The Impact of Enterprise Digital Transformation on Book Value: a Mediating Perspective Based on ESG Performance

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Abstract: Using the data of listed companies from 2010 to 2021, From the perspective of enterprise ESG performance, this paper studies the impact of enterprise digital transformation on the book value of enterprises and finds that (1) enterprise digital transformation can improve the book value of enterprises; (2) Enterprise digital transformation can improve the ESG performance of enterprises; (3) enterprise ESG performance plays an intermediary effect between enterprise digital transformation and book value.

Keywords*:* Digital Transformation; Book Value; ESG Performance

1.introduction

Rapid development of Internet technology has brought rapid development of digital economy, and this rapid development makes digital economy become one of the important driving forces of our economy to achieve high-quality development.

The research contributions of this paper are as follows: from the perspective of enterprise ESG performance, this paper studies the impact of enterprise digital transformation on book value, clarifies the mechanism of the impact of enterprise digital transformation on book value, enricfies and improves the research on the factors affecting book value, and provides empirical evidence for further promoting the high-quality development of enterprises.

2. Literature review and research hypothesis

As a micro component of the macro economy, enterprises should accelerate their own digital transformation under the background of the rapid development of the digital economy. In recent years, many scholars have studied the impact of digital transformation on the development of enterprises, including the impact on the economic and non-economic performance of enterprises: Tu Xinyu and Yan Xiaoling (2022) believe that enterprises' digital transformation can significantly improve their total factor productivity, while Li Qi et al. (2021) believe that enterprises' digital transformation can improve their financial performance.

Modern corporate governance theory and stakeholder theory require enterprises to be responsible not only to shareholders, but also to creditors, employees, suppliers, customers, governments, communities and the environment, and pay more attention to external governance of enterprises to maximize the overall interests. With the rapid development of the digital economy, the digital transformation of enterprises also has certain effects in improving the non-economic performance of enterprises such as environmental, social and governance. Firstly, enterprise digital transformation can promote enterprise technological innovation, including the innovation and application of green technology, so as to enhance enterprises' contribution to social responsibility. Secondly, digital technology can reduce information asymmetry and transaction costs, improve the transparency of corporate information, and help enterprises better fulfill their social responsibilities. Third, the application of digital technology is conducive to improving the efficiency of resource allocation and use and enhancing the ESG practice ability of enterprises.

Based on the above conclusions, this paper proposes the following hypotheses:

H1: Enterprise digital transformation can improve enterprise efficiency

H2: Enterprise digital transformation can improve enterprise ESG performance

H3: Enterprise ESG performance plays an intermediary effect between enterprise digital transformation and enterprise book

2.1 Research design

This paper takes China's A-share listed companies from 2010 to 2021 as research samples, and the data of Shanghai and Shenzhen A-share listed companies from 2010 to 2021 as research samples. ST and ST* samples are removed, samples with asset-liability ratio greater than 1 are removed, and samples with missing data are removed. The tail reduction of 1% and 99% of the continuous variables is also carried out. The ESG data of this paper is based on the ESG rating results of China Securities, which are from wind database. The digital transformation data of enterprises is obtained by text analysis and word frequency statistics of the annual reports of listed companies. The relevant annual reports of listed companies are from the official websites of Shenzhen Stock Exchange and Shanghai Stock Exchange, and the rest data are from the CSMAR database.

2.2 Variable specification

2.2.1 Explained variable

In this paper, the return on assets (ROA) is used to measure the book value of enterprises, and the net sales rate (NPM) is used to test the robustness.

2.2.2 Explanatory variable

Enterprise digital transformation (Indigital). Referring to the research methods of Wu Fei et al. (2021), word frequency and digital transformation level of computing are utilized from five aspects: "artificial intelligence technology", "big data technology", "cloud computing technology", "blockchain technology" and "digital technology application".

2.2.3 Mediating variable

Enterprise ESG performance (ESG)

In this paper, the ESG rating data of China Securities was selected as the explained variable. The ESG score of China Securities was divided into 9 grades, which were assigned 1-9 points respectively in this paper. The higher the score, the higher the ESG rating

2.2.4 Control variable

This paper refers to the research method of Zhu Naiping et al. (2014), and selects enterprise Size (Size), Age (Age) and asset-liability ratio (Lev) as the control variables. The names, codes and definitions of the main variables are shown in Table 1.

Table 1 Main variable definitions

Variable type	Variable name	Variable code	Variable definition
Explained variable	Book value of enterprise	ROA	Return on assets = net profit/average total assets
		NPM	Net profit rate on sales = Net profit/operating income
Explanatory variable	Enterprise digital transformation	Indigital	Based on text analysis and word frequency statistics
Mediating variable	Enterprise ESG performance	ESG	China Securities ESG quarterly rating is assigned a score of 1-9, taking the average
Control variable	Enterprise scale	Size	The natural log of our ending assets
	Asset-liability ratio	Lev	Year-end liabilities/year-end total assets
	Enterprise age	Age	The age of the firm is logarithm
	Cash to assets ratio	CF	Net cash flow for the period/total assets at the end of the year
	Fixed assets ratio	Fixed	Fixed assets/total assets
	Shareholding ratio of the largest shareholder	Top	Number of shares held by the largest shareholder/total number of shares x100
	Board independence	Indep	Number of independent directors/Board of Directors x100

2.3 Model design

The model construction of this paper refers to Wen Zhonglin and Ye Baojuan (2014) 's test of mediating effect, and builds models (1)~(3) as follows:

$$ROA_{it} = \alpha_0 + \alpha_1 Indigital_{i.t} + \Sigma Controls_{i,t} + \Sigma Year + \Sigma Ind + \varepsilon_{i,t} \quad (1)$$

$$ESG_{it} = \beta_0 + \beta_1 Indigital + \Sigma Controls_{i,t} + \Sigma Year + \Sigma Ind + \varepsilon_{i,t} \quad (2)$$

$$ROA(NPM、TQ)_{it} = \gamma_0 + \gamma_1 Indigital_{i.t} + \gamma_2 ESG_{i,t} + \Sigma Controls_{i,t} + \Sigma Year + \Sigma Ind + \varepsilon_{i,t} \quad (3)$$

Model (1) tests the impact of enterprise digital transformation on enterprise book value. If α1 is significantly positive, it indicates that enterprise digital transformation can improve enterprise efficiency, and verifies hypothesis 1. Model (2) tests the impact of enterprise digital transformation on enterprise ESG performance. If β1 is significantly positive, it indicates that enterprise digital transformation can improve enterprise ESG performance, and verifies hypothesis 2. If there is a mediating effect, the β1 product (β1×γ2) of model (2) is consistent with and positive with the γ1 sign of model (3), that is, the firm's ESG shows a mediating effect between the firm's digital transformation and the firm's benefits, and verifies hypothesis 3.

3. Empirical results and analysis

3.1 Regression analysis

As can be seen from the regression results in Table 3, the coefficient of ROA in Column (1) is significantly positive, indicating that the higher the degree of enterprise digitization, the higher the book value of the enterprise. Hypothesis 1 has been verified. In column (2), the coefficient of enterprise digital transformation is significantly positive, indicating that the higher the degree of enterprise digital transformation, the better the enterprise ESG performance, hypothesis 2 is verified. The coefficient of enterprise digital transformation in column (3) is significantly positive, and the product of the coefficient of enterprise ESG and the coefficient of enterprise digital transformation in column (2) is positive, indicating that the performance of enterprise ESG plays an intermediary effect between enterprise digital transformation and enterprise book value, and hypothesis 2 is verified.

Table 2 Regression analysis

Variable name	(1) ROA	(2) ESG	(3) ROA
Indigital	0.00169***	0.02433**	0.00161**
	(2.721)	(2.468)	(2.597)
ESG			0.00317***
			(5.734)
Size	0.01910***	0.21250***	0.01842***
	(11.481)	(10.632)	(11.122)
Lev	-0.15361***	-0.56962***	-0.15180***
	(-21.685)	(-8.214)	(-21.267)
Age	-0.00356	-0.31266***	-0.00257
	(-1.211)	(-5.970)	(-0.874)
CF	0.03587***	0.01141	0.03583***
	(4.803)	(0.136)	(4.829)
Fixed	-0.04882***	0.09635	-0.04913***
	(-5.418)	(1.221)	(-5.452)
Top	0.00065***	0.00243**	0.00064***
	(6.335)	(2.335)	(6.292)
Indep	0.00423	-0.05759	0.00442
	(0.613)	(-0.529)	(0.649)
_cons	-0.27934***	2.01039***	-0.28572***
	(-7.747)	(4.202)	(-7.986)
N	29740	29740	29740
adj. R^2	0.1793	0.0559	0.2829

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.2 Robustness test

In this paper, the method of replacing explained variables is adopted to conduct robustness test. The return on assets

(ROA) of the enterprise is replaced by the net interest rate on sales (NPM) and then regression is carried out. The regression results are shown in Table 3.

Table 3 Robustness test after replacement of explained variables

Variable name	(1) NPM	(2) ESG	(3) NPM
Indigital	0.00402**	0.02433**	0.00377*
	(2.086)	(2.468)	(1.958)
ESG			0.01014***
			(6.531)
Size	0.06743***	0.21250***	0.06527***
	(14.314)	(10.632)	(14.124)
Lev	-0.41117***	-0.56962***	-0.40540***
	(-21.145)	(-8.214)	(-21.405)
Age	-0.00748	-0.31266***	-0.00431
	(-0.595)	(-5.970)	(-0.343)
CF	0.12540***	0.01141	0.12529***
	(6.219)	(0.136)	(6.253)
Fixed	-0.14253***	0.09635	-0.14350***
	(-5.466)	(1.221)	(-5.516)
Top	0.00187***	0.00243**	0.00184***
	(5.707)	(2.335)	(5.608)
Indep	0.01543	-0.05759	0.01602
	(0.591)	(-0.529)	(0.623)
_cons	-1.09816***	2.01039***	-1.11855***
	(-9.613)	(4.202)	(-9.318)
N	29740	29740	29740
adj. R^2	0.1619	0.0559	0.1640

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4. Conclusion and suggestion

Promoting high-quality development of enterprises is indispensable in achieving high-quality development of Chinese economy. Therefore, this paper attempts to boost high-quality development of enterprises and improve enterprise efficiency by studying the mechanism of influence of enterprise digitization on enterprise book value. The research results show that: (1) Enterprise digital transformation can improve the book value of enterprises; (2) Enterprise digital transformation can improve the ESG performance of enterprises; (3) Enterprise ESG performance plays an intermediary effect between enterprise digital transformation and book value.

Based on the above conclusions, this paper puts forward the following suggestions:

On the one hand, it is necessary to vigorously promote the digital transformation of enterprises, which is an important policy to promote the development of enterprises. On the other hand, attention should be paid to improving the social responsibility performance of enterprises while using the Internet and digitalization to improve other aspects of enterprises, so as to better promote the improvement of the book value of enterprises.

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