

Research on the Impact of Digital Transformation on the Capital Labor Ratio of Enterprises

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Abstract: Having a good capital labor ratio is beneficial for improving the production efficiency of enterprises. In the process of digital transformation, enterprises can capture and utilize data information more comprehensively and quickly through digital technology, helping them make reasonable capital labor investment decisions and thereby affecting the capital labor ratio of enterprises. This study focuses on all A-share listed companies in China from 2010 to 2020 to verify the inherent logical relationship between digital transformation and capital labor ratio. Empirical research is conducted to demonstrate whether digital transformation has a significant impact on capital labor ratio, and the conclusions of the problem are summarized. Based on the conclusions, policy opinions are proposed at the government and enterprise levels.

Keywords: Digitization: Capital labor ratio: Investment efficiency.

1. Introduction

With the comprehensive arrival of the digital age, the digital economy has become an inevitable choice for innovation driven development in various countries. As of 2021, the scale of China's digital economy has reached 45.5 trillion yuan, accounting for 39.8% of GDP. Digital development has entered an accelerated track. Statistics from the National Development and Reform Commission show that enterprises can improve operational efficiency by about 60%, management efficiency by about 50%, and save labor costs by 20% by using digital technology. Enterprises empower their development by utilizing data as a new type of production factor. At present, the development goals of enterprises have shifted from high-speed growth to high-quality development, and efficiency improvement is the first priority of high-quality development. However, inefficient capital labor allocation still widely exists in enterprises, and the capital labor ratio can well reflect the relationship between enterprise capital and labor input. Whether enterprises should rely more on labor input or capital investment in production is not only related to enterprise production efficiency, but also to the sustainable development of the social economy. Therefore, whether enterprises can leverage digital transformation to improve the efficiency of capital and labor allocation and achieve high-quality development is an important practical issue that urgently needs to be explored.

There are three types of literature closely related to the research topic of this article: first, research on the impact of digital transformation on enterprise investment efficiency and capital allocation efficiency; second, research on the impact of digital transformation on labor investment efficiency and human capital structure; and third, research on relevant factors affecting the capital labor ratio of enterprises.

Research on the impact of digital transformation on investment efficiency and capital allocation efficiency of enterprises. Digital transformation has significantly improved the efficiency of enterprise investment, which Li Lei et al. (2022) believe is manifested in two aspects: suppressing excessive investment and alleviating underinvestment; Digital transformation can improve investment efficiency by

reducing agency costs, alleviating information asymmetry between enterprises and the outside world, and the promotion effect of digital transformation is more significant in non-state-owned enterprises, high-tech enterprises, and enterprises with high levels of external marketization. Li Qinyang et al. (2023) believe that digital transformation of enterprises can significantly improve their capital allocation efficiency. The impact of digital transformation on capital allocation efficiency of enterprises has heterogeneous characteristics, and the positive impact on capital allocation efficiency will further promote the growth of enterprise value. Liu Yiwen et al. (2022) confirmed that the digital economy can improve the investment efficiency of enterprises after the development transition period, mainly manifested as a regulatory effect on excessive investment behavior of enterprises; The development of digital economy can optimize the production and operation processes of enterprises, integrate advantageous production factor resources between regions, reduce the volatility of enterprise profits, and promote the improvement of investment efficiency of physical enterprises.

The impact of digital transformation on labor investment efficiency. Ye Yongwei et al. (2022) pointed out that digital transformation has significantly increased R&D investment in enterprises, which will further stimulate the demand for high skilled labor. Digital transformation has significantly improved business efficiency, while also increasing salaries for executives and ordinary employees. This indicates that digital transformation of enterprises has skill bias characteristics, which helps to transform and upgrade the labor structure of enterprises. Digitalization of enterprises can effectively improve the efficiency of labor investment, which is manifested in alleviating the excessive employment of labor investment in enterprises; Zhou Donghua et al. (2023) believe that improving information transparency and optimizing human capital structure are important mechanisms for digital enterprises to affect labor investment efficiency.

A study on the relevant factors affecting the capital labor ratio of enterprises. Kuang Yuzhen et al. (2021) demonstrated through the relationship between banking competition and corporate capital labor ratio that the effect of banking

competition on improving corporate capital labor ratio is more significant in enterprises with greater financing constraints. The role of different types of banks varies, with urban commercial banks having the greatest impact on corporate capital labor ratio, followed by joint-stock commercial banks, and state-owned large commercial banks having the smallest impact. Tang Yu et al. Furthermore, with the increase in social insurance contributions, per capita wages will increase, which means that capital is more likely to replace low skilled labor, and the substitution effect is significant in labor-intensive or small-scale enterprises. Wang Wenchun et al. (2022) argued from the perspective of increasing the minimum wage standard that it has a significant positive impact on the capital labor ratio of manufacturing enterprises. Raising the minimum wage standard will increase capital investment and reduce labor employment in enterprises. The impact of raising the minimum wage standard on the capital labor ratio of enterprises is mainly concentrated in non-state-owned enterprises, lower wage enterprises, and labor-intensive enterprises.

2. Research Hypotheses

In summary, there is still room for expansion in existing literature on the impact of digital transformation on the capital labor ratio of enterprises. The existing literature mainly analyzes and argues for digital transformation on a single capital or labor, and there is not much analysis on the overall capital labor ratio of enterprises. In the context of the digital economy, further innovation and exploration are needed for the capital and labor input ratio of enterprises. Therefore, this article proposes relevant research hypotheses,

H1a: Digital transformation has a significant impact on the capital labor ratio of enterprises.

H1b: Digital transformation has no significant impact on the capital labor ratio of enterprises.

3. Research Design

3.1. Data sources and research methods

This study selected A-share listed companies from the past decade (2010-2020) as the research sample, excluding financial industry enterprises and missing variable samples to obtain the final data sample. A total of 4049 listed companies and 30129 sample data were obtained, and the data was sourced from Juchao Information Network.

3.2. Model design and variable definition

To examine the impact of digital transformation on the capital to labor ratio of enterprises, a text analysis method based on machine learning was used to calculate the enterprise digital transformation index. A benchmark model for digital transformation and the capital to labor ratio of enterprises was constructed to study the digitalization level of different enterprises. Drawing on the research of Kuang Yuzhen et al. (2021) and Ye Yongwei et al. (2022), the following model was designed for testing:

$$CL_{i,t} = \alpha_0 + \alpha_1 Digital_{i,t} + \sum Control_{i,t} + \delta_t + \gamma_i + \varepsilon_{i,t}$$

Among them, the dependent variable is the capital labor ratio (CL), measured by the ratio of net fixed assets to the number of employees. The explanatory variable is the degree of digital transformation of the enterprise (Digital). This article uses text analysis to measure the degree of digital transformation of the enterprise based on the frequency of digital types in the annual report. *i* and *t* represent the enterprise and year, respectively. *Control_{i,t}* is a set of control variables, mainly including company type (TYPE), company size (SIZE), development capability (DC), etc. δ_t is the fixed effect of the year, γ_i is an individual fixed effect, $\varepsilon_{i,t}$ represents the random error term. The data for data-driven transformation comes from textual data in the annual reports of A-share listed companies in China, while other sample data comes from the CSMAR database. Among them, the dependent variable is the capital labor ratio (CL), measured by the ratio of net fixed assets to the number of employees. The explanatory variable is the degree of digital transformation of the enterprise (Digital). This article uses text analysis to measure the degree of digital transformation of the enterprise based on the frequency of digital types in the annual report. *i* and *t* represent the enterprise and year, respectively. *Control_{i,t}* is a set of control variables, mainly including company type (TYPE), company size (SIZE), development capability (DC), etc. δ_t is the fixed effect of the year, γ_i is an individual fixed effect, $\varepsilon_{i,t}$ represents the random error term. The data for data-driven transformation comes from textual data in the annual reports of A-share listed companies in China, while other sample data comes from the CSMAR database.

4. Empirical Results and Analysis

4.1. Descriptive statistical results

Table 1. Descriptive Statistical Results

Variable	Sample size	Mean	SD	Max	Min
CL	30129	0.610	1.057	8.870	0.010
Digital	30129	0.110	0.050	0.280	0.040

The above table presents the descriptive statistics of the main variables, where the mean and standard deviation of the capital labor ratio (CL) are 0.61 and 0.11, respectively, with a minimum value of 0.01 and a maximum value of 8.87. This indicates that there is a significant difference in the capital labor ratio among different enterprises. The mean and

standard deviation of the degree of digitalization are 0.11 and 0.05, respectively, with a minimum value of 0.04 and a maximum value of 0.28, indicating significant differences in the degree of digital transformation among different enterprises.

Table 2. Multiple Regression Analysis Results

Variable	Coefficient	Error	t-value	Significance
DIGITAL	0.500	0.006	6.257	0.0001
TYPE	-	0.389	6.376	0.0001
SIZA	-	0.332	3.267	0.0002
DC	-	0.002	13.667	0.0001

4.2. Regression analysis

According to the regression analysis results, it can be seen that the capital labor of enterprises is greatly affected by their digital transformation. The higher the degree of digital transformation, the lower the capital labor ratio of enterprises. The coefficient of DIGITAL performance is 0.5, indicating that if the degree of digital transformation does not increase by one unit, the capital labor ratio of the enterprise will correspondingly increase. Through the significance test of the control variable t-value, the significance level is high, indicating that the capital labor ratio of enterprises is greatly influenced by the type, scale, and development ability of the enterprise. On the other hand, the factors influencing the capital labor ratio of enterprises are multifaceted. Firstly, there is a difference in the intensity of enterprise factors. Generally speaking, labor-intensive enterprises have a higher proportion of labor costs in total costs, and rising labor prices often have a greater impact on enterprises. Due to their low technological content and low level of automation development, the impact of digital transformation on labor-intensive enterprises is relatively low. Secondly, the scale and development ability of enterprises are important factors affecting the capital labor ratio. Large scale enterprises often have stronger financing and development capabilities, relatively high levels of digitalization, and face relatively low financing constraints. In small-scale, young, and non government subsidized enterprises, the constraining effect of this financing constraint is more prominent, with a relatively low degree of digital transformation and a relatively low capital labor ratio. The above empirical analysis results reveal that digital transformation has a significant impact on the capital labor ratio of enterprises, confirming the validity of the above hypothesis.

5. Conclusions and Suggestions

This article conducts a study on the impact of digital transformation on the capital labor ratio of A-share listed companies from 2010 to 2020. The following conclusions are drawn: digital transformation of enterprises has a significant impact on the capital labor ratio. The degree of digitalization of different enterprise types, sizes, and development capabilities has different effects on the capital labor ratio of enterprises. The impact of digital transformation on the capital labor ratio of labor-intensive enterprises is relatively low. Conversely, the level of digitalization of technology-based enterprises has a greater impact on the capital labor ratio. The degree of digitalization of enterprises with strong development capabilities has a relatively significant impact on the capital labor ratio, while the opposite has a smaller impact.

Based on the above research conclusions, the following suggestions are proposed: as enterprises, in the era of big data, enterprises should seize opportunities, integrate digital

resources to empower high-quality development. Faced with internal and external pressures, enterprises should be able to make reasonable plans for their own resources, explore and innovate, and strengthen cooperation and communication with external enterprises. We need to accelerate the construction of basic information and promote digital transformation and development. In today's era of information explosion, the accuracy of information mastery is crucial for the development of enterprises. The construction of basic information platforms can help enterprises grasp the most basic operational information, which is crucial for analyzing the future development direction of enterprises. Strengthening the deep integration of digital technology and the real economy, digital technology takes the lead, and information construction needs to have a good foundation. The government needs to improve the mechanism for protecting intellectual property rights. In the process of digital transformation, digital technology is crucial. To promote research and development production, the government should strengthen encouragement, strengthen the protection of digital intellectual property rights, and stimulate the enthusiasm of enterprises for technological innovation.

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