

Original Paper

Research on the Impact of Enterprise Digital Transformation on The Impact of Corporate Digital Transformation on Stock Price Synchronization: Evidence from Chinese A-share Listed Firms

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Abstract

The digital transformation of enterprises is a major trend among firms currently. Clarifying its impact on stock price synchronization is a basic issue to explore how the digital transformation of enterprises can empower the capital market. Based on the data of Chinese Shanghai and Shenzhen A-share listed companies from 2010 to 2024, this paper studies the impact of digital transformation of Chinese companies on stock price synchronization. The results show that digital transformation will lead to stock price synchronization. The mechanism analysis shows that the digital transformation of enterprises improves corporate governance level and improves the stock price synchronization of the external path that analysts pay attention to. Furthermore, the efficiency of enterprise digital transformation on stock price synchronization is more significant in industries with a high level of marketization and fierce competition and small-scale enterprises. This article provides data for a deep understanding of the impact of digital transformation on stock price synchronization, provides theoretical support based on pricing efficiency for the digital transformation of enterprises to drive high capital markets, and has beneficial enlightenment for gradually improving the allocation of resources in the capital market.

Keywords

enterprise digital transformation, stock price synchronization, corporate governance level, analyst concern

1. Introduction

Since the 21st century, global technology has shown a trend of accelerated iteration and rapid changes.

Now the digital economy strategy has risen to the level of national strategy and has become a high and important thrust. The Outline of the "Fifteenth Five-Year Plan" clarifies that it is necessary to fully implement "artificial intelligence" to drive the intelligent transformation of thousands of industries, promote the deep integration of the real economy and the digital economy, cultivate intelligent original new formats, and realize the deep evolution of the digital economy to digital intelligence and energy level jump. The digital transformation of enterprises has become an important reform to enhance the competitiveness of enterprises under the background of the prevalence of digital intelligence, and it is also an indispensable path to promote enterprises to achieve high performance. According to the data of "Digital China (2025)", the value of the core industries of the digital economy has risen, and its proportion in GDP has steadily exceeded 10.5%. Obviously, promoting the construction of digital China has become a new power source for building a high level, and the digital transformation of enterprises is increasingly shouldering the strategic task of reshaping the competitive landscape and defining the boundaries of enterprises.

High stock price synchronization often restricts the efficiency of optimal allocation of resources. Stock price synchronization helps to enhance the price discovery ability of the capital market and guide capital to flow to high-efficiency enterprises more accurately, thereby improving the efficiency of resource allocation and better exerting financial influence on the real economy. Therefore, analyzing the influencing factors of stock price synchronization and exploring feasible paths for stock price synchronization have important theoretical reference value and practical guidance significance for improving pricing efficiency and promoting a high capital market. At the same time, under the wave of the digital economy, digital technology is increasingly integrated into the industry, and the economic benefits brought about by the digital transformation of enterprises have sparked extensive discussions in the academic circles. Existing studies have shown that the digital transformation of enterprises will promote internal organizational changes, weaken hierarchical boundaries, Promote the transformation of the organizational structure to a more flexible and flat structure, promote the improvement of enterprise productivity, and significantly improve the ability of enterprises to apply digital technology (Yuan Zeming et al., 2022) and the ability to deal with risks (Ma Hui, 2022), encourage the management to actively disclose more digital transformation information to the outside world, so the digital transformation of enterprises should be able to demonstrate its digital technology strength and digital strategy to investors, Attract and help investors make decisions, thereby promoting the flow of corporate characteristic information in the capital market and accelerating its integration into stock prices. To this end, exploring the impact of enterprise digital transformation on stock price synchronization has important theoretical and practical significance for exploring feasible paths for stock price synchronization, improving pricing efficiency, and promoting a high capital market.

Based on the above analysis, this paper takes Chinese Shanghai and Shenzhen A-share listed companies from 2010 to 2024 as micro samples to empirically examine the specific impact and internal mechanism of corporate digital transformation on stock price synchronization, in order to reveal the empowerment

of digital transformation from the perspective of stock price synchronization. The potential path and deep logic of China's high economy. The empirical results show that the digital transformation of enterprises has a significant negative effect on the synchronization of stock prices. Further mechanism tests prove that digital transformation improves the level of corporate governance and attracts the attention of information intermediaries such as analysts, which are the two internal logics of the synchronization of stock prices. Heterogeneity analysis shows that the negative impact of enterprise digital transformation on stock price synchronization is more significant in samples with higher marketization levels, more intense industry competition, and smaller scale.

The contributions of this paper are mainly shown in the following aspects: (1) On the one hand, it enriches the research on the causes of stock price synchronization. Empirical verification of the stock price synchronization of the digital transformation of enterprises through the two paths of internal corporate governance and external information provides a new perspective based on the active strategic choice of enterprises to understand the stock price synchronization. On the other hand, it enriches the literature on the factors affecting the synchronization of stock prices through digital transformation. (2) Explore the role of corporate governance and information in the process of digital transformation affecting stock price synchronization, and further improve the complex causal relationship between digital transformation and stock price synchronization. (3) Further excavated the heterogeneous impact of marketization level, industry competition, and enterprise scale on the synchronization between digital transformation and stock prices, and deepened the understanding of the synchronization of stock prices in digital transformation under different scenarios.

2. Literature Review

2.1 *The Economic Consequences of Enterprise Digitalization*

Enterprise digital transformation refers to the strategic behavior of enterprises using new digital technologies to optimize business processes, driven by digital technology and digital resources, to promote business and organizational transformation of enterprises, so as to achieve value creation (Fitzgerald et al., 2014; Demirkan et al., 2016). Combing the existing literature, it is found that the existing research is mainly carried out from the dimensions of corporate performance, internal governance, and capital market performance: digital transformation can improve corporate innovation capabilities, optimize corporate organizational structure, reduce external transaction costs, and promote corporate specialization. Enterprise productivity empowerment significantly improves the economic benefits of enterprises (He Fan et al., 2019;). In the process of embedding digital technology into enterprises in the digital transformation of enterprises, it is also reshaping the internal governance ecology of enterprises, auditing costs (Zhang Yongshen et al., 2021), improving the level of enterprise operations and stabilizing cash flow, which can effectively curb earnings manipulation or selective disclosure Motivation to improve internal governance level (Qi Huaijin et al., 2020). Correspondingly, the impact of digital transformation on the information efficiency of the capital market is also a cutting-

edge research hotspot. In the process of enterprise digital transformation, the company's characteristic information that was originally deposited internally and difficult to be obtained by external investors can be more fully released to the market, providing the market with Incremental characteristic information beyond financial data reduces information asymmetry and significantly improves stock liquidity (Wu Fei et al., 2021).

2.2 Factors Affecting Stock Price Synchronization

Stock price synchronization measures the information content of company characteristics contained in individual stock price fluctuations (Roll, 1988). Excessive stock price synchronization makes it difficult for the capital market to effectively direct funds to high-quality companies, thus improving capital allocation efficiency (Wurgler, 2000). There are two categories that are relevant to the article:

A class of literature mainly discusses the impact of corporate governance on stock price synchronization. Studies have shown that management has a natural advantage in corporate characteristic information. When the management has a stronger ability and motivation to conceal internal information, external investors rely more on macro-level information such as industry or market, and the stock price is more synchronized (Jin & Myers, 2006). Therefore, improving the level of corporate governance can effectively improve information transparency (Hutton et al., 2009) and stock price synchronization. Specifically, by optimizing information disclosure and strengthening power checks and balances, high internal control effectively inhibits the room for corporate management to manipulate earnings and enhances the credibility and transparency of externally disclosed information (Fang Hongxing, 2011); High corporate governance can inhibit management information embezzlement, inhibit information concealment, and release idiosyncratic information, so that corporate idiosyncratic information can be more fully integrated into stock prices (Yuan Zhizhu et al., 2009; Wang Lizhang et al., 2016), thereby improving The transmission efficiency of corporate idiosyncratic information to the market and the synchronization of stock prices.

Another type of literature mainly focuses on the impact of external factors on stock price synchronization. China's securities market is still dominated by individual investors in terms of investor structure, subject to high information acquisition costs and insufficient information mining capabilities, and often rely on information intermediaries such as analysts in the pricing process. The study found that securities analysts can improve the information content of stock prices through high information search and interpretation, greatly increasing the information barriers between companies and external investors, and the synchronization of stock prices (Huang, 2014; Cheng, 2016). Furthermore, some researchers are based on analysts' text intonation (Wu Wuqing et al., 2020), analysts' personal characteristics (Xu, 2013) and analysts' optimism bias (Xu Nianxing, 2012). Research on stock price information content from perspectives.

2.3 Literature Review

Through the review of the above literature, it can be found that enterprise digitalization can improve total factor productivity, economic benefits, and corporate governance at the micro level, and have an impact

on information, but there are still some contents that need further research: First, in the study of the economic consequences of digital transformation In terms of research, existing literature focuses on micro-level research such as total factor productivity (Zhao Chenyu et al., 2021), economic benefits (He Fan et al., 2019) and corporate governance levels, and pays less attention to market-level impact. This paper uses stock price synchronization as a market indicator to empirically test the impact and specific mechanism between the two, which is conducive to expanding the understanding of the economic consequences of digital transformation of enterprises. Second, in terms of the influencing factors of stock price synchronization, the current literature mainly focuses on corporate governance and text information, and the research on corporate governance focuses on the agency issue of management (Hutton et al., 2009), the research on text information focuses on analyst activities themselves (Yi Zhihong, 2019), text intonation (Wu Wuqing et al., 2020), analyst personal characteristics (Xu, 2013; Xu Nianxing, 2012) and other perspectives to convey the characteristic information at the enterprise level to the outside world, which in turn affects the synchronization of stock prices, and the research on the strategic transformation of enterprise digital transformation is still insufficient. Based on this, this paper further demonstrates the external research on the transmission path of stock price synchronization under the background of digital transformation, and further deepens the understanding of the role of enterprise digital transformation on stock price synchronization.

3. Theoretical Analysis and Assumptions

The core influencing factor of stock price synchronization lies in the information content of corporate characteristics contained in stock prices. When the information content of characteristics is lower, the synchronization of stock prices is higher. At this time, stock price fluctuations are mainly driven by public information such as macro and industry. Trait information is not fully integrated into stock prices. According to the information asymmetry theory, under the information asymmetry, insiders may choose to disclose the company's characteristic information insufficiently, timely or inaccurately out of self-interest motives or subject to backward information disclosure mechanisms; However, external investors are in an information disadvantaged position and can only rely more on public information when making decisions. At this time, market funds may flow to inefficient companies that follow the market's rise, while efficient companies that are dragged down by market sentiment may be undervalued., so the information efficiency of the capital market is low. In addition, the digital transformation of enterprises itself sends a signal to the outside world. The qualitative and quantitative information about digital transformation disclosed by enterprises in annual reports, press conferences and announcements naturally carries new dimensional connotations that go beyond the boundaries of financial data. When investors receive this information, it is easier for investors to interpret information such as the company's specific strategic vision, so as to inject more special information into the transaction behavior and directly synchronize the stock price.

The key to stock price synchronization is to improve the key information content of the stock price and

integrate more characteristic information into the stock price. To achieve this goal, both internal and external aspects need to be coordinated. On the one hand, it is necessary to improve internal corporate governance, and on the other hand, it is necessary to improve corporate information.

From the perspective of internal corporate governance, first, digital transformation can improve the operating efficiency of enterprises, stabilize the cash flow performance of enterprises, and weaken the agency motivation of management. Jin and Myers (2006) research pointed out that if there are problems in the internal operation of the company, the insiders of the company are more likely to carry out self-interested activities. Enterprises undergoing digital transformation use digital technology to predict changes in supply and demand, enhance supply chain elasticity, and stabilize business operations (Gu et al. 2021; Tao Feng et al., 2023), the internal coordination costs and external transaction costs of enterprises, and improve business operations. Good operational efficiency will motivate management to whitewash reports through earnings management (Zhao Ling et al., 2022). In the case of operational stability, managers are more inclined to truthfully disclose information rather than manipulate figures, thus enhancing the credibility of financial information. Investors incorporate these differentiated information into the pricing model when making decisions, so that the stock price can more accurately reflect the company's unique management efficiency. Second, digital transformation can improve the effectiveness of internal supervision, fundamentally restrain the management's opportunistic behavior ability and space, and improve the accuracy of public information. First of all, digital transformation is conducive to cross-departmental communication and cooperation within the enterprise, realizes the transparency of each business chain, breaks the "information island" between departments, and realizes comprehensive and real-time supervision. Secondly, the organizational structure of enterprises undergoing digital transformation is more conducive to expanding grassroots power, limiting the information monopoly advantages and discretionary power of enterprise insiders (Luo Jinhui & Wu Yilong, 2021), effectively acting as an agent for conflict issues, and effectively restricting the self-interest of management Behavior. Studies have shown that the improvement of the effectiveness of internal supervision will significantly improve the internal control of enterprises (Zhang Qincheng et al., 2022) and accounting information (Qi Fei et al., 2024), thus ensuring the accuracy of information.

From the perspective of company information, while the digital transformation of enterprises improves the information content, it also needs external promotion, and the market information media builds a communication bridge for enterprises and investors with its professional information mining and analysis capabilities, and promotes more The company's characteristic information is absorbed by the capital market, which provides an indispensable boost to the synchronization of stock prices. First, the digital transformation of enterprises will attract external attention. First of all, digital transformation has expanded the information pool that analysts can mine. These idiosyncratic information provide analysts with rich materials beyond financial statements, and can conduct more value research and judgment on enterprises, directly attracting more analysts to start tracking digitalization. Companies with a high degree of transformation (Wu Fei et al., 2021; Wei Yanlin et al., 2022). The degree of attention has

correspondingly increased the number and reliability of research reports, providing investors with richer and more reliable information (Jin Xiankun et al., 2023). In the process of helping investors make decisions, accelerate the rapid integration of corporate characteristic information into stock prices (Yuan Zeming et al., 2024), the common fluctuations at the market and industry levels in the stock price have been diluted, and the synchronization of the stock price has declined accordingly. Second, digitalization has transformed the information processing costs of analysts. Digital tools enable analysts to quickly extract key variables with the help of data mining and statistical tools, the cost of information collection (Qi Fei et al., 2024), and improve the accuracy of analyst forecasts (Wang Yao et al., 2023). Second, digital transformation accelerates the integration of information into stock prices. With the help of digital systems, enterprises can transmit high-frequency data to the market in near real time, and the inflow of high-frequency information makes stock prices form a continuous and dynamic trajectory. When the interval between information reaching the market is shortened, the stock price can more quickly capture small changes in the company's fundamentals, thus making the stock price passively dependent on the joint impact of the market and the industry. The improvement of capital market information is conducive to more high corporate information for investors, making more investors willing to actively trade based on the company's characteristic information. The market caused by information problems improves stock liquidity and accelerates the integration of corporate information into stock prices. As transactions based on idiosyncratic information increase, stock prices will naturally reflect more company-level factors, and stock price synchronization will decrease accordingly.

Based on the above analysis, this paper puts forward the following assumptions:

Hypothesis: Enterprise digital transformation will lead to stock price synchronization

4. Research Design

4.1 Sample Selection and Data Resource

This paper takes Shanghai and Shenzhen A-share listed companies from 2010 to 2024 as observation objects, and cleans the initial data as follows: (1) exclude companies belonging to the financial industry; (2) Observations with missing and abnormal core variables are eliminated; (3) Eliminate companies with missing data; (4) delete samples that have been PT, ST and ST * during the sample period; (5) All microscopic continuous variables were tailed down at the 1% and 99% levels. Finally, 19,062 observations were obtained. The main raw data used in this study comes from the Guotai'an (CSMAR) database, and the enterprise digital transformation data comes from the annual reports of listed companies.

4.2 Variable Definition

4.2.1 Explained Variable

Share price synchronicity (SYN). Referring to the practice of Durneave (2003), first use model (1) to estimate the goodness of fit (R^2) of individual stocks to measure the strength of public information at the market and industry levels to explain the price fluctuations of individual stocks. Then, according to model (2), the logarithmic transformation of R^2 is carried out, thus constructing the core explained variable of

this paper, stock price synchronism, which is recorded as SYN.

$$R_{i,t} = \alpha_i + \beta_{i,1}R_{m,t} + \beta_{i,2}R_{I,t} + \varepsilon_{i,t} \quad (1)$$

$$SYN = \log\left(\frac{R^2}{1-R^2}\right) \quad (2)$$

Among them, $R_{i,t}$ is the rate of return of individual stock i in the t week; $R_{m,t}$ and $R_{I,t}$ are the market and industry returns in the t week respectively, both of which are calculated using the weighted average method of total market capitalization, and the industry classification follows the industry standard revised by the China Securities Regulatory Commission in 2012.

4.2.2 Explanatory Variable

Digital transformation (DA). As the core carrier of the annual report, "Management Discussion and Analysis" elaborates on forward-looking information such as business and operating conditions of enterprises, from which we can comprehensively observe the degree of digital transformation of enterprises. Referring to the research of Jin Xingye et al. (2024), and drawing on its digital transformation keyword corpus to establish a relatively complete digital dictionary, on this basis, with the help of python to count the emergence of digital transformation in the "Management Discussion and Analysis" paragraph, as a measurement variable of the degree of digitalization (DA) of enterprises.

4.2.3 Control Variables

When this paper selects control variables, it mainly controls two aspects of enterprise characteristics and enterprise performance. In terms of enterprise characteristics, it selects enterprise Size (Size), asset-liability ratio (Lev), Fixed asset ratio (Fixed), current ratio (Liquid), Capital intensity (Cap) and Intangible asset ratio (Intangible) are used as control variables; In terms of corporate performance, return on assets (ROA), price-to-book ratio (PB), Tobin Q value (TobinQ) and Growth (Growth) are selected as control variables.

The main variables and their specific measures are shown in Table 1.

Table 1. Main Variable Definition Table

Variable Name	Variable Symbol	Variable Definition
Stock Price Synchronicity	SYN	Defined as described previously
Corporate Digital Transformation	DA	Due to the large magnitude of word frequency counts for the explanatory variable of digital transformation, this paper adjusts its unit to "per hundred times" for ease of interpretation.
Firm Size	Size	Natural logarithm of total assets at year-end
Leverage Ratio	Lev	Total liabilities at year-end / Total assets at year-end

Capital Intensity	Cap	Total assets / Operating revenue
Current Ratio	Liquid	Current assets / Current liabilities
Proportion of Fixed Assets	Fixed	Net fixed assets / Total assets
Proportion of Intangible Assets	Intangible	Net intangible assets / Total assets
Return on Assets	ROA	Net profit / Average total assets
Price-to-Book Ratio	PB	Stock price per share / Net assets per share
Tobin's Q	TobinQ	(Market value of tradable shares + Non-tradable shares × Net assets per share + Book value of liabilities) / Total assets
Growth	Growth	Growth rate of operating revenue
Province	Province	Province of registration
Industry	IndustryName	Industry classification name based on the 2012 CSRC industry classification
City	City	City of registration

4.3 Model Construction

In order to test the impact of enterprise digital transformation on stock price synchronization, the following model is constructed to test the above research assumptions:

$$SYN_{i,t} = \beta_0 + \beta_1 DA_{i,t} + \beta_2 Control_{i,t} + \sigma_i + \theta_i + \varepsilon_{i,t} \quad (3)$$

Among them, the subscripts i and t represent the enterprise and year respectively. The explained variable "stock price synchronization" ($SYN_{i,t}$) is the stock price synchronization of enterprise i in year t , and the core explanatory variable "digital transformation" ($DA_{i,t}$) is the digitalization level of enterprise i in year t . $Control_{i,t}$ represent control variables, σ_i and θ_i are fixed effects of firm and year, respectively, and $\varepsilon_{i,t}$ are stochastic perturbation terms.

5. Empirical Analysis

5.1 Benchmark Regression

The results of the benchmark regression analysis are shown in Table 2. In the table, the regression result for column (1) DA was -0.14 and passed the significance test at the 1% level. Column (2) performed firm-individual and year fixed effects, with a regression coefficient of -0.17 for DA, significant at the 10% level. Number (3) adds control variables on top of (2), and the regression result is -0.25 , which is significant at the 1% level. This shows that the digital transformation of enterprises does have a negative effect on the synchronization of stock prices, verifying Hypothesis H1.

Table 2. Benchmark Regression Results

	(1)	(2)	(3)
	SYN	SYN	SYN
DA	-0.14*** (-4.12)	-0.17* (-2.50)	-0.25*** (-3.79)
Control	No	No	Yes
Year/stked	No	Yes	Yes
robust	No	Yes	Yes
N	19062.00	19062.00	19062.00
R ²	0.00	0.48	0.49

5.2 Robustness Test

5.2.1 Replace Explained Variable

Re-estimate by replacing the measure of stock price synchronism, drawing on the practice of existing literature (Piotroski & Roulstone, 2004; Guletal, 2010), the market and industry the lagging term of the rate of return is included in the model (1) to control the endogenous interference brought about by the market model estimate. As shown in the model (4), other variables remain unchanged from the model. The re-estimated stock price synchronism is substituted into the model (3), and the regression results are shown in column (1) of Table 3. The data shows that the negative effect is still significant at the 1% statistical level, and the results are still robust.

$$R_{i,t} = \alpha_i + \beta_{i,1}R_{m,t} + \beta_{i,2}R_{i,t} + \beta_{i,3}R_{m,t-1} + \beta_{i,4}R_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

5.2.2 Replace Explanatory Variable

In order to eliminate the measurement errors that may be caused by the differences in the length of annual reports of different companies, and to measure the degree of digitalization more purely, this paper standardizes the digital word frequency, divides the digital word frequency by the total number of words in the full text of the corresponding annual report, and obtains a new The explanatory variable digital word frequency is regressed, and the regression results obtained are shown in column (2) of Table 3. The regression coefficient is -0.24, which is significant at the 1% level, and the results are still stable.

5.2.3 Subsample Regression

In order to mitigate the possible interference of extreme financial events on causal identification, this paper focuses on the 2015 stock market crash that occurred during the study period. Referring to the method of Tang Song (2020), we excluded the observations in 2015 to exclude the impact of this temporary market shock. The regression results in column (3) of Table 3 show that the negative effect of enterprise digital transformation on stock price synchronization is still significant at the 1% statistical level. At the same time, in order to mitigate the possible interference of macro shocks on causal identification, this paper further focuses on the outbreak of COVID-19 at the end of 2019. Referring to

the above ideas, we excluded the sample range from 2020 to 2022 to rule out the extensive economic disturbances and market anomalies brought about by this special period. The regression results in column (4) of Table 3 show that the negative effect between the two is still significant at the level of 5%.

The above research shows that the basic relationship between the synchronization of stock prices in digital transformation has cross-cycle robustness, and is not driven by abnormal stock market fluctuations in a specific period, nor is it affected by special circumstances during the epidemic, thus proving the robustness of the aforementioned research conclusions sex.

5.2.4 Fixed Effect

In order to further alleviate the omission variable bias caused by the heterogeneity of regional institutional differences, this paper introduces the fixed effect re-estimation of provinces. The results are shown in column (5) of Table 3. The results show that the negative effect between the two is still significant at the 1% level. The test results are consistent with the benchmark regression results, which further shows that the core research of this paper, the digital transformation of enterprises, is robust and reliable for the stock price synchronization results.

Table 3. Robustness Test Results

	(1)	(2)	(3)	(4)	(5)
	SYN	SYN2	SYN	SYN	SYN
DT	-4.83*** (-3.62)				
DA		-0.21*** (-3.54)	-0.24*** (-3.53)	-0.27** (-3.22)	-0.27*** (-3.87)
Control	Yes	Yes	Yes	Yes	Yes
Year/stkcd	Yes	Yes	Yes	Yes	Yes
robust	Yes	Yes	Yes	Yes	Yes
N	19062.00	19062.00	18512.00	11000.00	19062.00
r2	0.49	0.50	0.47	0.51	0.50

5.3 Endogenous Analysis

5.3.1 Explanatory Variables Lag One Period

Considering the two-way causal correlation between stock price synchronization and enterprise digitalization, in order to exclude the impact of reverse causality on the estimated results, this paper lags the core explanatory variables by one period, and the regression results are shown in column (1) of Table 4. The results showed that the negative effects of the two methods were consistent with the baseline regression through a significance level of 1%, and the results were still robust.

5.3.2 Instrumental Variable Method

Referring to existing practices, this paper uses the average degree of digital transformation of other enterprises in the same industry in the same year as the tool variable IV1 (Xiao Tusheng et al., 2022), and uses a two-stage regression method to alleviate the deviation, the regression results are shown in columns (2) and (3) of Table 4. First of all, the digital transformation of enterprises is largely affected by external influences, and enterprises in the same region will inevitably observe and imitate each other. Therefore, there is a correlation and correlation requirement between other enterprises in the same region and the enterprise itself. Secondly, when calculating the digital transformation of enterprises in the same region, excluding oneself, the overall average performance does not directly affect micro-decision-making, exogenous requirements. The regression results proved that in the first stage of regression, the regression results were significantly positively correlated at the level of 1%, and the hypothesis of instrumental variable correlation was established. In the second stage of regression, the weak tool test value is 548.079, which is significantly greater than the standard value at the 10% level, indicating that the risk of the weak tool variable is low, and the tool is not a weak tool variable; The test value in the under-identification test was 26.288, and its p value was less than 0.01, which significantly rejected the null hypothesis at the 1% level, and the model did not have under-identification problems. The above shows that the instrumental variables selected in this paper are effective, and the instrumental variable method is used to re-estimate. The coefficient of the explanatory variable DA is significantly negative at the 1% level, which is consistent with the benchmark regression, and the results are still robust.

5.3.3 Propensity Matching Score

Considering that the sample self-selection problem may interfere with causal inference, this paper deals with it through the propensity matching score method to identify the relationship between core variables more reliably. Referring to the practice of Zhang Yongshen (2021), this paper takes the numbers with word frequency greater than 0 in digital transformation as the experimental group, the ones equal to 0 as the processing group, the control variables in the benchmark regression as the covariates, and estimates the propensity score based on the Logit model., use the kernel matching method to pair samples, and use the common support domain and the estimated average processing effect that allows parallel matching. Judging from the results before and after matching, the degree of covariate bias before and after matching has decreased significantly, and the standardized bias of the sample data Both are controlled below 10%, and the p value is basically significant, indicating that the matching effect is good. The model is most re-estimated using matched samples, and the regression results are shown in Table 4 (4). The regression result coefficient is -0.253, which is significant at the 1% level, and the results are consistent with the benchmark regression results.

5.3.4 Entropy Balance Test

Furthermore, due to the differences between the covariates of the samples of the treatment group and the control group, and these differences may be directly related to the synchronization of the stock price, in order to strengthen the robustness of the benchmark regression conclusion, this paper further uses the

entropy balance method to re-estimate, and at the same time Control the first-order moments of the samples of the treatment group and the control group, and realize the precise matching of the covariate distribution of the two groups of samples without losing the sample observation value. Referring to Hainmueller's (2012) control method for covariate dimensions, when selecting the optimal weight, the covariate and the quadratic and cross terms of each variable are included on the original basis to achieve the distribution balance of degrees. After entropy balance matching, the regression results are shown in column (5) of Table 4. The results show that the negative effect is significant at the 5% confidence level, and the results are consistent with the benchmark regression.

Table 4. Regression Results of Endogeneity Test

	(1)	(2)	(3)	(4)	(5)
	SYN	DA	SYN	SYN	SYN
L.DA	-0.2234*** (-2.8004)				
IV1		0.4336*** (6.8144)			
DA			-1.7793*** (-3.3675)	-0.2530*** (-3.7517)	-0.2589** (-2.5505)
Constant	-3.9032*** (-7.7406)	-0.7352*** (-5.6474)		-3.7901*** (-9.5561)	-3.6484*** (-5.3367)
Control	Yes	Yes	Yes	Yes	Yes
Observations	14979	19062	19062	19062	19062
R-squared	0.507	0.823	-0.004	0.490	0.508
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap rk LM statistic			26.288		
Cragg-Donald Wald F statistic			548.079		
			16.38		

5.4 Mediation Effect Analysis

The above research verifies that the digital transformation of listed companies in Chinese country will lead to stock price synchronization, and this part will further test the intermediary mechanism of digital transformation on stock price synchronization from two aspects of internal corporate governance and external information. Drawing on the two-step method of Jiangchuan (2022) to test the mediating effect, the following model is constructed on the basis of model (3) for testing:

$$M_{i,t} = \alpha_0 + \alpha_1 DA_{i,t} + \alpha_2 Control_{i,t} + \sigma_i + \theta_i + \varepsilon_{i,t} \quad (5)$$

where i, t distributions represent firms and years; M denotes a mechanism variable; Other variables consistency.

5.4.1 Improve the Level of Corporate Governance

The improvement of corporate governance through the digital transformation of enterprises is mainly reflected in: First, the company's operating efficiency is improved through digital means, so that the management conceals real information in order to achieve the salary assessment goals; The second is to enhance the effectiveness of internal supervision, restrain the opportunistic tendency of management, and enhance the accuracy of information.

In order to accurately measure the level of corporate governance, this paper draws on the research of Bai Chongen (2005) and Fang Hongxing et al. (2013), selects the proxy variables of corporate governance, and extracts the first through principal component analysis (PCA). Principal components, based on which a comprehensive index to measure the level of corporate governance is constructed. In addition, in order to further describe the discretionary space of management in accounting treatment, earnings degree (Es) is used to measure the earnings management space of enterprise management. Based on the above model, the results are shown in Table 5. The results from columns (1) to (3) of Table 6 show that the digital transformation and corporate governance variable (Sup) are significantly positive at the 5% level, and the earnings degree (Es) is significantly negative at the 5% level, indicating that digital transformation does improve corporate governance. Effectively supervise the management and thus improve the company's information content.

5.4.2 Improve Company Information

The improvement information of enterprise digital transformation is mainly reflected in: first, attract the attention of analysts and digital transformation enterprises, so that they can better play the role of information media; The second is to accelerate the integration of information into stock prices, attract more investors to more actively obtain corporate-specific information, and integrate it into stock prices. This paper draws on the research of Pan Yue et al. (2011), and uses the total number of analysts who issue investment ratings and earnings forecasts for listed companies within a year as the calculation basis to measure analyst attention (lnAnaAtten). Drawing on the research of Wang Xiaohong et al. (2022), the indicator Zeros _ Y is constructed based on the ratio of the number of days with zero return in the year to the number of days traded in the year to measure the integration of corporate information into stock prices. The results are shown in Table 5. The results from columns (4) and (5) of Table 5 show that digital transformation and analyst attention (lnAnaAtten) are significantly positive at the 1% level, and Zeros _ Y are significantly positive at the 1% level. It is negative, indicating that digitally transformed companies will pay attention to external analysts, and at the same time, investors' corporate characteristic information accelerates the integration of corporate information into stock prices, and stock prices are synchronized.

Table 5. Mechanism Analysis of Enterprise Digital Transformation on Stock Price Synchronization

	(1)	(2)	(3)	(4)	(6)
	SYN	Sup	Es	lnAnaAttenn	Zeros_Y
DA	-0.25*** (-3.79)	0.10** (2.80)	-0.98** (-3.25)	0.38*** (5.59)	-0.01*** (-6.90)
Control	Yes	Yes	Yes	Yes	Yes
Year/stked	Yes	Yes	Yes	Yes	Yes
robust	Yes	Yes	Yes	Yes	Yes
Constant	-3.79*** (-9.58)	-1.82*** (-7.28)	10.51*** (3.43)	-5.51*** (-11.99)	-0.07*** (-8.36)
N	19062.00	19062.00	19062.00	19062.00	19062.00
r2	0.49	0.87	0.48	0.75	0.63

5.5 Heterogeneity Analysis

This paper further explores the differences in the impact of digital transformation on stock price synchronization from the three levels of market, industry, and enterprise, that is, the heterogeneity of marketization level, industry competition degree, and enterprise size. In view of whether there are significant differences in group regression coefficients, Fisher's combination test is used to test. Specifically, the P value of the difference between groups is obtained through repeated sampling of 1000 simulations by the Bootstrap sampling method to verify the heterogeneity of the coefficients between groups.

5.5.1 Heterogeneity Analysis Based on Marketization Level

The degree of marketization varies in different regions. Highly market-oriented regions have relatively complete market economic systems and usually have more mature information infrastructure, which enables the digital transformation of enterprises to support resources more smoothly. The massive amount of information generated by enterprises through digital transformation, can be more fully and quickly obtained by the market. This article expects that in areas with a high level of marketization, it will provide stronger support for the value creation and information release of the digital transformation of enterprises, so that the characteristic information generated by the digital transformation of enterprises can be effectively integrated into the mature market, thereby having a significant impact on the synchronization of stock prices. Influence.

Based on the data of "China's Marketization Index Report by Province (2024)", this paper divides the sample into two groups of high and low marketization index according to the median, and performs regression tests in groups. The results are shown in columns (1) and (2) of Table 6 show. The results show that the negative effect is significant in areas with higher marketization level, but not significant in

areas with lower marketization level. This shows that in regions with a high level of marketization, the role of digital transformation on stock price synchronization is more obvious, which is consistent with the above analysis.

5.5.2 Analysis of Heterogeneity Based on Industry Competition

The degree of market competition varies in different industries. In highly competitive industries, the strategic deployment of enterprises to promote digital transformation has evolved from an optional item to a compulsory item (Zhu Xiumei et al., 2023). In a highly competitive industry, the management has a stronger motivation to actively disclose the progress and achievements of digital transformation, which improves the company's characteristic information supply and the synchronization of its stock price. This paper expects that in the highly competitive market structure of the industry, the digital transformation behavior of enterprises will have a stronger information effect and governance effect, thus having a more significant effect on the synchronization of stock prices.

Drawing on the existing research practices, the Herfindahl-Hirschman Index (HHI) calculated according to the asset size is used as the proxy variable of the degree of industry competition, and the sample is divided into high and low groups according to the median. The group regression results are as shown in Table 6 shown in columns (3) and (4). The results show that the impact of enterprise digital transformation on stock price synchronization is more significant in industries with high industry competition, and not significant in industries with low industry competition. This shows that industries with more intense competition can better promote the digital transformation of enterprises, have stronger information effects and governance effects, and are more conducive to the synchronization of stock prices, which is consistent with the above analysis.

5.5.3 Analysis of Heterogeneity Based on Firm Size

In the pricing process of the capital market, small and micro enterprises often have more serious information asymmetry with investors due to their small scale, weak business structure, insufficient voluntary disclosure, and weak internal control. At the same time, there is a lack of analysts and institutional investors. With the stable tracking of investors, investors are more inclined to rely on public information at the market and industry levels to make decisions with limited attention. This article expects that among small-scale enterprises, digital transformation will play a stronger role in information empowerment and signal sending, which can effectively alleviate the inherent lack of information in small and medium-sized enterprises, and the stock price synchronization is significant.

In this paper, the sample is divided into high and low groups based on the asset size according to the median, and the regression results are shown in columns (5) and (6) of Table 7. The results show that the negative effects of the two are more significant in smaller companies, which shows that the marginal information release effect of digital transformation of smaller companies is stronger, and the digital effect is faster transformed into observable performance changes, and is recognized by the market. Quick identification has a more significant effect on stock price synchronization, which is consistent with the above analysis.

Table 6. Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	High Marketizati on Level	Low Marketizati on Level	High Industry Competition	Low Industry Competition	Large Firm Size	Small Firm Size
DA	-0.34** (-3.24)	-0.13 (-1.35)	-0.47*** (-4.70)	-0.06 (-0.65)	-0.05 (-0.48)	-0.33** (-2.77)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Year/stkcd	Yes	Yes	Yes	Yes	Yes	Yes
robust	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-3.48*** (-5.65)	-3.50*** (-6.10)	-3.68*** (-6.31)	-3.73*** (-5.79)	-4.89*** (-6.63)	-3.62*** (-4.25)
N	8405.00	10449.00	9543.00	9030.00	9490.00	9345.00
r2	0.50	0.52	0.51	0.51	0.48	0.53
F	14.18	19.43	14.54	21.28	15.01	19.37
Difference between groups P value	0.06		0.000		0.000	

6. Conclusion and Enlightenment

As an important reform to enhance the competitiveness of enterprises under the background of the prevalence of digital intelligence, the digital transformation of enterprises affects the internal governance level of enterprises and external information, and even affects the measurement of the efficiency of resource allocation in the capital market. Taking China's Shanghai and Shenzhen A-share listed companies from 2010 to 2024 as samples, this paper analyzes and verifies the negative effect and specific mechanism of corporate digital transformation on stock price synchronization. The core conclusion is still valid after controlling potential endogenous biases. Further mechanism analysis proves that digital transformation plays a role through two paths: on the internal path, digital transformation improves the level of corporate governance to improve information disclosure, thereby enhancing the transparency of company-specific information; On the external path, digital transformation has increased the attention of analysts, accelerated the process of integrating information into stock prices, and made stock prices better reflect the company's characteristic information. The heterogeneity analysis further found that the effect of digital transformation on stock price synchronization is more prominent in companies with a higher level of marketization, more intense industry competition, and smaller scale. Based on the above research findings, this paper puts forward the following implications:

(1) Enterprises should actively promote the digitalization process. Digital transformation can not only optimize internal processes and strengthen internal control, but also an important mechanism to improve

the company's characteristic information supply and information asymmetry. Enterprises should use digital technology to optimize internal business processes, strengthen internal control, and actively display company-specific information such as phased results of digital transformation, application scenarios, and future business potential, and rely on macro-level information, so as to effectively synchronize stock prices.

(2) Different types of enterprises should implement their own digital transformation strategies according to their own scale, industry and marketization. Studies have shown that under the condition of limited resources, the marginal improvement effect of digital transformation is more prominent for small enterprises, and resources should be concentrated to prioritize the deployment of lightweight digital management tools; Enterprises in highly competitive industries are facing greater pressure on information transmission, and should highlight their differentiated competitive advantages in data assets and intelligent decision-making in external disclosure; Enterprises located in areas with a high level of marketization should make full use of the advantages of regional information diffusion to accelerate the transmission of company-specific information to the capital market, thereby increasing the information content of their own stock prices.

(3) In the process of comprehensively promoting digital transformation, enterprises must also establish a data security governance framework for the risks that may be brought about by technology applications. Although digital transformation is generally conducive to the synchronization of stock prices, if it ignores possible derivative problems such as information leakage and false signals, it will exacerbate market misjudgment and information asymmetry. Therefore, enterprises should conduct regular audit tests to ensure the fairness, accuracy and reliability of their output reports.

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