Study on the Influence Mechanism and Path of Digital Transformation on the Performance of Agriculture-Related Enterprises

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Abstract. Digital transformation is an effective path for agriculture-related enterprises to adapt to the development of the digital age and achieve sustainable performance growth. In order to explore the impact of digital transformation on the performance of enterprises, based on the sample of listed agriculture-related enterprises, this paper analyzes the impact of digital transformation on the activities of agriculture-related businesses and how they operate. Empirical research shows that digital transformation has a significant positive direct impact on the way agriculture-related businesses operate, and indirectly promotes the performance improvement of agriculture-related enterprises by promoting enterprise cost optimization. Therefore, it is suggested that agriculture-related enterprises should seize the opportunity of transformation and promote the process of comprehensive digital transformation to achieve sustainable development of enterprises.

Keywords: digitalization; Enterprise performance; Agricultural enterprises

1 Introduction

In recent years, the digital economy has developed rapidly, and under the tide of the digital economy era, all walks of life will face no small opportunities and challenges. Enterprises in the manufacturing and financial industries are often able to quickly adapt to The Times and seize the opportunities of digital transformation. However, in the context of rural revitalization, the future of digital transformation of agriculture-related enterprises with weak digital foundations seems confusing, and it is particularly urgent to conduct supplementary research on it. By examining the intermediary role of enterprise cost optimization in digital transformation and the performance of agriculture-related enterprises, this paper reveals the mechanism of digital transformation of agriculture-related enterprises on enterprise performance and provides an important theoretical reference for the study of digital transformation of agriculture-related enterprises. This paper selects the data of 131 A-share listed agriculture-related enterprises from 2017 to 2022 and uses Stata17 software to conduct A series of empirical analyses and testing.

2   Research Design

2.1   Selection of Variables

(1) The explained variable is enterprise performance. This paper selects the return on total assets (ROA) of enterprises to measure the enterprise performance level of agriculture-related enterprises[1].

(2) The explanatory variable is digital transformation. Referring to the measurement method of scholars such as Wu Fei, this paper makes statistics on 99 digital-related word frequencies in four dimensions, namely, digital technology application, Internet business model, intelligent manufacturing, and modern information system, in the annual report of agriculture-related enterprises[2]. The logarithm of digital word frequency (DIG) was taken to represent the level of digital transformation of agriculture-related enterprises.

(3) The intermediary variable is the enterprise cost. In this paper, the ratio of the sum of operating costs and sales expenses to operating income will be used to measure the cost of agriculture-related enterprises[3].

(4) Control variables: The control variables selected in this paper are asset-liability ratio (lev), shareholding ratio of the largest shareholder (top1), year (year), debt-paying ability (lrate), and listing age of the enterprise[4].

2.2   Model Construction

In order to test the relationship between digital transformation and enterprise performance of agriculture-related enterprises[5], model (1) is established:

$$ROA_{i,t} = \alpha_0 + \alpha_1 DIG_{i,t} + \alpha_2 \text{Control}_{i,t} + \varepsilon_{i,t} \tag{1}$$

In order to test the mediating role of enterprise cost optimization in the impact of digital transformation on enterprise performance[6], model (2) and model (3) are further constructed on the basis of model (1):

$$cost_{i,t} = \beta_0 + \beta_1 DIG_{i,t} + \beta_2 \text{Control}_{i,t} + \varepsilon_{i,t} \tag{2}$$

$$ROA_{i,t} = \theta_0 + \theta_1 DIG_{i,t} + \theta_2 \cos t_{i,t} + \theta_3 \text{Control}_{i,t} + \varepsilon_{i,t} \tag{3}$$

In the above formula, α, β and θ are the parameters to be estimated, Control represents the control variable, and ε represents the random error.

3   Results and Discussion

3.1   Descriptive Statistics

As can be seen from Table 1, the minimum value of digital transformation of agriculture-related enterprises is 0.477, the maximum value is 1.964, and the standard deviation is 0.333. This indicates that the level of digital transformation of listed agriculture-

related enterprises is generally low, and there is a certain gap, which is consistent with reality. The minimum value of return on total assets is -0.172, and the maximum value is 0.276. It can be seen that the profitability of agriculture-related enterprises is relatively strong, most of them can maintain profitability, and the average rate of return is considerable.

Table 1. Descriptive statistics

Variable	N	Mean	Max	Min	SD
ROA	786	0.060	0.276	-0.172	0.0799
DIG	786	1.332	1.964	0.477	0.333
cost	786	0.790	1.198	0.153	0.174
lev	786	0.384	0.758	0.0467	0.162
age	786	13.18	28	1	7.635
lrate	786	2.380	19.94	0.448	2.481
top1	786	36.25	74.66	9.180	14.99

3.2   Baseline Regression

In order to test the impact of digital transformation on the performance of agriculture-related enterprises, model (1) is regressed, and the results are shown in Table 2. The regression coefficient of (DIG) to (ROA) is 0.024, which is significantly positive at the significance level of 1%, indicating that digital transformation can improve the performance of agriculture-related enterprises to a certain extent. After the addition of control variables, the coefficients and significance of explanatory variables did not change dramatically, indicating that the model results were robust.

Table 2. Baseline regression test

	ROA	ROA
DIG	0.024***	0.034***
	(2.77)	(4.22)
lev		0.183 (8.84)
lrate		0.006 (4.72)
top1		0.001*** (6.69)
year		0.002 (1.08)
age		0.000 (0.73)
Constant	0.028**	3.584
	(2.40)	(1.10)
N	786	786
R^2	0.008	0.155
F	7.691	24.989

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.3   Intermediate Effect Test

Regression analysis was performed on model (2) and model (3),and the results are shown in Table 3. In model (2), to test the effect of explanatory variables on intermediary variables, the coefficients of variables (DIG) and (cost) are significantly negative at the level of 5%, indicating that the higher the degree of digital transformation of agriculture-related enterprises, the lower the cost of enterprises, that is, the cost can be optimized. Model (3) is the intermediate effect test step 3. The influence coefficients of variables (DIG) and (cost) are both significant at the level of 1%, and the influence coefficients of (DIG) are decreased compared with the model (2). This indicates that enterprise cost plays a negative and partial mediating effect in the relationship between digital transformation and enterprise performance. The above conclusions confirm the mechanism of digital transformation on the performance of agriculture-related enterprises, that is, "digital transformation -- enterprise cost -- enterprise performance", and the proportion of intermediary effect is 29.82%. Meanwhile, this paper provides three significant tests in the process of the Sgmediation command test, namely, Sobel, Goodman1 tests, and Goodman2 tests, all of which are significant.

Table 3. Mediating effect test

	(1) ROA	(2) cost	(3) ROA
DIG	0.034^{***}	-0.036^{**}	0.024^{***}
	(4.218)	(-2.019)	(3.771)
cost			-0.284^{***}
			(-22.201)
lev	-0.183^{***}	0.352^{***}	-0.083^{***}
	(-8.837)	(7.739)	(-4.945)
lrate	-0.006^{***}	0.008^{***}	-0.004^{***}
	(-4.721)	(2.634)	(-3.918)
top1	0.001^{***}	-0.003^{***}	0.000^{***}
	(6.694)	(-6.793)	(3.058)
year	-0.002	0.003	-0.001
	(-1.084)	(0.834)	(-0.720)
age	0.000	-0.003^{***}	-0.001^{*}
	(0.730)	(-3.649)	(-1.954)
Constant	3.584	-5.142	2.123
	(1.101)	(-0.721)	(0.833)
N	786	786	786
R2	0.155	0.141	0.482
F	24.989	22.423	105.356
Sobel test	0.0102^{**} (z=2.011)		
Goodman Inspection 1	0.0102^{**} (z=2.009)		
Goodman Inspection2	0.0102^{**} (z=2.013)		
Mediating effect ratio	0.2982		

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.4   Robustness Test

This paper adopts the method of substitution variables to conduct the robustness test. The return on equity (ROE) is used as the substitute variable of ROA. The results show that the impact of the degree of digital transformation on ROE is significantly positive at the level of 1%, and the coefficient is 0.049, which is consistent with the empirical analysis above, so the empirical results have good robustness.

4   Conclusion

This paper draws the following conclusions: (1) The digital transformation of agriculture-related enterprises has a direct impact on their corporate performance, that is, the higher the degree of digital transformation of agriculture-related enterprises, the higher their corporate performance. (2) The digital transformation of agriculture-related enterprises has a certain inhibition and reduction effect on the cost of enterprises. (3) The optimization of enterprise cost plays an intermediary role in the process of the digital transformation of agriculture-related enterprises to promote the growth of enterprise performance, playing a partial intermediary role. (4) It reveals the mechanism path of the impact of digital transformation on enterprise performance: digital transformation -- enterprise cost optimization -- enterprise performance.

At the same time, it can draw some enlightenments for enterprise management: First, agricultural enterprises should adopt a digital transformation strategy, increase digital capital investment, promote the digitization process of enterprise operation process, and realize the optimization of enterprise cost. Secondly, agriculture-related enterprises should continue to promote the digital process, train more digital talents, and ensure the continuous power source of digital transformation of enterprises.

Finally, enterprises should realize comprehensive digital transformation, not only in the production and manufacturing stage but also in all aspects of sales, management, and so on, in order to achieve sustainable growth of corporate performance.

Through empirical analysis, this study innovatively shifts the topic of digital transformation to agriculture-related enterprises with less attention and takes enterprise cost as an intermediary variable to enhance the explanatory power of digital transformation affecting enterprise performance and further enriching the mechanism of digital transformation affecting enterprise performance of agriculture-related enterprises.

Future studies can further explore other pathways and mechanisms for the impact of digital transformation on firm performance of agriculture-related enterprises, so as to improve the completeness of the study. In addition, in the early stage of digital transformation, whether there is a lag in improving the performance of agriculture-related enterprises can be further explored in the future.

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