

# Impact of digital economy development on labor force employment

Yilin Ma \*

College of Economics and Management, China Agricultural University, Beijing, China, 100083

\* Corresponding Author Email: mylin0107@163.com

**Abstract.** Since the first year of the commercial application of big data, the digital economy has become an important driving force for global economic development and has had a huge impact on the labor employment market. This paper aims to explore how the development of the digital economy reshapes the employment pattern of the labor market. By analyzing the core features of the digital economy, which is highly informative, networked, and intelligent, it reveals the dual effects of the digital economy on the total and structural employment of the workforce and puts forward policy recommendations to address the employment challenges posed by the digital economy. The study finds that, on the one hand, the application of automation technology and artificial intelligence has reduced the demand for traditional low-skilled labor, triggering employment reductions in some industries; on the other hand, emerging digital technologies have created new career opportunities, especially in the fields of data analysis, software development, and digital marketing, which have brought more employment opportunities for high-skilled labor. In addition, the digital economy has given rise to numerous flexible forms of employment.

**Keywords:** Digital Economics, Labor force employment, Total employment, Employment Structure.

## 1. Introduction

As a strategic choice for a new round of scientific and technological revolution and new opportunities for industrial change, the digital economy is becoming a key force in reorganizing global factor resources, reshaping the structure of the global economy, and changing the pattern of global competition. The core of the digital economy lies in the use of digital information and technology as key production factors, the optimal allocation of resources through modern information networks, and the promotion of efficient operation of economic activities. It covers everything from the production of digital products and services to the digital transformation of traditional industries, as well as new business models and consumption patterns based on them. According to the data in the White Paper on the Global Digital Economy 2023, the development of the digital economy in a total of 51 major economies around the world amounted to \$41.4 trillion in 2022, an increase of \$2.9 trillion year-on-year from the previous year, and the development of the digital economy is more dynamic. Against this background, China's digital economy employment market, in general, presents a development trend of rapid expansion and structural upgrading: the total number of jobs in the digital economy is about 240 million, and the total factor productivity of the digital economy is about 1.75, and the employment structure is diversified, giving rise to a series of new occupations such as intelligent machinery manufacturing, blockchain project engineering, and big data marketing on the Internet, etc., and the employment in the tertiary industry has increased by more than 17 million people on average every year. The number of employed people in the tertiary industry has increased by more than 1700 million on average every year.

In terms of the impact of digital economic development on total employment, Liu Cuihua et al. (2023) emphasized that the digital economy can drive the growth of the number of jobs by accelerating the prevalence of flexible employment, promoting entrepreneurship-driven employment, creating new jobs in new occupations, increasing employment opportunities for women, and promoting employment for key groups [1]. In terms of the impact of digital economic development on employment structure, Huang Qiyu et al. (2023) pointed out that the promotion of digital economic development on secondary industry employment is mainly reflected in the manufacturing industry,

while the promotion of tertiary industry employment is reflected in both traditional services and high-end services, and the development of the digital economy mainly promotes the non-farm employment of the central and western regions, rural areas, and the young labor force [2]. In addition, Liang Mu et al. (2023) argued that the development of the digital economy affects the employment structure of the labor force through the number of unemployed labor force, and has obvious regional heterogeneity [3].

In summary, based on the core features of the digital economy, this paper will apply basic economic theories to further analyze in-depth the impact of the digital economy on the total volume and structure of employment in the job market. This study has important theoretical and practical significance for understanding the evolutionary trends of the labor market in the digital economy era, designing effective employment policies, and promoting inclusive economic growth.

## **2. Analysis of the mechanism of the impact of the development of the digital economy on total employment**

The mechanism by which the development of the digital economy affects total employment can be summarized as the dual role of the substitution effect and the suppression of the substitution effect. Among them, the substitution effect describes the process of digital technology replacing human labor, which is manifested in the reduction of labor demand and a certain degree of unemployment; the suppression of the substitution effect (also known as the complementary effect) refers to the fact that digital technology is not replacing the labor force, but rather forming a complementary relationship with the labor force to create new job opportunities and career paths, such as cloud computing services, big data analysis, network security and so on. The actual impact of the digital economy on total employment is the result of the combined superposition of these two effects. Thus, the overall employment effect depends on the strength of the relationship between the substitution effect and the suppression of the substitution effect.

### **2.1. Substitution effects of digital economy development on total employment**

On the one hand, the development of the digital economy has a direct replacement effect on certain jobs. Accompanied by the development of blockchain, artificial intelligence big data, and other related technologies, the phenomenon of "machine for man" has been emerging from time to time. The price of machines and equipment has been significantly reduced, and automated operations consume less and produce more output, which has an absolute advantage over human operations, and therefore directly replaces human labor. In addition, the substitution effect on low-skilled laborers in the digital economy era has increased significantly [4], especially when it comes to routine physical labor or data processing work. In addition, the development of the digital economy promotes the standardization of the commodity distribution process and enhances the efficiency of information exchange and matching, leading to the fact that traditional intermediary functions that rely on human labor, such as agency and distribution, are facing gradual elimination.

On the other hand, there are indirect crowding out effects of digital technologies on labor employment. First, digitization and automation increase productivity, which means that other factors being equal, less labor is needed to produce the same amount of goods and services, potentially causing a decline in overall employment demand. Second, advances in digital technology have squeezed the value out of low-skilled jobs and shortened the life cycle of many traditional occupations. At the same time, the screening of highly skilled jobs requires a large amount of human capital investment, so the rising cost of labor factors may lead to lower profits for enterprises, which in turn affects their incentives for labor demand. Ultimately, in the process of industrial upgrading and transformation, human capital will not match labor market demand if workers are limited in their adaptive capacity, unable to quickly adapt to new job requirements during the transition between the old and new economic forms, and lack the skills to match the demand for jobs. This situation could lead to significant structural unemployment in the short to medium term.

## **2.2. Suppressive substitution effects of digital economy development on total employment**

The dampening substitution effect of the digital economy on total employment is mainly reflected in productivity gains and industrial innovation. On the one hand, in terms of employment impact, the productivity growth of the digital economy can be divided into two main parts: the price effect and the income effect. The price effect is reflected in the fact that with the improvement and application of digital technology, labor productivity is enhanced, which makes the production cost of products lower, resulting in lower product prices. Under the premise of keeping nominal income unchanged, the decline in product prices will prompt a rise in market demand for the product, which in turn promotes the expansion of industrial scale and an increase in employment opportunities; the income effect describes an increase in labor income due to the improvement in labor efficiency and the growth of output in the development of the digital economy. This increase in income motivates workers to provide more labor resources and increases their willingness to supply labor. As a result, firms are encouraged to further expand production and employment opportunities. Some analyses show that this income-increasing effect is more significant in younger rural labor groups and in areas with lower levels of clan networks [5]. In summary, the income effect and the substitution effect both work together to increase the volume of employment. On the other hand, in the process of industrial innovation, the industrial research and development of digital technology require a large amount of input of highly skilled labor, which cultivates the employment soil for many high-level workers. The accelerated integration of the digital economy and the real economy has given rise to a large number of new industries and new business forms, and new employment patterns have emerged [6].

## **2.3. Combined impact of the development of the digital economy on total employment**

The impact of the development of the digital economy on total employment is the result of the hedging of various effects. Technological change has given rise to the process of "creative destruction", promoting the deep integration of information technology and industry, helping traditional industries move from labor-intensive to technology-intensive, and realizing a more sustainable and inclusive green economy, thus creating sustainable employment opportunities [7]. In the first half of 2023, the average unemployment rate of the national urban survey was 5.3%, down 0.2 percentage points from the first quarter. unemployment rate averaged 5.3%, down 0.2 percentage points from the first quarter. In terms of industrial structure, the primary industry accounted for 24.1% of the country's employed people, the secondary industry accounted for 28.8%, and the tertiary industry accounted for 47.1% This shows that the tertiary industry, such as the service industry, is the main field of absorbing employment. This shows that the job market in the context of China's digital economy has shown a certain degree of vitality. Although there are problems such as some jobs being replaced and difficulties in switching to new technologies, there is no large-scale unemployment in the labor market. In particular, the development of the digital economy breaks the occupational time and space limitations, increases the female labor participation rate, releases the gender dividend of female employment, and helps to achieve work-life balance [1]. Due to the unstoppable historical trendiness of technological progress, under the coexistence of the two effects, this employment creation effect will greatly offset the impact of the emergence of new technologies on traditional employment, thus pushing the employment of the population towards a new and higher level of equilibrium in the long term [7].

## **3. Analysis of the mechanism of the impact of the development of the digital economy on the structure of employment**

On the one hand, the development of the digital economy could lead to a polarization of the labor market, with an increase in high-skill jobs and a decrease in middle-skill jobs. The integration of China's manufacturing industry with the digital economy has exceeded 30%, and both high-skill access jobs and low employment thresholds are growing faster than middle-skill occupations, with a greater risk of the middle tier of the labor force being replaced, and a greater risk of their

unemployment. In this regard, the World Bank report has pointed out the polarizing impact of the digital economy on the global labor job market. Under that impact, corporate structures tend to flatten, outsourcing procedural and continuous jobs, hosting formatted jobs using computational procedures such as programming, and focusing on mainstays to support sophisticated and individualized employment. As a result, polarization may lead to excessive wage gaps and increased socioeconomic stratification.

On the other hand, the development of the digital economy has had a diversionary effect on the employed, highlighted by the age structure and geographical structure. About the age structure of practitioners, the era of technological advancement tends to favor the receptive young generation, who are usually better at adapting to new technologies, and who tend to be able to master digital skills more quickly. On the other hand, middle-aged and older workers with greater traditional thinking inertia will face more challenges, and they may need more time and resources to adapt to new digital tools and work environments. Regarding the geographical structure of practitioners, the development of the digital economy has facilitated the rise of teleworking and flexible employment models, changing to some extent people's choice of residence and workplace. In addition, the well-developed digital infrastructure in developed regions and cities, and the fact that less developed regions often lack the necessary digital infrastructure and educational resources, have led to the movement of employed people to more dynamic regions.

## **4. Recommendations for measures**

### **4.1. Measures to Promote Aggregate Employment**

With regard to the employment substitution effect of the digital economy, in order to slow down the direct substitution rate of the digital system on the workforce, first of all, we should strengthen digital skills training, optimize the supply of labor factors, and give full play to its active role in cultivating the subjectivity of technical and skilled talents through the fundamental transformation of talent cultivation, so as to continuously cultivate workers that meet the requirements of a higher form of society [8]. Secondly, it is necessary to give full play to the role of "Internet+" employment services and formulate flexible labor regulations to adapt to new forms of work brought about by digitalization, such as telework, part-time work, and freelancing. In addition, enterprises should be incentivized to innovate and transform, the growth of new industrial clusters should be promoted, the construction of a modern service industry system should be accelerated, and the healthy development of new forms and modes of business should be supported. Promote the transformation of traditional manufacturing industries to digitalization and intelligence, and create new employment opportunities in the manufacturing industry by improving international competitiveness. Finally, it is necessary to ensure the healthy and stable development of the digital economy, improve the quality of employment for workers, and ensure that the healthy development of the digital economy helps to improve the employment environment, optimize the employment structure, and promote high-quality employment [9].

In response to the possible substitution-inhibiting effect of the digital economy, the key is to increase the basic demand for labor by enterprises by promoting industrial expansion and improving production efficiency. This is particularly so given that new industries, new forms of business, and new models driven by the digital economy have emerged mainly in the tertiary sector and that the level of digitization of the tertiary sector is positively correlated with its employment elasticity, i.e., the higher the degree of digitization, the greater its ability to create jobs. Therefore, it is particularly important to strengthen support for employment prioritization policies in the service sector. In order to achieve this, measures are needed to expand the employment-absorbing capacity of those sectors of the tertiary sector that are more digitized, so as to provide more employment opportunities in the labour market. This may include investing in relevant infrastructure, providing tax incentives, encouraging innovation and technical training programs, and ensuring that the workforce is equipped with the skills

required to transition to the digital economy. Through such efforts, the positive impact of the digital economy on the job market can be maximized while mitigating its potential negative effects.

#### 4.2. Measures concerning the structure of employment.

With regard to the polarization of the employment structure, it is necessary to promote the upgrading of the industrial structure and to support traditional industries in improving their competitiveness and employment-absorbing capacity by means of technological innovation and other means, so as to fill the employment gaps for those with middle-level technical skills. In addition, it is necessary to optimize the information structure of the labor market. By integrating information resources, upgrading network systems, and improving service processes, a platform based on "Internet + employment services" should be built. This will provide more effective career planning and employment opportunities for middle-skilled workers, thereby slowing down the polarization of the labor market's completion structure. Finally, it is necessary to balance regional development, promote the rational distribution of industries in different regions, reduce the imbalance of employment opportunities between regions, and support the construction of digital infrastructure in less developed regions to enhance their ability to attract and retain talent. Harnessing the digital economy to provide new momentum, new industries, and new employment opportunities for high-quality economic development [10].

### 5. Conclusion

The development of the digital economy is a key factor in advancing economic flows, stimulating economic growth dynamics, and improving economic adaptability, while it also constitutes an important pillar of a new type of development pattern and acts as a powerful driving force for the construction of a modernized economic system. While the digital economy presents great potential and unlimited business opportunities in terms of job creation, its impact is double-edged. Not only does it herald a wide world of innovation and business opportunities, but it also places demand on us to address new challenges. Therefore, in order for its fruits to reach the masses, the socio-economic challenges that accompany its development require sustained attention and solutions. Policymakers also need to consider how to make technology more equally accessible to all groups in order to avoid the marginalization of certain segments of society.

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