

The Impact of Artificial Intelligence on Current Social Employment and Structure: Empirical Evidence from Provincial Industrial Robots

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ABSTRACT

Artificial intelligence, as the core driving force of the new round of technological revolution and industrial change, has far-reaching impact on current social employment and structure. This study, based on the data of provincial industrial robots, explores the impact of artificial intelligence on employment. Through literature review, it is found that artificial intelligence has impact on the labor market, which may lead to changes in employment scale, employment structure, and income distribution. The study uses panel data model to analyze the impact of artificial intelligence development on employment scale and structure in 31 provinces (autonomous regions, municipalities directly under the Central Government) of China from 2010 to 2019. The results show that the development of artificial intelligence has a significant promoting effect on the employment scale in China, and also affects the employment structure towards “high-end” direction, but there is also a spillover effect towards “polarization”. In addition, the study finds that artificial intelligence has different effects on the employment of labor with different skills, promoting the employment of high-skilled labor in the manufacturing industry and inhibiting the employment of low-skilled labor, leading to a trend of high-end employment structure in the manufacturing industry. Therefore, the study proposes some prospects and suggestions for the impact of artificial intelligence on the social employment structure, in order to promote the transformation and upgrading of the industry, and achieve efficient intelligent production and optimal adjustment of employment structure. Through in-depth analysis of this study, important reference basis is provided for the current social issues facing the impact of artificial intelligence.

KEYWORDS

Artificial intelligence; Employment structure; Social employment

1. INTRODUCTION

With the advent of the fourth industrial revolution, the rapid development of technology, particularly in the realm of artificial intelligence (AI), is reshaping the fabric of our society, economy, and employment structure at an unprecedented pace. The transformative power of AI is evident across various sectors, but its influence is especially pronounced in the field of industrial robots. These machines have become a cornerstone of modern manufacturing, where they are deployed to execute tasks with a level of precision, speed, and endurance that surpasses human capabilities. The integration of AI-driven robots has not only become a critical catalyst for industrial upgrading but also a key driver in enhancing production efficiency across the manufacturing spectrum.

However, the widespread adoption of AI and the ascent of industrial robots are not without their complexities and challenges. As these technologies become more sophisticated and accessible, they have triggered a significant transformation in the employment landscape and labor market dynamics.

This paper seeks to delve into the multifaceted impact of AI on current social employment and structure, analyzing the underlying mechanisms and trends with a focus on empirical evidence drawn from the deployment of provincial industrial robots across China.

The rise of industrial robots as a tangible manifestation of AI in the manufacturing sector has led to a quantum leap in the automation of production processes. This has resulted in substantial reductions in labor costs, as machines take over tasks traditionally performed by human workers. Moreover, the deployment of robots has been instrumental in bolstering product quality and ramping up production efficiency, thereby giving manufacturers a competitive edge in the global market. Yet, this technological progress does not come without a social cost. The increasing reliance on industrial robots has led to the gradual obsolescence of certain manual and repetitive labor jobs, posing a potential threat to the employment prospects of low-skilled workers. As robots assume more roles on the factory floor, there is a growing concern that the demand for human labor, particularly for those with fewer skills, may diminish.

Concurrently, the infiltration of industrial robots into the workforce has precipitated a seismic shift in the labor market's demand and structure. As traditional roles are phased out, a new breed of technical and managerial positions is emerging, with a pronounced upsurge in the demand for highly skilled labor. These new roles often require a sophisticated understanding of AI and robotics, as well as the ability to manage and maintain complex automated systems. This shift towards a more skill-intensive job market presents both an opportunity and a challenge. While it opens up new avenues for employment and professional growth, it also exacerbates the existing skills gap and intensifies competition for these coveted positions.

In light of these developments, this paper endeavors to address several pivotal questions. Firstly, it seeks to understand the extent to which the proliferation of industrial robots has influenced the overall employment levels and the composition of the workforce. Secondly, it aims to explore whether the impact of AI and robotics varies significantly across different regions, industries, and segments of the labor force distinguished by their skill levels. Lastly, the paper ponders on the strategic responses necessary to navigate the employment challenges and structural changes brought about by the burgeoning application of industrial robots.

To unravel these complex issues, the paper leverages empirical evidence of industrial robots at the provincial level, conducting a thorough analysis of the available data. This approach allows for a nuanced understanding of how the prevalence and application of industrial robots in various regions have affected the employment structure and labor market. By synthesizing the empirical findings with relevant theoretical frameworks and literature, the paper aims to offer a comprehensive interpretation and in-depth discussion of the observed phenomena.

The implications of AI and industrial robots on employment and labor markets are far-reaching and multifaceted. They touch upon critical areas such as job displacement, skills development, income inequality, and regional disparities. As this paper demonstrates, a concerted effort is required to address these challenges effectively. This involves not only policy interventions aimed at reskilling the workforce and fostering innovation but also collaborative initiatives across government, industry, and educational sectors to ensure that the transition to an AI-driven economy is inclusive and sustainable.

The journey towards a future where AI and humans coexist and complement each other in the labor market is fraught with both promise and peril. As we stand at the crossroads of this technological revolution, it is imperative that we adopt a proactive and thoughtful approach to harness the potential of AI while mitigating its adverse effects on employment and society at large. Through careful analysis, strategic planning, and collaborative action, we can steer the course towards a future where the benefits of AI are shared widely, and its challenges are managed effectively, paving the way for a more equitable and prosperous tomorrow.

2. LITERATURE REVIEW AND ARTICLE HYPOTHESES

2.1. The Impact Of AI On The Job Market

There are different views on the impact of AI on the job market. On the one hand, some scholars believe that the popularization of industrial robots will replace part of the traditional labor force and lead to the disappearance of some jobs. For example, some highly repetitive and low-skill jobs, such as assembly workers on production lines, are likely to be replaced by robots. To some extent, this has increased the competitive pressure in the job market, making part of the labor force face the risk of unemployment.

However, on the other hand, some scholars believe that the development of artificial intelligence will give rise to new jobs and opportunities. With the popularity of industrial robots, the demand for robot research and development, maintenance, operation and other professional skills will continue to increase. At the same time, the application of robotics technology will also promote the development of related industries and create more job opportunities for the job market.

2.2. The Impact Of Artificial Intelligence On Labor Structure

Beyond its impact on the job market, AI has profound implications for the structure of the workforce. On the one hand, the application of industrial robots has freed the labor force from traditional manual labor to work that focuses more on skills and knowledge. To some extent, this has improved the overall quality of the labor force and promoted the optimization of the labor force structure.

On the other hand, the development of artificial intelligence has also increased the fragmentation of the labor market. A labor force with higher skill levels tends to be better able to adapt to the development of new technologies, resulting in more employment opportunities and higher incomes. The labor force with lower skill level may face greater employment pressure and income inequality.

2.3. Others

In addition, existing literature also pays attention to the differences in the application of artificial intelligence in different industries and regions. In the manufacturing field, the application of industrial robots has been quite common, which has played a positive role in improving production efficiency and product quality. However, in the service sector, the application of AI is still in its infancy, but its potential is huge. There are also great differences in the application of industrial robots in different regions, and regions with developed economies and stronger technological strength tend to have higher penetration rates of industrial robots and more significant changes in employment structure.

From the empirical evidence of industrial robots at the provincial level, the application of industrial robots has a significant impact on the local job market and labor force structure. On the one hand, the popularization of industrial robots improves production efficiency and reduces enterprise costs, but at the same time, it also leads to the disappearance of some traditional jobs. On the other hand, with the application of industrial robots, new jobs and opportunities continue to emerge, which plays a positive role in improving the local employment level and optimizing the labor structure.

To sum up, the impact of artificial intelligence on current social employment and structure is complex and far-reaching. Although the development of artificial intelligence has led to the disappearance of some traditional jobs to a certain extent, it has also given rise to new job opportunities and job demands. In addition, artificial intelligence has also promoted the optimization and upgrading of labor structure, making the labor market more adaptable to the development needs of the new era. Therefore, we should objectively view the impact of AI on employment and structure, actively respond to challenges, seize opportunities, and promote sustainable development of society. To sum up, this paper puts forward the hypothesis:

Hypothesis H1: The development of artificial intelligence will promote the optimization of employment structure

3. EMPIRICAL ANALYSIS

3.1. Descriptive Statistical Analysis

In order to more intuitively show the mathematical characteristics of all variables and indicators used in this paper, descriptive statistical analysis will be carried out in this section. This paper selects the panel data from 2010 to 2019 as the data of the empirical part. The explained variable is "structure," which represents the employment structure and is obtained by the ratio of the number of employees in the tertiary industry to the number of employees in the secondary industry. Referring to the definition of "industrial optimization," this paper holds that the higher the ratio of the number of employees in the tertiary industry to the number of employees in the secondary industry is, the higher the "employment structure" is; The core explanatory variable is "ai." The more industrial robots there are, the higher the level of artificial intelligence development in the local area that year. Due to the large amount of data, this paper uses "ten thousand units" as the unit of this variable. Table 1 is the descriptive statistical analysis of the above two variables.

Table 1. Descriptive statistical analysis

VarName	Obs	Mean	SD	Min	Median	Max
structure	543	1.7926	0.861	0.52	1.60	6.13
ai	529	0.5390	1.347	0.00	0.11	15.73

3.2. Multiple Regression Analysis

In order to more accurately explore and present the relationship between explanatory variables and explained variables, after model testing, this paper decides to build the following multiple regression models:

$$structure_{it} = \alpha + \beta ai_{it} + u_{it} + \varepsilon_{it} \quad (1)$$

The explained variables and explanatory variables in the above equation have been introduced in the previous paper, so this paper will only introduce the remaining part of the equation in this part. Since the formula fixed the time effect and the regional effect, "i" and "t" are marked in the subscript to represent the data of a variable in the "t" year of the "i" city. α is the intercept term of the equation, and β is the coefficient of explanatory variable, which represents the degree of influence of explanatory variable on explained variable; u is a dummy variable with double fixed effects and ε is a random disturbance term. Table 2 shows the results obtained after importing the equation and related data in the equation into stata software for multiple regression analysis.

Table 2. Multiple Regression Analysis

	(1) structure	(2) structure
ai2	0.009 (0.028)	0.005* (0.016)
_cons	1.798*** (0.041)	1.594*** (0.057)
N	528	528
F	0.093	17.394
r2	0.000	0.395

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

It can be seen from Table 2 that after the fixed time and regional utility model, the positive promoting effect of ai variable on structure variable is significant at the level of 10%, that is, improving the development level of AI can significantly promote the optimization of employment structure. Therefore, Hypothesis H1 is proved.

4. CONCLUSION AND POLICY SUGGESTIONS

Based on the empirical evidence of provincial industrial robots, this study deeply explores the impact of artificial intelligence on current social employment and structure. Through the systematic collection and analysis of data, as well as the sorting and comparison of relevant theoretical literature, this paper draws the following conclusions:

First of all, the development of artificial intelligence does change the landscape of the job market to some extent. In terms of quantity, the widespread application of AI technology has led to the disappearance of some traditional jobs, especially those with low skills and high repeatability. At the same time, however, it has spawned a range of new jobs that often require higher skill levels and innovation. Thus, in the long run, the development of AI may lead to a shift in the skill structure of the job market, with an increase in the demand for high-skill jobs and a decrease in the demand for low-skill jobs.

Secondly, the impact of artificial intelligence on employment structure is also reflected in the upgrading and transformation of industrial structure. With the popularization and application of AI technology, the employment structure of traditional manufacturing, service and other industries has undergone profound changes. On the one hand, some traditional and labor-intensive industries are gradually replaced by automated and intelligent production methods, leading to a decrease in the number of employees in these industries; On the other hand, some emerging technology-intensive industries, such as intelligent manufacturing and smart services, are showing a booming trend, providing new growth points for the job market.

In addition, the development of AI has exacerbated inequality in the job market. On the one hand, high-skilled job opportunities tend to be concentrated in a few big cities or developed areas, leading to a more prosperous job market in these areas, while the job market in some small and medium-sized cities or less developed areas is relatively lagging behind; On the other hand, due to the widespread

application of artificial intelligence technology, some high-paying jobs are replaced by robots or automated equipment, which are often performed by low-skilled workers, thus exacerbating the inequality of income distribution.

In view of the impact of artificial intelligence on current social employment and structure, this paper puts forward the following policy suggestions:

First of all, the government should increase the training and introduction of highly skilled personnel. With the popularization and application of artificial intelligence technology, the market demand for highly skilled talents is increasing. Therefore, the government should increase investment in education, training and other fields to improve the quality and efficiency of personnel training. At the same time, we should actively introduce overseas high-level talents to provide strong talent guarantee for our country's innovation and development.

Secondly, the government should promote the optimization and upgrading of industrial structure. In view of the changes in industrial structure brought by artificial intelligence, the government should increase support for emerging industries, encourage enterprises to increase R&D investment, and promote technological innovation and industrial upgrading; At the same time, we should also strengthen the transformation and promotion of traditional industries, guide enterprises to adopt new technologies and processes, and improve production efficiency and product quality.

In addition, the government should also strengthen the supervision and regulation of the job market. In view of the inequality of the job market brought by artificial intelligence, the government should strengthen the monitoring and analysis of the labor market, and timely grasp the dynamic changes of the job market; At the same time, tax, social security and other policy means should be used to adjust income distribution and alleviate inequality.

Finally, the government should also strengthen cooperation and communication with all sectors of society. The development of artificial intelligence is a complex social problem, which requires the joint efforts of the government, enterprises, academia and all sectors of society. Therefore, the government should strengthen cooperation and communication with all parties to jointly promote the healthy development of artificial intelligence technology and realize the harmonious coexistence of human and machine.

To sum up, the impact of artificial intelligence on current social employment and structure is profound and complex. We need to face up to these challenges and opportunities, and promote the healthy development of AI technology by formulating reasonable policies and measures, so as to inject new impetus into the economic and social development of our country. At the same time, we should strengthen international cooperation and exchanges to jointly respond to the global challenges brought by artificial intelligence and promote the building of a community with a shared future for mankind.

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