The Impact of Corporate Digital Innovation on Debt Financing Costs: The Mediating Role of Information Disclosure Quality

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Abstract. This study employs data from A-share listed companies in China from 2012 to 2023 to empirically examine the impact of corporate digital innovation on debt financing costs, with a particular focus on the mediating role of information disclosure quality. Utilizing textual analysis methods, the findings reveal that the true effect of digital innovation on debt financing costs may be partially obscured by other factors in the main regression analysis. After accounting for control variables that absorb confounding effects, the net impact becomes more pronounced. Robustness checks confirm the validity of the core findings across different measurement approaches, suggesting that the cost-reducing effect of digital innovation on debt financing exhibits broad applicability. Mechanism analysis further demonstrates that information disclosure quality serves as a significant mediator in the relationship between digital innovation and financing costs. Heterogeneity analysis using interaction terms shows that improvements in digital innovation significantly reduce debt financing costs across firms of different sizes, board independence levels, and growth potentials. As existing research on the mechanisms through which digital innovation influences debt financing costs remains limited, this study contributes to the literature by enriching the understanding of the economic consequences of digital innovation.

Keywords: Level of Digital Innovation; Cost of Debt Financing; information disclosure quality.

1. Introduction

1.1. Research Significance

With the rapid advancement of the digital economy, digital innovation has become a key driver of high-quality corporate development. In recent years, the Chinese government has placed strong emphasis on enhancing the digital innovation capabilities of enterprises. The 2024 Government Work Report explicitly calls for “the deep integration of digital technologies with the real economy to empower the transformation and upgrading of traditional industries,” while also stressing the need to “strengthen intellectual property protection, improve the governance framework for the digital economy, and unlock the potential of data as a production factor.” Similarly, the “14th Five-Year Plan for Digital Economy Development,” issued by the State Council, outlines the imperative to “accelerate the construction of digital information infrastructure and continuously improve the digital innovation service system.” During the annual "Two Sessions" meetings, numerous delegates advocated for accelerating enterprise digital innovation, enhancing technical barriers through strategic patent deployment, and cultivating new sources of international competitiveness.

Against this backdrop, digital patents—serving as a concentrated embodiment of technological achievements—provide a direct reflection of a firm’s capacity to transform digital technologies into core competitive advantages. These patents offer a quantitative basis for evaluating the effectiveness of national digital transformation policies. Existing literature has shown that digital patents can not only enhance coordination across industrial chains through technological spillovers (Breschi et al., 2022), but also reshape corporate value creation logic. Notably, patents based on technologies such as artificial intelligence and blockchain significantly improve a firm’s responsiveness to market demand (Cennamo et al., 2020).

Given these developments, an important question emerges: how can digital innovation be leveraged to maximize its utility for enterprises? The actual value of enterprise-generated digital patents lies in their ability to provide direct commercial benefits for operations and decision-making.

Their latent value, on the other hand, lies in the potential to generate future growth, innovation, and competitive advantages (Xu et al., 2024).

As a core variable in corporate financial decision-making, the cost of debt financing not only directly affects a firm's capital structure and investment efficiency, but also serves as a critical indicator of the efficiency of financial resource allocation. The level of debt financing cost determines the extent of financial constraints faced by firms, thereby influencing their capacity for technological innovation, scale expansion, and long-term competitiveness (Zhang Xinmin et al., 2021). Existing studies indicate that reducing debt financing costs can significantly alleviate financial constraints and improve investment efficiency—this is particularly vital for high-tech enterprises and small-to-medium-sized private firms, for whom financing costs may be a matter of survival (Lu Zhengfei et al., 2018). Furthermore, debt financing costs are influenced by macroeconomic policy, the development of financial markets, and the firm's own credit risk. Therefore, identifying the driving factors behind debt financing costs not only enhances our understanding of corporate financing behavior, but also provides theoretical guidance for optimizing financial resource allocation and reducing financing costs in the real economy (Wang Yongqin et al., 2020).

1.2. Research Methodology and Findings

This study investigates how digital innovation affects corporate debt financing costs. It hypothesizes that improvements in the level of digital innovation enhance the quality of information disclosure, thereby significantly reducing a firm's debt financing costs. Using a panel dataset of Chinese A-share listed companies from 2012 to 2023, and employing textual analysis methods, the study empirically examines both the direct impact of digital innovation on debt financing costs and the mediating role played by information disclosure quality in this relationship.

The main findings are as follows:

(1) The actual effect of digital innovation on debt financing costs may be partially masked by other factors; once control variables are included to absorb confounding influences, the net effect becomes more pronounced.

(2) The core conclusion remains robust across alternative measurement approaches, confirming the generalizability of digital innovation's cost-reducing effect on debt financing.

(3) Mechanism analysis reveals that information disclosure quality serves as a crucial mediator through which digital innovation influences debt financing costs.

(4) Heterogeneity analysis using interaction terms shows that improvements in digital innovation significantly reduce debt financing costs across firms of varying sizes, board independence ratios, and growth potentials.

Therefore, the study concludes that corporate digital innovation can effectively lower debt financing costs by enhancing the quality of information disclosure.

1.3. Research Contributions

A substantial body of literature has analyzed the determinants of debt financing costs from the perspectives of credit risk, information environments, market conditions, and international factors (Xie Peibo et al., 2023). However, only a limited number of studies have incorporated digital innovation into the analytical framework of corporate debt financing. In the context of a rapidly developing digital economy, digital innovation has fundamentally reshaped traditional business models and product paradigms, offering new momentum for China's pursuit of high-quality development (Yu Jiang et al., 2017).

Existing studies have explored how improvements in digital capabilities enhance supply chain coordination efficiency (Breschi et al., 2022), suggesting that digital innovation may also reduce debt financing costs by improving information transparency and reducing agency costs. Moreover, research on patent holdings has shown that technological innovation enables firms to reduce debt financing costs, as reflected in narrower loan spreads associated with higher patent counts (Francis et al., 2012).

Nevertheless, research that systematically examines the mechanisms through which digital innovation affects debt financing remains scarce. By exploring the relationship between corporate digital innovation and debt financing costs, this study not only extends the boundaries of corporate finance theory but also provides empirical evidence for policymakers to refine financial support mechanisms and promote the deep integration of digital technologies with the financial system.

2. Literature Review and Research Hypothesis

2.1. Literature Review

The core focus of this study is whether the level of corporate digital innovation can significantly reduce the cost of debt financing by improving the quality of information disclosure. In recent years, the rapid development of digital innovation and the digital economy has attracted increasing attention from academia. Existing literature suggests that digital innovation can enhance firm value by improving production efficiency (Wu Fei et al., 2021), optimizing governance structures (Xiao Tusheng et al., 2022), and strengthening market competitiveness (Zhao Chenyu et al., 2023). Furthermore, corporate invention patents, as a key vehicle of technological innovation, can convey positive signals to the market and reduce information asymmetry (Wang Yongqin et al., 2022). Digital innovation also helps optimize corporate decision-making through big data and artificial intelligence technologies, thereby mitigating financing frictions (He Fan et al., 2023).

The cost of debt financing is influenced by factors such as corporate credit risk, the information environment, market conditions, and the international landscape. Previous studies have found that high-quality information disclosure (Li Wenjing et al., 2021), sound financial conditions (Zhang Xinmin et al., 2022), and strong ESG performance (Shen Hongtao et al., 2023) can all significantly reduce debt financing costs. Moreover, firms with strong innovation capabilities often enjoy lower financing premiums, as their technological assets can serve as collateral or enhance debt repayment capacity (Lu Zhengfei et al., 2022). While existing research has separately explored the determinants of digital innovation and debt financing costs, there remains limited literature directly linking the two. The mechanism through which digital innovation specifically affects the cost of debt financing warrants further exploration. Therefore, this study, based on data from A-share listed companies in China, investigates in depth the impact of digital innovation on the cost of debt financing, aiming to provide new empirical evidence for the field.

2.2. Hypothesis Research

Against the backdrop of the flourishing digital economy, digital technologies represented by big data, artificial intelligence, blockchain, and cloud computing are profoundly reshaping corporate operations and competitive advantages (Brynjolfsson et al., 2016). The advancement of digital innovation significantly enhances the quality of corporate information disclosure. This enhancement is primarily reflected in the deep application of digital technologies, which enables firms to collect, process, and disclose information more efficiently, thereby improving the accuracy and timeliness of financial data. The development of digital platforms also reduces the cost of information disclosure, allowing companies to provide more comprehensive and timely information to creditors at lower costs.

Improved information disclosure quality, in turn, contributes to a reduction in the cost of debt financing. The underlying mechanisms are as follows: high-quality disclosure effectively mitigates information asymmetry between creditors and firms, enabling creditors to more accurately assess a company's true credit risk; sufficient disclosure lowers creditors' costs of information search and monitoring, thereby reducing the required risk premium; and sustained transparency helps build a positive market reputation, enhancing creditor trust.

Based on the above analysis, this study proposes **Hypothesis 1**: *An increase in the level of corporate digital innovation significantly reduces the cost of debt financing.*

3. Empirical Design

3.1. Sample Selection and Data Sources

Based on the availability of corporate digital innovation patent data, this study selects a sample of A-share listed companies in China from 2012 to 2023. The initial dataset includes 46,774 firm-year observations. The sample is refined through the following steps: First, financial sector firms (1,038 observations) are excluded;

Second, firms labeled as ST or *ST during the sample period (1,286 observations) are removed; Third, firms with negative net assets (i.e., insolvent firms, 121 observations) are excluded; Fourth, firms with severe missing values in key control variables for the main regression (7,426 observations) are deleted. After these steps, the final sample comprises 36,903 firm-year observations. Additionally, all continuous variables are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. All financial data used in this study are obtained from the CSMAR (China Stock Market & Accounting Research) database, specifically the Company Research Series.

3.2. Model Specification

Building upon the theoretical analysis and relevant literature review, this study constructs the following econometric model to investigate the relationship between corporate digital innovation (as measured by digital innovation patents) and the cost of debt financing:

$$Deb_{i,t} = \beta_0 + \beta_1 Dig_{i,t} + \sum \varphi CV + \sum Year + \sum Industry + \varepsilon_{i,t}$$

In this model, the dependent variable is the **cost of corporate debt financing**, proxied by the ratio of the total amount of interest expenses, service fees, and other financial charges to the total liabilities at the end of the period, multiplied by 100 (**Deb**).

The key independent variable is the **level of corporate digital innovation**, measured as the natural logarithm of one plus the number of digital innovation-related invention patents and utility model patents (**Dig**).

CV represents the set of control variables discussed previously, and **ε** denotes the random error term. Additionally, $\sum Year$ represents **time fixed effects**, $\sum Industry$ denotes **industry fixed effects**.

3.3. Variable Definitions

(1) Dependent Variable: Cost of Debt Financing (Deb)

Following the approach of Liu Li et al. (2009), this study measures the cost of corporate debt financing by calculating the ratio of total interest expenses, service fees, and other financial charges to total liabilities at the end of the period, multiplied by 100. This measure is adopted because listed companies incur not only direct costs (e.g., interest payments) but also indirect costs (e.g., service fees and other financial expenses) in the debt financing process. Both types of costs jointly constitute the firm's debt financing cost.

(2) Independent Variable: Level of Digital Innovation

The level of digital innovation is measured by the number of digital invention patent applications filed by Shanghai and Shenzhen A-share listed companies from 2012 to 2023. Given the multidimensional and dynamic nature of digital innovation, its accurate measurement remains challenging due to factors such as the lag in innovation output, uncertainty in technology commercialization, and industry-specific innovation patterns. Patents serve as a direct indicator of innovation output, with invention patents in particular reflecting a firm’s innovation capabilities. Following the common practice in corporate innovation research (Chen Qingjiang et al., 2021), the digital innovation index is constructed as the natural logarithm of one plus the number of digital invention patent applications.

(3) Control Variables

To mitigate the impact of omitted variable bias, this study includes a range of firm-level control variables: firm size (Size), growth capacity (Growth), proportion of independent directors (Indep), ownership share of the largest shareholder (Top1), return on assets (Roa), leverage ratio (Lev), ratio of tangible assets (Tangible), management expense ratio (Manaexp), asset liquidity (Liquid), CEO duality (Duality), and ownership type (Soe). Details on the variables and their measurement are provided in Table 1.

Table 1. Description of Key Variables

Variable Categories	Variable Symbols	Explanation of Variables
Explained Variables	Deb	The proportion of the total amount of a company's interest expenses, handling charges and other financial expenses to its total liabilities at the end of the period, multiplied by 100.
Explanatory Variables	Dig	Enterprise The natural logarithm of the number of enterprise digital invention patent applications plus one is taken.
Control Variables	Growth	The difference between the current year's operating income and the previous year's operating income divided by the previous year's operating income
	Size	The natural logarithm of the total assets at the end of the period
	Tangible	The sum of fixed assets and inventory at the end of the period divided by the total assets at the end of the period
	Manaexp	Administrative expenses divided by operating income
	Roa	Net profit at the end of the period divided by total assets at the end of the period
	Lev	Total liabilities at the end of the period divided by total assets at the end of the period
	Liquid	Current assets at the end of the period divided by current liabilities at the end of the period
	Top1	The number of shares held by the largest shareholder divided by the total number of shares
	Duality	1 if the chairman and the general manager are the same person, otherwise 0
	Indep	The number of independent directors divided by the number of board members
	Soe	1 if the actual controller is of state-owned nature, otherwise 0

4. Analysis of Empirical Results

(1) Descriptive Statistics Table 2 presents the descriptive statistical results of the main variables. The mean value of the company's debt financing cost (Deb) is 0.889, and the median is 0.182. This indicates that, on average, listed companies need to pay approximately 0.889 yuan in interest for every 100 yuan of debt. Moreover, 50% of listed companies pay less than 0.182 yuan in annual interest for every 100 yuan of debt, suggesting that most listed companies enjoy relatively low debt financing costs. Overall, the debt burden of Chinese listed companies is relatively light. However, a small number of enterprises bear high financing costs, highlighting significant polarization in the debt market. The mean value of the enterprise digital innovation level (Dig) is 1.151, and the median is 0.693. This means that, on average, each listed company owns about 2.16 digital invention patents, and 50% of listed companies own no more than 1 digital invention patent. In addition, the median is significantly lower than the mean, indicating that a small number of enterprises with leading digital innovation levels possess a large number of patents, which raises the overall average. This demonstrates a "concentration at the top" phenomenon in enterprise digital innovation, and the innovation distribution remains unbalanced.

Table 2. Descriptive Statistics of Key Variables

Variable	N	Mean	SD	Min	p25	p50	p75	Max
Deb	36,903	0.889	1.198	0.000	0.000	0.182	1.582	4.799
Dig	36,903	1.151	1.461	0.000	0.000	0.693	2.079	5.775
Size	36,903	22.271	1.288	19.939	21.351	22.075	22.995	26.277
Lev	36,903	0.423	0.204	0.057	0.259	0.414	0.574	0.894
Roa	36,903	0.032	0.064	-0.258	0.011	0.034	0.064	0.192
Tangible	36,903	0.343	0.173	0.017	0.216	0.331	0.456	0.774
Manaexp	36,903	0.087	0.073	0.008	0.042	0.068	0.108	0.454
Liquid	36,903	2.475	2.418	0.329	1.171	1.696	2.781	15.510
Indep	36,903	37.708	5.307	33.330	33.330	36.360	42.860	57.140
Duality	36,903	0.301	0.459	0.000	0.000	0.000	1.000	1.000
Top1	36,903	22.639	17.330	0.367	7.306	19.723	34.402	68.255
Soe	36,903	0.321	0.467	0.000	0.000	0.000	1.000	1.000
Growth	36,903	0.146	0.390	-0.585	-0.045	0.087	0.245	2.343

(2) Main Regression Analysis

Table 3 presents the results of the main regression analysis. Column (1) reports the baseline regression without control variables, where the coefficient of digital innovation (Dig) is −0.024 and statistically significant at the 1% level. This indicates that a one-unit increase in a firm's digital innovation level is associated with an average decrease of 0.024 percentage points in its debt financing cost.Column (2) incorporates a set of control variables, including firm size, leverage, profitability, growth rate, and corporate governance indicators. In this specification, the coefficient of Dig becomes −0.056, remaining significant at the 1% level. The magnitude of the effect more than doubles compared to the baseline model, suggesting that the inclusion of control variables reveals a stronger negative relationship between digital innovation and debt financing cost. This enhancement implies that certain confounding factors may have previously masked the true impact of digital innovation. By accounting for these variables, the model more accurately captures the net effect of digital innovation, thereby reinforcing the conclusion that higher levels of digital innovation contribute to lower debt financing costs.

(3) Robustness Checks

To address potential endogeneity issues such as omitted variable bias, this study conducts robustness checks by altering the measurement of the dependent variable and controlling for time-varying industry and regional characteristics. These tests aim to verify whether the relationship between corporate digital innovation and debt financing cost remains consistent under different specifications. If the results remain significant, it would indicate that the findings are not sensitive to variable definitions, thereby enhancing the credibility of the conclusions.The first column of Table 4 presents the results of the robustness check using an alternative measurement of the dependent variable. Specifically, a new variable, Deb2, is defined as the ratio of interest expenses to the sum of short-term borrowings, current portion of non-current liabilities, long-term borrowings, bonds payable, and long-term payables at the end of year t for firm i. The second column reports the results of the robustness check that does not fix industry effects, thereby allowing for time-varying industry characteristics.Re-estimating the regression models based on these alternative specifications, the results, as shown in Table 4, indicate that the coefficients of digital innovation (Dig) remain negative and statistically significant at the 1% level across both tests. These findings reaffirm the core conclusion that digital innovation significantly reduces the cost of debt financing. The robustness of the model is thereby strengthened, suggesting that the beneficial effect of corporate digital innovation on lowering debt financing costs is consistent across different measurement approaches and model specifications.

Table 3. Main Regression Results

	(1)	(2)
VARIABLES	Deb	Deb
Dig	-0.024***	-0.056***
	(0.000)	(0.000)
Size		0.084***
		(0.000)
Lev		0.975***
		(0.000)
Roa		-2.568***
		(0.000)
Tangible		0.298***
		(0.000)
Manaexp		1.103***
		(0.000)
Liquid		-0.026***
		(0.000)
Indep		0.001
		(0.144)
Duality		-0.026**
		(0.015)
Top1		-0.002***
		(0.000)
Soe		-0.173***
		(0.000)
Growth		-0.046***
		(0.000)
Constant	0.286***	-1.997***
	(0.000)	(0.000)
Observations	36,903	36,903
IND&YEAR FE	YES	YES
Adjusted R-squared	0.397	0.488

5. Further Analysis

(1) Mechanism Analysis

As discussed in the theoretical framework, the quality of information disclosure serves as a key channel through which corporate digital innovation influences the cost of debt financing. Existing research has shown that financial institutions often consider the number, quality, and potential value of digital innovation-related patents when assessing a firm's credit risk. A higher level of digital innovation can enhance the quality of information disclosure and improve earnings management, thereby mitigating information asymmetry in credit assessments and reducing the risk premium required by external stakeholders such as investors and suppliers.

To better understand the mechanism through which digital innovation affects the cost of debt financing, this section conducts an empirical test using two commonly adopted indicators of information disclosure quality: the KV index and the absolute value of discretionary accruals (|DA|). According to Zhou Kaiguo et al. (2011), the KV index captures market-based information and reflects investors' objective evaluation of information asymmetry. It comprehensively measures the effectiveness of both mandatory and voluntary disclosures by listed firms, thus serving as a reliable proxy for disclosure quality. The |DA| measure reflects the extent of discretionary accruals based on the modified Jones model, as published in the CSMAR database. A higher absolute value of DA indicates greater room for earnings manipulation and, hence, lower accounting information quality.As reported in columns (1) and (2) of Table 5, the regression coefficient of the KV index is significantly positive at the 1% level, while the coefficient of |DA| is significantly negative at the 1% level. These

results provide further empirical support for the hypothesis that corporate digital innovation reduces debt financing costs by improving the quality of information disclosure.

Table 4. Robustness Test Results

	(1)	(2)
VARIABLES	Deb2	Deb
Dig	-0.015***	-0.043***
	(0.005)	(0.000)
Size	-0.007*	0.006
	(0.099)	(0.779)
Lev	-0.008	0.729***
	(0.771)	(0.000)
Roa	-0.528***	-1.264***
	(0.000)	(0.000)
Tangible	-0.006	0.286***
	(0.839)	(0.001)
Manaexp	0.012	1.467***
	(0.843)	(0.000)
Liquid	-0.004**	0.004
	(0.024)	(0.429)
Indep	-0.001	-0.001
	(0.536)	(0.485)
Duality	-0.050***	0.005
	(0.000)	(0.814)
Top1	-0.001***	-0.001**
	(0.000)	(0.030)
Soe	-0.018	0.074
	(0.108)	(0.159)
Growth	-0.013	-0.062***
	(0.227)	(0.000)
Constant	0.259**	-0.675
	(0.010)	(0.123)
Observations	9,226	36,903
IND&YEAR FE	YES	YES
Adjusted R-squared	0.891	0.577

(2) Heterogeneity Analysis

In the preceding empirical tests, this study examined the effect of corporate digital innovation on debt financing costs from the perspective of the full sample. However, considering the heterogeneity among micro-level entities, the effectiveness of digital innovation in reducing financing costs may vary depending on firm-specific internal and external characteristics. Based on this rationale, the sample was further segmented by firm size, growth potential, and the proportion of independent directors. Interaction terms were employed to examine how these characteristics influence the relationship between digital innovation and the cost of debt financing.

Table 6 presents the results of the interaction regressions with the three primary moderating variables. Column (1) reports the interaction between firm size and digital innovation, column (2) examines the interaction between the proportion of independent directors and digital innovation, and column (3) reports the interaction between firm growth and digital innovation. The coefficients on the interaction terms *Dig_Size* and *Dig_Indep* are both negative and statistically significant at the 1% level, while the coefficient on *Dig_Growth* is also negative and significant at the 10% level. These results suggest that the impact of digital innovation on reducing debt financing costs varies

significantly across firms with different characteristics. Specifically, the beneficial effect of digital innovation is more pronounced in firms that are larger in size, have a higher proportion of independent directors, or exhibit stronger growth potential.

Table 5. Results of the Mechanism Analysis

	(1)	(2)
VARIABLES	KV	DA
Dig	0.010***	-0.002***
	(0.000)	(0.000)
Size	0.044***	-0.004***
	(0.000)	(0.000)
Lev	-0.039***	0.019***
	(0.000)	(0.000)
Roa	0.540***	-0.207***
	(0.000)	(0.000)
Tangible	-0.011*	-0.001
	(0.073)	(0.714)
Manaexp	0.178***	-0.016**
	(0.000)	(0.028)
Liquid	0.002***	0.000**
	(0.002)	(0.016)
Indep	0.001***	0.000***
	(0.000)	(0.004)
Duality	0.005**	-0.000
	(0.033)	(0.725)
Top1	0.000	-0.000***
	(0.200)	(0.000)
Soe	-0.019***	-0.006***
	(0.000)	(0.000)
Growth	0.026***	0.028***
	(0.000)	(0.000)
Constant	-0.592***	0.141***
	(0.000)	(0.000)
Observations	36,821	36,675
IND&YEAR FE	YES	YES
Adjusted R-squared	0.206	0.133

Several explanations account for these findings. Large firms generally enjoy higher credit ratings and more stable access to capital markets. They also possess greater financial resources, more advanced digital infrastructure, and more efficient R&D and management systems. These advantages enable them to better leverage data assets to improve financing decisions, reduce information asymmetry, and lower innovation costs through economies of scale. Firms with a higher proportion of independent directors typically have stronger corporate governance structures and more professional oversight and advisory mechanisms. This allows for more effective evaluation of the return and risk profiles of digital innovation projects, enhancing decision-making and boosting investor confidence. High-growth firms are more favored by creditors in capital markets, and the signaling effect of digital innovation can further alleviate financing constraints and improve borrowing conditions.

Table 6. Results of Heterogeneity Analysis

	(1)	(2)	(3)
VARIABLES	Deb	Deb	Deb
Dig_Size	-0.010***		
	(0.000)		
Dig_Indep		-0.002***	
		(0.003)	
Dig_Growth			-0.014*
			(0.087)
Dig	0.170***	0.002	-0.054***
	(0.000)	(0.900)	(0.000)
Size	0.098***	0.084***	0.084***
	(0.000)	(0.000)	(0.000)
Lev	0.972***	0.974***	0.977***
	(0.000)	(0.000)	(0.000)
Roa	-2.577***	-2.568***	-2.563***
	(0.000)	(0.000)	(0.000)
Tangible	0.301***	0.299***	0.299***
	(0.000)	(0.000)	(0.000)
Manaexp	1.110***	1.102***	1.109***
	(0.000)	(0.000)	(0.000)
Liquid	-0.025***	-0.025***	-0.025***
	(0.000)	(0.000)	(0.000)
Indep	0.001*	0.003***	0.001
	(0.090)	(0.004)	(0.151)
Duality	-0.025**	-0.026**	-0.025**
	(0.017)	(0.015)	(0.016)
Top1	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)
Soe	-0.172***	-0.173***	-0.173***
	(0.000)	(0.000)	(0.000)
Growth	-0.047***	-0.047***	-0.032**
	(0.000)	(0.000)	(0.035)
Constant	-2.319***	-2.081***	-1.998***
	(0.000)	(0.000)	(0.000)
Observations	36,903	36,903	36,903
IND&YEAR FE	YES	YES	YES
Adjusted R-squared	0.489	0.489	0.488

6. Research Conclusions and Future Directions

Empirical Findings

In the context of the rapid development of the digital economy, digital innovation has emerged as a crucial driver for fostering new growth momentum within enterprises, playing a significant role in promoting the deep integration of informatization and industrialization as well as the high-quality transformation of traditional industries (Li Xiaoqing et al., 2022). Using a sample of A-share listed companies in China from 2012 to 2023, this study systematically investigates the relationship and underlying mechanisms between corporate digital innovation and the cost of debt financing. The main conclusions are as follows:

(1) Corporate digital innovation significantly reduces the cost of debt financing. This core finding remains robust under various alternative measurement approaches;

(2) Mechanism analysis reveals that the quality of information disclosure serves as a key mediating channel through which digital innovation affects the cost of debt financing;

(3) Heterogeneity analysis, using interaction tests, indicates that improvements in digital innovation can significantly reduce debt financing costs across firms of varying sizes, proportions of independent directors, and levels of growth potential. The cost-reducing effect is more pronounced for larger firms and those with a higher proportion of independent directors.

Practical Implications and Limitations

This study contributes to the literature by deepening the understanding of the economic consequences of corporate digital innovation under the broader digital economy context, specifically its impact on debt financing costs and the associated mechanism. However, the analysis is limited in scope, as it only considers information disclosure quality as a mediating variable. Other potential mechanisms remain unexplored.

Future Research Directions

Future studies should aim to identify additional mediating variables that link corporate digital innovation to the cost of debt financing. Further in-depth investigations are needed to elucidate these mechanisms and provide a more comprehensive understanding of the pathways through which digital transformation influences corporate financing outcomes.

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