term, with significant cross national, cross industry, and cross regional heterogeneity in its impact. Skill mismatch constitutes the core contradiction of labor force transformation. There are still significant shortcomings in existing research in terms of local empirical evidence, micro task mechanisms, and the impact of cutting-edge AI. This article aims to provide systematic literature support for subsequent research and adaptive policy formulation.

Keywords: Artificial intelligence, Labor market, Employment effect, Policy intervention, Skill mismatch

1. Introduction

As the most subversive productivity tool in the 21st century, the AI agent is gradually affecting people's lives: it covers machine learning, NLP, automation and so on, and is infiltrating the whole industry. In the past decade, AI technology innovation has changed the way production is organized and reshaped the rules of human production and employment. Acemoglu and Restrepo found in their research in 2019 that AI is currently shifting from impacting manual labor to core replacement of mental labor. Its influence also extends from manufacturing to high-tech fields such as finance, medical care and law [1, 2].

Facing the pressure of industrial organization, the impact of employment and income has also become a global issue, and has set off a wave of generative AI investment. During the period of 2021-2025, China set AI as its core strategic goal in the 14th Five-Year Plan, and defined the employment impact as a livelihood issue [3]. Technological change has brought employment pressure in the short term while rebuilding the post structure, but in the long run, it has also steadily improved productivity.

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At present, in the Chinese market, unemployment continues to increase, but the quality of employment has also improved [3]. In international organizations, the demand for repetitive jobs has declined, and the demand for digital AI collaborative jobs has grown rapidly: the demand for complementary skills has soared and the demand for alternative skills has shrunk [4]. The development degree and influence of AI technology are significantly different among countries. Overall, AI hurts the employment rate and the proportion of labor income. Many enterprises are facing problems such as high AI penetration management, and the demand for administrative and business skills is the first to fall back. Its core contradiction lies in the mismatch between labor skills and market demand, and the unemployment risk of low-skilled workers rises [4].

This paper is devoted to the analysis of the theoretical mechanism of direct and indirect influence: exploring the substitution, complementary effect and skill demand change of AI on the labor market; analyzing the heterogeneity of AI employment impact; focusing on the general positions of non-professional AI, judging the impact of skills, etc. Generally speaking, in order to systematically clarify the mechanism of AI and the labor market, a coordinated development path should be proposed.

2. The theoretical mechanism of AI's influence on the labor market

2.1. Substitution effect

The substitution effect means that some of the original jobs of human beings are replaced by AI, so the labor demand is reduced [5]. The substitution effect mainly occurs in the following four directions: manual labor, basic skills, routine tasks and some high-skilled mental tasks. The most obvious physical labor is manufacturing, and a large number of industrial robots can replace the original workers at low cost. In basic skill-based jobs, data processing, text review, customer service, translation, etc., a large number of simple task-based jobs have been replaced by AI; Conventional tasks refer to those standardized and repetitive processes in industries. Investing in AI can reduce costs, just like assembly line operations, so it appears frequently. At the same time, some high-skilled mental tasks are challenged because of the powerful model of AI self-learning, such as standardized investment and research tasks, such as financial valuation, financial report judgment and market forecast [6], but AI plays more auxiliary roles than leading roles.

In fact, the available data show that in manufacturing jobs, the robot density per thousand people increases by 1 unit, and the employment decreases by 0.18% [3], while in the financial industry, the penetration rate of AI public opinion tools is positively correlated with the turnover probability of analysts [6].

In the substitution effect, AI tools will give priority to positions that are easy to quantify and have no emotional interaction, and with the iteration of technology updates, the substitution effect will increase exponentially in the later stage. AI automatically magnifies the value of non-automated and highly interactive tasks while replacing human routine tasks.

2.2. Complementary effect

Complementary effect means that AI and human skills form synergy, which improves labor productivity and job value [5]. The core complementary skills are mainly divided into cognitive skills, social and emotional skills, digital compound skills, and management skills [7]. Finding talents with complementary skills is the key for enterprises to follow the development of the times, so there is a 5%-10% salary premium to promote complementary skills [8]. Complementary effect

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raises the threshold of talents and improves the quality and efficiency of brain posts. In the manufacturing field, AI and operational skills complement each other to improve the efficiency of production lines [4]. In the field of the financial industry, analysts turn to soft communication, which complements AI research and judgment [6]. Research shows that the scale and influence of the complementary effect are greater than that of the substitution effect, so the best way to avoid the risk of substitution is still to master complementary skills [8].

2.3. New task creation effect

The new task creation effect means that the development of AI technology gives birth to new task occupations, and the job demand is expanded to balance the labor market and alleviate the losses caused by some substitution effects [5]. The new task creation effect brings new employment forms, such as intelligent system operation and maintenance division, AI risk control docking, man-machine judgment and calibration and so on. In the whole industry, it is possible to generate new tasks such as supporting services, management and calibration around AI applications.

2.4. Skill mismatch effect

The skill mismatch effect means that when the iteration speed of AI is faster than the skill update of the labor force, it will lead to skill-position mismatch [5]. Its concrete form is as follows: if the workers only master the use of a single AI skill, after learning, enterprises update iterative AI technology, the old AI skills are wasted and cannot adapt to the post. The reason for the skill mismatch effect is not only that the skill iteration speed is much lower than the updating speed of AI technology, but also that the education structure lags and does not match the skill demand in the AI era [3].

3. The direct impact of AI on the labor market

3.1. The multiple effects of substitution, complementarity and creation

In recent years, AI has had a net negative impact on the employment rate in the global market [2]. It is mainly reflected in the obvious substitution effect in repetitive low-skilled jobs such as manufacturing, while in high-skilled jobs such as medical care and finance, the complementary and creative effects promote employment. Because the substitution effect promotes the unemployment rate and the creation effect weakens the unemployment rate, the final balance speed of the two determines the employment result [1]. Experiments show that in the short term, the substitution effect is dominant, and the number of labor posts is really serious, but in the long term, the complementary and creative effects will gradually become prominent, and finally, the number of posts will be increased, that is, the quality [5].

3.2. Changes within the profession

The overall replacement of occupations with the substitution effect appears less nowadays, and the more obvious phenomenon is the reorganization of tasks within occupations. The core of a career is the dynamic change of task combination, not the disappearance of posts [9]. Its specific performance is that routine tasks such as standardization and encodable tasks are easily replaced by AI automation; Although unconventional tasks have the nature of anti-substitution, they will also be redefined by AI. In the retail and manufacturing industries, the share of IT tasks has increased, while

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the share of industry knowledge tasks has decreased [9]; Cut quantitative routine tasks and add soft interactive tasks [6]. Generally speaking, the salary share of routine tasks has decreased, and the weight of skilled interactive soft occupations has increased.

3.3. Changes in skill demand

As the professional task is facing the stage of remolding, the research on job increase and decrease in the market will change to the research on skill elimination and value-added. The demand for the labor force has shifted from "single skill" to the compound skill needed for man-machine cooperation [7]. The salary premium of technical posts reached 1.8%, while the salary of repetitive posts decreased by 0.6% [3]. The growth rate of demand for high-skilled jobs has become more than three times that of low-skilled jobs. Therefore, the higher the education level, the stronger the skill adaptability and the lower the unemployment risk [2].

4. The indirect impact of AI on the labor market

4.1. Job migration

When the internal occupation and skill share change, workers will naturally choose to move across tasks and posts. The fundamental path of job migration is that AI replaces routine tasks → releases labor force → shifts to new tasks/non-automated tasks [5]. There are three different directions for job migration. The first is intra-industry migration. Without changing the big premise, it only shifts from replaceable positions to AI cooperative complementary positions in the industry [8]. The second is the migration of high-skilled fields, which also realizes job changes in cutting-edge fields. For example, financial analysts leave the hard-core investment and research posts and turn to investor relations and customer operation and maintenance posts [6]. The third is cross-track migration, which means that high-tech talents turn to non-professional but promising industries. When job migration occurs, the complementary effect is 1.7 times the substitution effect, which dominates the direction of job migration [8]. At the same time, the skill training level and labor mobility determine the speed of job migration [5].

4.2. National industrial and regional differences

The impact of AI technology development on the labor market varies in different countries and industries. The research shows that in developed countries, the impact of AI technology on the labor market only leads to a slight decline in the employment rate, and the share of labor income remains relatively stable; In developing countries, the employment rate and labor income have both declined, resulting in a more severe employment impact [2, 10]. The reason is that the creative effect of developed countries is better than the substitution effect, and the transition of jobs and technology is more moderate than that of developing countries, and the education and training of complementary high-end skills in developed countries are also more refined.

Different industries are also facing similar problems: the primary industry has suffered the least AI impact, and the employment scale still maintains a slight upward trend; The substitution effect in the secondary industry is remarkable, and the employment scale continues to decline; The tertiary industry is the hardest hit, and the reconstruction of financial and business service skills is the most intense [7].

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Regional differences will also affect the degree. For example, in the same country, AI penetration in cities is faster than that in rural areas, so the differentiation of urban and rural labor markets continues to expand; AI technology in first-tier and new first-tier cities will also promote the quality of employment, and the effect of creation and complementarity is significant, but the substitution effect of third-and fourth-tier cities will be stronger [3]. On a global scale, AI industrial clusters will naturally guide employment upgrading, and the labor force in backward areas will intensify the outflow [2].

4.3. The necessity of policy intervention

When the market is facing structural changes, because its spontaneous adjustment can't solve the problems such as skill mismatch, structural unemployment and employment differentiation, it needs government intervention and adjustment [3]. These policies generally fall into three categories:

First, education and training. To help workers cultivate practical complementary skills, the government will adjust the professional settings of colleges and universities, expand the scale of higher education, and adapt to the needs of AI skills [3]; Or carry out targeted skills training, focusing on improving complementary skills and soft cooperation skills and increasing personal value [4].

Second, the social security category. In the face of transition and excessive imbalance, the government can help the unemployed, which can effectively alleviate social contradictions. For example, it provides unemployment assistance and temporary living security for those who have left their posts in AI transformation [7]. At the same time, should also focus on protecting the employment and income rights of low-skilled, middle-aged and elderly workers who can't pay a very high cost to learn new skills or make career changes [4].

Third, the category of institutional governance. The government needs to strengthen regulatory norms, such as strengthening AI data security, algorithm ethics supervision, etc., to maintain private data security and maintain the normal and coordinated operation of society.

5. Conclusion

The core effect consensus of this paper is that AI has multiple effects of substitution, complementarity and creation on the labor market, and the substitution effect is dominant in the short term, and the long-term new task creation and productivity effect are gradually prominent. However, AI has a significant heterogeneous impact on the total employment and employment quality. Specifically, different countries, industries and regions will be affected. Task reorganization and skill differentiation are the core characteristics of AI's influence on the labor market. The demand for complementary skills continues to rise, while the demand for alternative skills continues to decline. Skill mismatch is the core employment contradiction in the labor market in the AI era. At the same time, policy intervention is a necessary means to alleviate the impact of AI employment and resolve skill mismatch.

Although the existing research has systematically discussed the role of AI in the labor market, there are still many shortcomings. From the perspective of research, most literature focuses on the macro-changes of total employment, but fails to discuss the micro-mechanism of job reorganization within the profession, and the research samples are concentrated in developed countries. The empirical research on localization in developing countries such as China is relatively lacking, and the impact research on high-skilled mental positions, such as financial analysts, is not deep enough. In the research content, the quantitative analysis of the AI spillover effect, the formation and long-

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term impact of skill mismatch have not been fully verified, and the employment risk brought by excessive automation is also lacking in systematic discussion. In terms of research timeliness, the research on the labor market impact of new generation technologies, such as generative AI, is obviously lagging, and the support of micro-enterprise and professional task data is also limited. Future research direction

In the future, can deepen the related research from three directions. First, strengthen localization and micro-demonstration, build a more comprehensive evaluation system based on China labor market data, track the actual impact of AI on employment quality and income distribution for a long time, and make up for the gap between existing data and perspective. Second, focus on policy research, focus on skills training and social security, explore the path of solving skills mismatch that is suitable for China's national conditions, and improve the AI employment ethics and employment security system. The third is to follow up on the influence of cutting-edge technology, focus on the new impact brought by generative AI, strengthen the research on task reconstruction of high-skilled jobs, and carry out cross-border and cross-industry comparisons to provide a more accurate reference for the labor market to adapt to AI transformation.

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