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The Impact of Digital Transformation on Cost Stickiness in Enterprises

Chenyue Zhu[1]

[1] Xi'an International Studies University, China

Correspondence: Chenyue Zhu, Xi'an International Studies University, Xi'an, Shaanxi, China

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Abstract

Against the backdrop of rapidly advancing emerging digital technologies, digital transformation is increasingly integrated with enterprise production and management activities. Based on data from A-share listed companies in China from 2012 to 2023, this paper investigates the impact of digital transformation on cost stickiness. The study finds that digital transformation significantly suppresses cost stickiness in enterprises, and this conclusion remains robust after a series of sensitivity tests. The inhibitory effect of digital transformation on cost stickiness is more pronounced in small and medium-sized enterprises, asset-intensive firms, non-state-owned enterprises, and enterprises located in central and western regions. Mechanism analysis reveals that digital transformation can reduce cost stickiness by enhancing the quality of internal control and improving the transparency of accounting information. These findings have important implications for encouraging enterprises to accelerate digital transformation, reduce cost stickiness, and achieve high-quality development.

Keywords: digital transformation of enterprises, cost stickiness, internal control, accounting information transparency

1. Introduction

In recent years, digital transformation has deeply integrated digital technologies and industries into various sectors of the economy and society, providing new momentum for the development of new quality productive forces. The 2024 Government Work Report emphasizes the importance of accelerating the development of the digital economy and promoting the deep integration of digital technologies with the real economy. However, Chinese enterprises continue to face high transaction, labor, tax, financing, and logistics costs, largely due to outdated production technologies and inefficient cost management. Excessive cost stickiness—where costs do not decline proportionally with revenue—reflects poor cost control and increases operational risk, hindering high-quality development.

Cost stickiness often stems from adjustment costs, agency problems, and managerial expectations. According to principal-agent theory, conflicts of interest between managers and owners can lead to over investment and excessive non-productive spending, intensifying cost stickiness. Identifying the factors influencing cost stickiness and exploring effective mitigation strategies are therefore critical for enhancing enterprise cost management and achieving high-quality growth.

Existing literature has shown that digital transformation can improve enterprise efficiency, innovation, and financial transparency, while reducing agency costs and financing constraints. Recent studies further suggest that digital transformation may suppress cost stickiness by enhancing management efficiency, leveraging data analytic, and reducing reliance on labor. Building on this foundation, this paper investigates the impact of digital transformation on cost stickiness in Chinese A-share listed firms and explores the mechanisms through which this effect occurs.

2. Research hypotheses

2.1 Enterprise Digital Transformation and Cost Stickiness

Cost stickiness refers to the asymmetric adjustment of costs in response to changes in business activity. Specifically, when revenue declines, the decrease in costs tends to be less than proportional, indicating a non-symmetric relationship between costs and business volume (Banker & Chen, 2006)[1]. Excessive cost stickiness often reflects inefficient resource allocation, leading to over investment during business expansion and delayed cost reductions during downturns. This inefficiency results in resource waste and constrains both enterprise and broader economic

high-quality development (Zhang Lu et al., 2019) [2]. When businesses fail to reduce inputs proportionally during periods of declining activity, significant waste can occur, impeding economic efficiency and transformation (Zhao Can et al., 2020) [3].

To cope with external environmental changes, enterprises have pursued digital transformation by implementing organizational restructuring, technological innovation, and strategic adjustments, thereby improving operational efficiency and resource allocation capabilities. Through the application of digital technologies such as big data, cloud computing, and artificial intelligence, firms can dynamically monitor production and sales data, enabling timely adjustments in resource input and enhancing management flexibility and foresight (Qi Yudong et al, 2020) [4]. Moreover, digital transformation fosters the development of resource-sharing mechanisms, which reduce internal communication barriers and transaction frictions (Meng Xia, 2022) [5]. This in turn improves supply chain responsiveness and mitigates uncertainty in external operations.

In summary, digital transformation enhances firms' capacity for dynamic resource adjustment and optimizes resource allocation efficiency, thereby fundamentally weakening traditional cost stickiness. Based on this, the paper proposes the following hypothesis:

H1: Digital transformation can effectively suppress cost stickiness.

2.2 The Impact of Internal Control on the Relationship Between Corporate Digital Transformation and Cost Stickiness

The five key elements of internal control are fundamental safeguards that enable firms to leverage internal control mechanisms in managing financial risks. Among them, the control environment forms the foundation for the other four elements; control activities are central; risk assessment serves as a prerequisite; monitoring provides assurance; and information and communication function as the conduit for transmitting information (Ye Chengang et al., 2016) [6]. Prior research has shown that high-quality internal control can effectively suppress real earnings management behavior, thereby reducing cost stickiness (Yang Shunhua et al., 2023) [7]. Digital transformation significantly strengthens the negative correlation between internal control and corporate financial risk—meaning the implementation of digital transformation strategies enhances the role of internal control in managing financial risk (Wang Chenhao & Wang Junhui, 2025) [8]. Through leveraging the effectiveness of digital information, corporate digital transformation can suppress second-type agency costs by improving internal control and enhancing the information environment in the market (Yao Youfu, 2022) [9].

In summary, digital transformation can, to a certain extent, improve the quality of a firm’s internal control, which in turn helps reduce cost stickiness. Based on this, the paper proposes the following hypothesis:

H2: Digital transformation improves the quality of internal control, thereby further suppressing cost stickiness.

2.3 The Impact of Accounting Information Transparency on the Relationship Between Digital Transformation and Cost Stickiness

Accounting information serves as the primary basis for external stakeholders to understand a company’s true financial condition and operating results, which informs their investment and financing decisions. At the same time, shareholders rely on accounting information to evaluate management’s performance. Therefore, the quality of accounting information is a focal point of concern from multiple perspectives, with accounting information transparency being a key manifestation of accounting information quality. Through digital transformation, enterprises establish accounting information platforms that enhance the visibility of operational activities across different functional departments, making management’s accounting policy choices more transparent (Xi Chenglong & Liu Huanfeng, 2024) [10]. Digital transformation gradually shifts communication within and between firms towards platform-based systems, enabling data connectivity and interoperability across entities (Zhu Heliang & Wang Chunjuan, 2021) [11].

Digital transformation facilitates communication and collaboration between internal departments and positions. Distributed information architectures and shared network platforms significantly improve information transparency and dissemination efficiency, helping to reduce information asymmetry (Qi Huaijin et al., 2020) [12]. Furthermore, digital transformation enables cross-platform integration of corporate information, increasing internal business process transparency, accelerating information flow and utilization, and enhancing transparency both within and outside the firm (Zhang Yongshen et al., 2021) [13]. The breaking down of “data silos” has substantially improved resource allocation, cost management, and responses to environmental changes.

Therefore, accounting information transparency affects the relationship between digital transformation and cost stickiness. Based on this, the paper proposes the following hypothesis:

H3: Digital transformation improves accounting information transparency, thereby further suppressing cost stickiness.

3. Research Design

3.1 Research Design

To test whether digital transformation suppresses cost stickiness, this study adopts a regression model based on the methodologies of Anderson et al. (2003) [14] and Liang Shangkun et al. (2018) [15], as specified below:

$$\boldsymbol{sticky = \alpha + \beta DIGITAL - A + \gamma' Control + \sum year + \sum ind + \varepsilon}$$

In this model, the dependent variable Sticky represents cost stickiness. This study primarily focuses on the estimated value of the regression coefficient β. If the estimated coefficient is significantly negative, it indicates that digital transformation suppresses cost stickiness, thereby supporting the hypothesis of this paper.

Drawing on existing research, this study controls for two types of variables in the model. The first type includes firm-level variables: company size (Size), return on assets (ROA), leverage ratio (Lev), cash flow ratio (Cashflow), whether the firm incurred a loss in the previous year (Loss), listing age (Age), and management shareholding ratio (Mshare). The second type consists of year dummy variables (year) and industry dummy variables (ind). Detailed variable definitions are provided in Table 1.

Table 1. Variable Definition

Variable Name	Variable Symbol	Variable Definition
Digital Transformation	DIGITAL-A	Logarithm of (1 plus the total frequency of digital-related keywords in the company's annual report)
Digital Technology Application	DIGITAL-B	Logarithm of (1 plus the total frequency of digital technology application keywords in the annual report)
Cost Stickiness	sticky	Calculated using the Weiss model
Industry Peer Digitalization Level	IDBM	Average digital transformation level of other companies in the same industry segment as the focal firm
Internal Control	IC	Natural logarithm of (1 plus the internal control index from the DIB database)
Accounting Information Transparency	Trans	Average percentile rank of five variables: earnings quality indicator, information disclosure rating by Shenzhen Stock Exchange, number of analyst followers, analyst earnings forecast accuracy, and whether audited by one of the Big Four international firms
Market Monopoly Degree	Pcm	Measured by the firm's Lerner index
Company Size	Size	Natural logarithm of total assets at year-end
Return on Assets	ROA	Net profit at year-end divided by total assets
Leverage Ratio	Lev	Total liabilities divided by total assets
Cash Flow Ratio	Cashflow	Net cash flow from operating activities divided by total assets
Previous Year Loss	Loss	1 if net profit in the previous year is less than 0, otherwise 0
Listing Age	Age	Natural logarithm of the number of years the company has been listed
Management Shareholding	Mshare	Number of shares held by directors, supervisors, and senior executives divided by total shares
Year	year	Year dummy variable
Industry	ind	Industry dummy variable

3.2 Data Sources and Sample Selection

This study selects A-share listed companies from 2012 to 2023 as the research sample. All data are sourced from the China Stock Market & Accounting Research (CSMAR) database. Following the approach of Wu Fei et al. (2021) [16], the digitalization of enterprises is measured by counting the frequency of 76 digitization-related keywords across five dimensions: artificial intelligence technology, big data technology, cloud computing technology, block chain technology, and digital technology application. To ensure the accuracy and

representativeness of the data analysis, and based on existing related studies, the raw data were processed as follows: (1) samples related to the financial sector, including banks, insurance, and securities companies, were excluded; (2) samples of companies that were under ST or *ST status during the sample period were removed; (3) samples with missing key variables were deleted; (4) to eliminate the influence of extreme values, the sample variables were winsorized at the 1% level on both tails. Ultimately, a total of 28,301 valid sample observations were obtained.

3.3 Descriptive Statistics

This paper provides statistics for the main variables in the model, with the results shown in Table 2. The core explanatory variable, digital transformation (DIGITAL-A), has a minimum value of 0 and a maximum of 6.38, exhibiting a significant right-skewed distribution across firms. The mean and standard deviation are close, indicating that most firms have a relatively low level of digitalization, while a few have achieved a high degree of digital transformation. The standard deviation of 1.368 is much higher than the mean, reflecting substantial variation in the pace and depth of digital transformation among firms. This variation may be related to factors such as firm size, industry characteristics, and management's strategic preferences.

The explained variable, cost stickiness (sticky), ranges from -4.488 to 3.494, with a standard deviation of 0.92, indicating notable differences in firms' cost adjustment capabilities and their ability to adapt to changes in the market environment. The average value of cost stickiness is negative, suggesting that, overall, firms still maintain some cost adjustment capacity when revenue declines, though the extent of adjustment is limited.

Table 2. Descriptive Statistics of the Main Variables

Variable	Sample Size	Mean	Standard Deviation	Minimum	Maximum
DIGITAL-A	28301	1.561	1.368	0.000	6.380
sticky	28301	-0.185	0.920	-4.488	3.494
Size	28301	22.280	1.332	17.641	28.697
Lev	28301	0.428	0.205	0.008	1.957
ROA	28301	0.038	0.071	-1.859	1.285
Cashflow	28301	0.048	0.072	-0.742	0.876
Loss	28301	0.117	0.322	0.000	1.000
ListAge	28301	2.164	0.834	0.000	3.526
Mshare	28301	13.889	19.645	0.000	235.262
DIGITAL-B	28301	1.035	1.124	0.000	6.073
IDBM	28262	13.506	19.384	0.000	164.750
IC	26521	6.339	0.938	0.000	6.803
Trans	19971	5.515	2.023	1.000	10.000
Pcm	28001	0.126	0.130	-0.766	0.572

4. Empirical Analysis

4.1 Analysis of Benchmark Regression Results

The regression results are shown in Table 3. The digital transformation variable (DIGITAL-A) exhibits a significant negative effect across all four models, indicating that enterprises can significantly reduce cost stickiness by optimizing resource allocation, improving management efficiency, and enhancing information transparency through digital technologies. Column (2) presents the results after including relevant control variables, where the regression coefficient of DIGITAL-A remains significantly negative at the 1% level, further confirming the existence of cost stickiness among Chinese listed companies. Column (3) adds year fixed effects based on column (2), and column (4) introduces industry fixed effects on top of column (3). In both columns, the regression coefficient of DIGITAL-A remains significantly negative at the 1% level, with costs further decreasing. This indicates that digital transformation significantly reduces firms' cost stickiness, thus supporting Hypothesis 1. The adjusted R^2 increases from 0.035 to 0.087, further reinforcing the robustness of the core conclusion.

Table 3. The Impact of Digital Transformation on Cost Stickiness

variable	(1)	(2)	(3)	(4)
DIGITAL-A	-0.213***	-0.204***	-0.204***	-0.201***
	(-29.237)	(-25.174)	(-24.351)	(-23.941)
Size		-0.058***	-0.057***	-0.060***
		(-4.097)	(-3.767)	(-3.928)
Lev		0.272***	0.277***	0.283***
		(4.454)	(4.470)	(4.545)
ROA		1.988***	1.989***	1.962***
		(15.818)	(15.791)	(15.525)
Cashflow		-0.478***	-0.468***	-0.472***
		(-5.059)	(-4.935)	(-4.963)
Loss		-0.382***	-0.373***	-0.375***
		(-16.567)	(-16.071)	(-16.142)
ListAge		0.086***	0.110***	0.106***
		(4.476)	(4.174)	(4.020)
Mshare		-0.001	-0.001	-0.001
		(-0.776)	(-0.741)	(-0.695)
_cons	0.146***	1.179***	1.098***	1.267***
	(11.764)	(4.058)	(3.465)	(3.288)
Year fixed effect	No	No	Yes	Yes
Industry fixed effect	No	No	No	Yes
N	28066	28066	28066	28066
R^2	0.035	0.083	0.085	0.087

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

4.2 Robustness Test

4.2.1 Replacement of the Explanatory Variable

To further verify the robustness of the inhibitory effect of digital transformation on cost stickiness, this study examines the application of digital technologies within enterprises. A regression analysis is conducted by replacing the original explanatory variable digital transformation (DIGITAL-A) with the application of digital technologies (DIGITAL-B) to test the robustness of the results. The regression results are shown in Table 4. The regression coefficient of DIGITAL-B is -0.154 and is significant at the 1% level, indicating that an increase in the level of digital technology application significantly reduces cost stickiness. This result is consistent with the main regression findings and further confirms that digital transformation can effectively suppress cost stickiness.

Table 4. Replacement of the Explanatory Variable

variable	(1)
DIGITAL-B	-0.154***
	(-17.201)
Size	-0.083***
	(-5.492)
Lev	0.299***
	(4.795)
ROA	2.011***
	(15.870)
Cashflow	-0.443***
	(-4.638)
Loss	-0.371***
	(-15.904)
ListAge	0.089***
	(3.351)

Mshare	-0.001
	(-0.992)
_cons	1.626***
	(5.123)
N	28066
R^2	0.074

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

4.2.2 One-Period Lag of the Explanatory Variable

There may be a reciprocal causal relationship between digital transformation and cost stickiness, meaning that firms with lower cost stickiness might be more proactive in pursuing digital transformation. To address the endogeneity issue caused by this reciprocal causality, and considering that the impact of digital transformation on cost stickiness may have a lagged effect, this study follows Liu Yanxia (2022) [17]by using a one-period lagged digital transformation indicator as the explanatory variable for regression analysis. The results are shown in Table 5. The coefficient of the lagged digital transformation variable is -0.079 and is significant at the 1% level, consistent with the baseline regression results.

Table 5. One-Period Lag of the Explanatory Variable

variable	(1)
L.DIGITAL-A	-0.079***
	(-7.691)
Size	-0.080***
	(-3.938)
Lev	0.249***
	(3.040)
ROA	2.185***
	(13.777)
Cashflow	-0.353***
	(-3.047)
Loss	-0.352***
	(-12.458)
ListAge	0.114**
	(2.458)
Mshare	-0.000
	(-0.180)
_cons	1.445***
	(3.306)
N	19483
R^2	0.067

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5. Further Research

This study conducts regressions of the independent variable on the mechanism variables. Jiang Ting (2022) [18] suggests that in testing mediating effects, researchers can propose mechanism variables that reflect the channels through which the independent variable affects the dependent variable. When the relationship between the mechanism variables and the dependent variable is well-established by existing theories and literature, the focus of the mechanism test should be on identifying the causal effect of the independent variable on the mechanism variables. This paper conducts mechanism tests by directly regressing the core explanatory variable DIGITAL-A on the mechanism variables.

5.1 Mechanism Analysis

5.1.1 Mediating Variable: Internal Control (IC)

This paper uses internal control as the mediating variable. Internal control refers to a series of methods, means, and measures taken internally by a firm to achieve business objectives, protect asset security, ensure the reliability of information, and promote legal and compliant business operations. Existing literature mainly evaluates internal control through two approaches: one based on core internal control elements, and the other based on internal control objectives. Referring to Li Ruijing et al. (2022) [19], this paper uses the internal control index scores and ratings published by DIB as the measurement, denoted as IC.

The regression results in Table 6. show that the coefficient of DIGITAL-A on cost stickiness is -0.1894 and is significant at the 1% level, consistent with the main regression results. Moreover, the coefficient of DIGITAL-A on internal control quality is 0.0216, also significant at the 1% level, indicating that higher levels of digital transformation are associated with better internal control quality. Therefore, this paper finds that digital transformation not only directly suppresses cost stickiness but also indirectly affects it by improving the quality of internal control. Digital transformation can optimize corporate governance mechanisms and strengthen management control, thereby enhancing the micro-mechanism of cost adaptability.

Table 6. Results of Enterprise Internal Control

variable	(1) y	(2) IC
DIGITAL-A	-0.1894***	0.0220***
	(0.0000)	(0.0000)
Size	-0.0184***	0.0819***
	(0.0020)	(0.0000)
Lev	0.2345***	-0.3775***
	(0.0000)	(0.0000)
ROA	1.6421***	1.4922***
	(0.0000)	(0.0000)
Cashflow	-0.6745***	-0.0730
	(0.0000)	(0.4112)
Loss	-0.3943***	-0.3601***
	(0.0000)	(0.0000)
ListAge	0.0539***	-0.0776***
	(0.0000)	(0.0000)
Mshare	-0.0010***	0.0008**
	(0.0092)	(0.0230)
_cons	0.3795***	4.8506***
	(0.0019)	(0.0000)
N	28066	26304
adj. R^2		

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.1.2 Mediating Variable: Accounting Information Transparency

While internal control reflects an internal perspective, this paper uses accounting information transparency as an external perspective for the second mediating variable. Accounting information transparency refers to the level at which management discloses accounting information to shareholders and external stakeholders. Following the method of Xin Qingquan et al. (2013) [20], this paper constructs a composite transparency index, Trans, based on the average percentile rankings of five variables: earnings quality indicators, information disclosure assessment results from the Shenzhen Stock Exchange, number of analysts following the firm, analyst forecast accuracy, and whether the company is audited by one of the Big Four international accounting firms.

As shown in Table 7., the coefficient of digital transformation on cost stickiness is -0.1894 and is highly significant at the 1% level, confirming the main effect—that digital transformation significantly suppresses cost stickiness. The coefficient of digital transformation on accounting information transparency (Trans) is 0.0208 and is

significant at the 10% level, with a positive sign, indicating that digital transformation contributes to improving the transparency of corporate accounting information.

Therefore, digital transformation not only directly reduces cost stickiness but also indirectly enhances firms' dynamic cost adjustment capabilities by improving accounting information transparency. This underscores the crucial role of an optimized information environment in reducing cost stickiness.

Table 7. Results of Accounting Information Transparency

variable	(1) y	(2) Trans
DIGITAL-A	-0.1894***	0.0364***
	(0.0000)	(0.0005)
Size	-0.0184***	0.0013
	(0.0020)	(0.9163)
Lev	0.2345***	-0.9047***
	(0.0000)	(0.0000)
ROA	1.6421***	4.7449***
	(0.0000)	(0.0000)
Cashflow	-0.6745***	-6.0539***
	(0.0000)	(0.0000)
Loss	-0.3943***	-0.2694***
	(0.0000)	(0.0000)
ListAge	0.0539***	0.1150***
	(0.0000)	(0.0006)
Mshare	-0.0010***	-0.0018
	(0.0092)	(0.1029)
_cons	0.3795***	5.4254***
	(0.0019)	(0.0000)
N	28066	19840
adj. R^2	0.128	0.0947

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.1.3 Moderating Variable: Market Monopoly Degree (Pcm)

The degree of market monopoly directly influences a firm's operating environment and decision-making motivations. To further explore the moderating effect of the market environment on the relationship between digital transformation and cost stickiness, this paper introduces a firm-level market monopoly indicator—the Lerner Index—into the regression analysis. Following Wang Yanchao et al. (2020) [21], the Lerner Index is used to measure market monopoly power, which reflects a firm's ability to set prices above direct or marginal costs. A higher Lerner Index indicates stronger pricing power and greater monopoly power.

As shown in Table 8., the regression coefficient of the Lerner Index is -0.4260 and is significant at the 1% level, suggesting that the degree of market monopoly has a certain impact on cost stickiness. In Column (2), an interaction term is introduced, and its coefficient is 0.1260, which is significant at the 5% level. This result indicates that market monopoly plays a moderating role in the relationship between digital transformation and cost stickiness, further confirming the importance of market structure characteristics.

These findings suggest that the monopolistic nature of a firm's market environment significantly influences the effectiveness of digital transformation in reducing cost stickiness. When market competition is lower, the suppressive effect of digital transformation on cost stickiness may be weakened to some extent.

Table 8. Results of the Degree of Market Monopoly

variable	(1)	(2)
DIGITAL-A	-0.2014***	-0.2002***
	(-22.0521)	(-21.8580)
Pcm	-0.4260***	-0.3958***
	(-3.6725)	(-3.3921)
DIGITAL-A×Pcm		0.1260**
		(2.3573)
Size	-0.0496***	-0.0513***
	(-2.8443)	(-2.9282)
Lev	0.2582***	0.2589***
	(3.3267)	(3.3339)
ROA	2.3665***	2.3474***
	(8.5491)	(8.4978)
Cashflow	-0.4159***	-0.4145***
	(-3.9753)	(-3.9569)
Loss	-0.3852***	-0.3841***
	(-12.2958)	(-12.2588)
ListAge	0.1117***	0.1092***
	(4.1799)	(4.0878)
Mshare	-0.0007	-0.0006
	(-0.8149)	(-0.7930)
_cons	0.9670***	1.0016***
	(2.6712)	(2.7534)
N	27791	27791
R^2	0.0873	0.0877

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.2 Heterogeneity Analysis

5.2.1 Firm Size

Firm size may influence the effectiveness of digital transformation in practice. To examine the heterogeneous effects among firms of different sizes, this study follows the approach of Luo Yu (2024) [22] and divides the sample into two groups—large and small firms—based on whether a firm's total assets are above or below the industry median. According to the regression results presented in Table 9., the coefficient of digital transformation for small and medium-sized enterprises (SMEs) is significantly larger in absolute value at the 1% level compared to that of large firms. This indicates that the inhibitory effect of digital transformation on cost stickiness is more pronounced in SMEs.

This phenomenon can be attributed to the characteristics of digital transformation, such as knowledge spillovers, peer effects, and the “long-tail effect,” which contribute to the formation of digital technology service ecosystems and create more transformation opportunities for small and medium-sized enterprises (SMEs). In contrast, although large firms possess resource advantages, the expansion of firm size often leads to rigid organizational structures, increased communication costs, and heavier internal management burdens, which may undermine the efficiency of digital transformation. Therefore, differences in firm size influence the effectiveness of digital transformation in mitigating cost stickiness, with SMEs benefiting more significantly from such initiatives.

Table 9. Analysis of Heterogeneity in Enterprise Scale

variable	(1) large firms	(2) medium-sized enterprises
DIGITAL-A	-0.175***	-0.229***
	(-15.47)	(-16.18)
Size	-0.0872***	-0.00407
	(-3.41)	(-0.12)

Lev	0.343***	0.253**
	(3.51)	(2.62)
ROA	2.671***	1.978***
	(13.21)	(10.76)
Cashflow	-0.283*	-0.676***
	(-1.96)	(-4.94)
Loss	-0.347***	-0.346***
	(-10.50)	(-9.71)
ListAge	0.146***	0.0814
	(3.41)	(1.95)
Mshare	0.000818	-0.00178
	(0.64)	(-1.51)
_cons	1.650**	0.0467
	(2.95)	(0.07)
N	15224	12825

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.2.2 Nature of Corporate Resources

The nature of a firm's resources may lead to differences in how digital transformation affects cost stickiness. Following the classification method by Yin Meiqun (2018) [23], this study categorizes sample firms into technology-intensive, asset-intensive, and labor-intensive types based on the 2012 CSRC industry classification. As shown in Table 10., the regression results indicate that digital transformation has the most significant suppressing effect on cost stickiness in asset-intensive firms.

This can be attributed to the fact that cost stickiness in asset-intensive firms mainly stems from rigid equipment usage and delayed capacity adjustment. Digital technologies, such as real-time equipment monitoring and intelligent scheduling, can directly alleviate these issues. In labor-intensive firms, cost stickiness is often caused by inflexible labor allocation, which can be improved through better supply chain responsiveness and reduced labor redundancy. However, in technology-intensive firms, high and irreversible R&D expenditures limit the marginal effect of digital transformation in reducing cost stickiness, even though it may enhance R&D process efficiency.

Table 10. Analysis of the Heterogeneity of Enterprise Resource Nature

variable	(1) technology-intensive firms	(2) asset-intensive firms	(3) labor-intensive firms
DIGITAL-A	-0.179***	-0.265***	-0.200***
	(-14.48)	(-11.89)	(-14.44)
Size	-0.116***	-0.0956*	0.0191
	(-4.74)	(-2.35)	(0.75)
Lev	0.381***	0.199	0.103
	(4.04)	(1.28)	(0.98)
ROA	2.486***	1.298***	1.783***
	(13.12)	(4.19)	(8.61)
Cashflow	-0.746***	-0.389	-0.156
	(-4.96)	(-1.46)	(-1.14)
INV	-0.383*	-0.793*	-0.429***
	(-2.09)	(-1.98)	(-3.53)
Loss	-0.439***	-0.288***	-0.335***
	(-12.50)	(-5.37)	(-9.00)
ListAge	0.129***	0.0725	0.113*
	(3.52)	(0.99)	(2.43)
Mshare	-0.000556	-0.000918	0.000137
	(-0.55)	(-0.39)	(0.09)
_cons	2.260***	2.156*	-0.531

	(4.46)	(2.47)	(-0.98)
N	13732	4951	9858

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.2.3 Ownership Nature

State-owned enterprises (SOEs) bear policy responsibilities such as employment stability and industrial support, causing their cost adjustments to be influenced by non-economic goals, which may weaken the resource allocation optimization effect of digital transformation. In contrast, non-state-owned enterprises (non-SOEs) rely on market signals and are more likely to leverage digital tools to reduce cost stickiness. To compare the impact of digitalization on cost stickiness between different ownership types, this study divides the sample into SOEs and non-SOEs for regression analysis (see Table 11.). The results show that the inhibitory effect of digital transformation on cost stickiness is stronger in non-SOEs, with coefficients significantly higher than those of SOEs at the 1% level. This may be because non-SOEs face more intense market competition and have more flexible decision-making mechanisms, enabling them to better activate digital capabilities, whereas SOEs are constrained by multiple policy objectives and management inertia, limiting the depth of digital transformation in core cost management. The digital transformation coefficients for both ownership types are significantly negative at the 1% level, -0.178 for SOEs and -0.212 for non-SOEs, indicating a significant reduction in cost stickiness.

Table 11. Analysis of Heterogeneity in Property Rights Nature

variable	(1) SOEs	(2) non-SOEs
DIGITAL-A	-0.178***	-0.212***
	(-12.52)	(-19.31)
Size	-0.0298	-0.0565**
	(-1.14)	(-2.77)
Lev	0.287*	0.321***
	(2.56)	(3.87)
ROA	2.123***	1.839***
	(7.36)	(12.20)
Cashflow	-0.357*	-0.520***
	(-2.22)	(-4.15)
Loss	-0.249***	-0.470***
	(-6.42)	(-14.88)
ListAge	0.0877	0.121***
	(1.33)	(3.52)
Mshare	0.0069	-0.000968
	(1.11)	(-1.09)
_cons	0.534	1.099**
	(0.92)	(2.60)
N	9144	17315

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

5.2.4 Regional Heterogeneity

Due to differences in economic strength and development levels across provinces, the impact of digital transformation on cost stickiness varies by region. Based on the classification in the China Statistical Yearbook, this study divides the sample into Eastern and Central-Western regions. The regression results in Table 12. show that the inhibitory effect of digital transformation on cost stickiness is significantly stronger for firms in the Central-Western region than those in the Eastern region. This may be because firms in the Central-Western region have long faced resource constraints and low management efficiency, so digital transformation can effectively optimize resource allocation and supply chain coordination, compensating for management weaknesses and thus more effectively reducing cost stickiness. In contrast, firms in the Eastern region operate in a more market-oriented

environment with relatively mature management practices, resulting in diminishing marginal benefits of digital technology and limited potential to reduce cost stickiness.

Table 12. Analysis of Regional Heterogeneity

variable	(1) Eastern region	(2) Central-Western region
DIGITAL-A	-0.200***	-0.207***
	(-20.31)	(-12.85)
Size	-0.0492**	-0.0870**
	(-2.65)	(-3.16)
Lev	0.222**	0.448***
	(2.97)	(3.91)
ROA	2.118***	1.601***
	(14.18)	(6.64)
Cashflow	-0.481***	-0.363*
	(-4.28)	(-2.01)
Loss	-0.391***	-0.350***
	(-13.81)	(-8.50)
ListAge	0.126***	0.0712
	(4.08)	(1.32)
Mshare	-0.000585	-0.000392
	(-0.66)	(-0.20)
_cons	0.954*	1.694**
	(2.46)	(2.89)
N	20032	7904

Note: The robust t-statistic is in parentheses; ***, ** and * respectively indicate significance at the levels of 1%, 5% and 10%.

6. Conclusion

This study uses data from A-share listed companies in China from 2012 to 2023 as the research sample. It constructs a measurement index for digital transformation and establishes a theoretical model to empirically analyze the relationship between digital transformation and cost stickiness, thereby examining the impact of digital transformation on cost stickiness in enterprises. The findings reveal that digital transformation has a significant inhibitory effect on cost stickiness, and this conclusion remains robust after a series of robustness tests. Mechanism analysis indicates that digital transformation reduces cost stickiness by enhancing the quality of internal control and increasing the transparency of accounting information. The suppressive effect of digital transformation on cost stickiness is more evident in small and medium-sized enterprises, asset-intensive firms, non-state-owned enterprises, and firms located in central and western China.

This paper provides empirical evidence for enterprises aiming to reduce cost stickiness and improve cost management efficiency, as well as for the government in promoting digital technologies and the development of the digital economy. It also offers the following policy recommendations for both government and enterprises:

At the government level:

(1) Vigorously support the development of digital technologies and the digital economy, actively guide enterprises in digital reform, and provide financial and policy support to lay a solid foundation for corporate digital transformation;

(2) Offer technical training and support throughout the digital transformation process to help enterprises acquire the necessary knowledge and skills;

(3) Improve digital infrastructure by strengthening information network construction and establishing open and integrated digital service platforms, providing a strong foundation for the rapid development of digital technologies and a shared platform for technological exchange;

(4) Accelerate the development of a sound market system, strengthen regulatory oversight, and foster a fair and open competitive environment that enables enterprises to fully benefit from digital transformation.

At the enterprise level:

(1) Strengthen awareness of digitization, seize new opportunities brought by the digital economy, actively engage in digital development, increase investment in digital transformation, and advance transformation steadily to leverage the benefits of digitization;

(2) Fully harness the positive effects of digital technologies to improve overall management efficiency；

(3) Continuously enhance technological innovation capabilities and actively engage in innovative activities to provide a strong technical foundation for digital transformation;

(4) In the process of digital transformation, enterprises should tailor their strategies based on their specific circumstances, such as ownership structure, firm size, and regional characteristics, and formulate targeted digital transformation plans to drive digital reform effectively.

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