

Are Chain Shareholders Driving Digital Transformation in the Enterprise?

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Abstract. Chain shareholders play an important role in guiding the transformation of enterprises, and it is worth exploring whether they can further play an effective role in the face of the digital transformation dilemma of enterprises in the digital economy. This paper empirically examines the impact of chain shareholders on the digital transformation of enterprises by selecting the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021. The findings show that chain shareholders can significantly drive the digital transformation of enterprises and improve their economic performance, and this finding still holds after a series of robustness tests. The heterogeneity analysis shows that the role of chain shareholders on corporate digital transformation is more pronounced in non-state owned enterprises and management-owned enterprises. This paper has implications for a deeper understanding of the role of chain shareholders in the digital transformation of enterprises.

Keywords: chain shareholders; digital transformation; digital economy

1 Introduction

China's digital economy increased from 10.0% to 38.6% of GDP, and the value added of core industries reached 7.8% of GDP, providing a strong impetus for the sustainable and healthy development of the economy and society. However, the digital transformation of enterprises also faces many obstacles in economic practice^{[1][7]}. Many enterprises do not dare to transform due to insufficient basic technical skills, "cannot transform" due to high cost investment and "dare not transform" due to prolonged transformation pain. The existing literature suggests that management characteristics can have a significant impact on the digital transformation of enterprises. However, shareholders, as suppliers of corporate equity capital, are the ultimate bearers of corporate returns and risks. Differences in shareholder attributes and shareholding ratios not only affect the achievement of corporate value maximization, but also influence the effectiveness of shareholder governance and the efficiency of monitoring and disciplining management, which in turn affects the decisions made by management^[2].

Chain shareholders are a natural development of the capital market, and as the market continues to evolve and improve [8], some well-funded investors will invest in multiple companies at the same time in search of greater economic returns, with the goal of maximizing the value of the portfolio rather than maximizing the value of a particular company [3]. So in the digital economy, will chain shareholders influence the digital transformation of enterprises and what impact will they have? The investigation of this series of questions not only helps to clarify the

relationship between chain shareholders and microeconomic entities, but also has certain theoretical value and practical significance for regulating the digital transformation of enterprises.

Compared with the previous literature, the contribution of this paper focuses on the following aspects: First, this paper provides new empirical evidence on the economic consequences of the governance effects of chain shareholders from the perspective of digital transformation. Second, while most scholars study the economic contributions and consequences of digital transformation, this paper explores the motivations that promote digital transformation from another perspective, which expands the research content of the literature related to digital transformation of enterprises.

2 Theoretical analysis and research hypothesis

Unlike other investment activities, the digital transformation of enterprises has strong information asymmetry, high investment risk, uncertainty and long cycle, often affected by financing constraints, risk tolerance and information resources, only the digital transformation of the required elements are sufficient, transformation activities can be carried out. According to investor portfolio theory, chain shareholders as portfolio owners have two different characteristics relative to single investment shareholders^[4]. The first is that chain shareholders often do not seek to maximize the value of a single firm's investment^[5], but to maximize the value of the portfolio, which may lead to a tendency for chain shareholders to have investment collusion (Hassen and Lott, 1996), and second, because chain shareholders have investment experience in the industry, they tend to have information on industry development dynamics and industry characteristics^{[9][10]}, which are transmitted to different firms through the network formed by chain shareholders, showing synergistic effects (Pan, Yue et al., 2020). The resource capacity of multiple major shareholders is stronger than that of a single major shareholder, which can provide a better economic foundation for the digital transformation of enterprises^[6]. Based on the above analysis, it is hypothesized that:

Chain of shareholders significantly contributes to the digital transformation of enterprises

3 Study Design

3.1 Data source

This paper analyzes the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021. In order to improve the quality of the empirical regressions, this paper treats the data as follows: first, exclude special companies such as financial companies (including real estate companies); second, exclude ST, *ST, PT and terminated companies, and exclude the observation of listed companies with gearing ratio greater than 1; third, exclude the observation of initial public offering; fourth, exclude the observation of missing key financial variables; fifth, apply 1% and 99% tailoring to all micro-level continuous variables to reduce the interference of outliers. Finally, 32118 observations were obtained.

3.2 Variables and their definition

(1) Explanatory variable: corporate digital transformation (ADT). In this paper, we analyze the word frequency of enterprise annual reports in four dimensions: digital technology application, Internet business model, smart manufacturing and modern information system, and standardize the total word frequency according to the length of annual reports.

(2) Core explanatory variable: chain shareholders (CROSS). This paper follows the following steps to construct indicators to measure chain shareholders (CROSS): First, shareholders with shareholdings of no less than 5% are retained on a quarterly basis. According to China's securities law, shareholders with 5% shareholding have a greater influence on the company's operation and decision making, and have a natural advantageous position. Therefore, this paper takes the shareholding ratio of 5% as the cut-off point; secondly, on each quarter, we calculate how many shareholders of each company have a shareholding ratio of not less than 5% and the shareholding ratio of other companies in the same industry is also not less than 5%; finally, we find the annual average value of the above-mentioned number of chain shareholders and add 1 to take the natural logarithm. Among them, the industry according to the SEC 2012 industry standard, manufacturing subdivided into secondary codes, other industries subdivided into primary codes.

(3) Control variables: In order to improve the fit of the research model, a series of company characteristics that may affect the digital transformation of enterprises are controlled including enterprise size, gearing ratio (lev), return on net assets (roe), loss or not (loss), dual position (dual), shareholding ratio of top 10 shareholders (top10), listage, and audit opinion (opinion). top10, years of listing (listage), and audit opinion (opinion).

3.3 Model construction

To verify the effect of chain shareholders on the digital transformation of enterprises, an benchmark regression model was constructed as follows:

$$ADT_{it} = \alpha + \beta_1 Cross_{it} + \beta_2 Controls + \sum year + \sum ind + \epsilon$$

Among them, digital transformation of firms (ADT) is the explanatory variable; chain of shareholders (Cross) is the core explanatory variable; Controls are the aforementioned controvariables. Industry and Year denote the industry and year fixed effects of firms, controlling for non-time-varying factors at the industry level and the impact of shocks at the year level, respectively; ϵ is the random error term clustered to the micro-firm level.

3.4 Empirical results and analysis

The empirical results based on the baseline regression model are shown in Table 1 Column (1) is the basic regression results. From the regression results, the coefficient of the effect of chain shareholders on the digital transformation of enterprises is significantly positive, indicating that chain shareholders can significantly promote the digital transformation of enterprises. The promotion effect is still significant. The hypothesis of this paper is verified.

3.5 Substitution of explanatory variables.

In this paper, referring to Wu Fei (2021), 76 digitization-related word frequencies in five dimensions of artificial intelligence technology, big data technology, cloud computing technology, blockchain technology, and digital technology use are counted to construct the degree of enterprise digital transformation B for replacing the above degree of enterprise digital transformation A. Robustness tests are conducted, and the results are still significant as shown in column (2) of Table 1.

3.6 One period lag on the independent variable.

Since the digital transformation of enterprises has a lag effect, this paper lags the chain shareholders by one period for robustness testing, and the robustness results, as shown in column (3) of Table 1, remain significant.

3.7 Excluding some samples.

The results of the regression test after excluding some samples are shown in the table below. The excluded samples include two categories: one is sudden external factors that may interfere with the empirical results, such as the China stock market crash in 2015, so the data after 2015 are excluded and robustness tests are conducted: the second is to consider the impact of the new crown epidemic in 2020, so the sample data after 2020 are also excluded in Table 2. column (4) excludes the data after 2020. and the coefficient of chain shareholders is significantly positive; column (5) is the regression result of keeping only the data from 2010-2014, and the coefficient of chain shareholders is significantly positive. The above results show that even after excluding some samples, the empirical results still support the conclusion that the development of chain shareholders can promote the digital transformation of enterprises.

Table 1. Baseline regression results and Robustness tests

	(1) ADT	(2) ADT	(3) ADT	(4) ADT	(5) ADT
Cross	0.153*** (3.37)	0.109** (2.11)	0.166*** (3.53)	0.142*** (2.70)	0.619*** (6.53)
Size	0.460*** (24.68)	0.452*** (22.13)	0.411*** (19.37)	0.455*** (21.43)	0.275*** (8.74)
ListAge	0.475*** (27.95)	0.480*** (24.29)	0.695*** (27.56)	0.444*** (23.23)	0.259*** (9.46)
ROE	0.059*** (-2.68)	0.085*** (-3.18)	0.074*** (-2.77)	-0.060** (-2.38)	0.066 (1.57)
Dual	0.030 (1.61)	0.006 (0.29)	0.036* (1.83)	0.021 (1.00)	0.036 (1.21)
Opinion	-0.048 (-1.11)	-0.083* (-1.86)	-0.042 (-0.95)	-0.073 (-1.51)	-0.035 (-0.50)
Lev	0.751*** (-9.69)	0.696*** (-8.23)	0.695*** (-8.25)	0.759*** (-8.80)	0.362*** (-3.35)
Loss	0.016	0.036*	-0.007	0.019	-0.007

	(0.95)	(1.92)	(-0.42)	(0.96)	(-0.25)
Top10	0.146	-0.186	0.444***	-0.013	0.468***
	(1.44)	(-1.63)	(4.16)	(-0.11)	(-3.26)
Constant	8.089***	9.205***	7.747***	7.916***	3.920***
	(-20.68)	(-21.73)	(-17.95)	(-17.98)	(-6.06)
Observations	32,118	32,118	27,670	24,721	11,113
Number of id	4,028	4,028	3,828	3,468	2,447
R-squared	0.333	0.292	0.323	0.290	0.096

3.8 Heterogeneity Teste

3.8.1 Property Rights Nature Heterogeneity Test

The sample enterprises are divided into two categories according to the nature of property rights, state-owned enterprises and non-state-owned enterprises, to examine the degree of absorption of the chain shareholder drive by enterprises with different property rights attributes. The empirical results in the table below show that the regression coefficient of the non-SOE group in column (1) of Table 2 is significant at the 0.05 level, indicating that the chain shareholder gives a significant boost to their digital transformation in non-SOEs, while the regression coefficient of the SOE group in column (2) is not significant. This indicates that chain shareholders have a more significant effect on the promotion of digital transformation in non-SOEs compared to SOEs.

3.8.2 Grouping test for differences in management shareholding

Management ownership is one of the most effective ways to reduce agency costs, as it gives management the status of a shareholder and allows them to govern the company together with the chain of shareholders. This paper concludes that the chain shareholder model is likely to be more effective in driving digital transformation in management-owned companies than in non-management-owned companies. Column (3)(4) of Table 2 gives the test results for the sample of management non-ownership firms and the sample of management non-ownership firms, respectively. It shows that in management-owned firms, chain shareholders can effectively contribute to the digital transformation of the firm. In management non-ownership firms, chain shareholders are unable to have a significant impact on corporate digital transformation.

Table 2. Heterogeneity teste

	(1) ADT	(2) ADT	(3) ADT	(4) ADT
Cross	0.162** (2.13)	0.083 (1.08)	-0.921 (-0.46)	11.605*** (4.24)
Size	0.460*** (17.88)	0.429*** (11.74)	8.359*** (7.90)	15.639*** (14.73)

ListAge	0.420*** (18.66)	0.648*** (14.27)	11.738*** (9.15)	11.156*** (13.68)
ROE	-0.069* (-1.72)	-0.050 (-1.14)	-1.046 (-1.30)	-2.795* (-1.73)
Dual	0.004 (0.17)	-0.011 (-0.27)	-0.740 (-0.62)	1.579 (1.46)
Opinion	-0.106** (-2.13)	-0.031 (-0.33)	-5.766* (-1.91)	0.159 (0.08)
Lev	-0.546*** (-5.23)	-0.861*** (-5.87)	10.094*** (-2.72)	10.500*** (-2.67)
Loss	0.055** (2.18)	0.017 (0.59)	-0.991 (-1.09)	1.779** (1.98)
Top10	-0.333** (-2.38)	-0.159 (-0.79)	1.036 (0.18)	34.365*** (-6.05)
Constant	-8.815*** (-16.29)	-9.887*** (-13.45)	182.167*** (-8.57)	307.531*** (-14.23)
Observations	20,664	11,034	6,367	25,751
Number of id	3,041	1,241	1,353	3,759
R-squared	0.298	0.268	0.166	0.225

4 Conclusion and Insights

This paper empirically examines the impact and mechanism of chain shareholders on the digital transformation of enterprises using the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021. The results show that: chain shareholders have a significant positive effect on the digitalization level of enterprises, and the above findings still hold after the robustness tests of replacing variables, lagging one period, and changing the sample data years. Based on the above findings, this paper proposes the following policy recommendations.

First, we should give full play to the governance effect of the chain of shareholders to provide decision support for the digital transformation of enterprises. We should fully integrate the opinions from different perspectives of the chain of shareholders for digital transformation, and enhance the rationality of digital transformation decisions.

Second, we should give full play to the resource advantages of chain shareholders and actively promote the digital transformation of enterprises. The major shareholders with different attributes have different resources, and in the current process of mixed ownership reform of state-owned enterprises, the introduction of private capital and foreign capital major shareholders is more conducive to bringing into play the resource advantages of major shareholders with different attributes, so as to widely gather the resources of various major shareholders and fully release the role of different major shareholders' resources in promoting digital transformation.

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