

The Influence of Digital Economy on Enterprise Financialization

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Abstract. Digital economy is essentially the application of modern information technology to various economic activities, which is mainly reflected in extensive application of Internet, big data, artificial intelligence, cloud computing and other digital technologies in industrial sectors. Especially after the outbreak of COVID-19 in 2020, digital economy has shown its amazing volume and development prospect, and more and more enterprises have begun to attach importance to digital transformation. With listed companies at Shanghai Stock Exchange and Shenzhen Stock Exchange from 2011 to 2019 as research samples, this paper presents research on the influence of digital economy to enterprise financialization. It is concluded that digital economy significantly promotes enterprise financialization.

Keywords: Digital economy; Enterprises; Financialization.

1. Introduction

Today, rapid development of digital technologies has brought great impact on production and life. At the same time, digital economy also becomes a hot topic. According to the White Paper on the Digital Economy Development in China (2020), the scale of digital economy value added in China expanded from RMB 2.6 trillion in 2006 to RMB 35.8 trillion in 2019; from 2005 to 2019, the share of digital economy in China's GDP rose from 14.2% to 36.2%; in 2019, digital economy contributed 67.7% of China's economic growth. It can be seen from the above data that digital economy has greatly promoted economic growth in China. Digital economy is essentially the application of modern information technology to various economic activities, which is mainly reflected in extensive application of Internet, big data, artificial intelligence, cloud computing and other digital technologies in industrial sectors. An effective way to promote development of real economy and foster a dual-circulation (domestic and international circulation) development paradigm is to use digital economy to create development dividends and promote the application of digital technologies relating to big data and artificial intelligence in economy amidst the opportunity of development of digital economy. With technological progress, enterprise financialization is gradually more dependent on development of information technology. Since the development of digital economy is closely related to that of information technology, the research on the relationship between digital economy and enterprise financialization is of great significance in promoting enterprise financialization.

2. Literature review

In Analysis of Digital Economy from the Perspective of Political Economics, Pei Changhong, Ni Jiangfei and Li Yue et al. mainly tend to study the connotative definition of digital economy.[1] In Digital Economy and Improvement of Regional Innovation Capability,[2] Wen Jun, Yan Zhijun and Cheng Yu et al. mainly researched the role of digital economy in local innovation, and the result showed that digital economy can promote regional innovation; in Research on the Evaluation Index System of Digital Economy Development – from the Input-Output Perspective, Wan Xiaoyu, Luo Yanqing and Yuan Ye et al. specifically introduced the construction process of evaluation system for digital economy development.[3] Compared with previous research on digital economy, this index system no longer involves a single-dimension index, but it is constructed from the two perspectives of input and output.

In Enterprise Financialization and Production Efficiency[4], Hu Haifeng, Dou Bin, and Wang Aiping et al. defined enterprise financialization as the degree to which an enterprise participates in

financial activities, and the research showed that there was an inverted U-shaped relationship between the enterprise financialization and production efficiency; In Enterprise Financialization and Innovation — Re-examination from the Perspective of Industrial Policy, Shi Xuezhi and Yang Zhen et al. defined enterprise financialization as the proportion of an enterprise's financial assets in asset allocation[5].

By reference to previous research literature, this paper presents research on the influence of digital economy on enterprise financialization, where the index system of digital economy is constructed from the five dimensions, namely, the urban telecommunication business income, the number of computer-related employment, the number of Internet access users, the number of mobile phone users, and the Peking University Digital Financial Inclusion Index of China (PKU_DFIIC); the level of corporate financialization is defined as the proportion of an enterprise's financial assets in total assets. Compared with previous research literatures, the constructed indexes for digital economy are relatively more comprehensive since major influencing dimensions have been taken into account; the enterprise financialization is mainly measured by reference to the results of existing research literatures.

3. Research hypothesis and research method

3.1 Research hypothesis

Hypothesis H1: Digital economy has a positive influence on corporate financialization.

Since digital economy is closely related to regional informatization, higher development of digital economy indicates higher regional informatization which can improve operation efficiency of enterprises; furthermore, digital economy also plays a positive role in financial diversification. Therefore, the hypothesis that digital economy has a positive influence on enterprise financialization is proposed.

Hypothesis H2: The development of digital economy has a greater influence on financialization of non-state-owned enterprises than on state-owned enterprises.

Compared with state-owned enterprises, non-state-owned enterprises are more sensitive to changes in the market environment. Therefore, the hypothesis that the development of digital economy has a greater influence on financialization of non-state-owned enterprises is proposed.

3.2 Research method

Empirical analysis is adopted herein to verify foregoing research hypotheses; the specific model is fixed effect regression of panel data; and the software is stata16.0.

4. Empirical analysis

4.1 Data source, variable selection and model design

4.1.1 Data source

After consideration of the availability of data and the elimination of ST enterprises and enterprises with missing data, 1,138 domestic companies listed on Shanghai and Shenzhen stock exchanges from 2011 to 2019 were selected as research samples.

The data was from the WIND database. Through data analysis and mining, a new index system was formed to obtain the ultimate data indexes for modeling. This part of the work is done with excel, and the follow-up work is done with stata16.0.

4.1.2 Variable selection

As paper mainly focuses on the influence of digital economy on enterprise financialization, the level of enterprise financialization is used as an explained variable. Due to the uncertainty of financialization returns, by reference to previous practices, the proportion of financial assets of listed

companies in their total assets is used to measure the level of financialization. The financial assets include monetary funds, trading financial assets, derivative financial assets, interest receivable, dividends receivable, held-to-maturity investments, long-term equity investments and investment real estate. [6]

The explanatory variable is the development level of digital economy in the city where the enterprise is located. In terms of measurement indexes, the PKU-DFIIC has been widely used in empirical research. At the same time, drawing on predecessors' research results, the urban telecommunication business income, the number of computer-related employment, number of Internet access users, and number of mobile phone users (the data of these four indexes were all from China City Statistical Yearbook) are included in measuring the development level of digital economy. In this paper, entropy weight is used to reduce the dimensions of the above five indexes to obtain the index of development level of urban digital economy (dig).

Based on predecessors' research experience, the enterprise scale, enterprise asset-liability ratio, return on assets, board size and the combination of General Manager and Chairman roles are used as control variables for regression analysis. The description of the variables is shown in Table 1:

Table 1. Description of variables

Type of variables	Symbol of variables	Name of variables	Description of variables
Explained variable	fin	Enterprise financialization	Financial assets/total assets
Explanatory variable	dig	Level of digital economy	PKU_DFIIC, telecommunication business income, number of computer-related employment, number of Internet access users, number of mobile phone users are calculated using entropy weight method
Control variables	size	Enterprise scale	The logarithm of total assets
	lev	Asset-liability ratio	Total liabilities/total assets
	roa	Return on assets	Net profit/total assets
	boa	Board size	The logarithm of the number of board members
	dua	Combination of General Manager and Chairman roles	If the Chairman and General Manager are the same person, the value is 1; otherwise, the value is 0
	soe	Nature of enterprise	If it is a state-owned enterprise, the value is 1; otherwise, the value is 0

4.1.3 Model design

In order to research the influence of digital economy on enterprise financialization, the model is designed as follows:

$$\text{fin}_{it} = \beta_0 + \beta_1 \text{dig}_{it} + \beta_2 \text{size}_{it} + \beta_3 \text{lev}_{it} + \beta_4 \text{roa}_{it} + \beta_5 \text{boa}_{it} + \beta_6 \text{dua}_{it} + \gamma_t + \lambda_i + \varepsilon_{it}$$

Where, fin_{it} means the level of financialization of enterprise i in year t ; digit means the development level of digital economy in year t in the city where the enterprise i is located; size_{it} means the asset scale of company i in year t ; lev_{it} means the asset-liability ratio of enterprise i in year t ; roa_{it} means the return on total assets of bank i in year t ; boa_{it} means the board size of company i in year t ; dua_{it} means the combination of General Manager and Chairman roles at enterprise i in year t ; γ_t means the controlling for time effect; λ_i means Controlling for individual effect; ε_{it} means the random disturbance term.

4.2 Empirical content

4.2.1 Descriptive statistical analysis

Before analysis and modeling, in order to master the macro situation of variables as a whole, descriptive statistics analysis was firstly performed on the variables studied, and the results are shown in Table 2:

Table 2. Descriptive statistics of variables

Variables	Observed value	Mean value	Standard deviation	Minimum value	Maximum value
fin	12942	0.448	0.231	0.000	1.000
dig	12942	0.212	0.142	0.000	0.556
size	12942	21.990	1.211	13.080	28.260
lev	12942	0.349	0.211	-0.087	1.426
roa	12942	0.084	2.831	-0.840	298.300
boa	12942	2.142	0.199	1.609	2.708
dua	12942	0.242	0.428	0.000	1.000

It can be seen from Table 2 that the maximum value of enterprises' financialization 1; the minimum value is 0; and the mean value is 0.448, indicating that the level of financialization varies greatly among different enterprises; at the same time, the maximum value of digital economy is 0.556; the minimum value is 0; and the mean value is 0.212, indicating that there is little difference in development level of digital economy in different cities.

4.2.2 Pearson correlation test

In order to understand the correlation between each variable and the explained variable, it is necessary to carry out Pearson correlation test on the variables, and the results are shown in Table 3:

Table 3. Pearson correlation test

	fin	dig	size	lev	roa	boa	dua
fin	1						
dig	0.707***	1					
size	-0.089***	-0.103***	1				
lev	-0.422***	-0.366***	0.451***	1.000			
roa	0.026***	-0.011	-0.082***	-0.007	1.000		
boa	-0.052***	-0.065***	0.247***	0.134***	-0.001	1.000	
dua	0.054***	0.093***	-0.142***	-0.125***	-0.008	-0.183***	1

Note: “***”, “**”, “*” indicate significant correlation at levels of 1%, 5% and 10%, respectively; the value in brackets means the standard error.

It can be seen from Table 3 that the correlation coefficient between enterprise financialization and digital economy is 0.707, and is significant at the 1% level, indicating that there is significant positive correlation between enterprise financialization and digital economy at the 1% level. Similarly, it can be learned that there is a significant correlation between enterprise financialization and enterprise scale at the 1% level; a significant negative correlation between enterprise financialization and asset-liability ratio at the 1% level; a significant positive correlation between enterprise financialization and return on total assets at the 1% level; a significant negative correlation between enterprise financialization and board size at the 1% level; a significant positive correlation between enterprise financialization and combination of General Manager and Chairman roles at the 1% level.

4.2.3 Multicollinearity test of variables

Table 4. Multicollinearity test of variables

Variable	VIF	1/VIF
lev	1.450	0.691
size	1.340	0.746
dig	1.170	0.857
boa	1.090	0.916
dua	1.050	0.950
roa	1.010	0.991
Mean VIF	1.180	

If there is multicollinearity between variables, it will affect the accuracy of the model. Therefore, it is necessary to perform a multicollinearity test on the variables before regression, and the results are shown in Table 4:

Previous studies have shown that if VIF is greater than 10 or if $1/\text{VIF}$ is less than 0.1, there is multicollinearity between variables. It can be seen from Table 4 that the mean VIF of variables is 1.180. Furthermore, since the VIF of all variables is less than 10 and the $1/\text{VIF}$ is all greater than 0.1, there is no collinearity between the variables.

4.2.4 Selection of optimal model

The regression models of panel data include: mixed effect model, fixed effect model and random effect model. The model should be selected before regression.

Table 5. Selection of optimal model

Models	Test method	Test value	P value	Conclusion
Fixed & mixed	F test	28.240	0.000	Fixed effect
Random & mixed	LMF test	21923.380	0.000	Random effect
Fixed & random	Hausman test	800.710	0.000	Fixed effect

(1) The selection between mixed effect model and fixed effect model

It is tested whether μ_s which does not change with time is equal in all models. If it is equal in all models, the mixed regression model is selected; otherwise, select the fixed effect model is selected. Table 5 shows that the P value of the model is less than 0.05, indicating that the model rejects the null hypothesis that " μ_s of all companies is equal" at the 5% significance level. Therefore, fixed effect model is selected.

(2) Selection between random effect model and mixed regression model

According to Lagrange multiplier (LM) test method, the null hypothesis $H_0: \sigma_u^2 = 0$. If the null hypothesis is rejected, the random effect model is preferred; if the null hypothesis is accepted, the mixed regression model is preferred.

Table 5 shows that the P value of 0.000 is less than 0.05. Therefore, LM test rejects the null hypothesis of "no individual random effects" at 5% significance level. In other words, it is considered that the selection swings between random effect and mixed effect. In this case, the random effect model should be selected.

(3) The selection between of random effect model and fixed effect model

As to selection between fixed effect or random effect should be selected, Hausman test should be carried out. The null hypothesis $H_0: \mu_i$ is not correlated to x_{it} and z_i . It can be learned from Table 5 that the P value in the model test is less than 0.05. Therefore, the null hypothesis H_0 is rejected at the 5% significance level, and the fixed effect model other than random effect model should be selected.

In conclusion, the final model should be fixed effect regression for panel data.

4.2.5 Regress analysis

By substituting each variable into the formula for regression of model, the regression result is obtained, as shown in Table 6.

The second column of Table 6 is the regression results without addition of control variables. The results show that without addition of control variables, the regression coefficient of the digital economy in the city where the enterprise is located to the financialization of the enterprise is 1.751, which is significant at the 1% level. This indicates that development level of digital economy in the city where the enterprise is located significantly promotes enterprise financialization. To be specific, where the digital economy is increased by one unit in the city where the company is located, the enterprise financialization will increase by 1.751 units.

The third to sixth columns of Table 6 show the results after adding control variables. After gradual addition of control variables, the regression coefficient of the digital economy in the city where the company is located to the financialization of the enterprise is still significantly positive at the 1% significance level, indicating that digital economy in the city where the enterprise is located does play a significant role in promoting enterprise financialization.

Table 6. Stepwise regression analysis

Variables	fin	fin	fin	fin	fin
dig	1.751*** (0.009)	1.622*** (0.009)	1.620*** (0.009)	1.620*** (0.009)	1.620*** (0.009)
size		0.014*** (0.001)	0.016*** (0.001)	0.016*** (0.001)	0.016*** (0.001)
lev		-0.239*** (0.007)	-0.241*** (0.007)	-0.241*** (0.007)	-0.241*** (0.007)
roa			0.002*** 0.000	0.002*** 0.000	0.002*** 0.000
boa				-0.013* (0.007)	-0.013* (0.007)
dua					-0.002 (0.003)
Constant	0.077*** (0.002)	-0.127*** (0.031)	-0.174*** (0.032)	-0.146*** (0.036)	-0.145*** (0.036)
Observations	12942	12942	12942	12942	12942
R-squared	0.763	0.786	0.787	0.787	0.787

Note: “***”, “**”, “*” indicate significant correlation at levels of 1%, 5% and 10%, respectively; the value in brackets means the standard error.

4.2.6 Heterogeneity analysis

In order to study whether an enterprise is state-owned or not affects the regression result, the whole sample is divided into state-owned enterprises and non-state-owned enterprises in the regression, and the results are shown in Table 7:

Table 7. Heterogeneity analysis

Variables	fin (state-owned enterprises)	fin (non-state-owned enterprises)
dig	1.431*** (0.021)	1.723*** (0.009)
size	0.017*** (0.003)	0.009*** (0.001)
lev	-0.367*** (0.013)	-0.142*** (0.007)
roa	0.002*** 0.000	0.013 (0.010)
boa	-0.009 (0.015)	-0.011* (0.007)
dua	-0.003 (0.006)	-0.002 (0.002)
Constant	-0.038 (0.078)	-0.066* (0.034)
Observations	5220	7722
R-squared	0.664	0.883

Note: “***”, “**”, “*” indicate significant correlation at levels of 1%, 5% and 10%, respectively; the value in brackets means the standard error.

It can be seen from Table 7 that, in both state-owned enterprises and non-state-owned enterprises, the regression coefficient of digital economy in the city where the enterprise is located to the

financialization of the enterprise is significant at the 1% level, but it is greater in non-state-owned enterprises, indicating that development level of digital economy in the city where the company is located has a greater influence on enterprise financialization among non-state-owned enterprises.

4.2.7 Robustness test

Sine enterprises spend the vast majority of monetary funds on production and operation, the monetary funds are considered as a special financial asset and were excluded from financial assets in previous studies. In this paper, they are also excluded in calculation of enterprise financialization for robustness test, and the regress result is shown in Table 8.

Table 8. Robustness analysis

Variables	fin
dig	1.363*** (0.017)
size	0.091*** (0.003)
lev	-0.208*** (0.012)
roa	0.002*** 0.000
boa	-0.119*** (0.013)
dua	-0.019*** (0.005)
Constant	-1.670*** (0.064)
Observations	12942
R-squared	0.490

Note: “***”, “**”, “*” indicate significant correlation at levels of 1%, 5% and 10%, respectively; the value in brackets means the standard error.

It can be seen from Table 8 that after excluding monetary funds from financial assets, the regression coefficient of the digital economy in the city where the enterprise is located to the financialization of the enterprise is still significantly positive, indicating that the results of benchmark regression are robust and reliable. Therefore, the model robustness test is passed.

5. Conclusion

This paper presents research on the influence of urban digital economy to enterprise financialization using the listed companies at Shanghai Stock Exchange and Shenzhen Stock Exchange from 2011 to 2019 as research samples. The research result is as follows:

Urban digital economy significantly promotes enterprise financialization. The urbanization economic development level is reflective of the level of urban economic development and informatization which jointly constitute an important living environment for modern enterprises. Therefore, the higher the economic development, the higher the financialization of urban enterprises. Hence, in order to create a satisfactory financial environment, it is necessary to start with the enterprise finance from a micro perspective, and in the end, it is necessary to improve regional digital economy. The government should strengthen regional informatization construction and economic construction to improve regional digital economy. In order to improve financialization, enterprises should actively respond to the call for the development of digital economy in the region. For high-tech enterprises in particularly, they should actively improve their R&D capabilities to contribute to regional economic development, which is also a necessary measure to improve their own market competitiveness.

On the other hand, digital economy plays a greater role in promoting financialization in non-state-owned enterprises than in state-owned enterprises. Since the competition for survival is more intense for non-state-owned enterprises, it is reasonable that market changes have a greater impact on their financial development. In order to secure a place in the increasingly fierce competition, they should attach greater importance to digital transformation, so as to improve the core competitiveness.

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