# Research on Whether Digital Finance Can Improve the Management Level of Enterprises

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**Abstract.** This paper takes the panel data of 30 provinces (autonomous regions and municipalities directly under the Central Government) in China from 2011 to 2020 as the research sample to conduct an empirical analysis on how digital finance can improve the enterprise management level. It is found that digital finance helps to improve the management level of enterprises, and the coverage breadth, usage depth and digitization level will have a promoting effect on enterprise management; the heterogeneity test results show that the management level of state-owned enterprises and enterprises in eastern China is more sensitive to the development of digital finance; the relationship between digital finance and enterprise management level is positively regulated by the degree of marketization and informatization. The research provides a theoretical basis for the transformation and upgrading of digital finance to achieve inclusive and convenient development, and provides new ideas for the improvement of the management level of Chinese enterprises, so that enterprises can better benefit from digital finance.

**Keywords:** Digital Finance; Enterprise Management; Asset Contribution Rate; Marketization; Informatization.

## 1. Introduction

The world economic situation is more complex and more uncertain, which has brought greater challenges and higher requirements to the development of enterprises. Enterprises need to conduct in-depth exploration and analysis of the development path of enterprise management level, so as to continuously improve their core competitiveness and help the development of enterprises (Qi, Y. and X. Xiao, 2020). The operation and management of enterprises are inseparable from the financial market. With the vigorous development of the Internet, big data and AI, various digital technologies have been deeply integrated with traditional finance, and digital finance has emerged at the historic moment. According to the definition of digital finance in the *Digital Financial Services Report* released by the World Bank in April 2020, digital finance is a financial model in which traditional financial sectors and fintech enterprises use digital technology for financial services, which has the characteristics of lower service costs, wider coverage and broader service objects than traditional finance, including various financial products and services, such as payment, savings, credit, securities, etc.

Is there a link between digital finance and the management level of enterprises? Can we improve and solve the current problems in China's enterprise management? Are there any differences in the impact on enterprises with different regions and different property rights? At present, the existing literature on digital financial research mainly focus on the macro level, analyzing how digital finance affects high-quality economic development (Yang, M. and X. Tang, 2023), the effect of monetary policy (Zhan, M. et al., 2020), urban-rural income gap (Zhou, L. et al., 2020), etc. Some scholars pay attention to the impact of digital finance on micro-enterprise level, such as enterprise risks (Zhai, S. et al., 2022; Ma, L. and S. Du, 2021), enterprise competitiveness (Zhang, J., 2023), and enterprise technological innovation (Tang, S. et al., 2020). But so far, few scholars have focused on the impact of digital finance on enterprise management level.

To answer the above questions, this paper will delve into the internal mechanisms of digital finance affecting enterprises management level. It is expected to have marginal contribution in the following aspects. First, it links digital finance with enterprise management level, carry out multi-faceted and

multi-angle discussions, enrich the research results of digital finance at the micro-enterprise level and extend the boundaries of factors affecting enterprise management level. Second, it provides a theoretical model for the government to carry out digital financial reform and enterprises to deepen the construction of internal management systems, which is conducive to promoting the continuous improvement of enterprise efficiency and sustainable economic development. Third, it will help enterprises better embrace the wave of digital finance, realize digital transformation, and enjoy safer and more efficient financial services.

## 2. Literature Review

### 2.1 Relationship between Finance and Enterprises

Finance has four basic functions: financing intermediary, payment and settlement, information consultation and risk management, which can provide multi-dimensional support for the development of enterprises. The existing literature has studied the influence of finance on business performance, import and export, innovation, audit pricing, R&D costs, etc.

Guo, L. and S. Xu (2021) used the data of A-share non-financial listed companies from 2011 to 2016 to verify the "inverted U-shaped" relationship between the financialization level of enterprises and their business performance. When the financialization degree is less than 27.85%, beneficial to the enterprise business performance, when financialization degree is greater than the threshold, it will weaken the business performance. There is also an "inverted U-shaped" relationship between enterprise financialization and innovation investment, and finance influences enterprise innovation investment in the form of "reservoir effect" and "wealth effect". Moderate allocation of enterprises will promote the innovation investment, while overallocation will produce constraints (Chen, Y. et al., 2023). Liu, Z. et al. (2022) empirically found that financial agglomeration can meet the high export costs needs to a certain extent and solve their financing difficulties, so as to promote their export expansion, stimulate export vitality and enhance their export resilience. Xi, L. and Y. Wan (2021) related finance to enterprise audit pricing. and found that enterprises with higher degree of financialization had higher audit pricing due to greater audit business complexity, and the positive impact was more significant in enterprises with large scale, high financing constraints and serious internal control deficiencies.

### 2.2 Digital Finance and Traditional Finance

The combination of finance and technology has produced "fintech", "electronic finance", "online finance" and "Internet finance". "Digital finance" is no exception, it is a new type of financial service that deeply integrates traditional financial services and digital technology.

Digital finance originated from PayPal, an online payment tool in the US in 1998. In the following 6-8 years, "Alipay" in China, "Zopa" in the UK and "Prosper" in the US appeared successively. Digital finance helped the financial industry to enter an era of innovation and upgrading at an impressive speed (Razzaq, A. and X. Yang,2023).

There are three views on the relationship between digital finance and traditional finance: "substitution theory", "complementarity theory" and "competition and cooperation theory". Wang, D. and X. Hu (2023) believe that, on the whole, there is a "competition and cooperation" relationship between the two. The development of digital finance has intensified the competition in the financial industry, and put forward new requirements for digital, structural and efficiency reform for traditional financial institutions.

It can be seen that in the era of digital economy, digital finance will become the main theme, and it will have a more extensive and profound impact on the export domestic value-added (Jin, X. and W. Zhang, 2022) innovation (Wang, M. and Z. Li, 2023; Li, W. and W. Pang, 2023) and other aspects.

### 2.3 Digital Finance and Enterprise Management

Enterprise management is the general term of a series of activities such as planning, organizing, commanding, coordinating and controlling. It is the objective demand of socialized large-scale production. To evaluate the management level of an enterprise, we should start from the above five aspects. The development of enterprise management has generally experienced three periods: the first period was the period of traditional management from the late 18th to the late 19th century, the management function is separated from manual labor, and the management work was completed by the capitalists. The 1920s to 1940s was a period of scientific management, the managers began to summarized the experience and gradually formed a set of scientific management theory. After the 1950s, the third period, that is, the modern management stage, the managers began to make quantitative analysis of the management of mathematical decision-making methods.

Although the enterprise management level does not directly create economic benefits for enterprises, but the enterprise management level determines the direction of the enterprise development and the time of continuous operation, and will have a direct impact on other strategic resources such as capital, technology, talents, etc. The enterprise with high management level has strong ability to obtain and use these resources, and can better cope with the risks caused by the deterioration of market conditions, which is the key core factor for enterprises to achieve "profit maximization". Since the 18th century, enterprise management has been constantly discussed and studied. How to improve the level of enterprise management is a problem that all enterprises attach great importance to and need to solve urgently.

With the continuous development of digital finance, financial products and service modes have undergone innovative changes, providing new financing channels for enterprises, improving information transparency, and enhancing the financing capacity and financing efficiency of enterprises (Gehringer and Agnieszka, 2013). Financing constraints have eased so that funds can be organized and coordinated to take full advantage of existing opportunities. At the same time, enterprises can plan and arrange future entity investment expeditiously (Hu, Y. et al., 2017) to cope with and control uncertainties in the future production and operation process. The efficiency of resource allocation has been improved, the management level of enterprises has been improved, and the healthy development of enterprises has been promoted.

### 2.4 Marketization and Informatization

Effective enterprise management cannot be separated from an effective market. The so-called marketization is the state of taking the market as the basic means and solving social, political and economic problems as the main purpose. With the continuous improvement of marketization level, it gradually provides strong support for economic and social development. Due to the different resources and policy implementation in different regions, there are differences in marketization degree among regions. Hu, G. (2021) believes that if the enterprise is located in a high degree of marketization, the market competition mechanism will be better established, and it will be subject to less government intervention and unfair competition. Such a good social environment is more conducive to enterprises to obtain market information and industry dynamics in a timely manner, reduce the risks brought by information asymmetry, and make plans and coordination for the allocation of resources, which will exert big influence on the command and decision-making of enterprises (Wang, L. et al., 2020), thereby improving the management level of enterprises.

Informatization refers to the in-depth application of information technology, so that the existing economic pattern and production mode can reach a new form. Its essence solves the contradiction between supply and demand of information (Han, X. et al., 2014). With the advancement and application of informatization, it brings opportunities and benefits to the development of enterprises. The improvement of informatization will promote the efficient transfer of information within the enterprise, reduce the cost of internal coordination, which in turn will help to manage business processes and change the organisational structure of the enterprise.

# 3. Empirical Design

## 3.1 Model Setting

This paper uses the fixed effects model to test the basic role of digital finance on the management level of enterprises. The model is set as follows:

$$\mathrm{Asset}_{it} = \alpha_0 + \alpha_1 \mathrm{Index}_{it} + \sum \alpha_2 X_{it} + \eta_i + \sigma_t + \varepsilon_{it} \quad (1)$$

i and t indicate the province and year, the dependent variable $y_{it}$ indicate the level of enterprise management. $\mathrm{Index}_{it}$ shows the development level of digital finance of enterprise. $X_{it}$ reveals a set of control variables that change over time at the provincial level,$\eta_i$ and$\sigma_t$ are the fixed effect of province and year, and$\varepsilon_{it}$ is the random error term.

In order to further test the moderating effects of marketization and informatization on enterprise management level, the following model including interactive terms is established:

$$y_{it} = \alpha_0 + \alpha_1 \mathrm{DFindex}_{it} + \alpha_2 \mathrm{DFindex}_{it} \times \mathrm{Mar}_{it} + \alpha_3 \mathrm{Mar}_{it} + \sum \alpha_4 X_{it} + \eta_i + \sigma_t + \varepsilon_{it} \quad (2)$$

$$y_{it} = \alpha_0 + \alpha_1 \mathrm{DFindex}_{it} + \alpha_2 \mathrm{DFindex}_{it} \times \mathrm{Inf}_{it} + \alpha_3 \mathrm{Inf}_{it} + \sum \alpha_4 X_{it} + \eta_i + \sigma_t + \varepsilon_{it} \quad (3)$$

$\mathrm{Mar}_{it}$ represents the marketization level, $\mathrm{Inf}_{it}$ indicates the informatization level, $\mathrm{Index}_{it} \times \mathrm{Mar}_{it}$ represents the multiplication term of digital finance and marketization level, $\mathrm{Index}_{it} \times \mathrm{Inf}_{it}$ indicates the multiplication term of digital finance and informatization level. The remaining variable explanations are the same as for model (1).

## 3.2 Sample Selection and Data Source

In this paper, after eliminating Tibet with large data loss, the panel data of 30 provinces (autonomous regions and municipalities directly under the Central Government) from 2011 to 2020 were selected as research samples, and 300 sample observations were obtained. The digital finance data comes from the provincial level data in the *The Peking University Digital Financial Inclusion Index of China*. The remaining variables come from the EPS database and *China Industry Economy Statistical Yearbook.*

## 3.3 Variable Definition

### 3.3.1. Independent Variable

Digital finance (DFindex). The index compiled by Guo, F. et al. (2020) can objectively and comprehensively reflect the development status of digital finance. In this paper, the provincial level data is selected as the proxy variable of digital finance (DFIndex). In addition, this paper also adopts three secondary indicators: coverage breadth (Breadth), usage depth (Depth) and digitization level (Dig) to further describe how digital finance can affect the management level. Digital finance is hereinafter referred to as DFinance.

### 3.3.2. Dependent Variable

Contribution rate of total assets (Asset). Enterprise management level is a very complex concept. Differences in organizational structure, management spirit, corporate culture and other aspects will lead to differences in the management philosophy and measures of enterprises. But nevertheless, the management goals of different enterprises are the same, that is, to maximize their own interests. It can be seen that through some quantitative financial indicators, the ability of enterprises in all aspects of operation and management can be well reflected. Compared with other indicators, the contribution rate of total assets (Asset) contains more abundant and more comprehensive information, reflecting the profitability of all assets of an enterprise. It is the core index for evaluating and assessing the profitability of an enterprise, and is a concentrated embodiment of the business performance and management level. Since the total tax and interest expense data of enterprises are difficult to obtain, the ratio of total profits to total assets of industrial enterprises above provincial scale is used to

measure the management level of enterprises by referring to relevant literature. The enterprise management level is referred to as EML below.

### 3.3.3 Control Variable

To reduce the interference caused by omitted variables, drawing on the research of Zhang, H. and S. Li (2022), Chen, Z. et al. (2004), this paper mainly selects the control variables from the macro level: investment degree (Invest), environmental regulation (Environ), infrastructure (Infra), urbanization (Urban), Human capital (Human).

### 3.3.4. Moderator Variable

Marketization (Mar) and Informatization (Inf) are the moderator variables of this paper.

Specific variable definitions and calculations are detailed in Table 1.

**Table 1.** Variable definitions

| Type of variable | Variable name | Variable symbol | Variable calculation method |
|---|---|---|---|
| Independent variable | Digital finance | DFindex | Digital financial inclusion general index |
| | Coverage breadth | Breadth | Digital financial inclusion coverage breadth index |
| | Usage depth | Depth | Digital financial inclusion usage depth index |
| | Digitization level | Dig | Digital financial inclusion digitization level index |
| Dependent variable | Total assets contribution rate | Asset | Total profit / total assets |
| Control variable | Investment degree | Invest | Total social fixed asset investment / GDP |
| | Environmental regulation | Environ | Investment in industrial pollution control completed / industrial added value |
| | Infrastructure | Infra | Log of road miles |
| | Urbanization level | Urban | Percentage of urban population |
| | Human capital | Human | Log of the number of students in ordinary universities and junior colleges of higher learning |
| Moderator variable | Marketization | Mar | Average number of employees in non-state-owned holding industrial enterprises above designated size / average number of employees in industrial enterprises above designated size |
| | Informatization | Inf | Log of Internet broadband access users |

## 3.4 Descriptive Statistical Analysis

**Table 2.** Descriptive statistics

| Variable name | Variable symbol | Number of samples | Average value | Standard deviation | Minimum value | Maximum value |
|---|---|---|---|---|---|---|
| Digital finance | DFindex | 300 | 217.246 | 96.968 | 18.330 | 431.930 |
| Coverage breadth | Breadth | 300 | 198.010 | 96.334 | 1.960 | 397 |
| Usage depth | Depth | 300 | 212.036 | 98.106 | 6.760 | 488.680 |
| Digitization level | Dig | 300 | 290.238 | 117.644 | 7.580 | 462.230 |
| Total assets contribution rate | Asset | 300 | 6.136 | 2.871 | -7.780 | 14.220 |
| Investment degree | Invest | 300 | 79.301 | 25.782 | 21 | 147.950 |
| Environmental regulation | Environ | 300 | 0.291 | 0.310 | 0.010 | 2.800 |
| Infrastructure | Infra | 300 | 11.681 | 0.848 | 9.400 | 12.885 |
| Urbanization level | Urban | 300 | 59.006 | 12.218 | 35.030 | 89.600 |
| Human capital | Human | 300 | 13.469 | 0.800 | 10.730 | 14.729 |
| Marketization | Mark | 300 | 69.244 | 17.552 | 31.760 | 96.180 |
| Informatization | Inf | 300 | 6.534 | 0.916 | 3.728 | 8.266 |

There are large extreme difference ranges in DFinance, both in terms of general index and three dimensions, which shows that the development level of DFinance among provinces is not balanced. In particular, the maximum value of digitization level is 462.23, the minimum value is 7.58, and the standard deviation is 117.644, showing that there are great differences in the digitalization level between different regions. The total assets contribution rate's average value is 6.136, the minimum value is -7.78, and the maximum value is 14.22. It can be seen that most enterprises are able to maintain a certain level of profitability, while for a small number of enterprises, the total assets contribution rate may be negative due to their weak competitiveness and the sluggish economic environment in some years.

# 4. Empirical Results Analysis

## 4.1 Benchmark Result Analysis: the Impact of DFinance on EML

**Table 3.** The benchmark estimation results

| | Asset (1) | Asset (2) | Asset (3) | Asset (4) | Asset (5) | Asset (6) |
|---|---|---|---|---|---|---|
| DFindex | 0.029**<br>(2.36) | 0.036***<br>(3.01 ) | 0.036***<br>(2.99) | 0.041***<br>(3.37) | 0.049***<br>(3.83) | 0.052***<br>(4.06) |
| Invest | | -0.025***<br>(-3.71) | -0.025***<br>(-3.69) | -0.025***<br>(-3.81) | -0.030***<br>(-4.24) | -0.033***<br>(-4.63) |
| Environ | | | 0.055<br>(0.16) | 0.059<br>(0.18) | 0.009<br>(0.03) | 0.004<br>(0.01) |
| Infra | | | | 3.862**<br>(2.32) | 2.797<br>(1.60) | 2.370<br>(1.35) |
| Urban | | | | | 0.123*<br>(1.90) | 0.052<br>(0.71) |
| Human | | | | | | 3.053**<br>(2.01) |
| Time effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Constant term | 7.633***<br>(13.74) | 8.923***<br>(13.85) | 8.908***<br>(13.67) | -35.918*<br>(-1.86) | -30.186<br>(-1.55) | -61.973**<br>(-2.48) |
| R-squared | 0.474 | 0.501 | 0.501 | 0.511 | 0.518 | 0.525 |
| Obs | 300 | 300 | 300 | 300 | 300 | 300 |

Columns (1) is the result of the influence of DFinance on EML when other control variables are not controlled, and columns (2) - (6) are the results after gradually adding control variables. It can be found that as the control variables are added continuously, the coefficient of DFinance increases and becomes more significant, indicating that DFinance can bring EML to a better extent. The synergistic effect of digital fiance and digital technology can help enterprises to obtain stable and continuous financial resources to maintain the daily production, operation and expansion needs. Managers can be freed from the constraints of financing difficulties (Wu, Y.and S. Huang, 2022), so as to focus on the future planning and organization of enterprises, improve risk prevention and control capabilities, and improve EML.

The results of the control variables show that the degree of investment (Invest) has a significant inhibiting effect on EML, probably due to the lack of planning for long-term investments, and the influence of management tenure to pursue short-term performance rather than sustainable development. Combined with the fact that some enterprises have not yet formed a scientific and effective management system in investment management, resulting in non-efficient investment, which in the long run will damage EML. Environmental regulation (Environ), infrastructure (Infra) and urbanization level (Urban) haven't had a significant promotion effect on EML. Human capital (Human) has a significant positive impact on EML. Human capital is the most decisive force in productivity, through the investment of human capital can improve the quality of labor, workers'

ability to work, thereby improving labor productivity and EML, becoming an important source and sustainable driving force for economic growth.

### 4.2 Analysis of the Structural Effects of DFinance

**Table 4.** Results of the structural effect tests

| | Asset (1) | Asset (2) | Asset (3) |
|---|---|---|---|
| Breadth | 0.044**<br>(2.38) | | |
| Depth | | 0.034***<br>(4.33) | |
| Dig | | | 0.011**<br>(2.28) |
| Invest | -0.026***<br>(-3.72) | -0.034***<br>(-4.79) | -0.029***<br>(-4.01) |
| Environ | 0.015<br>(0.04) | 0.073<br>(0.22) | 0.723<br>(0.22) |
| Infra | 1.796<br>(1.00) | 2.431<br>(1.40) | 2.537<br>(1.41) |
| Urban | -0.041<br>(-0.56) | 0.102<br>(1.34) | 0.022<br>(0.29) |
| Human | 1.798<br>(1.16) | 3.817**<br>(2.48) | 2.831*<br>(1.82) |
| Time effect | Yes | Yes | Yes |
| Regional effect | Yes | Yes | Yes |
| Constant term | -33.593<br>(-1.32) | -74.934***<br>(-2.94) | -58.039**<br>(-2.25) |
| R-squared | 0.506 | 0.529 | 0.505 |
| Obs | 300 | 300 | 300 |

In order to explore whether the three secondary indicators: coverage breadth (Breadth), usage depth (Depth) and digitization level (Dig) will have different effects on EML, the structural effect analysis is conducted. The results of Table 4 show that all three dimensions can contribute to the improvement of EML, among which the coverage breadth has the greatest impact on EML, followed by usage depth and digitization level the least. As can be seen from *The Peking University Digital Financial Inclusion Index*, the coverage breadth and usage depth show a trend of steady growth year by year, and the former is faster than the latter, while the digitization level has a significant decline in 2016, and then gradually recovers. Relying on digital technology, DFinance has enhanced its geographical penetration and expanded the spatial scale of financial services. At present, its coverage has been relatively wide. At the same time, the frequency of using DFinance has been improved. It provides financial support for enterprises in various provinces, and then playing a role in promoting the EML. However, there is still room for improvement in terms of the mobility, convenience and efficiency in the provision of financial services.

### 4.3 Heterogeneity Analysis

To test the impact of DFinance on EML in different regions and with different property rights, this paper divides the whole sample into three sub-samples: eastern, central and western, and divides the enterprises into state-owned enterprises and non-state-owned enterprises, then re-runs the regressions.

Based on the results of Table 5 columns (1), (2) and (3), it can be seen that the coefficient of DFinance is significantly positive in the eastern region, but not significant in the central and western regions, indicating that the promotion effect of DFinance on EML is mainly reflected in the eastern region. This may be due to the high development level of DFinance and the good financial environment in eastern China, so the effect of alleviating financing constraints is more obvious. At the same time, the lack of financial infrastructure in the central and western regions has led to weak

absorption and utilization of DFinance and insufficient ease of doing business, which has increased the business risks and operating costs of enterprises (Wu, F. et al., 2018), enterprise cannot effectively transform the advantages of DFinance into the advantages of EML.

**Table 5.** Heterogeneity test results

| | Eastern Region (1) | Central Region (2) | Western Region (3) | State-owned enterprises (4) | Non-state-owned enterprises (5) |
|---|---|---|---|---|---|
| DFindex | 0.056*** (2.76) | 0.009 (0.29) | 0.055 (1.49) | 0.053*** (3.34) | 0.047*** (3.01) |
| Invest | 0.007 (0.55) | -0.037*** (-3.00) | -0.046*** (-3.12) | -0.041*** (-4.67) | -0.024*** (-2.72) |
| Environ | -0.751 (-1.37) | 0.029 (0.07) | 0.073 (0.05) | 0.576 (1.42) | -0.642 (-1.61) |
| Infra | 4.908* (1.79) | 2.049 (0.60) | 2.794 (0.66) | -2.144 (-1.00) | 4.028* (1.90) |
| Urban | -0.037 (-0.37) | 1.149*** (3.35) | 0.376* (1.82) | 0.177* (1.96) | -0.077 (-0.87) |
| Human | -4.766 (-1.21) | -15.160*** (-2.79) | 4.660** (2.08) | 5.389*** (2.90) | 1.246 (0.68) |
| Time effect | Yes | Yes | Yes | Yes | Yes |
| Regional effect | Yes | Yes | Yes | Yes | Yes |
| Constant term | 17.947 (0.35) | 140.085 (1.62) | -99.513* (-1.95) | -49.877 (-1.63) | -48.077 (-1.59) |
| R-squared | 0.548 | 0.745 | 0.555 | 0.383 | 0.523 |
| Obs | 110 | 80 | 110 | 300 | 300 |

As can be seen from column (4) and (5) of Table 5, the promotion effect of DFinance on both SOEs and non-SOEs is significantly positive, indicating that DFinance has been an important achievement in the development of different ownership nature. but relatively speaking, the promotion effect on SOEs is stronger. As the rise of digital economy has become a national strategy and the digital transformation of the financial industry has become the mainstream, SOEs as the backbone of national economic, need to be more in tune with the national strategy and make better use of DFinance to play its important role in achieving high-quality corporate development. In China's institutional context and existing financial market environment, the government still acts a vital role in the allocation of resources. The natural "blood relationship" relationship between SOEs and the government makes the advantages of SOEs more prominent. Meanwhile, they are backed by state credibility, have more implicit guarantees and higher credit ratings (Xiao, H. and Z. Yang, 2022), have good risk control management and information disclosure systems compared to non-SOEs, and have superior scale in terms of markets and resources, so it is easier to obtain financial institutions of credit funds, making DFinance better serve the management improvement of SOEs.

### 4.4 Analysis of Moderating Effects

According to the previous analysis, marketization and informatization may further catalyse and stimulate the promotion effect of DFinance on EML, which is considered to be tested using moderating effects.

The results of Table 6 column (1) show that the interaction item of DFinance and marketization (DFindex * Mar) on EML is significantly positive, with marketization playing a positive moderating role between DFinance and EML. As the level of marketization increases, the promotion effect of DFinance on EML becomes more obvious. This may be because marketization is conducive to improving the efficiency in resource allocation, improving the mismatch of financial resources, breaking information barriers, which make better use of DFinance for EML.

Column (2) is the regression result after the introduction of the interaction term between DFinance and informatization (DFindex * Inf), which is significantly positive at the 5% statistical level, thus

showing that informatization positively moderates the effect of DFinance on the improvement of EML. The penetration of modern information technology into the business processes and management methods of finance allows companies to make better use of this grip of DFinance to achieve an improvement of EML of the whole enterprise and its various elements.

**Table 6.** Results of the moderating effect tests

| | Asset (1) | Asset (2) |
|---|---|---|
| DFindex | 0.007<br>(0.44) | 0.020<br>(1.10) |
| DFindex*Mar | 0.0002***<br>(4.36) | |
| DFindex*Inf | | 0.003**<br>(2.61) |
| Invest | -0.038***<br>(-5.39) | -0.032***<br>(-4.46) |
| Environ | -0.075<br>(-0.23) | -0.053<br>(-0.16) |
| Infra | 1.753<br>(1.03) | 3.955**<br>(2.16) |
| Urban | 0.039<br>(0.55) | -0.029<br>(-0.37) |
| Human | 3.245**<br>(2.21) | 3.615**<br>(2.39) |
| Time effect | Yes | Yes |
| Regional effect | Yes | Yes |
| Constant term | -55.208**<br>(-2.71) | -82.965***<br>(-3.20) |
| R-squared | 0.559 | 0.538 |
| Obs | 300 | 300 |

## 4.5 Robustness Test

**Table 7.** Robustness test results

| | One-period lagged variable | Change the sample range | Instrumental variables approach |
|---|---|---|---|
| DFindex | 0.028**<br>(2.14) | 0.038**<br>(2.53) | 0.037**<br>(2.30) |
| Invest | -0.028***<br>(-3.54) | -0.030***<br>(-3.90) | -0.031***<br>(-3.77) |
| Environ | 0.001<br>(-1.70) | -0.124<br>(-0.34) | 0.001<br>(0.00) |
| Infra | 2.149<br>(1.14) | 2.117<br>(1.12) | 2.327<br>(1.64) |
| Urban | 0.053<br>(0.38) | 0.193*<br>(1.76) | 0.055<br>(0.89) |
| Human | 1.969<br>(1.18) | 2.228<br>(1.40) | 2.302*<br>(1.71) |
| Time effect | Yes | Yes | Yes |
| Regional effect | Yes | Yes | Yes |
| Constant term | -45.655*<br>(-1.72) | -54.558**<br>(-2.03) | -71.011***<br>(-3.09) |
| Cragg-Donald | | | 192.369 |
| R-squared | 0.392 | 0.546 | |
| Obs | 270 | 260 | 270 |

To test the robustness of the above results, the following three approaches are taken.

#### 4.5.1. One-period Lagged

Considering the endogenous problem caused by reverse causality, this paper treats the digital financial general index with a one-period lag. The results obtained in column (1) are generally consistent with the benchmark results, and the estimates are well robust.

#### 4.5.2. Change the Sample Range

Considering the leading level of the economic, the particularity of political status and the completeness of transportation infrastructure may cause deviation to the estimated results, this paper excludes the sample of Beijing, Tianjin, Shanghai and Chongqing to enhance the accuracy. According to the results in column (2) of Table 7, the positive impact of DFinance on EML is significant at the 1% level, the conclusion has not changed.

#### 4.5.3. Instrumental Variables Approach

In this paper, DFinance with a one-period lag is selected as the instrumental variable of DFinance. As shown by the Cragg-Donald test in column (3), there is no weak instrumental variable problem, the instrumental variable is selected as valid. The DFinance is significantly positively correlated with EML, which is consistent with the aforementioned conclusion.

## 5. Conclusion and Recommendation

Based on finance and driven on technology, DFinance helps the optimization and upgrading of the economic system and boosts the management level of Chinese enterprises. This paper takes the panel data from 2011 to 2020 from 30 provinces (autonomous regions and municipalities directly under the Central Government) as a research sample to empirically analyze the impact of DFinance on EML. The findings show that. First, DFinance is an important driver of the EML. Second, the Breadth, Depth and Dig of DFinance can empower enterprise management, with the first two dimensions having more obvious utility. Third, the influence of DFinance on EML has regional heterogeneity and differences in the nature of property rights. Compared with the central and western regions and non-SOEs, the driving effect of DFinance is more significant in the eastern region and SOEs. Fourth, the moderating effect results suggest that marketization and informatization play a positive regulatory role between DFinance and EML.

On the ground of the research conclusions, this paper cautiously puts forward the following recommendations from three perspectives of financial institutions, the government and enterprises in a bid to further realize the long-term development of DFinance and provide strong support for the improvement of EML. First, further promote digital reform, make extensive use of big data, cloud computing, blockchain and other digital technologies. By improving support efficiency, reducing service acquisition costs and improving the digital service environment to achieve digitization, mobility and intelligence. Second, to enhance the the inclusiveness and integration of DFinance, the government needs to increase the construction of digital financial infrastructure in backward areas. The degree of perfection and operation efficiency will be directly correlated with the quality and efficiency of financial financing, resource allocation and policy transmission. Third, the government should strengthen its guidance and regulatory role in the financial market, promote the synergistic development of DFinance and regulatory innovation, accelerate the development of laws and regulations for DFinance, regulate the behavior of market participants, strengthen investor protection, so as to create favourable external conditions for the development of DFinance in China and make the advantages of DFinance fully manifest. Fourth, DFinance can help enterprises improve their management level. Enterprises should take into account their own capital situation, business results and strategic objectives, and make appropriate use of the convenience and opportunities brought by DFinance. At the same time, they should be more vigilant and take precautions against the risks that digital finance may bring.

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